

**Fingerboards Mineral Sands Project — Inquiry and Advisory Committee (IAC)**  
**Expert meeting statement — Findings in Jess Drake’s report, from F.1, F.3 to F.7**

Meeting held: **12 April 2021, remotely via Microsoft Teams**

Experts: **Jess Drake (JD) and Rob Loch (RL)**

Observers: *none*

Note taker: **Cathie Shorthouse**

Date, time and location of meeting(s): **12 April 2021, 10:45 – 12:06 (AEST), remotely via Microsoft Teams**

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The following key issues and areas of agreement and disagreement were identified by the participating experts at the meeting:

Item No.	Issue	
1.	<p>F.1 Baseline soil information, JD comments 23-40 expressing concerns with respect to quality of soil data</p> <p>F.6 Rehabilitation and mitigation strategies for soils, JD comments 129-159 querying the decision not to use local subsoils</p>	
	<b>Matters of agreement</b>	
	<b>No.</b>	<b>Agreed fact/opinion</b>
	1.1.	<p>JD’s Summary: Understands and acknowledges decisions that were made along the way in assessing soils, but those decisions have not been communicated in the EES, and consequently, the way the information is presented is not in the context of those decisions. The background information, including any decisions made, is essential to understand how the effects of the mine have been assessed.</p>
		<b>Assumptions relied upon in reaching agreement</b>
		<p>RL: Explained that a traditional soil survey was not done, intentionally.</p> <p>Focus was to determine what materials would be likely to be delivered to a rehabilitation site in disturbed condition in a large truck. Main interest was in particle size, stability in terms of exchangeable cations, and fertility issues.</p>

Item No.	Issue	
		<p>A previous 1:100 000 survey had been done for the area by the Victorian DNRE. That study suggested a large proportion of the area was Sodosols (duplex soils with a sandy surface overlying sodic clay), with some Podosols (leached sandy profiles) also present.</p> <p>Samples were taken for analysis from drill core samples that had been taken by Kalbar. The samples analysed showed a surface layer of sandy soil, either with varying depths to gravel (if gravel at all) or to heavy clay, also at varying depths. The clay was generally sodic.</p> <p>Soil profile descriptions by Andrew Long &amp; Assoc indicated similar soil types, and it was noted that geology of the Fingerboards area is fairly consistent (a Pleistocene river terrace) and that the available information reasonably confirmed that the two broad soil types present were consistent with those reported by DNRE.</p> <p>Previous data and analyses made led to the conclusion that the B horizon of either broad soil type present would not be suitable for rehabilitation, but that the topsoil (A horizon) layer was suitable for rehabilitation works provided an alternative and more productive subsoil layer could be formed. As the A horizon materials were relatively uniform across the area, it raised the question – do we need to know any more about the spatial distribution of sub soils?</p> <p>RL had met with Ian Sargent, who did the DNRE mapping and was confident in it. He also discussed the option of electromagnetic induction (EMI) mapping of sub soils. He had mapped one sodosol at Fingerboards and details of that profile were provided in the DNRE report. His descriptions of both sodosol and podosol soils stressed low water holding capacity and low fertility. RL also has considerable experience at a range of other sites with the extreme difficulty of using sodic clay subsoils in rehabilitation works. It was clear that neither subsoil would not be suitable for rehabilitation works and no further information about them was considered necessary. Therefore there was no value in mapping subsoils.</p> <p>It was concluded that there was no reason to attempt to measure the distribution of soil types (because soil type was determined by the properties of subsoils.)</p> <p>Knowing that A horizon properties (including particle size distribution) are fairly consistent, then rehabilitation planning was possible.</p> <p>Subsequently, has become apparent that data on the depth of A horizon (or depth to subsoil) will be needed to run CAESAR modelling. Consequently, EMI mapping to provide accurate and detailed information on depth to subsoil will be undertaken in the near future.</p> <p><b>Individual comments in respect of agreed fact/opinion</b></p>

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	JD	The report was reviewed not knowing this background information, as it was not provided. Having clarity on how RL's conclusion was arrived at, and how the decisions were made along the way aligns more with the style of RL's work.

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2.	F.1 Baseline soil information, JD comments 41-42, lack of information on soils on steep slopes bordering the plateau	
	<b>Matters of agreement</b>	
	<b>No.</b>	<b>Agreed fact/opinion</b>
2.1.	Agreed that rock armouring on steeper slopes (rock sourced from Fingerboards) will minimise any erosion associated with rehabilitation works.	
	<b>Assumptions relied upon in reaching agreement</b>	
	RL: Slopes are not particularly high, though still likely that the soils at the bottom of the slope would have different particle size. However, at such a small scale, varying surface properties along a relatively short slope is not practical for rehabilitation works, and decision was made to put same soil as elsewhere, with rock armouring on steeper slopes (rock sourced from Fingerboards).	
	RL: Initial plan was to place gravelly HHF and rip to bring rock to surface. Currently, due to cost of gypsum treatment of HHF, planning focuses on adding rock separated from HHF into the surface layer of the soil placed to provide rock armouring.	
	<b>Individual comments in respect of agreed fact/opinion</b>	
	JD	Knowing the information about rock armouring that wasn't included in EES assists in understanding this aspect.

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	JD	Raised concerns regarding the planning and information included in the Kalbar rehabilitation plan (not written by Landloch). Noted that the Rehabilitation Plan has HHF on the surface of the slopes in some diagrams, as an example of concerns.

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3.	F.4 Soil rehabilitation, JD comments 107-110, variation in specified target topsoil depth in various reports and publications	
	<b>Matters of agreement</b>	
	<b>No.</b>	<b>Agreed fact/opinion</b>
	3.1.	Agreed that the EMI survey will be valuable for information related to topsoil availability for rehabilitation.
		<b>Assumptions relied upon in reaching agreement</b>
		RL: Precise depth of topsoil has not, to his knowledge, been completely established as rehabilitation trials are still on-going and soil layer depths are being considered, though comparison of depths that are only slightly dissimilar would not be practicable or effective. 30cm has been discussed with Kalbar and is a desirable goal. Suggested running a water balance model rather than a trial to assess suitable topsoil depth.
		RL: Approximately 20cm topsoil depth was used for convenience in initial trials. This was done with the view that topsoil was a constant across all treatments.
		<b>Individual comments in respect of agreed fact/opinion</b>
	JD	Mass balance was queried.

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	RL	Necessary information will be available after running EMI survey. Expect topsoil availability to be OK, but there may be possibility of excavating extra from profiles of deeper sands where available and if needed.

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4.	F.4 Soil rehabilitation, JD comments 66-124 with respect to: <ul style="list-style-type: none"> <li>1. Trials of profiles, querying quality of experimentation</li> <li>2. Concerns with respect to whether tailings used in the studies was representative</li> </ul>	
	<b>Matters of agreement</b>	
	<b>No.</b>	<b>Agreed fact/opinion</b>
4.1.	Agreed that the rehabilitation trials undertaken were for the purpose of feasibility, but it is not a prescriptive report for how to conduct rehabilitation, and does not constitute full rehabilitation trials for the purpose of understanding effects of rehabilitation. Agreed that further rehabilitation trials are essential.	
	<b>Assumptions relied upon in reaching agreement</b>	
	RL: Conduct of trials. Trials were carried out to provide an initial assessment of the concept of creating alternative subsoils. Those studies were meant to provide guidance for the next round of rehabilitation trials that was to commence a year ago, and were the initial studies were never intended to provide definitive information on rehabilitation practices and performance.	
	RL: Considered where to conduct trials (glasshouses or alternatives). Decided that applied climatic conditions were not important, even when comparing vegetation, as all treatments would be exposed to a wide range of climatic conditions over each year when under field conditions. The focus was very much on comparing subsoil options, and the study generated valuable data on water holding capacity and on water entry rates, on root penetration and hardsetting.	

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		<b>Individual comments in respect of agreed fact/opinion</b>
	JD	Glass house trials versus field conditions for rehabilitation trials was discussed. Concerns raised about how RL's reports have been extrapolated in Kalbar reports. Purpose of RL reports as a feasibility trial was not clear in report. Further work to develop rehabilitation methods is required before progressing.
	RL	Agreed that further rehabilitation trials are essential.
	F.4 Soil rehabilitation, JD comments 73-77 querying whether the tailings used in trials were representative, as the method of processing might affect their properties.	
	<b>Matters of agreement</b>	
	<b>No.</b>	<b>Agreed fact/opinion</b>
	4.2.	Agreed that the tailings used in the trial were representative for the method suggested at that point in time.
	<b>Assumptions relied upon in reaching agreement</b>	
	RL: Checked with Kalbar to confirm the separation process is by gravity under water and that properties of tailings will not be affected by the processing method. Not enough energy to break particles down and the size distribution of material that becomes tailings is not changed by the process, meaning that concerns re: process are addressed.	
	<b>Individual comments in respect of agreed fact/opinion</b>	
	JD	Checked no chemicals were used.
	RL	Confirmed. Flocculants (PAM) may be used.

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	JD	Discussed findings of differences in rates of PAM breakdown and breakdown products between aerobic and anaerobic environments in information provided by Kalbar, and that Julia Jasonsmith has also provided information on this in her Supplementary Reports as an expert in the field. RL considered additional data will be helpful.

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5.	<p>F.5 Rehabilitation criteria and soils, JD comments 91-124, with respect to materials used in rehabilitation and prescriptive rehabilitation methods.</p> <p>F.6 Rehabilitation and mitigation strategies for soils, JD comments 125-159, including points 143 &amp; 144 with respect to:</p> <ol style="list-style-type: none"> <li>1. Discussion re: tailings hardsetting</li> <li>2. Sustainable rehabilitation and fertiliser</li> <li>3. Risk mitigation</li> </ol>	
	<b>Matters of agreement</b>	
	<b>No.</b>	<b>Agreed fact/opinion</b>
	5.1.	Agree that the tailings rehabilitation trial as a pilot study is valuable for understanding water holding capacity and rates of fine tailing rehabilitation mixes. It not a prescriptive report for how to conduct rehabilitation, and does not constitute full rehabilitation trials for the purpose of understanding effects of rehabilitation. JD agrees with RL that the information provided shows feasibility of rehabilitation but it is not a prescriptive report for how to conduct rehabilitation, and does not constitute full rehabilitation trials for the purpose of understanding effects of rehabilitation. Agreed that further rehabilitation trials are essential.

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	<p>The reader of EES is not able to understand the purpose of the rehabilitation reports by Landloch and thus how conclusions were made in terms of a statement of effects, as context is not provided. The purpose was not fully explained in the report. RL agrees that guidance documents for the purpose of the EES may have been helpful.</p> <p>Agreed that any issues identified in the rehabilitation reports should be included in the risk register along with appropriate mitigation measures.</p>	
	<p><b>Individual comments in respect of agreed fact/opinion</b></p>	
	RL	With sufficient proportion of sand grains in tailings mix it will not set so strongly (and avoid brick like setting).
	JD	Was looking at more than just water holding capacity and rates when reviewing information on tailings hardsetting, and was considering it in a broader rehabilitation context i.e. where are tailings being placed more broadly in rehabilitation, not just for use in rehabilitation as a manufactured subsoil. Agreement that the trials were more like a pilot study rather than a full rehabilitation trial, and that the trial is valuable for understanding water holding capacity and rates for tailings mixes.
	RL	Commented that the aim of his rehabilitation work was not to produce a prescription for rehabilitation, but to outline issues to be addressed, methods that could be used, and to identify rehabilitation goals.
	JD	In higher level documents (i.e. in those provided by Kalbar) it would have been beneficial to include the purpose of the Landloch documents in terms of their environmental effects and what else are they considering, from a wholistic approach (possible limitations, risks and mitigation strategies). Linkages are missing and contribute to being a problem in reviewing the report and understanding the rationale.
	RL	Land use is likely to go back to grazing and able to use fertiliser to drive rehabilitation establishment, but the aim is to set up something that is sustainable. Adding organic matter to topsoil and subsoil initially, and aim to accumulate organic matter in initial years.
	JD & RL discussed	Some potential issues due to damage to trees by kangaroos, deer, and other grazing animals. Tree guard and electric fence options were discussed. Concerns with cost of gypsum, if used. Follow up fertilisation is accepted as being required, and there will be issues with does need to be looked into.
	JD	The behind the scenes thinking processes, evidence and decision making for the Landloch rehabilitation reports did exist but were not presented in the reports or documents read by JD. The reader of EES is not



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		able to understand the purpose of the work and thus how conclusions were made, as context is not provided. The purpose was not fully explained in the report. JD agrees the information provided shows feasibility of rehabilitation but it is not a prescriptive report for how to conduct rehabilitation, and does not constitute full rehabilitation trials for the purpose of understanding effects of rehabilitation.
	RL	In agreement with JD and suggests a guidance document would be helpful.
	JD	Monitoring, evaluation, reporting and adaptive management (MERA approach) is adequate to evaluate and adaptively manage rehabilitation, and is an expected and accepted practical process.
	RL	Discussed experience and benefits of rehabilitation monitoring, and considers that quantitative targets for rehabilitation are critical for both mine and regulator.
	JD	Recognises Victorian regulators will be more active in reviewing monitoring data in the future.
	RL	Was of the opinion that many of the issues identified in F.5 were not high risk, and suggested JD dot point issues to be included in risk register. Agreed that inclusion of all issues might be useful for QA and not opposed to more detailed listing of issues.
	JD	The issues that should be included are covered in Point 143 of her EWS. JD believes all issues should be included in the risk register. This information could be used in the EES as points that are known and unknown – to clarify what has been considered and what has not. For example, used to consider information available, limitations, risks and mitigation relevant to understanding the effects of the mine.

Item No.	Issue	
6.	F.7 Characterisation of tailings	
	<b>Matters of agreement</b>	

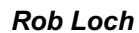
Item No.	Issue		
	<b>No.</b>	<b>Agreed fact/opinion</b>	
	6.1.	Not discussed, as outside of RL's expertise.	
		<b>Assumptions relied upon in reaching agreement</b>	
		RL: Outside of RL's expertise. JD: Commented that this is an issue for the regulators (ERR and EPA) to discuss	

Prepared jointly by:



**Jess Drake**

**[19<sup>th</sup> April 2021]**



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**Jess Drake**

**19 April 2021**



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**Rob Loch**

**19 April 2021**