

Fingerboards EES – Submission 335 Additional Submission – Centrifuges

The project

Kalbar claims the project has the potential to be one of the world's major producers of zircon, ilmenite, rutile and rare earths – minerals essential to technology, transport, communications and renewable energy. Webinar oct 2020.

This bold statement must be measured against the key findings of the R.J. Robbins and Associates Scoping Study prepared for Rio Tinto and Oresome Metallica in 2012/13. It is instructive that Rio Tinto Exploration (RTX), the original tenement holder of the Glenaladale Mineral deposit decided to divest the project on the basis that it was unlikely to meet the minimum criteria for a Rio Tinto mining project. Oresome Australia Ptd Ltd, a wholly owned subsidiary of Metallica Minerals Ltd entered into a "Right to Explore and Option to Purchase Agreement" with RTX in August 2011. After the Robbins Report they also decided not to proceed with the purchase of the rights to the tenement.

Key findings from the Robbins Report were that:

- The mine would cost \$271 million to establish (2012 costs)
- It would cost \$80.3 million per year to operate exclusive of royalties and taxes
- It would require 4.6GL, and potentially up to 6.2 GL per year to operate excluding water for dust suppression.
- Although they would still be saleable, chromium and magnesium content would downgrade most titanium products, causing price reductions in the vicinity of 30%
- Uranium and thorium content would cause the downgrade of zircon produced, potentially by up to 20%.
- Water availability was problematic

Risk Management

The Proponent (Kalbar) has a vested interest in ensuring final low risk status. Therefore, their risk assessments and corresponding management are overly optimistic, flawed and must be challenged. **The use of centrifuge technology does not lessen the risks but introduces new risks.**

Why hasn't the Technical Reference been reconvened to comment on the introduction of the centrifuges in according with the Consultation obligation cited in the State of Victoria EES Scoping Requirements for Fingerboards Mineral Sands Project, March 2018?

"The proposed centrifuges are a solid bowl decanter centrifuge using electrical power for operation. Each unit is approximately 9m long and weights around 18tons. As the project entails two mining unit plants (MUP) in two separate areas, two centrifuge plants would also be required. Each plant would contain three operating units and one standby unit, with a throughput rate of ~55tons solids per hour per unit and would be enclosed in a building that is approximately 23.5m long, 13.5m wide and 11.5m high at the crest of the roof. The top floor would be clad in a sound attenuation cladding, similar to the main process plant. The proposed building layout for each plant entails the four centrifuge units on the cladded top floor, a cake discharge conveyor below them, and an external cake stacking conveyor."

Additional infrastructure for centrifuges includes:

- 2 x 23.5m long, 13.5m wide, 11.5m high buildings with 3 centrifuges in each equals 9 centrifuges in total
- concrete sump 0.5m high (TD 194, p4/40)

Centrifuge Costs

“In terms of tailings, the main goal for all mine operation is to minimize operating costs and the environmental impact on the disposed material” (Klug, p1/8, cited in TD 130 Saracik, p7/53).

However, Kalbar’s own expert witness reports indicate that the centrifuges will add to project costs both in capital (CAPEX) and operating expenditure (OPEX) (TD 43, 11, p9/9). The full capital cost of the project is unknown because Kalbar will not present a budget. However, Kalbar estimates: “Operating expenditure for the mine will be in the order of \$60 million per annum.”¹ This is well below the estimated OPEX of \$80 million per year, exclusive of royalties and taxes, provided by RJ Robbins and Associates to Rio Tinto Exploration (RTX) and Oresome-Metalica Ltd in 2012/13, as part of the feasibility study for the Glenaladale Deposit. So, OPEX will now be considerably more than \$80 million.

Kalbar states under its website FAQs² that the cost benefit analysis (CBA) “compares all costs and benefits attributable to the initiative” yet, it omits key information from the Robbins Report that pertains to the financial viability of their project.

Kalbar needs to explain why its proposal will succeed when Rio Tinto and Metallica concluded otherwise.

TD 43, p5/9: “Centrifuges have previously been evaluated and successfully trialed (sic), but **not used, in mineral sands applications. The decision by project owners not to implement them was a cost consideration, rather than a technical reason.**”

Compared to the EES scenario, the centrifuge units require increased upfront CAPEX. The centrifuge cost is partially offset by the removal of the TSF construction, but not withstanding this offset, **the additional investment is significant**. Even Mr. Saracak agrees that “the high capital cost of centrifuges has overridden the benefits of centrifuging versus filtration” (TD 130, p3/53). By Kalbar’s own estimates, operating costs are twice as much as conventional TSF (TD 194, p3/40).

Power costs

Power costs further increase OPEX Kalbar estimates electricity usage **before centrifuges** as 30,387 MWh for 15 years; 4380 MWh in years 16 and 17 TD 38 Appendix A009, Table 33, p103/364). But estimates for power usage of the centrifuges vary:

TD 194 states: “Initially, the power demand for the Project will be 8,000kW/6,400kW (Maximum/Average) for a total average consumption of 54,000MWh per annum. At peak production, this will increase to 15,000kW/12,100kW (Maximum/Average) for a total consumption of 104,300MWh per annum. 14,000 (14MW), not 9,000, kVA will be required for the mining unit plants and wet concentrate plant”. A whole of project cost, including the “substantial” grid upgrades to facilitate the additional electricity required for continuous centrifuges’ operation during the mine life is not provided.

TD 197 Amended Work Plan, p49/191: “The power demand for the MUPs, WCP and WCP centrifuge plants is estimated at 914,000 kVA on average. Kalbar will construct a new 66 kV line and 22 kV line in the infrastructure corridor. The new power lines would connect with the existing 66 kV network, which runs about 5 km south of the proposed mining licence area. A 66 kV sub-station and transformers to lower the voltage to 22 kV will be installed within the proposed mining licence area. Power will be reticulated through the proposed mining licence area using 22 kV power lines. No gas is required for the processing of heavy mineral concentrates. During the construction phase six diesel generators will be required”.

Centrifuges untried in mineral sands mining

¹ Fingerboards project Q&A with Jozsef Patarica - Ceo, Kalbar Operations, Wednesday 20 January, 2021, <https://www.fingerboardsproject.com.au/news/>

² <https://www.fingerboardsproject.com.au/community-engagement/fag>

Kalbar's inexperience in mineral sands mining and the fact that centrifuges have not been trialled in mineral sands mining (TN 01 001 (TD43, p6/9) poses a high level of risk of operational and commercial failure.

TD 194, TN 14, p3/40: "The reason centrifuges have not previously been used in mineral sands projects is due to the higher cost of implementing them when compared to tailings storage facilities (TSFs), **not because of any technical challenges in achieving desired performance**. The operating cost of a typical above ground, unlined, conventional paddock style TSF is approximately \$1.50 to \$2.00 per tonne of tailings stored. By comparison, the operating cost of the centrifuge operations is in the range of \$3.50 to \$4.00 per tonne of tailings processed and hauled to the pit for backfill. Using centrifuges doubles the operating costs associated with treatment of fine tailings from \$1.50-\$2.00 per tonne, to \$3.50 - \$4.00/tonne (TN 14; pg 3).

However, even Kalbar's reports reveal "technical challenges". According to Klug, p2/8 (in TD 130) centrifuge technology lacks the performance of thickeners and filter press. Also, the "consumption of polymer affects the OPEX of the equipment".

Without a full and transparent budget it is impossible to know the difference between the capital and operating costs of the direct tailings versus the centrifuges.

Polymer Flocculant³

Kalbar initially claimed that no harmful chemicals are used in the mining or the mineral separation process. Now, it will use polyacrylamide (PAM) 83384 (anionic polyacrylamide) as the selected flocculant TD 130, p8/53) as part of the centrifuges' process. "PAM flocculants are based on the acrylamide monomer, which typically makes up between 100 and 500ppm of the bulk polymer" (TD 194, p4/40).

The merits of the centrifuge technology "**is based on laboratory scale measurements and observations only**", Kalbar wants this data kept secret (TD 195, p1/54).⁴ **Why?** There are inconsistencies in the test reporting, for example:

"The polymer dose required for strong, shear resistant flocs [was variously reported in the **same** document] as approximately **400 grams** (300, 374, 500, 320 grams) active flocculent powder per tonne of dry solids" (TD 195, pp15, 24, 33, 42, 51 respectively).

So, which is the correct figure or is this an average, or is none correct?

Like so much of the information scattered throughout Kalbar's reports these figures cannot be relied upon as true and correct. Even a cursory reading readily reveals such inaccuracies so there are certainly more to find with closer scrutiny (which, of course, is not possible under the unreasonable constraints of a 26 March deadline for additional submissions).

Another document, TD 194, p3/40 claims: "The flocculant will be used at a dosing rate of approximately **370 g/tonne of dry solids** reporting to the centrifuge. This translates to a nominal (average or usual) dose rate of around 118 kg of flocculant every hour as the centrifuge units nominally receive around 321 tph of solids, noting that the percentage of fines tailings is variable due to natural variations in the deposit geology".

³ **The type of polymer selected is critical to economic operation of the centrifuge.** Unlike the thickeners and filter presses where relatively large, stable flocs are desirable, a centrifuge needs a polymer which reacts very quickly to form very small flocs almost instantly after inline dosing at the centrifuge feed inlet. **Due to the short residence time the flocculent only has a maximum of 30 seconds in which to have an effect.** To minimize consumption of polymer an online ultrasonic density meter is installed in the feed to optimize polymer dosing" (Klug, p4/8).

⁴ "Alfa Laval requests that this Spin Test Report is maintained as confidential and remains within the possession of Wave International, Kalbar Operations Pty Ltd and Alfa Laval. Please seek permission from Alfa Laval to share with 3rd parties.

Whatever figure: 370 or 500, this is a massive amount of flocculant, estimated at 10,000 tonnes p.a.⁵ over 15 -20 years; it is not sparing use, as claimed: “Flocculant used in the centrifuges will be used sparingly and the majority of it will adhere to the fine tailings cake, not the process water” (TD 193, p2/7); nor “a very low dosing rate” (TD 194, p5/40).

TD 195 emphasises that more tests are needed to determine the efficacy of the technology. The 4.1 Polymer Test was not even conducted under Fingerboards’ conditions, e.g. using “Perth tap water”, not Glenaladale water.⁶

TD 130 Appendix 5, p34/53: “Typical of mineral sands tailings, the characteristics of Glenaladale slimes create a narrow band of conditions for effective flocculation such that **feedwell design factors become critical to ensuring that design throughput can be maintained without excessive flocculant dosing.** Specifically, the -63um slimes and silt content of the feed slurry in the centerwell must not exceed 3.0%w/w”.

TD 197, p188/191, refers to an Auckland Regional Council 2004 report, Why?

Note: this report states: “environmentally safe at levels present in polyacrylamide products. Guidelines for PAM use in the United States recommend products with <0.05% AMD” Amount” [and] “no significant negative impacts have been reported for aquatic macro fauna, edaphic micro-organisms or crop species **when used for erosion control at recommended concentrations and rates**”. The report also “emphasised that toxicity should be evaluated not only in standardised tests but also under conditions of actual use to obtain reasonable estimates of hazard. Any such studies of toxicity in field situations have not been reported”. “...**concentration in treated waters is very low in all but serious overdose situations. Such low concentrations would effectively avoid a toxicological risk.**” One can extrapolate that in high doses such as Kalbar contemplates, toxicological risk will occur. “The authors emphasised that if dry granules were used then methods needed to also be used to promote the uniform dissolution and distribution of PAM”.

Importantly. all the cases discussed in the Auckland report refer to the very low doses used in soil erosion and water treatment. Kalbar has not tested its flocculant loads in the field; all supposition of its efficacy and safety remains experimental.

According to the Australian Drinking Water Guidelines:

“When nonionic or anionic polyacrylamides are used in water treatment at a typical dose level of 1 mg/L, the maximum theoretical concentration of acrylamide has been estimated at 0.0005 mg/L, with practical concentrations 2–3 times lower... **Concern over the health effects of acrylamide has led some countries to introduce tight restrictions on its use for water treatment...**[However] **Acrylamide has not been found in Australian drinking waters.** It is included here to provide guidance in the unlikely event of contamination, and because it has been detected occasionally in drinking water supplies overseas...”

To draw an analogy between the amounts used in town water supplies and what Kalbar will use is plainly dishonest.

PAM and Human Health

Polyacrylamide may de-polymerise to form acrylamide. In a study conducted in 1997 at Kansas State University, the effect of environmental conditions on polyacrylamide were tested, and it was shown that under certain conditions polyacrylamide degradation can cause the release of acrylamide.⁷

⁵ BDEC PPV L4 Directions letter, p6/9.

⁶ This data is based on laboratory scale measurements and observations **only**. Results and previous installations/trials on similar slurries indicate that it is **suitable for further development work** with decanter centrifuges (TD 195, p10/54)..

⁷ Smith EA; Prues SL; Oehme FW. (June 1997). "[Environmental degradation of polyacrylamides. II. Effects of environmental \(outdoor\) exposure](#)". *Ecotoxicology and Environmental Safety*. **37** (1): 76–91. [doi:10.1006/eesa.1997.1527](#). [PMID 9212339](#). Archived from [the original](#) on 2016-04-20. Retrieved 2007-11-02.

“Although PAM is relatively nontoxic to humans, animals, fish, or plants, the **acrylamide monomer can be adsorbed via dermal exposure and inhalation, and it is a known neurotoxin and a potential carcinogen**: it is immediately dangerous at concentrations of 0.06 mg/L and is lethal (LD50) at 150–200 mg/kg body weight. A 13-week exposure to acrylamide in drinking water at a concentration above 1 mg/kg/day leads to peripheral nerve alterations as observed under electron microscopy.”⁸

PAM exposed to sunlight degrades to ammonia, carbon dioxide and water. “The potential risks on environment and health are thus linked to the spreading of acrylamide and polyacrylamide degradation products in the natural environment... residual monomers remain dissolved in the water and may spread in surface and ground waters...”

“as the acrylamide is considered as a carcinogenic molecule, mutagen and reprotoxic (Molak, 1991), all polyacrylamides (PAMs) used within the European Union are required to contain less than 0.1 % (w/w) of residual acrylamide (AMD) (European Parliament 1999) unless they are classified and labelled as a category 2 carcinogen (European Parliament 2006).⁹

Acrylamide is readily absorbed following ingestion or inhalation, or through the skin, and it forms a number of metabolites. It can accumulate in nervous system tissues and blood. The results of animal studies indicate that it is largely excreted as metabolites in urine and bile. It can cross the placenta. An extensive review and summary of the human and animal toxicity data for acrylamide is available (IPCS 1985)” (P408/1309).¹⁰

“The American Conference of Governmental Industrial Hygienists (ACGIH) has designated acrylamide an A2 substance (suspected human carcinogen)...Acrylamide is an irritant, a potent neurotoxin that affects both the central and peripheral nervous systems, a reproductive toxin, and a carcinogen...The toxic effects of acrylamide on the central nervous system are reversible if the dose and duration of exposure are minimal...The primary effects of repeated exposures are neurotoxic and involve the central and peripheral nervous systems. The central nervous system effects predominate during acute and subchronic exposures and can also involve somnolence and hallucinations...”¹¹

Toxic Pollution of the Environment

As confirmed by TD 88 MFG Expert witness report Hydrogeology (and other professionals in the field) “current groundwater recharge processes are not well understood, and there are significant uncertainties regarding how the major disturbance of the site through mining and emplacement of the tailings would influence recharge/seepage rates, water table levels and flow of groundwater towards surface water bodies and other aquifers in the area”.

TD 193, p2/7: “Flocculant used in the centrifuges will be used sparingly and the majority of it will adhere to the fine tailings cake, not the process water. The flocculant to be used is polyacrylamide (PAM), which degrades to form nitrogen, ammonia, carbon dioxide and water. **It is not considered harmful to aquatic organisms** and does not cause long-term adverse effects in the environment. **Further work is recommended during detailed design** to determine the concentrations and flux of total nitrogen and ammonia that might be generated **if residual PAM degrades in the mine void and seeps into groundwater**. The initial assessment is that potential impacts of these compounds on groundwater is likely to be very low and therefore, this is expected to be a neutral change”.¹² There is no mention that Pam

⁸ Ibid., p6.

⁹ Guzzo p1.

¹⁰ National Water Quality Management Strategy, Australian Drinking Water Guidelines 6 2011, Version 3.1 updated March 2015, Australian Government, National Medical and Research Council, Natural Resource Management Ministerial Council. Endorsed by NHMRC August 2010 and January 2011.

¹¹ NIOSH (The National Institute for Occupational Health), Occupational safety and health guideline for acrylamide, 12

¹² Note: “likely” is not the same as “real ability” (Kralcopic v Minister for Resources, VSC 101 (9 Mar 2021,p13/41). If a “likely” risk were deemed “possible” and the consequence “moderate” this risk would become at least moderate and the “change” positive.

degrades to acrylamide. Of course, **it is in Kalbar's interests to describe the risks as low or insignificant.**

TD193's suggestion that seepage to groundwater is possible conflicts with both TD 42 and 43¹³ advice, viz.:

TD 42, 5, p2/3, at 5: "Any risk of seepage from fine tailings is removed as this material is fully dewatered to a state that will only retain capillary moisture that cannot seep to the environment".

TD 43, 12 (e), p9/9), TD 43, 12 (e), p9/9): "Any risk of seepage is removed as the material is fully dewatered to a state that will only retain capillary moisture that cannot seep to the environment."

Therefore, the claim (TD 42, 5, p2/3 & 43, 12 (e), p9/9), that the fully dewatered material **"cannot seep to the environment" is disputed in Kalbar's own reports.** Even if the slurry is buried as a semi-dry slurry clay, it is inevitable that, over time, successive rainfalls and floods will cause water to dissolve the clay and eventually the watery mixture will leach into surrounding soils and groundwater.¹⁴

TD 194, p5/40 claims "...because flocculants like PAM degrade very quickly when transferred mechanically in oxygenated water, they are not typically observed in process water." However, Xiong et al disagree: **"These applications of PAM can result in significant environmental challenges, both in water management and in contamination of local water supplies after accidental spills."**¹⁵

Kalbar has failed to produce any water quality data but admit that the centrifuges will increase concentration of solutes over time. [But] "During detailed design, further investigation will be undertaken to predict long term average process water quality for total and dissolved metals, as well as other water quality parameters such as total dissolved solids, nutrients and other solutes that may concentrate over time. **This may require management, but is not expected to have any impact on surface water**" (TD 193, p3/7). The fine tailings cake stockpile also "presents a water quality hazard if run off does not report to the water management dams" – but exactly how much is also left to the "detailed design" stage (TD 193, p3/7).

Kalbar's claim that there will no impact on surface water quality belies available research and is unsubstantiated because the necessary investigations have not been undertaken.

Scientific knowledge about flocculants is limited

Guzzo et al: "The low number of studies available on the environmental impact and ecological balances of flocculants use is mainly due to limits in developing efficient and reliable analytical techniques to follow these products in environmental media". Therefore, knowledge about the environmental behaviour of polyacrylamide and acrylamide (processing mechanisms and transfer, bioavailability) in particular contexts of flocculant use is limited and rudimentary.¹⁶

In dilute aqueous solution, as is commonly used for Enhanced Oil Recovery applications, **polyacrylamide polymers are susceptible to chemical, thermal, and mechanical degradation.** Concerns have been raised that polyacrylamide used in agriculture may contaminate food with acrylamide.^[9]

¹³ TD43 and TD 42 (white & Case letter to IAC 18/1/21).

¹⁴ As proof, try this simple backyard experiment: place a lump of clay in a sieve placed over a bucket and leave outside in the rain for a time.

¹⁵ Xiong, B., Loss, R.D., Shields, D. *et al.* Polyacrylamide degradation and its implications in environmental systems. *npj Clean Water* 1, 17 (2018). <https://doi.org/10.1038/s41545-018-0016-8>.

¹⁶ J. Guzzo & A. G. Guezennec, Degradation and transfer of polyacrylamide based flocculent in sludge and industrial and natural waters, *Environ Sci Pollut Res* (2015) 22:6387–6389 DOI 10.1007/s11356-014-3508-1.:

“The presence of degraded polyacrylamide could lead to a significant increase in mobility of the molecule in the environment due to the more hydrophilic nature of polyacrylamide with increased content of carboxylic groups after hydrolysis and degradation under various environmental conditions. This creates potential challenges for water supplies and wastewater treatment... High MW PAM and its co-polymers are used extensively in oil and gas processing, water treatment, and agricultural applications. **Oil and gas processes utilize PAM at much higher concentrations (500–3000 mg/L) than in water treatment and soil management (<10 mg/L).** In addition, **the former applications also impose a much higher mechanical stress and much harsher chemical/thermal conditions, both of which can lead to significant chemical and mechanical degradation of the PAM.**”¹⁷

Xiong et al, state that there are still significant unanswered questions about the rate and extent of PAM degradation, particularly in emerging applications.¹⁸

PAM-contaminated water surface will degrade under sunlight to produce various chemicals. Biodegradation of PAM occurs as microorganisms utilise the amide group of the polymer as a nitrogen source and/or the carbon backbone as a carbon source. It was found that the presence of Titanium oxide (TiO₂) nanoparticles caused a further reduction in MW to 3 × 10⁴ Da (Xiong et al).

Compared to the thousands of tonnes of flocculant Kalbar will use over the mine life, the amount of flocculant used in agriculture and water treatment is minuscule.¹⁹ A basic principle of toxicology is that the dose makes the poison; a chemical in very small doses may not be harmful but deadly in large quantities.²⁰ There are thousands of examples where this principle applies. To cite just two: sodium chloride (table salt) is essential for human health but in large amounts can lead to high blood pressure, strokes, or heart disease. In small doses, Paracetamol, is used to reduce pain and fever; in larger doses, causes liver damage and even death. All chemicals, from whatever source – human manufacture or natural – are potentially toxic at some dose. Therefore, Kalbar’s claims that their usage is “safe” is simply not based on accepted science.

Anionic flocculant may eventually be found to be harmful, like the many other substances initially proclaimed to be completely safe, e.g. tobacco, asbestos, Glyphosate and PFAS, in which case, lacking clear scientific evidence, a precautionary approach must apply.

In the absence of sound scientific information, the real impacts of the centrifuges are unknown. Given that even Kalbar recommends that “further work on the optimisation for flocculent dose should be undertaken, testing the type of flocculent, dilution of floc and feed and the impact of water chemistry” (TD 195, p36/54), **it would be naïve (even negligent) for anyone to accept Kalbar’s assurances that the technology will work under scaled-up Fingerboards’ conditions and that it will reduce the environmental effects.**

The information provided by Kalbar’s “experts” provides no assurances that the centrifuges will lessen environmental effects. There is absolutely no evidence to support Kalbar’s claim that: “Where there is potential for negative environment effects, the negative effect is expected to be slight and manageable (TD !94, p1/40).

Therefore, until proven scientific evidence as to the harmful effects of the polymer on the environment, including rivers, the Lake, soils, human health and future agriculture is found,

¹⁷ Xiong, B., Loss, R.D., Shields, D. *et al.* Polyacrylamide degradation and its implications in environmental systems. *npj Clean Water* 1, 17 (2018). <https://doi.org/10.1038/s41545-018-0016-8>

¹⁸ *Ibid.*, p6.

¹⁹ *Ibid.*, p3 & 4. PAM flocculant in drinking water treatment (at concentrations <1 mg/L) and Acrylamide concentrations in commercial PAM products are typically less than 100–500 parts acrylamide per million repeat units (w/w) as regulated by the Food and Drug Administration (FDA), the U.S. Environmental Protection Agency (EPA), and the National Resources Conservation Services (NRCS). The European Commission (EC) has a stricter limit of 0.1 ppb (w/v) acrylamide www.nature.com/npjcleanwater; *npj Clean Water* (2018) 1:17; oi:10.1038/s41545-018-0016-8;.

²⁰ *dosis sola facit venenum* 'only the dose makes the poison'. Adage attributed to Paracelsus. Circa 1538.

the precautionary approach is to conclude that the centrifuges will increase, not reduce, the adverse environmental effects.

Water Usage and Recovery

Kalbar's water usage figures keep changing from document to document like shifting sands. Claims that the centrifuges will achieve a water recovery rate of 80% compared to around 55% for fine tailings [with] "the remainder [20 %] subsequently lost to evaporation" (TD 42, p2/3) does not account for the fact that the centrifuge process will use considerably more water -- 4-5 GL per annum not 3GLpa (TD 43, p7/9).

TD 43, p7/9: "Without the use of amphirols, the estimated water consumption of the project operating at a processing rate of 1,500tph is estimated to be in the range of 4-6 GL per annum. Modelling of the amphirols estimated that the additional water release could be as much as 2GL per annum and the water consumption was therefore estimated to be nominally 3GL per annum. **A review of this modelling has highlighted that the additional water released by the amphirols for process recovery was overestimated** and the 3GLpa water requirement is consequently under-estimated. It is likely to be in the range of 4-5 GL per annum when using the amphirols." However: "Based on centrifuge testwork results, the water recovery estimate shows that the 3GL per annum water requirement remains achievable, with ~2.9 GL per annum required for a process plant operating at the maximum 1,500tpa processing rate."

Compare TD 193, p1/7²¹: "Inclusion of centrifuges will slightly reduce the water requirement assessed in the EES from 3 GL/year to around 2.9 GL/year, which will result in a slight reduction to the amount of borefield make up water required. This is a neutral or slightly positive change" but one that remains unproven. These predictions do not account for the extra water **required for dust suppression**.

Natural infrastructure

Healthy natural ecosystems are not "nice to have", optional extras, but fundamental major assets of any nation. East Gippsland's natural infrastructure, e.g. rivers, the Lakes and groundwater sustain our economy, our health and wellbeing.

The MRSD Act 1990, Sec 2A 2 (b) and (c) requires inter-generational equity and the ecological integrity of biological diversity maintained and protected.

The migration of carcinogenic PAM flocculant to our waterways and the RAMSAR-listed Lakes and to groundwater is a major concern; the resulting contamination must not be downplayed. Not only irrigators but also stock and domestic users will be affected by further declines in groundwater quality and quantity. In addition, Kalbar states (somewhat awkwardly) that the "dewatering of the flocculant slurry results in much water lost to evaporation with some water returned to a process water dam". To allow Kalbar to waste water is highly irresponsible when other users have capped allocations or are on water restrictions.

Any decision to allow the contamination of a valuable and declining resource with harmful substances would be dangerous, incredibly stupid, and probably illegal.

Without expert **independent** mining engineering and environmental scientific advice, it is impossible to ascertain whether the centrifuge model selected by Kalbar can really perform to the highest operational and environmental standards. Given the lack of suitable testing trials, this evidence will probably not be forthcoming within the EES timeframe.

Kalbar's flocculant use is massive. Managing the dosing rates is "critical"; inevitable mistakes will lead to significant environmental pollution, which, if it escapes to groundwater and waterways will be difficult, if not impossible, to reverse. All the evidence presented by Kalbar prove that the technology is still in its "design" and testing stage. Using false analogies such as cases cited in the Auckland Regional City report seems a calculated strategy to pervert the truth. The known risks are significant

²¹ TD 193 Impacts of the Use of Centrifuges on the EES Study.

but new risks could emerge when it is too late. Therefore, rejecting the proposal would comply with the Precautionary Principle (MRSD Act 1990, Sec 2A(2)(g).

Human Health Risk Assessment (HHRA) – Other Substances of Concern

As long ago as 1946 the World Health Organisation (WHO) adopted a broad definition of health: “A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” The US Centres for Disease Control (2013) defines wellbeing as: “A valid population outcome measure beyond morbidity, mortality, and economic status that tells us how people perceive their life is going from their own perspective.”²²

Kalbar’s health assessment rates radionuclides as “low and acceptable” in all circumstances, including “the health impacts associated with radionuclides in deposited dust on soil and on edible crops were quantified and found to be low and acceptable (refer to section 9.1.4 of the Assessment).”²³

It is absolutely staggering that exposure to carcinogenic radionuclides and silica dust is dismissed a minor consequence! Does this not remind you of big tobacco and James Hardie?

Collateral health effects from the centrifuges

The physical and emotional stress of having to write an additional submission must be included as collateral health effects of the centrifuges. The huge workload demanded by the EES process to track, read, and digest over 200 documents, reports and updated reports and conduct relevant research has been unreasonably time-consuming and, due to the time constraints imposed, absolutely exhausting. Sitting at the computer for endless hours without breaks day after day for weeks is a declared cancer and heart disease risk! I am not being flippant when I say that this process has taken a toll on my physical and mental wellbeing. And I am scarred because of it. It seems that Kalbar’s tactic is to wear down submitters in the hope they will simply despair and give up.

Dust

The use of centrifuges will not reduce the quantum of dust, which will still be generated by the cake haul trucks and will require additional water (TD 43, p7/9). Kalbar hides the fact that this dust contains radionuclides and carcinogenic materials, which it considers as a low or insignificant risk. When the mine was proposed sometime back in 2014, no mention was made of radionuclides. Will Gippsland be left with a huge dangerous radioactive toxic dump? Will the whole area be no go zone for generations?

The EES Appendix A006 estimated that 375 ML of water will be required per year for dust suppression by water trucks (Appendix A006, Appendix A, Section 4.6.4, page 36).²⁴ The cost of water and/or other dust suppression methods and revegetation (TD 84, 87, p21/83) is conveniently omitted. And how ironic is recommending revegetation **after** the original vegetation has been bulldozed. A far better mitigation method would be to keep the existing mature trees and bush and save the wildlife at the same time! Notwithstanding, all these time-consuming and extremely expensive mitigation suggestions will add to OPEX, already considerable and undoubtedly unsustainable.

Far worse than the amenity impacts (TD 84, 3.1.2, p 11/83) are the health impacts of fine particulates (TD 84, 3.1.3. 41, p 11/83), especially the very fine particulates. TD 82 Health (Coffey), p13/42) refers to submitters’ concerns about indirect ingestion of toxic dust via animal products and edible plants. Animal health is not discussed but livestock health is a biosecurity matter under Commonwealth law. **Teague notes that this information will not be available until the hearings.** So, once again, submitters are being kept in the dark about the full environmental impacts.

Note: TD 193, p4/7: “In year 5 operations, use of centrifuges reduces the total estimated

²² Valuing Nature

²³ Example: TD 82, p12&16/42; and EES 48 Human Health Risk Assessment.

²⁴ Cited in TD 84, Welchman, p21/83.

emission rate of TSP and PM10 but the total emission rate of PM2.5 increases by 1%.

In year 8 operations, use of centrifuges increases the total estimated emission rate of TSP by 1% and PM10 by 2%, with no change to the emission rate of PM2.5.

In year 12 operations, use of centrifuges reduces the total estimated emission rate of TSP and PM10, with no change to the emission rate of PM2.5.

Although these figures imply the centrifuges do not change particles' emission rates over 12 years (TD 193, p5/7), Simon Welchman concludes, TD 139, p6/15 "In relation to PM2.5, the emission rate increases by 1% as a result of the centrifuge scenario."

TD 84, p8/83, confirms: "fine particulate matter may remain suspended in the atmosphere for many days and travel many hundreds of kilometres." These PM particles can lead to cough, asthma and heart attacks, high blood pressure, stroke, other serious diseases and death. The smallest and most dangerous particulate PM2.5 has an atmospheric lifetime of days to weeks over a distance of hundreds of thousands of kilometers (TD84, Table 1, p10/83). Mr. Welchman concludes (TD 84, p11/83): "Air quality assessments of mining projects have shown that it is possible, with contemporary design and dust control measures, to avoid exceedance of the air quality objectives." But, he does not describe how this design process is executed. Why not? Perhaps because the fine particulates cannot be removed from the environment.

Compliance with other mitigation measures requested by EPA are simply impractical, e.g. speed limits on gravel roads; video monitoring) of high dust generation activities (TD 84, 67, p17/83); and monitoring of water tanks and crops on private land. If conditions on the mining licence require such monitoring in consultation with farmers and the community reference group, then the onus of compliance will inevitably fall on local people because the EPA do not have a good record of unsupervised monitoring. It is utterly unreasonable to expect the very people affected to bear responsibility for compliance.

A trigger speed of 20 km/h (TD 84, 76, p18/83) is not nearly low enough because, as any farming woman knows, at the best of times, black dust invades the house and surfaces must be cleaned daily. And, without anyone to test the dust, she will never know just how much radioactive fine particulate dust her family will be exposed to. What a nightmare! Do you think she will sleep at night? Will she feel safe?

The assumptions made relating to the scenarios presented (TD 84, p15/83) are unrealistic: works will not stop during the night and if they did, the overburden extraction [would be] twice the normal rate during the day (6am to 6pm). In the absence of diligent and regular monitoring by the EPA, SEPP AAQ compliance cannot be guaranteed, especially during the 15-20 year mine life, and beyond.

By using centrifuges, dust emissions from overburden haulage and vehicle exhaust emissions are reduced due to shorter haulage distances. However, the additional haulage of cake from the centrifuges to the mining void is a new dust source, which increases dust associated with tailings management. **"Dust emissions from tailings management are anticipated to increase due mainly to the materials being hauled during the day to their disposal site"** (TD 139, p6/15 Welchman Supplementary Air Quality report).

Kalbar's Health expert witness, Karen Teague, states at 5.4.4. Regional receptor radius and selection of sensitive populations: "Although I was not aware of the potential for farming activities on-site during mine operations, **it is suggested Kalbar provides these farmers with appropriate health and safety training, updates and PPE if required**"(TD 82,p15/42).

Why would farmers need PPE if the dust is not toxic or at a level considered to be only a low or negligible risk?

Perhaps because as TD 197 Amended Work Plan, p129/191, states: **"Up to 500,000 t of concentrate may be stockpiled on a temporary basis adjacent to the WCP, depending**

on market demand for the concentrate.” What happens if market demand drops? Or the mind is abandoned? Will the stockpile sit there indefinitely?

Given workers will be continuously exposed to radioactive, crystalline silica dust and soils, and PAM will they also be required to wear PPE? Can this mine operate within OH&S regulations? Will class actions ensue when workers and others contract cancer or other disease?

Radiation

TD 197 Amended Draft Work Plan, p133/191, acknowledges that: “Kalbar will need to apply for a management licence to cover the radiation safety related aspects of operations within the mine, in accordance with the provisions of the Victorian Radiation Regulations 2017”.

But how will offsite impacts be monitored and regulated? Offsite dust not only includes carcinogenic (radioactive silica sands) dust generated by bulldozers, trucks that is carried on the wind and deposited on nearby farms (vegetable, dairy, cattle and sheep), houses, and major water reservoir but also the dust that escapes from B-Double trucks and/or freight trains transporting the HMC loads to Port Melbourne. Absent from the EES reports is any reference to the risks of carcinogenic HMC dust blowing over all those homes, businesses and farms adjacent the Princes Highway and/or VLine rail line on the way to Port Melbourne. **Transport of radioactive materials is an issue of concern, as evidenced in the ARPANSA study.**²⁵

The exposure of hundreds of thousands of Victorians to radioactive and silica of radioactive also has political ramifications. Note: Effectively, radiation exposure to zircon dust would result in about 60% of radiation exposure received from ilmenite/synthetic rutile dust of the same activity concentration, and 65% of radiation exposure from HMC dust of the same activity concentration. Although this study found that mineral sands transportation “does not pose a significant risk to the workers and members of the general public”²⁶, no studies of cancer rates in employees has been done; as experience shows, cancers often take years to develop.

Kalbar considers dust falling on the Woodglen storage dam water supply is not an unacceptable health risk to users who consume the water (TD 82, p16/42). Acceptable or not, people will still be anxious about water quality. And, like other assurances, e.g., PFAS contamination around Commonwealth Defence bases, they are inevitably found to be false. At the very same time as I overheard one agency representative confess to his colleagues at the Sale PFAS community information meeting: “This problem will never go away”, another government spokesperson was reassuring the public that there was nothing to worry about. Likewise, the assessment that “the health impacts associated with radionuclides in deposited dust on soil and on edible crops were quantified and found to be low and acceptable (refer to section 9.1.4 of the Assessment)” (TD 82, p16/42) will not fool anyone.

TD 193, p4/7, states: “Broadly, modelling of dust emission rates with centrifuges included in the Project, shows little change to the EES modelling. Therefore, toxic dust remains a significant health and safety problem.

Noise

“The predicted noise levels for the centrifuge-based option are below the recommended levels in EPA Publication 1411 Noise from Industry in Regional Victoria for the day, evening and night periods” (TD 193, p5/7). However, this is not an Industrial zone but a Farming zone. Note: *Noise from Industry in Regional Victoria Guidelines* state, p5/15): “**The recommended levels will not maintain the existing tranquillity in these areas.**”

There will be added noise from the centrifuges 24/7 operation, the amphirols (if retained), combined as well as trucks, forklifts, scrapers, airblowers, sump pumps, generators etc. will increase the frequency, intensity of, and vibration from, the mine.²⁷ “Noisier activities will be scheduled for less sensitive times where feasible and works will be limited as much as practicable during the night and weekends” (TD 201, NV17, 30 pp15,16/22). This is not the

²⁵ Radiation exposure in the transport of heavy mineral sands: Report for the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), Sept 2008. For example: 3.7 Potential exposures of the members of the general public

²⁶ *Ibid.*, p35/37.

²⁷ Example: TD 194, p4/40.

same as: **“Front-end loaders and cake haul** from the cake stockpile to the mine void will only occur during the “day” period and **will not operate during “evening” and “night” periods** (TD 194, p6/40), **“where feasible”** (TD 201, NV16, p15/22). Once again, noise will be addressed through future “during detailed design” (TD 201, 17/22).

“Based on the above, it is expected that the introduction of the centrifuge plant will result in a lesser noise impact than the amphirol operations but this will be separately assessed by Kalbar’s noise experts, Marshall Day Acoustics.” However, TD 201, p17/22 (updated noise risk assessment) states noise risk from the centrifuges needed to be included in the “detailed design elements of the project”. **In other words, noise modelling not done yet!!**

Let’s face it: the centrifuges will be noisy. All the decibel charts and desktop modelling will not disappear the noise. Expectations are not reality. The centrifuges will produce a “lesser noise impact”—lesser than what and by how many decibels? With 6-8 centrifuges, bulldozers and trucks operating 24/7 exactly how many kilometres away will the noise be heard on a still, calm night? Will the trucks have those irritating backing beeps? Will there be sudden loud crashes as loads are dumped? Certain frequencies or throbbing can be intensely irritating; vibration that can affect a structure can be continuous, intermittent, or impulsive. Noise carries across the landscape, especially at night and can be audible many kilometres away. On a still morning, I can hear the Vline train 10kms from my home.

Added to noise will be lights—both stationary and moving, further ruining tranquil nights.

If the mine is approved and even if its noise limits are “well within applicable guidelines and standard criteria ranges, such that special control measures are not required” (TD 201, p4/22), Kalbar may still find itself subject of legal action due to noise nuisance, like Bald Hill Wind Farms Pty Ltd.²⁸ This is NOT an industrial zone; this is a closely-settled farming zone where common noise relates to agricultural activities. Chainsaws or heavy machinery can be very disturbing, but people put up with them because they know the noise is temporary. Unpleasant and unending noise is a form of torture, which will lead to physical and mental health problems. The discussion about noise, which always revolves around mitigation fails to account for the value of silence. Urban dwellers have no experience of silence so they do not comprehend what silence means for the soul. People have a right to peaceful enjoyment of their homes, especially at night. The Courts have taken a “strong approach ...to interference with sleep”²⁹. **Even the loss of one night’s rest may amount to nuisance.**

Air Quality: Greenhouse Gas Emissions (GGEs) and Climate change

Kalbar should have been required to prepare a Climate Change Action Management Plan and how its project complies with the Climate Change Act 2017. Hutley SC has advised that company directors who fail to consider foreseeable climate change risks in their business decisions will find themselves liable for breaching their duty of care and diligence in the future. Hutley warns that it is only “a matter of time” before individual directors, not just the company, will find themselves subject of negligence claims if they ignore climate risks.³⁰ Decision-makers also have obligations under Section 17 of the Act in relation to its policy objectives and guiding principles.

The State Government may also find itself vicariously liable if it approves the mine without a valid climate change and emissions reduction strategy.

²⁸ Supreme Court of Victoria: [Bald Hills Wind Farm Pty Ltd v South Gippsland Shire Council \[2020\] VSC 512 \(18 August 2020\)](#).

²⁹ *Munro v Southern Dairies* [1955] VLR 332, 335, Sholl J, referring favourably to the judgement of Sir Wilfrid Greene M.R. in *Andreae v Selfridge* [1937] 3 All ER 255, 261 [cited in] *Bald Hills Wind Farm*, at 64.

³⁰ Mr Noel Hutley SC and Mr Sebastian Hartford Davis, “Climate change and directors’ duties” supplementary memorandum of opinion, The Centre for Policy Development, 26 march 2019.

ASIC has endorsed the Hutley opinions. In a 2018 speech, ASIC Commissioner John Price considered that the opinions were 'relatively unremarkable' and said that, in ASIC's opinion, the view expressed 'appears legally sound and is reflective of our understanding of the position under the prevailing case law in Australia so far as directors' duties are concerned'. Commissioners Sean Hughes and Cathie Armour further emphasised ASIC's agreement with the Hutley opinions, and stressed the importance for company directors of considering the impact of climate change on the company's business, and ensuring that strong effective corporate governance practices are sustained in the company."³¹ Under pressure from shareholders, public companies are rapidly developing plans as to how they will meet net zero targets. Not to do so will mean the imposition of international emissions regulations and carbon taxes, which will have to be added to business costs.³² Climate change risks which may be material to a company's prospects must be disclosed.³³

As part of its risk management matrix, Kalbar must consider how its business model and its decision to use centrifuges will increase its contribution to greenhouse gas emissions and climate change. Although some mention is made of emissions, their impact on climate change generally is not discussed. The cumulative impacts of emissions must be considered in assessing Kalbar's contribution to Victoria's quotient. It is quite unreasonable to allow Kalbar to increase Victoria's emissions while others provide the cuts.

Kalbar states its main emissions are carbon dioxide (CO₂). with smaller contributions from methane (CH₄) and nitrous oxide (N₂O) (TD 38 Appendix A009, p99/364).

"Inclusion of centrifuges would use **approximately 10,194 MWh [Note: this figure is unreliable—figures vary widely in Kalbar's reports]** of electricity per year in total, which will have associated GHG emissions of approximately 10,400 tCO₂-e per year. This would represent a 15% increase in GHG emissions if no other changes to the Project were made" (TD 193, p5/7 and TD 139, section 4.5, 49, Welchman, 9 February 2021). The graph at 23, Figure 1, TD 84 Air Quality, p8/83 "shows a breakdown of GHG emissions by scope and source. The clear majority of Scope 1 GHG emissions are associated with diesel consumption of mining equipment and heavy machinery. Electricity usage is predominantly associated with processing operations."

The travel emissions (kilometres) from importing the centrifuges and flocculant and transporting them to Glenaladale must be added to on site emissions. Emissions embodied in the steel and concrete infrastructure as well as roads' infrastructure, e.g.the 40m long, deep haul road underpass (TD 197, p150/191), must also be included. These calculations are absent from the updated information on the centrifuges.

³¹ Keynote address by John Price, Commissioner, Australian Securities and Investments Commission, Centre for Policy Development: Financing a Sustainable Economy, Sydney, Australia, 18 June 2018 [Climate change | ASIC - Australian Securities and Investments Commission](#).

³² Hans van Leeuwen, 'Climate activist has big banks in his sights, Australian Financial Review, Companies, 20-21 March 2021, p28.

³³ Op. cit. John Price address.

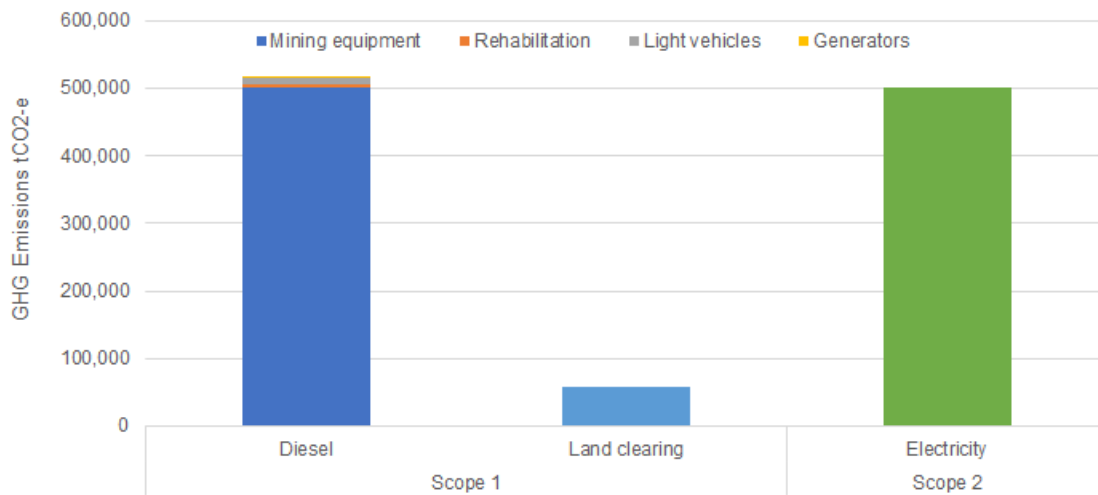


Figure 1 Project GHG emissions by emission source and emission scope (TD 84 Air Quality, p8/83)

Centrifuge Transport

Kalbar has not explained how the centrifuges will be transported from its Australian port of entry to Glenaladale. I did read one statement that said the Princes Highway via Sale could not be used because the centrifuges would not fit under Stratford rail viaduct, However, there is also an even lower viaduct on the Maffra-Stratford road.

Rehabilitation

“Decommissioning activities for the project are predominantly related to the rehabilitation of mine cells to a standard that is suitable for the re-establishment of agricultural activities” (TD 38 appendix 009 Air Quality and Greenhouse Assessment) p101/364).

The problem is that once tonnes of flocculant are buried, the land can never be restored to its original condition. No farmer would want to use the land for food and fibre production. Not ever!

Kalbar have not explained how they plan to remove the centrifuges and associated infrastructure, including the concrete sump (TD 194, p4/40) after mine closure (See Figure 7, TD 43, [6/9).

TD 215 Amended Work Plan, Appendix C, Draft Mine Rehabilitation Plan is silent on plans for the centrifuges, or contaminated concrete and steel, other than two cryptic statements:

TD 215, p79/165: “All hazardous structures removed from the area or **remaining structures made safe**” and “Infrastructure will be decommissioned and removed, **unless means of legal ownership transfer documentation has been agreed with stakeholders**”.

Apart from the tonnes of flocculant which will be progressively buried, what will happen to the “contaminated” buildings and infrastructure post mine closure? Could the infrastructure be sold to a new owner? Can Kalbar legally transfer its rehabilitation responsibility to another party? Is this permissible under government regulations? And who monitors this process?

is Kalbar’s Rehabilitation plan for its contaminated infrastructure? Is it consistent with Global Best Practice? Or do they plan to do what ERA plans to do at Jabiru Uranium mine?

I refer to Four Corners, Kakadu in Crisis (ABC, 22 February 2021) which explored the significant concerns about ERA/Rio’s rehabilitation of the Jabiru’s Ranger uranium mine site. Professor Keepsley Dixon, Ecological Rehabilitation expert, Curtin University, described

ERA's plan to bury the contaminated buildings and equipment in one of the mine's enormous pits as not being global best practice, saying that deep burial was "surprising". Professor Dixon feared that if the rehabilitation processes "can't put back the biodiversity, we could find the ERA site an eroding heap of substandard scrub." The land and the river systems for at least 50 km downstream are so highly polluted nobody can recover it. The Traditional Owners have closed Kakadu National Park due to the contamination.

Anyone who has worked in mining would not be at all surprised that it is general practice to bury abandoned infrastructure on site, covered only with a couple of metres of clay.

Decommissioned and abandoned mineral sands mines pepper Western Victoria (as Google Earth reveals. At all the gold mine sites established around central Victoria in the last five decades only part of the steelwork with commercial value has been removed--sometimes to another mine site. No concrete has ever been removed; concrete from any building site is classified as contaminated and cannot be dumped indiscriminately. In all these mines, we are talking about disposing of massive concrete and steel structures, which are 11 metres high (see Figure 7, TD 43, p6/9). At GBM Gold mine, Bendigo the concrete structure for the processing plant is 20 m high approx. Hazelwood coal mine, Latrobe Valley, have EPA approval to blow up their dredgers and buildings after asbestos removal which will all be buried in the pit.

In my original submission (No 335), I referred to the VAGO Report: Rehabilitating Mines, August 2020, which found "**systemic regulatory failures**" relating to mine rehabilitation. In fact, there has not been one mine in Victoria which has been successfully rehabilitated. And in practically all cases, mine sites have been abandoned leaving open steep-sided pits that are traps for vehicles, people, and wildlife. For example:

- Eaglehawk mine site; bulk sampling pits at Dunolly
- Hird's pit, Heathcote where the broken "security fence" allows children to swim in class B toxic waste. A sign was erected warning swimming was dangerous but the holes in the fence remain.
- The two main pits at Stawell and at Bendigo mines with current mining licences where the security fences are in such disrepair it is now only a matter of time before children or prospectors die in these pits.
- Kralcopic Pty Ltd has just declared involuntary liquidation leaving 100 tonnes of carcinogens lying in a paddock.³⁴ As part of rehabilitation, water contaminated with arsenic has been diverted to Woodvale.³⁵ Its mining licences have not been renewed due because it could not provide surety of its finances.
- Contrary to VAGO advice--Stockman's mine, Benambra continues to leak toxins into the Tambo River despite the State Government's expenditure of \$5.6 million to fix the problem.
- Iluka Douglas Mine – radioactive waste dumped in pit 23.

What is the net revenue from taxes and royalties less the taxpayer-funded costs of reparation and ill-health and suffering? Where is the net community benefit?

Even if they can dismantle the centrifuges—and this may be difficult due to the massive volume of concrete in the centrifuge foundations and the likelihood that the construction of dam spillways will be above the original soil profile—where could they transport the contaminated materials? Is there a toxic dump anywhere in Australia that would take radioactive waste of this size? Kalbar will undoubtedly want concrete structures to remain on the site, perhaps capped and clay-covered.

³⁴ <https://creditorrights.org.au/insolvency/kralcopic-pty-ltd/> and Kralcopic Pty Ltd v Minister for Resources 2021 VSC 101 (9 March 2021).

³⁵ A Report commissioned by the Victorian Department of Environment, Land, Water & Planning (DELWP) titled "**Water Tank and soil sampling Woodvale**" was released in September 2015.

TD 197, p113/191 notes: “Geotechnical risks are risks associated with ground movements. They include subsidence, natural rebound, or batter collapse. People, infrastructure or the environment may be harmed by ground movements, and accordingly the risks of harm arising from ground movements must be identified and minimised during the period of operation, rehabilitation, and after closure of the site.” What are the geotechnical risks of radioactive materials remaining in situ for decades to come?

The truth is that there has been absolutely no regulatory oversight of any Victorian mine site in the past thirty years. It seems our Governments simply don't care that country people are left to suffer high levels of toxins, and all that means for their health and wellbeing. No wonder suicide levels are so high.³⁶

Will the Kalbar experience, by some miracle, be different?

The IAC needs to consider what is Kalbar's real ability to fulfil its rehabilitation obligations.

- What is the estimated cost of rehabilitation works?
- How is that determined?
- Will the rehabilitation bond be sufficient to fund all the works spanning 20 years or more?
- How has Kalbar demonstrated it has the financial ability to fund the necessary rehabilitation works?
- What happens if they default or copy Kralcopic Pty Ltd's tactic of involuntary liquidation and, like so many others, the contaminated mine site is left abandoned so rehabilitation falls on Victorian taxpayers?
- Will the geotechnical risks be fully disclosed?
- Will the concrete structures, steelwork that cannot be easily recycled for financial gain be removed?

Given Australia's woeful mine rehabilitation record, the community has absolutely no confidence whatsoever that effective and sustainable rehabilitation will occur; and neither should the IAC.

A failure to rehabilitate the land would be inconsistent with the sustainable development principles Section 2A (a) and (b) set out in the MRSD Act which require a path of economic development that safeguards the welfare of future generations and provides for inter-generational equity.

Centrifuges versus TSF Option

The legitimacy of omitting the centrifuges' option and now excluding considering the TSF option needs to be examined in relation to the EES objectives outlined in the Scoping Requirements.

TD 130 Appendix B reports that **in 2018**, testing by Alfa Laval indicated that centrifuges were a viable option for tailings waste management. Moreover, the Robbins Report concluded that: “Given the nature of the orebody (in relation to the given water table), a dry mining technique is deemed the only practical option available for any proposed mining operation.”³⁷

The Scoping Requirements state: **“Overall, the main report should include:**

- **a description of relevant alternatives** capable of substantially meeting the project's objectives that may also offer environmental or other benefits (as well as the basis for the choice where a preferred alternative is nominated);

³⁶ Royal Commission into Victoria's Mental Health System, Feb 2021.

³⁷ Submission 610, p11/110.

The centrifuges' option should have been included in the original EES reports. To have hidden this critical information and then, ex post facto, to introduce it just as the hearings were about to commence may be interpreted a deliberate ploy to pervert the EES process and to cause submitters undue personal and financial hardship.

Mine Free Glenaladale have expressed concern that IAC has decided not to include the TSF option because of the "possibility, for financial or other reasons, the Proponent may wish to abandon centrifuges and revert to the TSF option in future after the Minister's Assessment" (TD 212, 20a).

The Scoping Requirements state: " The proponent will also need to identify and address other relevant policies, strategies, subordinate legislation and related management or planning processes that may be relevant to the assessment of the project and relevant roadside management strategies under the East Gippsland and Wellington Planning Schemes. **These include, but are not limited to: Management of Tailings Storage Facilities.**"

The IAC considers it cannot assess something not proposed. The Proponent is 'on the record' stating that centrifuges will be used in place of the TSF option, and therefore the potential that the TSF option may be reintroduced at some future time is not something that should directly influence the decision as to whether to assess the exhibited TSF option at this time" (TD 212, at 43). With due respect, this seems naïve. If the centrifuge technology fails in the field situation, which could happen due to the lack of testing, then Kalbar will want to resort to the TSF option. Should this happen, the ability of the Work Plan to be varied after approval without further community consultation would have the effect of leaving the community in the position where the mine was approved without an EES process. This is grossly undemocratic and contrary to the 'fair hearing' and 'bias' rules embodied in the principles of natural justice.³⁸

Moreover, to say, at 44: If the TSF option is assessed now this will add to costs and time, as opposed to some possible future occurrence. Who says future cost and time will be saved? For whom? Certainly not the community.

Kalbar has no business case

Will the mine be commercially viable, i.e., can it generate sufficient profits to fully fund all its environmental, social and rehabilitation obligations? Kalbar has failed to demonstrate that it has the financial capacity not only to fulfil its operations but to meet the necessary environmental standards required to protect this most sensitive catchment that feeds into the Ramsar-listed Gippsland Lakes.

Kalbar has not produced a business case for the mine. In the absence of a business case, the proponent (Kalbar) has not established that the project is commercially viable either with or without the centrifuges. For their retention licence to be converted to a mining licence, they must prove that the project which was issued with a retention licence (because at the time it wasn't a viable project), is now a viable project.

Can Kalbar concurrently hold two mining licences for the one project?

Section 14(4) amended by Nos 59/2010 s. 7(1), 43/2012 s. 3(Sch. item 30):

(4) The area of the land described in a licence must not exceed 260 hectares, unless the Minister decides a greater area may be required to mine a mineral resource.

The Supplementary Reports for the inclusion of the centrifuges seem to indicate that the two buildings, each to accommodate 3+1 centrifuges, will be located respectively on the Eastern and Western part of the site so that each pit is close enough to satisfy the trucking distance criteria. Given the 260ha licence restriction, would two licences be required—one for the West,

³⁸ Administrative Review Council, Decision Making: Natural Justice, Best Practice Guide, Commonwealth of Australia 2007.

one for the East? And is this a contravention of the Act? Or has the Minister varied the 260ha limit? And, if so, where is the evidence?

Kalbar has not produced any financial statements, no budget forecasts as part of the EES process. It has failed to disclose financial information despite my repeated requests for recent Annual Reports. It offers no evidence it has considered the full project costs either with or without centrifuge technology. It has not considered climate change risks. However, it did present some preliminary figures in a powerpoint presentation to prospective investors in 2018, indicating a total CAPEX OF \$105.9 million, which now seems wildly under-estimated.³⁹

How can Kalbar, an unknown company with no proven performance and without evidence say it will succeed where big miners Rio Tinto and Oresome Metallica, both listed companies on the Australian Stock Exchange, saw no hope of a commercially viable enterprise? This claim must be rigorously interrogated.

Instead, the “exact scope, detailed operating parameters that may be achieved in practice and economic implications on the Project **can only be determined after detailed design and cost estimating work is completed**” (TD 130, p7/53). Put simply, Kalbar does not know because it has not done its homework. Detailed costings should have been provided as part of the EES project description according to ERR regulations. Does Kalbar’s recalcitrance stem from incompetence or subterfuge? Either way, this is unacceptable and borders on fraudulence.

Conclusion

The EES Scoping Requirements—Resource Development states key Issues include:

- Efficient and environmentally sustainable mining of available resources.
- Best use of land’s resources considering environmental, agricultural and forest values.

Kalbar states it plans to produce over 8 million tonnes of heavy mineral concentrate (HMC) from 170 million tonnes of ore over a 15-20 year period. Compared to other mines, for example, to ARAfura mine’s 56 million tonnes 8 million tonnes is quite small.

Some benefits and disbenefits are more important than others

Kalbar would have you believe that the dubious “benefits” of this mine can compensate for the substantial loss of social and environmental values. What the State Government needs to understand is that healthy natural ecosystems are fundamental major national assets not optional extras, which are nice to have but dispensable. Our natural water infrastructure—Lakes, rivers, groundwater and the ecosystems’ services they provide—are critical to our economic and social health and wellbeing.

No matter how much care Kalbar might take to mitigate the environmental effects, the loss of such a critical natural asset would seal the fate of East Gippsland— the perfect place to live, work, invest and raise a family: never more! When scientific evidence about environmental or human health hazard is uncertain, where the stakes are high, as here, a precautionary approach is not only prudent but required under the legal terms of the MRSD Act. Kalbar has not been able to demonstrate any level of certainty that the centrifuges will have any real ability to lessen the substantial social and environmental impacts and will actually make them worse, especially in relation to human health and wellbeing.

Is the small amount of HMC, which Kalbar plans to sell to China at no benefit to East Gippsland really worth all the environmental and social damage? Which is worth more in terms of socioeconomic benefit to the people of East Gippsland: 200 jobs short-term (not all of which will be for locals) in a toxic mine over the mine life; or 10,000 long-term tourism jobs and 1000 plus horticultural existing jobs?

³⁹ <https://www.businesses.com.au/Analysts-Presentation-May-2017-for-website.pdf>

Will this small amount produce a profit not only for Kalbar but also for in terms of taxpayer revenue from royalties and taxes?

It is not known whether the claimed improved operational efficiency of the mining operations will compensate for the increased capital and operational costs of the centrifuges ((TN 01 001 (TD43, p5/9). Kalbar's various "expert witnesses" present conflicting claims on the environmental impacts of centrifuges. It is impossible to know if the centrifuges will really facilitate accelerated rehabilitation (TD43, p9/9), or if rehabilitation can restore the land's original condition, as promised. Fundamental to the project's feasibility is the availability of sufficient water (for example, TD194, p3/40). As Rio Tinto and Metallica found, water supply is not guaranteed.

When weighing up the contribution of this mine to Australia's complement of rare earths as well as its dire socioeconomic and climate change impacts, thoughtful consideration must be given to rapid advances in the recovery, recycling and processing of electronic waste which will provide opportunities for the proper disposal and treatment hazardous wastes and, in so doing, reduce demand for new mines.⁴⁰ Expectations are that in less time than the mine's life, materials recovery and reuse will be the norm, in which case, this mine will rapidly be redundant.

Full disclosure missing

Throughout the EES process, Kalbar has tried to convince us that absence of evidence is evidence of absence. In this regard:

"Altman and Bland considered the dangers of misinterpreting differences that do not reach significance, criticising use of the term "negative" to describe studies that had not found statistically significant differences. Such studies may not have been large enough to exclude important differences. To leave the impression that they have proved that no effect or no difference exists is misleading....

The truth of these situations can be established only by collecting more evidence, and statements implying that an intervention has no effect might actually discourage further studies by giving the impression that the question has been answered."⁴¹

"Ultimately it is the proponent's responsibility to ensure that adequate studies are undertaken and reported to support the assessment of environmental effects and that the EES has effective internal quality assurance in place. Close consultation with DELWP and the TRG during the investigations and preparation of the EES will be necessary to minimise the need for revisions prior to authorisation of the EES for public exhibition" (EES Scoping Requirements, 3.2).

Of grave concern is Kalbar's persistent endeavour to deny and postpone vital evidence relating to the real quantum of negative environmental effects. Yet another example arises in TD197 Amended Work Plan, p156/191: "**Under some circumstances (described in Section 42(A) of the MRSDA), a further environmental impact assessment report of the proposed new works may be required before a variation can be approved**". This is precisely why Mine Free Glenaladale, the East Gippsland SC and other submitters have requested the hearings be adjourned because a full and proper assessment cannot be conducted when much of the required EES documentation is missing. There are countless errors and omissions, inconsistent and differing statements on the same subjects. Even the expert witnesses are bamboozled, e.g. "**(Error! Reference source— Figure 4-8: Cross Sectional representation of the mining cell)—not found**" (author's emphasis TD 197, p105/191). The situation would be farcical if it were not so serious.

⁴⁰Lister, T.E, Diaz, L.A., Clark, G. G., Keller, P., Process Development for the Recovery of Critical Materials from Electronic Waste, International Mineral Processing Congress, Idaho National Laboratory, Sept 2016.

⁴¹ Anderson, Phil, [Absence of evidence is not evidence of absence: We need to report uncertain results and do it clearly](#), BMJ. 2004 Feb 28; 328(7438): 476–477. doi: 10.1136/bmj.328.7438.476, PMID: PMC351831.

Re Appendices to the Amended Work Plan. TD 197: Amy Selvaraj (DWELP)'s advice to me on Thursday 25 March 2021 was that apart from Appendix B [Risk Management Plan (Draft)] and Appendix C [Mine Rehabilitation Plan (Draft)], none of the other appendices to the work plan require updating as a result of the introduction of centrifuges and, therefore, did not need to be recirculated to the parties". Nonetheless, for the convenience of submitters, who are struggling to navigate the documentation within the time limits, all the available appendices should have been included in the Amended Work Plan; or at least a note to say which ones did not need updating. Note: Draft Rehabilitation Plan. Appendix C, TD 215, was tabled as late as the afternoon of Thursday, 25 March 2021, leaving less than 24 hours to assess it before the submissions' deadline. Is this really fair?

Kalbar has clearly failed the Project Description EES Scoping requirements "to describe the project in sufficient detail both to allow an understanding of all components, processes and development stages, and to enable assessment of their likely potential environmental effects". The relative merits of centrifuges and TSF options cannot be determined because "the [full and irrefutable] technical feasibility and environmental implications of alternative construction, mining, ore processing, tailings management and site rehabilitation methods" has not been done.

I submit that the use of centrifuges does not reduce the impacts from the toxic substances released to the air, water and soil, especially the thorium and uranium, deemed nuclear materials and required to meet IAEA international safeguards⁴². The addition of PAM only worsens the environmental effects and seriously threatens human and animal health and wellbeing.

The Hon Lisa Neville, MP Minister for Environment, Climate Change and Water said on launching the inquiry into the EPA, in 2016: "We need to better protect Victorians from exposure to chemicals and pollution than we unfortunately sometimes have in the past."⁴³ Let us hope the Minister for Planning feels the same.

I refer to the State of Victoria EES Scoping Requirements for Fingerboards Mineral Sands Project 2018 and the Table 1: Draft evaluation objectives, which commence with:

"Resource development – To achieve the best use of available mineral sands resources, in an economic and environmentally sustainable way, including while maintaining viability of other local industries—MRSD Act".

The extra 24/7 noise, lights from centrifuge use worsens the already egregious amenity impacts. Even if the centrifuges can hasten the rehabilitation process, the land will never be restored to its original (or better) condition. They will not resurrect the animals killed. They will not recover the vanished cultural heritage of our Traditional Owners. They will not protect the environment for future generations. They will not wash away the enormous sadness washing over the people for this great loss. This may sound like sentimental drivel but it reflects the sustainable development principles in the Act.

The bottom line: the transfer of wealth from individuals and communities to foreign interests is immoral and should be something no democratic government would consider. Were the true costs of ecosystems services and individual and community welfare lost weighed against the profits the result would show a huge destruction of net community benefit. The EES process is about the protection of threatened and endangered biodiversity and ecosystems, the health and wellbeing of people now and in the future, their inalienable right to the peaceful enjoyment of their homes and to be SAFE. This mine fails this test.

⁴² TD 87,

⁴³ Armytage, P., Brockinton, J. & van Reyk, J. 2017. The Independent Inquiry into Victoria's Environment Protection Authority (EPA) June 2015 to March 2016. Ministerial Advisory Committee for The State of Victoria Department of Environment, Land, Water & Planning. <https://www.environment.vic.gov.au/sustainability/independent-inquiry-into-the->

I request to be heard.

