Decision Report

Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L8675/2012/1
Licence Holder	Millennium Minerals Limited
ACN	003 257 556
File Number	DER2014/002927-1
Premises	Nullagine Gold Operation – Golden Eagle Project Mining Tenements M46/3, M46/47, M46/50, M46/57, M46/64, M46/98, M46/129, M46/138, M46/146, M46/163, M46/164, M46/166, M46/167, M46/170, M46/182, M46/186, M46/187, M46/189, M46/192, M46/198, M46/199, M46/200, M46/225, M46/261, M46/262, M46/263, M46/264, M46/265, M46/266, M46/267, M46/272, M46/273, M46/274, M46/275, M46/276, M46/277, M46/278, M46/279, M46/282, M46/283, M46/300, M46/302, M46/303, M46/426, M46/427, M46/428, M46/429, M46/430, M46/431, M46/432, M46/433, M46/434, M46/436, M46/441, M46/442, M46/443, M46/444, M46/445, M46/446, M46/447, M46/448, G46/2, L46/33, L46/45, L46/88, L46/89, L46/90, L46/91, L46/92, L46/98, L46/105, L46/115, P46/1670, P46/1671, P46/1672, P46/1673, P46/1674, P46/1675, P46/1676, P46/1703, P46/1704, P46/1705, P46/1706, P46/1707, P46/1757, P46/1758, P46/1759, P46/1760, P46/1761, P46/1804, P46/1823, P46/1824, P46/1855, and P46/1856 NULLAGINE WA 6758
Date of Report	2 February 2021
Decision	Licence granted

Alana Kidd

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Date: 2021.02.02 09:29:08 +08'00'

Alana Kidd
Manager, Resource Industries
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

This Decision Report documents the assessment of potential risks to the environment and public health from emissions and discharges during the operation of the Premises. As a result of this assessment, amendment to Licence L8675/2012/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Decision Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary

On 9 August 2020, Millennium Minerals Ltd (MML) (the applicant) submitted an application for a licence amendment to the department under section 57 of the *Environmental Protection Act 1986* (EP Act) to enable an assessment of variations from the original approved design. The application related to changes to the construction of tailings storage facility 2 (TSF2) at the Premises, following previous compliance matters having been resolved (see section 2.3).

MML requested that the changes to TSF2; constructed as a single cell (as opposed to two separate cells and two decant systems) with one central decant system be updated in the licence for future operation, and to bring the site into compliance with licence L8675/2012/1.

On 8 September 2020, a further licence amendment was submitted requesting for Beatons Creek oxide ore to be processed onsite with tailings discharged into TSF2.

The Premises relates to category 5 and an assessed design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in Licence L8675/2012/1. The infrastructure and equipment relating to the Premises category and any associated activities which the department has considered in line with *Guidance Statement: Risk Assessments* (DER 2017) are outlined in Licence L8675/2012/1.

As part of this amendment, the Department has also taken the opportunity to consolidate the licence and previous amendments notices.

2.3 Overview of Premises and history

Nullagine Gold Operation – Golden Eagle Project (the Premises) is located approximately 5.5 km south and east of the township of Nullagine in the Shire of East Pilbara.

In March 2017, MML was granted approval by DWER to construct. TSF2 as a paddock-type tailings impoundment located on Mining Tenements M46/436 and M46/444.

After completion of construction of TSF2, MML contravened conditions of the licence by operating the TSF2 before submitting to DWER compliance documentation confirming that TSF2 was constructed according to licence requirements.

Tailings deposition into TSF2 continued as MML entered voluntary administration and ceased in the second half of December 2019. Since this time, the site has been placed into Care and Maintenance and there has been no further ore processing involving the deposition of tailings into TSF2.

Contravention of licence conditions and other non compliances, were referred to and dealt with by the Departments Compliance section, these being:

- Construction of TSF2 differently to what was approved and started operating the TSF prior to submitting compliance documents.
- Approved TSF design had 2 decant areas whereas only 1 decant area was constructed.
- Construction compliance documentation to TSF2 Cell 2 (5 February 2018) - non-compliant in relation to permeability across the base of TSF2 Cell 2.
- Since the start of operation, 29 incidents/non-compliances listed.
- Site inspection in June 2018 identified further non compliances.
- In May 2020, MML was convicted in the Magistrates Court of Western Australia.

Omission of the environmental compliance documents for TSF2, prior to operation and the subsequent changes to the design of the TSF during operation resulted in uncertainty in the potential environmental impacts of emissions and discharges from the facility.

In September 2020, Novo Resources Corporation acquired MML, which operates the Nullagine Gold Project (NGP) located approximately 10 km south of the Beatons Creek Project. The NGP includes the requisite infrastructure to process ore from Beatons Creek Project.

Description of proposed activity

External Ore Source

MML proposes to bring an external ore source (EOS) to Nullagine Gold Operations for processing and discharge of the resulting tailings. The EOS will come from the Beatons Creek Mine site and will be processed in the NGP Carbon in Leach Plant (CILP) with tailings discharged into TSF2. The recently installed sulphide recovery circuit, not approved under the licence L8675/2012/1, will not be used. The treatment plant process flow diagram is shown in Appendix 2.

Beatons Creek ores will be stored and processed separately from Nullagine Gold Operation ores.

Ore samples were collected from the oxide zone of Beatons Creek (BC). Five tailings samples were generated during bench-scale processing testwork. Each sample was analysed for physical and chemical properties. The EOS tailings properties were compared against the NGP tailings approved under L8675/2012/1 with details outlined below.

Geotechnical characterisation of the external ore

The samples produced from BC oxide ore are finer than the NGP tailings. BC tailings have 93% fines and the NGP TSF2 tailings have 58% fines.

The design settled tailings dry density for TSF2 was 1.45 t/m^3. In field test at TSF2 indicated tailings dry density in the range 1.38 to 1.61 t/m^3, with an average value of 1.49 t/m^3. The BC oxide-ore tailings had a significant variation in the liberated liquor percentage over 48 hrs. The highest dry density recorded during the tests was 1.1 t/m^3 (sample BSX001). BC samples exhibit relatively poor settling performance compared to the NGP tailings. The BC poor settling performance is likely to be influenced by the samples smaller grind size and minerology.

Geochemical characterisation of the external ore

The same generated tailings slurry samples representative of the new tailings stream to be discharged to TSF2 were subject to geochemical testing:

• Acid-forming tendency (based on sulfide-S values);
• Multi-element composition (aqua regia digests); and
• US EPA LEAF testing (as applicable to tailings devoid of sulphide minerals).

The acid forming tendency results are presented in Table 1. The BC oxide tailings were compared against historical NGP tailings results from 2006 and 2010

Table 1: Acid forming properties of BC and NGP tailings.

Parameter	units	Beatons Creek					Nullagine Gold Project		
		BSX 001	BSX 016	BSX 027	BCRC18 014-020	BCRC18 022-024	GCA 6104	GCA 8601	GCA 8602
Total-Sulphur	%	0.06	0.03	0.18	0.26	0.23	0.97	0.5	0.75
Sulfate-S	%	0.05	0.02	0.16	0.18	0.17	0.04	0.03	0.02
Total-C	%	0.05	0.05	0.04	0.05	0.06	n.d.	0.1	0.06
Maximum Potential Acidity	kgH_2SO_4/t	1.8	0.9	5.5	8.0	7.0	29.7	15.3	23.0
Acid Potential	kgH_2SO_4/t	0.3	0.3	0.6	2.4	1.8	28.5	14.4	22.3
Acid Neutralizing Capacity	kgH_2SO_4/t	2	3	3	4	2	11	15	13
Carbon - Neutralization Potential	kgH_2SO_4/t	4	4	3	4	4.9	n.d.	8	5
Net Acid Production Potential	kgH_2SO_4/t	-1.7	-2.7	-2.4	-1.6	-0.2	17.5	-0.6	9.3
Net Acid Generation acidity	kgH_2SO_4/t	3	4	2	4	4	n.d.	6.7	14
Neutralization Potential Ratio	n/a	6.5	9.8	4.9	1.6	1.1	0.4	1.0	0.6
Net Acid Generation	pH	5.5	5.7	5.5	5.4	4.5	2.9	2.6	2.4

Notes:
MPA calculated from Total-S.
AP calculated from sulfide-S (difference between Total-S and SO_4-S).
NAPP calculated as AP-ANC.
NPR calculated as ANC/AP
Carb-NP calculated from Total-C (all assumed to be inorganic C).
NAG acidity from titration to pH 7.
n.d. = no data.

Based on the AMIRA (2002) classification criteria, three samples from BC are non acid forming and one is uncertain (Figure 1).

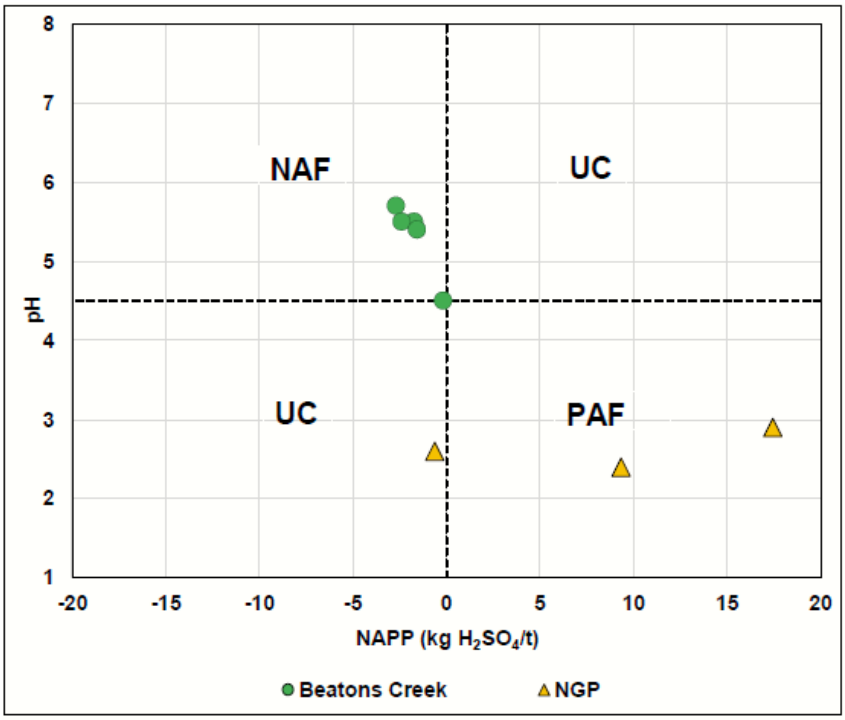


Figure 1: Geochemical characterization of BC and NGP tailings.

The multi-element analyses results for BC and NGP tailings samples were presented in Table 1Table 2 and compared against the Global abundance index (GAI). The. Elements with a GAI value of 3 or more are generally considered to be “enriched”.

Overall, elements from samples from BC with GAI ≥3 are arsenic, antimony and selenium.

The chemistry of the liquid fraction of tailings from both BC and the NGP were analysed and compared against ANZECC 2000 livestock drinking water. All of the tailings liquids were alkaline, with pH values in the range pH 8.9 – 11.3. Sulphate concentration in one of the BC samples was 1,805 mg/L, higher than the ANZECC 2000 guideline concentration of 1,000 mg/L. BC samples also recorded concentrations in excess of ANZECC 2000 guidelines for Cu, Hg, Cd, Co, F, Mo, Ni and Se.

Leach testing of the Beatons Creek tailings samples was carried out using a modified version of U.S. EPA LEAF method 1313. Leach extractions were carried out at pH 2, 4, 6, 8, 10 and 12. Solute concentrations were typically highest at the upper and/ or lower ends of the pH range and decreased on moving towards neutral conditions. Concentration increases towards the low and high ends of the pH range were recorded for Ag, Al, K, Th and Tl. Increased concentrations at acidic pH values only were exhibited by Ba, Be, Ca, Co, Cr, Cu, Fe, Mg, Mn, Ni, Pb, Sn, Sr and U. The trend for As, Mo, Sb, Se and SO_4 was increasing concentrations on moving towards higher leachate pH values.

Table 2: Table 2: Multi-element results

Element	Concentration (mg/kg)								
	GAI = 3	Beatons Creek					Nullagine Gold Project		
		BSX 001	BSX 016	BSX 027	BCRC18 014-020	BCRC18 022-024	GCA 6104	GCA 8601	GCA 8602
Al	960000	3490	4020	3840	6400	4760	81000	77000	74000
As	24	227	153	110	104	85	230	600	300
B	120	<5	<5	<5	<5	<5	66	110	67
Ca	360000	760	770	970	1970	1880	4100	2500	2300
Cd	2.16	0.03	0.01	0.03	0.05	0.01	0.2	0.3	0.3
Co	300	2.4	2.5	2.1	12.2	2.01	40	35	34
Cr	2400	122	104	116	127	65	650	580	590
Cu	720	57	25	39	38	26	62	64	53
Fe	600000	63330	40860	34360	34680	26530	56000	56000	52000
Hg	0.96	0.06	0.03	0.05	0.05	0.33	0.04	2.6	4
Mg	252000	200	200	330	870	370	21000	13000	18000
Mn	10800	152	67	76	86	59	600	650	560
Mo	24	6.6	6.9	3.7	5.6	4.4	32	44	41
Ni	960	8.1	12.2	10.6	52.6	10.9	380	400	400
Pb	192	17.5	15.2	6	9.9	16.8	25	30	24
S	6000	600	300	1800	2600	2300	9700	5000	7500
Sb	6	30.4	10.6	9.2	3.0	4.9	7.7	18	6.3
Se	1.1	1.3	1.1	0.8	0.9	0.6	0.4	0.1	0.3
Sn	30	0.4	0.5	0.4	0.3	0.5	1.7	1.7	1.9
Zn	840	20	7	8	29	10	110	120	99

Notes:
Average crustal concentrations from Smith & Huyck,1998.
GAI≥3 highlighted yellow.

Updates to licence: TSF2 conversion from two to one single cell facility

TSF2 Cell 1 was built without a works approval or licence conditions relating to the construction/operation of TSF2 being issued by the department. In March 2017, the department authorised the License Holder to operate TSF2. TSF2 approval was based on a two cell tailings storage facility with one decant tower in each cell.

With the construction of the Cell 1 Stage 1 raise, the layout of the TSF2 was modified to a half rock ring in Cell 1. With completion of the Cell 2 Stage 1 works in 2019, TSF2 operates a single cell facility with a full central rock ring. These changes were not assessed or approved by the department.

In 2018 MML commissioned MHA Geotechnical to document modifications to TSF2 Stage 1 Raise design prepared by Coffey Mining Pty Ltd (Coffey) as part of the overall TSF2 design.

The design changes are mainly in response to the findings of two geotechnical field investigations undertaken by MHA in January 2018 and August 2018.

Main changes to TSF2 Stage 1 raise construction

The decision to convert TSF2 into a single cell facility was made in order to reduce the Rate of Rise (RoR) of the facility to below 2.7 m/year and increase in-situ tailings dry density, which may increase storage capacity and tailings shear strength.

The TSF2 Rock Ring comprises an embankment of clean rock fill located centrally within the facility, with the purpose of filtering and collecting water from the tailing slurry. An increased volume of water can be recovered from a rock ring as opposed to a decant tower. The changes in the approved design has also been endorsed by the Department of Mines Industry Regulation and Safety (REGISTRATION ID: 90227).

The rock ring design consists of a 75 m internal diameter and 85 m external diameter located central to the facility. The rock ring consists of a 10 m wide base at RL 393, with 1:2 (V:H) batters and a crest width of 2 m at RL 395 m.

The tailings delivery pipeline runs from the NGP Carbon in Leach plant to TSF2. A series of discharge points (spigots) were installed at approximately 20 m intervals as shown in Figure 2.

The TSF review report (MHA Geotechnical, May 2019) stated that no artificial basal or embankment liners have been incorporated into the TSF2 design. The return water sump comprises solid large diameter concrete rings founded on a concrete base. Vibrating wire piezometers (VWPs) data logger results for TSF2 show minor fluctuations in the phreatic surface within the embankments, indicating that the embankments are preventing lateral water flow. However, while water is being retarded by the perimeter embankments, water is travelling beneath the embankments resulting in the increase in levels of external monitoring bores. VWP's at TSF2 are malfunctioning and providing discontinuous readings, particularly in loggers 2 and 4.

Monitoring bore water levels surrounding TSF2 have indicated a consistent rise throughout Cell 1 Starter Stage deposition. During Cell 2 Starter Stage deposition they typically continued increasing. Some drawdowns were noted in March 2019, which is likely a result of continued stress placed on the surrounding bores to provide site water during the commissioning of Cell 1 Stage 1.

The life of TSF2 with the current predicted final RL of 399m (13 m above ground level) is expected to extend until 2024.

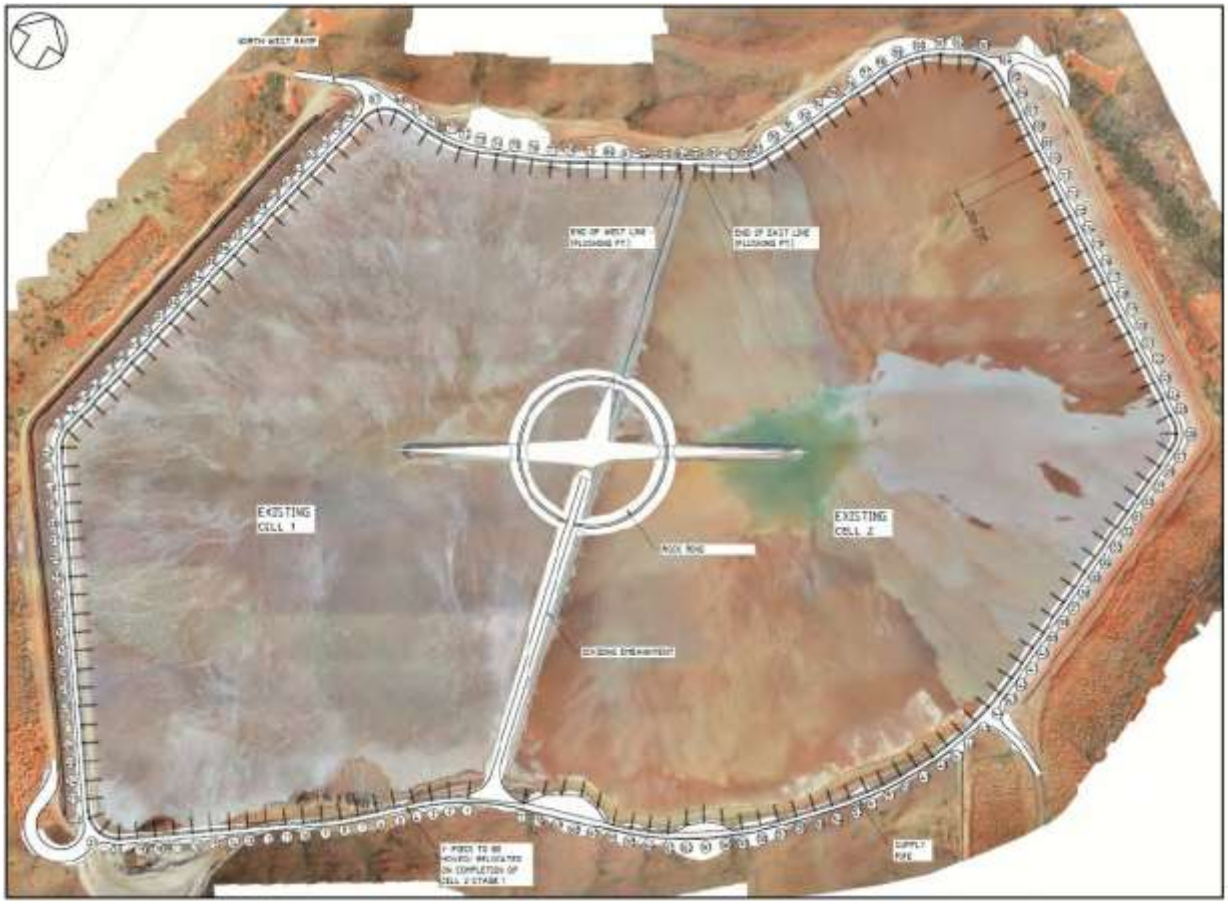


Figure 2: TSF2 single cell design, rock ring and spigots location

TSF2 risk factors

Risk of tailings deposition into TSF2 will be reassessed for the licence, due to the changes in design, processing ore from external source and rising groundwater levels observed at several bores.

All other risk assessment factors remain the same as assessed by L8576/2012.

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guidance Statement: Risk Assessments* (DER 2017).

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

3.1 Source-pathways and receptors

Emissions and controls

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Decision Report are detailed in Table 3 below. Table 3 also details the proposed control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 3: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Operation			
Seepage	*TSF2*	*Slurry water travelling though gravel layer associated with creek lines*	- *Implementation of deeper decant pond* - *Increase slurry water recovery to be reused in the process* - *Installation of new VWP's for accurate phreatic readings at TSF2* - *Cell 1 return line to be lengthened to extend out towards the rock ring* - *TSF2 will be operated as a single cell facility, reducing the rate of rise, increasing air drying cycle times and dry densities*
Overtopping	*TSF2*	*Waste fines released into ground.* *Risk of structural failure leading to physical damage or smothering of vegetation by tailings*	- *Installation of a pump in the Decant Ring structure to remove incidental rainfall and prevent overtopping/breach of freeboard* - *Tailings deposition will be carefully managed and monitored using aerial survey to control beach development*

Receptors

In accordance with the *Guidance Statement: Risk Assessment* (DER 2017), the Delegated Officer has excluded employees, visitors and contractors of the applicant's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 4 and Figure 3 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guidance Statement: Environmental Siting* (DER 2016)).

Table 4: Sensitive human and environmental receptors and distance from TSF2

Human receptors	**Distance from prescribed activity**
Town of Nullagine	5.5 km north west of TSF2
Environmental receptors	**Distance from prescribed activity**
PEC - Stony saline clay plains of the Mosquito Land System	Within Premises boundary
Dasycerus blythi (Brush-tailed mulgara)	100 m east and south of TSF2
Underlying groundwater (non-potable purposes) Pilbara Groundwater Area	Within Premises boundary
Nullagine Water Reserve – Priority One	3.1 km north west of TSF2
Cajuput Creek	2.2 km north west of TSF2
Native vegetation following creek line	Adjacent to TSF2

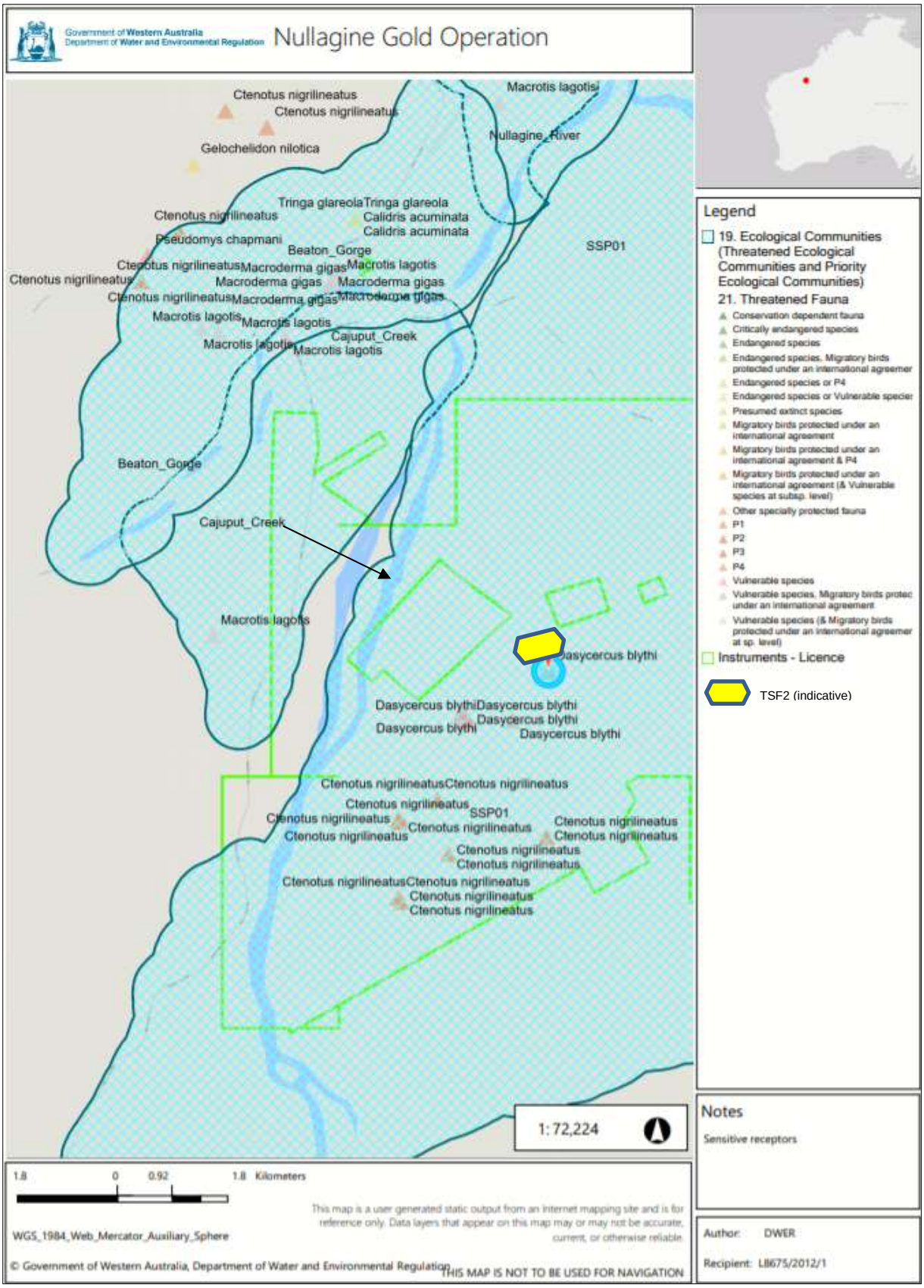


Figure 3: Sensitive receptors location in relation to TSF2.

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guidance Statement: Risk Assessments* (DER 2017) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 5.

Licence L8675/2012/1 that accompanies this Decision Report authorises emissions associated with the operation of the Premises i.e. operation of TSF 2 and process and discharge of tailings from Beatons Creek.

The conditions in the issued Licence, as outlined in Table 5 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 5: Risk assessment of potential emissions and discharges from the Premises during operation

Risk Event					Risk rating[1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Tailings deposition into TSF2	Seepage from TSF2	*Slurry water seepage entering groundwater and flowing down gradient to sensitive receptors may have the following impacts:* *• Groundwater mounding* *• Groundwater contamination* *• Water quality adversely affecting Cajuput Creek*	*Native vegetation along minor creek line either sides of TSF2* *Threatened fauna (closest 100 m south-east)* *Seasonal minor creek 2.2 km north-west*	*Refer to Table 3*	*C = Moderate* *L = Possible* ***Medium Risk***	*No*	Condition 1.2.7, 1.2.15, 3.3.1, 3.4.1, 3.4.3, 4.1	*Refer to section 3.3*
	Facility failure releasing waste fines or overtopping.	*Waste fines released into ground.* *Risk of structural failure leading to physical damage or smothering of vegetation by tailings.* *Soil contamination with the possible addition of ions and metals.*	*Native vegetation along minor creek line either sides of TSF2*	*Refer to Table 3*	*C = Moderate* *L = Unlikely* ***Medium Risk***	*No*	Condition 1.2.15 and 5.2.1	*Refer to section 3.4*
	Pipeline failure releasing waste fines	*Waste fines released into natural channels.*	Soil and native vegetation	No change from approved licence	C = Minor L = Unlikely **Low Risk**	Y	No new conditions	Pipeline failure controls were already conditioned in the licence.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guidance Statement: Risk Assessments* (DER 2017).

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

3.3 Detailed risk assessment for tailings deposition into TSF2

3.3.1 Description of Risk Event

Waste fines material (38 - 42% w/w solids), generated from BC ore processing will be pumped to TSF2 single cell via a delivery pipeline, at a rate of approximately 2 million tonnes per annum (Mtpa).

Deposition will occur via a series of discharge points (spigots) installed at approximately 20 m intervals as part. The TSF2 was not constructed according to the approved design, including:

- absence of a low permeability layer at the base of the TSF;
- single cell facility;
- central decant system comprised by precast slotted concrete rings and surrounded by rockfill to return to the process plant; and
- non compliant free bord during operation.

The site has been in care and maintenance for more than a year.

3.3.2 Identification and general characterisation of emission

Seepage from TSF2

Groundwater results extracted from NGP Annual Groundwater Reports and Annual Environmental Reports show that discharge of tailings into TSF2 has had a detrimental effect on groundwater quality. Sulphate levels in groundwater around TSF2 is 12 times higher than KCB41 (upstream abstraction bore). TSF2 MB5, located 1.3 km downstream of TSF2MB1, shows sulphate concentration 3.5 times lower (4,140 mg/l) than TSF2MB1 but 46 times higher than KCB41. A summary of sulphate concentration in groundwater around TSF2 is presented in Figure 5.

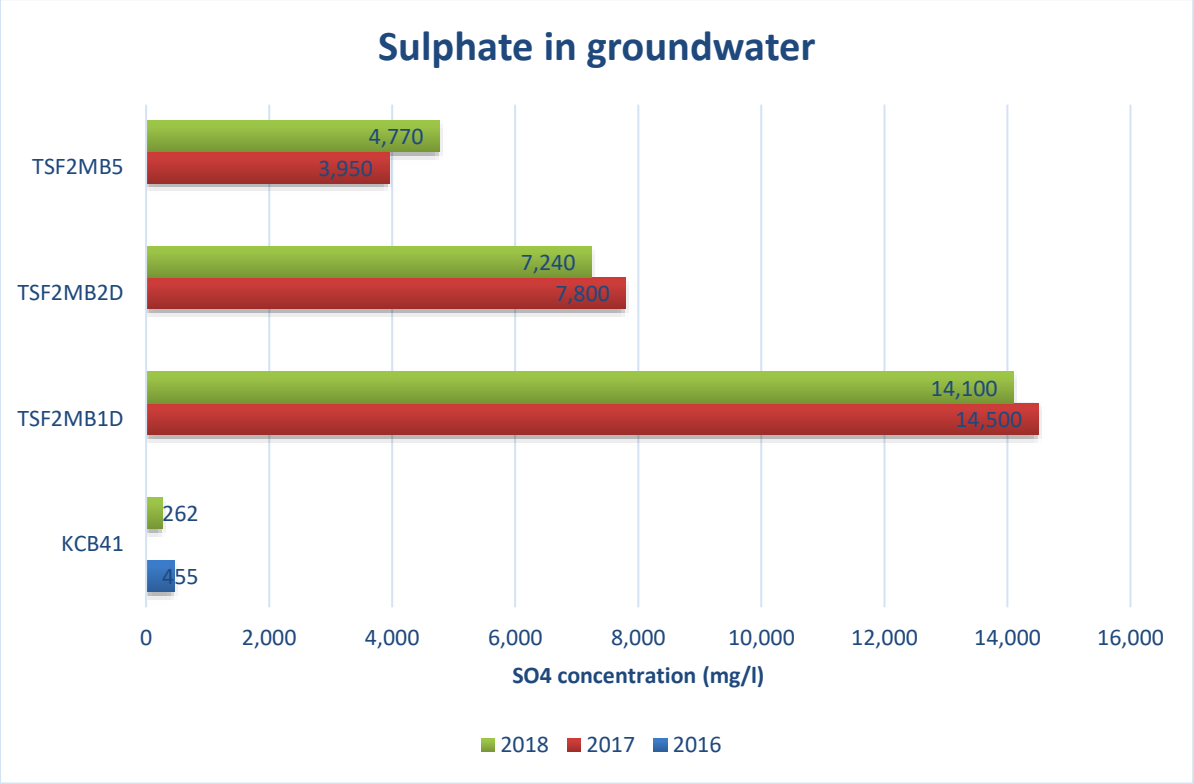


Figure 4: Sulphate concentration around TSF2.

Total dissolved solids (TDS) results also confirm the influence of tailings discharge in groundwater quality (Table 6).

Table 6: TDS concentration in groundwater.

	KCB41	TSF2MB1D	TSF2MB1S	TSF2MB2D	TSF2MB2S	TSF2MB5
Year	TDS (mg/l)					
2018	1200	24,650	24,840	14,980	19,300,	16,590
2019	1,670	24,150	26,830	15,120	19,490	12,500

The groundwater flows around TSF2 mimic the surface water flows and it is expected that most of the water lost through seepage would report to the area north of the TSF2 where monitoring TSF2MB5 is located.

Groundwater level at TSF2 monitoring bores TSF2MB1, TSF2MB2D and TSF2MB2D show direct correlation of tailings discharge and rise in surface water level. Surface water level behavior around TSF2, between March 2017 and August 2019, is depicted in Figure 5.

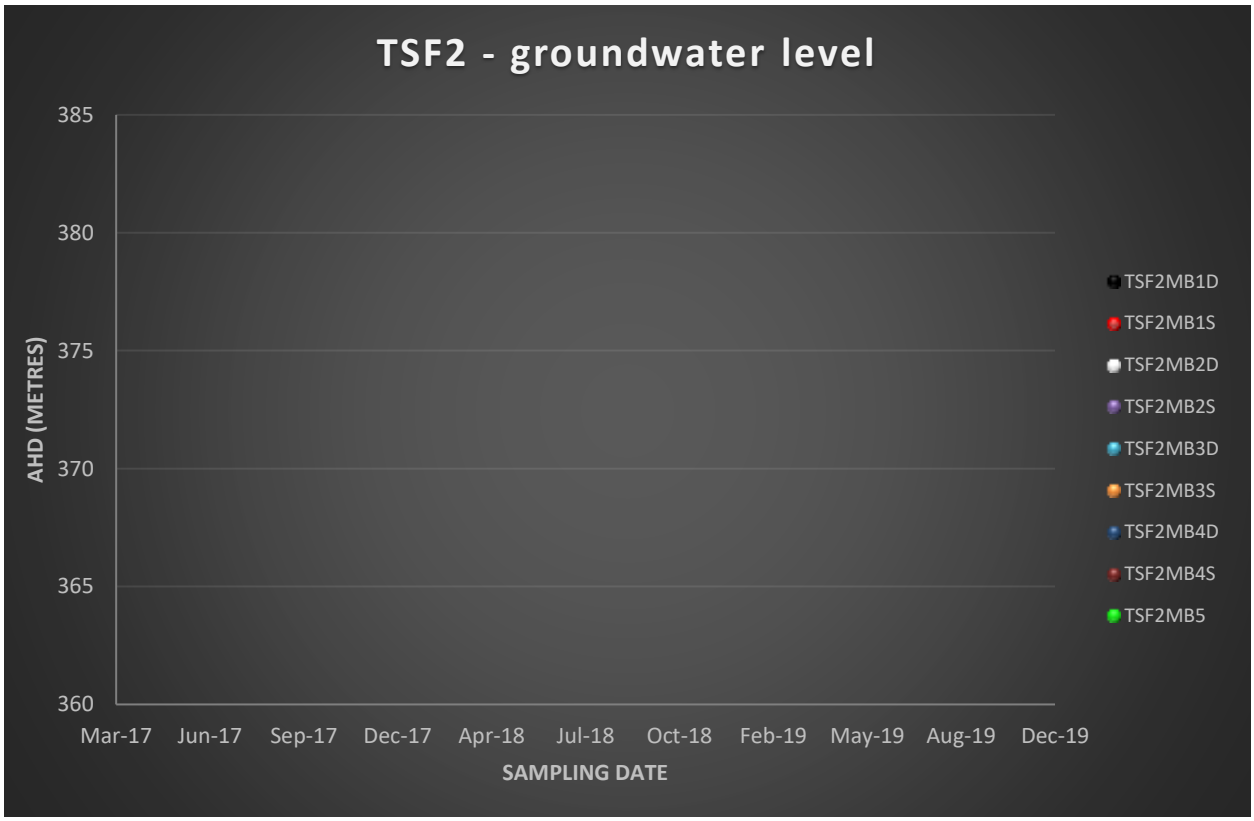


Figure 5: Monthly groundwater elevations around TSF2.

Figure 6 shows TSF2 water management between 2017 and 2018. Decant recovery is not consistent during the reported period. In December 2017 only 3% of the total water discharge was recovered in the decant. The average water recovery during the period was 41%.

The low recovery levels are reflected in the increase of surface water level in monitoring bores presented in Figure 5.

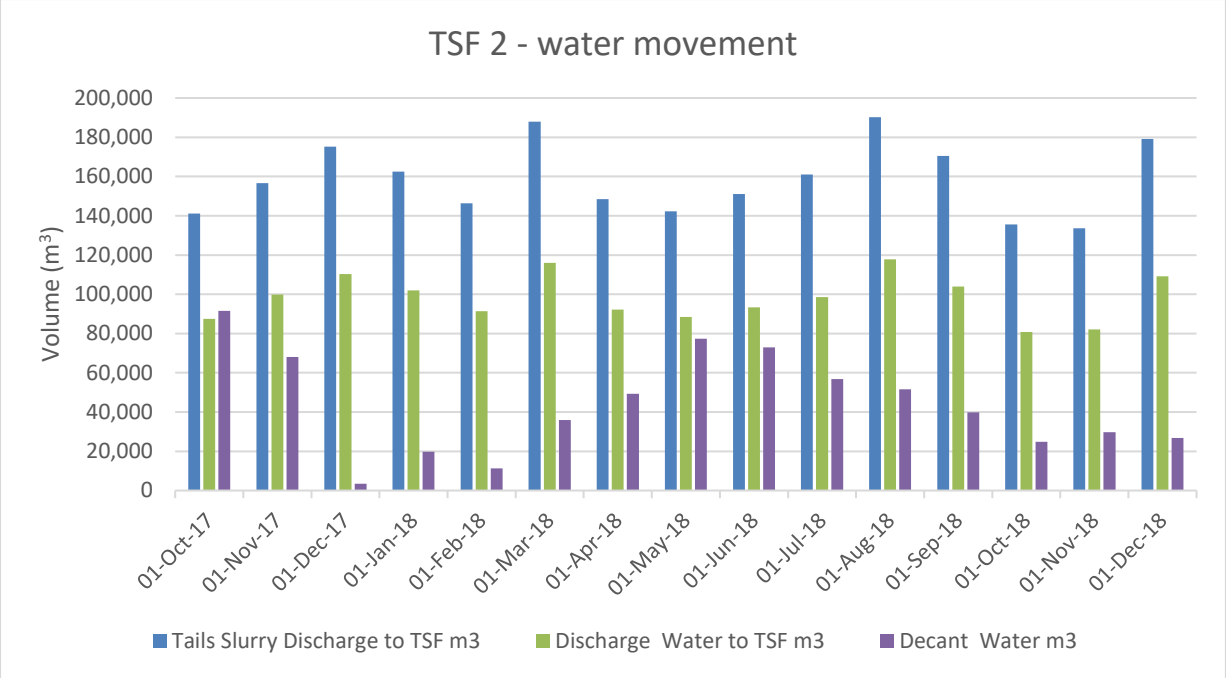


Figure 6: Water movement in TSF2 between 2017 and 2018.

DWER understands that changes in the decant system may improve recovery but the new design is yet to be tested.

Based on monitoring results and the fact that TSF2 was built without an impermeable layer, DWER will require a seepage management plan for TSF2 (condition 4.1), inclusion of recovery bores TSFB002 and TSFB003 to the licence (Table 1.2.7) and introduction of surface water level trigger level to prevent vegetation death, further deterioration of groundwater quality and expansion of contaminant plume (Table 3.3.1).

Location of monitoring bores and recovery bores in relation to TSF2 are shown in Appendix 1.

Discharge of BC tailings

The five tailings samples generated for the purpose of this application showed different geotechnical properties from the tailings from NGP. The BC tailings results provided showed lower sold content, higher percentage of fines and lower dry density. Such combination will lead to long term settling process, increase water content in tailings for longer periods of time. In November 2020 MML indicated that settling test with the BC tailings are still undergoing. This licence amendment will require further tailings investigation during the commissioning process (condition 3.4.3).

MML proposes tailings thickening as per process diagram (Attachment 3) to increase solid content. The flocculant to be used is polyacrylamide based of around 8,250 kg per year. The thickening process has not yet been tested with BC tailings. Polyacrylamide is classified as harmless. However, when in water that contains elevated concentrations of dissolved iron and exposure to intense sunlight; this can break-down these polymers to form monomeric acrylamide. Acrylamide is highly toxic and can impact sensitive receptors. Therefore, acrylamide will be added to the licence as a monitoring parameter (Table 3.4.1).

The BC tailings tested contains the mineral alunite. Alunite is a sparingly soluble potassium aluminium sulfate mineral that naturally forms in acidic environments under pH conditions less than about 4. This mineral, when disturbed / finely ground, can progressively decompose to form aluminium oxide minerals, and acidic leachate that contains dissolved aluminium, sulfate, and potentially some other metals that are leached from surrounding soil minerals by the released acidity.

DWER has reviewed the geochemical differences between BC and NGP tailings and is of the view that all the enriched elements are already captured in the licence.

3.4 Detailed risk assessment for TSF2 overtopping

From the Annual TSF2 Audit Report 2018/2019 (MHA, 2019) it was observed that TSF2 Cell 2 starter stage is in breach of operational freeboard requirements, however in its current decommissioned state can still satisfy minimum total freeboard requirements on the perimeter embankments.

The freeboard licence requirement for TFS2 (minimum of 300 mm) was not observed during the time of the audit. The estimated freeboard available was less than 100 mm. Also, it was noted that a high-water level was present in the decant ring structure and that surrounding tailings were still quite saturated. The installation of a pump in the decant ring structure was recommended to remove incidental rainfall and prevent overtopping/breach of freeboard.

There is currently one recovery pump connected to TSFB002 with maximum pumping capacity of 1,700 m³/day. Another pump (37Kw Grindex Maxi H 8107.011) will be installed shortly to provide another 1,700 m³/day pumping capacity.

Contingencies in place are:

- spare 160mm pipeline with a nominal bore of 130 mm,

- main pump feeding 2 x 110mm pipelines with a nominal bore of 90 mm, and

- spare pumps in place for genset hookup when required.

MML expect ongoing deposition of tailings into the facility until a final RL of 399 mAHD with a maximum tailings level to be 398.7 mAHD (300 mm freeboard).

Condition 1.2.14, Table 1.2.7 has been amended to reflect ANCOLD and DMIRS (2015) guidelines which require an operational freeboard of 300 mm. Reporting of freeboard breaches has been included in the licence as condition 5.2.1.

4. Consultation

Table 7 provides a summary of the consultation undertaken by the department.

Table 7: Consultation

Consultation method	Comments received	Department response
Application referred to the Shire of East Pilbara on 07/10/2020	No comments received.	N/A
Application referred to the Department of Mines, Industry Regulation and Safety (DMIRS) for comment on 07/10/2020	No comments received.	N/A
Applicant was provided with draft documents on 20/01/2021	The outstanding queries from DWER have been addressed in the response DRAFT document. Novo Resources Corporation waived the consultation period.	Document update.

5. Conclusion

Based on the assessment in this Decision Report, the Delegated Officer has determined that a licence amendment will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

5.1 Summary of amendments

A summary of licence amendments implemented as part of the amalgamation of amendment notices is included in Table 8. Note where a condition has only been modified to update text from "Licensee" to "Licence Holder", they are not listed within the amendments described in Tables 8.

Table 8: Consolidation of licence conditions in this amendment

Existing condition	Condition summary	Revised licence condition	Conversion notes
N/A	Premises details updated to include new piezometers and monitoring bores	N/A	N/A
1.1.2	Interpretation	Definitions updated	Revised to include updated definition.
1.1.5	Interpretation	N/A	Redundant condition. Adequately covered by alternative existing conditions and proposed new conditions. Deleted from licence.
1.2 1.2.1 1.2.2 1.2.3	General conditions	N/A	Redundant condition. Adequately covered by alternative existing conditions and proposed new conditions. Deleted from licence.
Various	Numbering	N/A	New numbering
Table 1.2.7 TSF2	Infrastructure requirements	N/A	Wording amended to present condition (and 'maintained') (c) removed – impermeable layer not present (d) Bullets rearranged (e) included to cover three recovery bores not listed in the licence (f) updated to reflect new piezometers (g) new monitoring bores included
1.3.15 and Table 1.3.6	Production or design capacity	N/A	Table moved to the front of the licence.
1.3.17 (old numbering)	Premises operation	Condition removed	As built construction report for TSF2 was submitted as part of this licence amendment. The changes in the construction were assessed and

Existing condition	Condition summary	Revised licence condition	Conversion notes
			conditioned in the amalgamated licence.
Table 3.3.1	Process monitoring	Table update	Updated to included Method
Table 3.4.1	Monitoring and ambient groundwater quality	Table update	Water level replaced by surface water level
Table 3.4.1	Groundwater limits for Chromium VI, Copper, Iron, Manganese and Nickel	Table update	Limits set according to MML DER IR1 & IR2 Response: Groundwater Management Improvement Plan, December 2016
Table 3.4.1	TSF2 piezometers monitoring	Table update	Groundwater level limit set
Condition and Table 3.4.3	Tailings samples and methodology and tailings characterisation parameters to be tested.	N/A	N/A
4.1	Improvements updated to Specified Actions	N/A	N/A
Section 5	Information updated to Records and Reporting	N/A	N/A
Table 5.2.1	Annual Environment Report	Table update/ excel data	Updated to replace format form. Inclusion of hyperlink to Annual Audit Compliance Report
Table 5.3.1	Notification requirements for TSF2 construction details	Condition removed	Removed as part of this licence amendment.

References

1. Department of Environment Regulation (DER) 2016, *Guidance Statement: Environmental Siting*, Perth, Western Australia.
2. DER 2017, *Guidance Statement: Risk Assessments*, Perth, Western Australia.
3. DER 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. Millennium Minerals Limited 2020, Tailings and Storage Facility 2 Prescribed Premise L8675/2012/1 License Amendment application.
5. Startegen JBS&G 2020, Licence L8675/2012/1 – Nullagine Gold Project - Licence Amendment Application.
6. Works Approval Application Supporting Document: Annual Audit 2018/2019 TSF1 and TSF2, Review B, authored by MHA Geotechnical, dated May 2019.
7. Correspondence dated 14 October 2020 from Novo Resources Group, providing response to further information requested by DWER on 1 October 2020, including following attachments:

   Attachment 1: Response to DWER RFI;
   Attachment A: 2020_GCA Memo on Beatons Creek oxide ores

Attachment B: Technical Memorandum P19-05-PR-01-TM02_A
Attachment C: Technical Memorandum P19-05-PR-01-TM01_REVA
Attachment D: MSDS Anionic Flocculant

8. Correspondence dated 17 November 2020 from Novo Resources Group, providing response to further information requested by DWER on 3 November 2020, including following attachments:

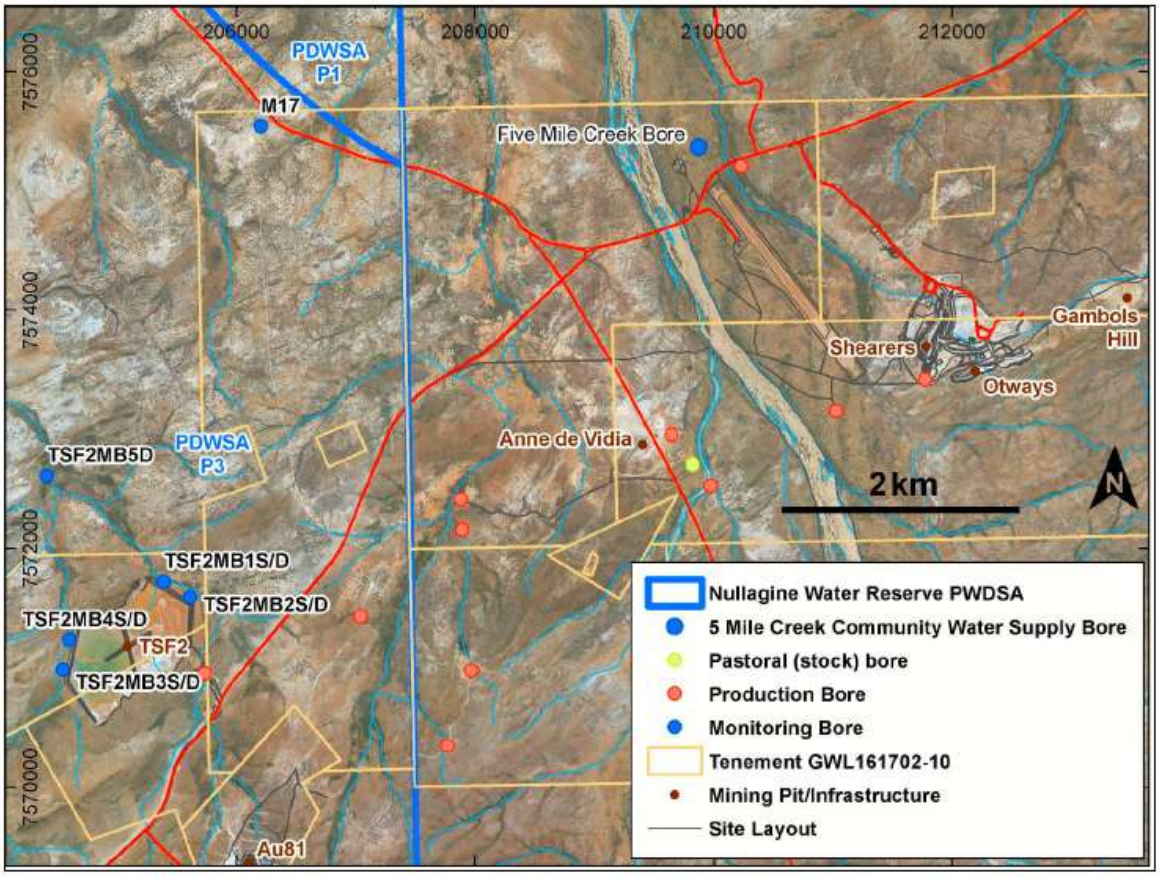
Attachment 1: Formal response to DWER RFI;

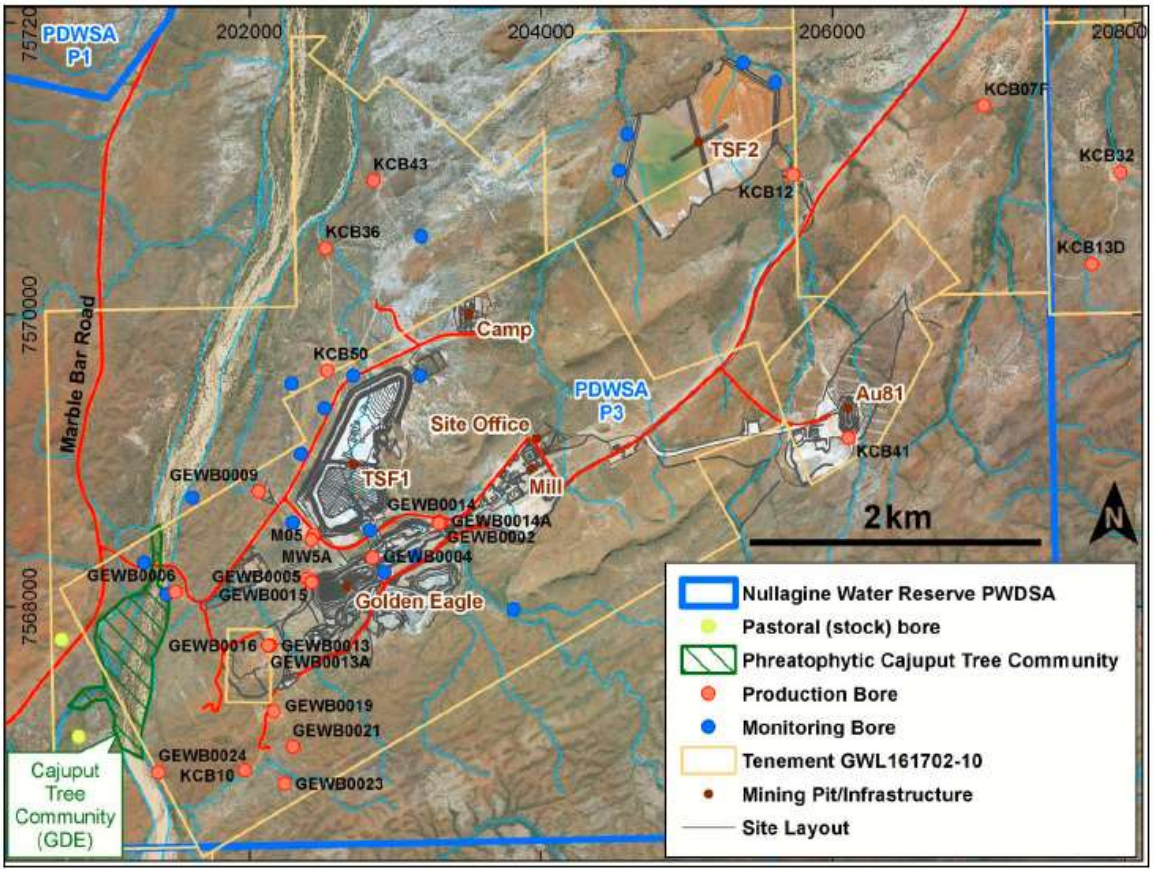
Attachment A: REC technical memorandum

Attachment B: Treatment Plant process flow diagram.

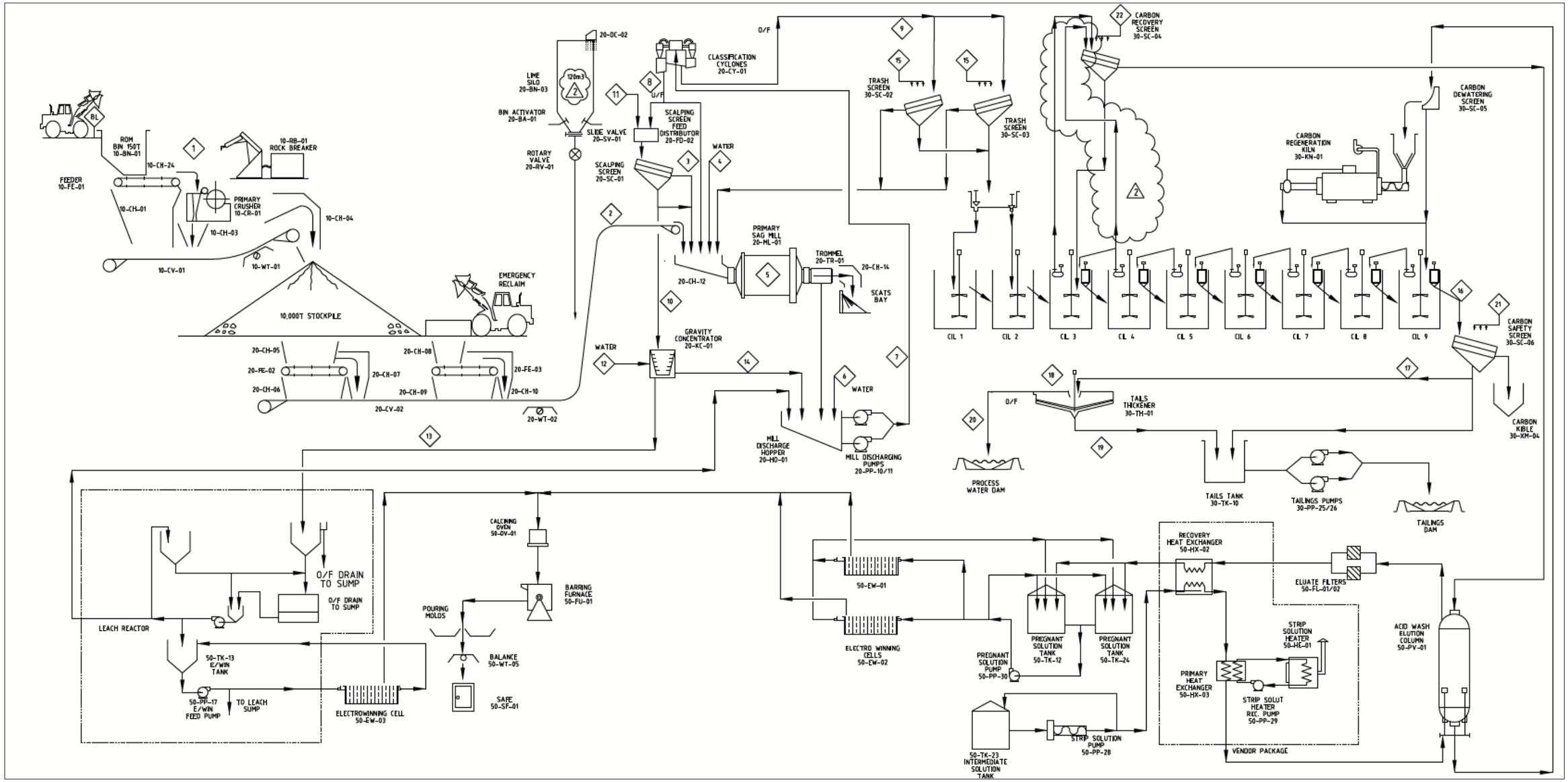
9. Millennium Minerals Limited 2016, DER IR1 & IR2 Response: Groundwater Management Improvement Plan report.

Appendix 1: NGP bores locations





Appendix 2: Treatment plant process flow diagram



Flow ID		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Flow Name		Crusher Feed	Grinding Feed	Gravity Concentrator Bypass	SAG Water Add'n	Mill	Mill Discharge Water	Cyclone Feed	Cyclone U/F	Cyclone O/F	Gravity Concentrator Feed	Gravity Dilute Water	Gravity Concentrator Water Add'n	Gravity Concentrate kg/hr	Gravity Tail	Trash Screen Wash	CIL Tailings	Discharge to Tailings	Thickener Feed	Tailings Thickener U/F	Tailings Thickener Water O/F	Carbon Safety Screen Water	Loaded Carbon Screen Water
Solids	tph	376	183	656		844		969	781	188	125			50	125		187	187	187	187			
	m3/h	142	71	249		320		367	296	71	47			0.0083	47		71	71	71	71			
	%	97%	97%	68%		72%		63%	69%	46%	55%			80%	53%		45%	44%	44%	60%			
Water	tph	12	6	309	20	335	134	579	359	220	100	50	10	0.013	110	10	233	235	235	125	110	2	3
	m3/h	12	6	309	20	335	134	579	359	220	100	50	10	0.013	110	10	233	235	235	125	110	2	3
Slurry	tph	388	193	965		1178		1548	1141	407	225				235		420	422	422	312			
	m3/h	154	77	557		654		946	655	291	148				158		304	306	306	196			
Size; P80=	mm		150							0.106													