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Second Supplementary Expert Witness Statement of Simon Welchman Fingerboards Minerals Sands Project

Department of Environment, Land, Water and Planning

Fingerboards Mineral Sands Project Inquiry and Advisory Committee

Prepared for:

White & Case on behalf of Kalbar Operations Pty Ltd

May 2021

Prepared by:

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1. INTRODUCTION

1. Name:

    a. Simon John Welchman

2. Address

    a. My business address is Ground Floor, 16 Marie Street, Milton, Queensland 4064.

3. Qualifications

    a. I hold the following qualifications:

        - I am a Director of Katestone Environmental Pty Ltd (“**Katestone**”), a consulting firm that works in the areas of air quality, odour, greenhouse gases, climate and weather forecasting.

        - Bachelor of Environmental Engineering (Hons) from the University of Queensland.

    b. My curriculum vitae is attached as Annexure A.

4. I have sufficient expertise to make this statement because I am a qualified environmental engineer who has worked for 25 years in the field of air quality. Since 2004, I have been director of Katestone. During my time as director, I have conducted, managed, supervised and conducted quality assurance on more than one hundred air quality projects per year. I have also guided the development of Katestone’s quality assurance process and project management system.

5. I have been instructed by White & Case on behalf of Kalbar Operations Pty Ltd to:

    a. Prepare an expert witness report for the Inquiry and Advisory Committee (IAC) hearing into the Fingerboards Project EES.

    b. Present evidence at the IAC hearing.

6. This written supplementary statement of evidence has been prepared in accordance with Planning Panel Victoria’s Guide to Expert Evidence.

7. I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

Simon Welchman

5 May 2021

2. BACKGROUND

8. Katestone Environmental Pty Ltd (Katestone) was commissioned to complete an Air Quality and Greenhouse Gas (GHG) Assessment of the Fingerboards Mineral Sands Project (the Project) that was included in the Project's Environment Effects Statement (EES). Katestone's report is included in the EES as Appendix A009 – Stage Two Air Quality and Greenhouse Gas Assessment (EES air quality assessment).

9. I prepared a Statement of Evidence (First Statement of Evidence) in relation to air quality and greenhouse gas issues that was filed with the Inquiry and Advisory Committee (IAC) hearing into the Fingerboards Project EES on 3 February 2021.

10. I prepared a supplementary statement of evidence to investigate the effect on dust emissions from the Fingerboards Project of Kalbar's proposal to use tailings centrifuges to dewater tailings. This supplementary statement also investigated, in a preliminary way, the effect on greenhouse gas emissions of Kalbar's proposal to use tailings centrifuges to dewater tailings. The supplementary statement was filed with the Inquiry and Advisory Committee (IAC) hearing into the Fingerboards Project EES on on 9 February 2021.

11. This second supplementary statement of evidence has been prepared to respond to issues raised in submissions related to the use of centrifuges.

12. A key issue raised in submissions was the need for a revised greenhouse gas inventory. I have prepared a revised greenhouse gas inventory. This is presented in Section 4. Other issues raised in the submissions are summarised and responded to in the Attachment.

3. TAILINGS CENTRIFUGES

13. Kalbar has committed to using centrifuges as part of the Project. By doing so, the Project will avoid the need for TSFs. Kalbar proposes to use solid bowl centrifuges, which produce dry cake from fine tailings. The centrifuge generates two products. Firstly, a clear overflow water (called the centrate) containing very little suspended solids, and secondly a readily transportable solid cake.

14. Dry cake will be stockpiled near the centrifuge after which it will be hauled via overland haul route using dump trucks. A front-end loader (FEL) will operate 11 hours per day to reclaim material from the cake stockpile and load the dump trucks.

15. The centrifuge plants would be located in close proximity to the mining area in order to reduce the overland haul distance of the dry cake back to the mining void, and thereby minimise dust generation. I am advised that, based on the preliminary mine planning, Kalbar anticipates that each centrifuge plant would be relocated to a new position every four to five years. The plant positions have been selected such that the average one-way haul distance from the plant to the mine void is 750m. I am advised that two dump trucks will operate 11 hours per day to transport tailings cake back to the mining void.

16. I understand that, by avoiding the need for TSFs, the active mining footprint is reduced, which in turn facilitates closer backfilling of mining voids with overburden. The total distance travelled by haul trucks transporting tailings cake is approximately 33,000 VKT per year (based on 2.798 Mt of tailings cake being transported 0.75 km). The decrease in the length of overland hauls for overburden transport provides a reduction in kilometres travelled of approximately 44% to an average of 274,000 VKT/year. Overall, this results in a decrease in distance travelled by haul trucks compared to the EES scenario.

17. I am advised that the electricity requirements for the centrifuges will be 10,550 MWh. This has been included in the inventory.

18. I am advised that the amphirol and dozer that previously were proposed to manage the TSFs are no longer required. These have been removed from the inventory.

19. Scrapers are no longer proposed to be used for overburden extraction and transport. These have been removed from the inventory.

20. In preparing this updated inventory it was identified that the electricity demand accounted for in the EES greenhouse gas assessment reflected an earlier iteration of the project description with power use of approximately 3.6 MW. This is now expected to be 9 MW, without the centrifuges. The revised greenhouse gas emissions inventory accounts for the 9 MW of power (78,840 MWh assuming 100% utlisation at maximum capacity) as well as the additional 10,550 MWh of electricity per year required by the centrifuges.

21. I am advised that the preferred option for off-site product transport is haulage of HMC to the Fernbank East rail siding followed by train freight to the Port of Melbourne. There is also an alternative option of off-site transport via train freight from Bairnsdale to port of Melbourne, which requires truck haulage of HMC from site to Bairnsdale.

4. GREENHOUSE GAS ASSESSMENT

4.1 Emission sources

22. Scope 1 and 2 greenhouse gas emissions have been estimated on an annual basis for each year of the construction and operations stages of the Project. This includes emissions from:

23. Scope 1 GHG emissions:

- Diesel combustion
  - Heavy machinery and site vehicles
  - Processing plants and equipment
  - Diesel generators
  - Haulage vehicles used to transport of HMC offsite to the first delivery point
- Land clearing

24. Scope 2 GHG Emissions

- Electricity usage
  - Processing operations, including centrifuges
  - Lighting
  - Offices and amenities

25. Scope 3 GHG Emissions

- Preferred option: Train freight from Fernbank East to Port of Melbourne (approximately 260 km), which requires truck haulage of HMC from site to a rail load out facility in Fernbank East (approximately 15 km).
- Alternative option: Train freight from Bairnsdale to port of Melbourne (approximately 278 km), which requires truck haulage of HMC from site to Bairnsdale (approximately 35 km).

26. Table 1 summarises the estimated energy usage and land clearing for each year of the construction and operation of the Project.

Table 1 **Summary of annual diesel usage, electricity usage and land clearing for key activities**

Year	Diesel (kL)				Electricity (MWh)	Land clearing (ha)	
	Mining equipment	Rehab	Light vehicles	Generators		Cleared	Rehab
Year 0	4,800	-	102	32	-	0	0
Year 1	6,227	77	203	-	89,390	93	0
Year 2	6,918	103	203	-	89,390	93	0
Year 3	6,930	103	203	-	89,390	93	41
Year 4	6,959	103	203	-	89,390	93	41
Year 5	7,485	103	203	-	89,390	93	41
Year 6	7,328	103	203	-	89,390	73	81
Year 7	7,361	103	203	-	89,390	73	81
Year 8	7,323	103	203	-	89,390	73	81
Year 9	7,081	103	203	-	89,390	73	81
Year 10	7,240	103	203	-	89,390	73	81
Year 11	7,599	103	203	-	89,390	74	73
Year 12	7,586	103	203	-	89,390	74	73
Year 13	7,337	103	203	-	89,390	74	73
Year 14	7,352	103	203	-	89,390	74	73
Year 15	7,100	103	203	-	89,390	74	73
Year 16	-	103	102	-	4,380	-	-
Year 17	-	103	102	-	4,380	-	-

Table notes:
Construction activities are assumed to occur in Year 0, with mining operations commencing in Year 1. Diesel generators are used only during the construction phase of the Project, decommissioning activities are assumed to continue for two years, Year 16 and Year 17, following the finalisation of mining activities.

4.2 Emission and energy use summary

27. GHG emissions associated with the Project have been estimated using the same methodologies as used in the EES greenhouse gas assessment. The emission factor for electricity use has been revised to the most recent published value of 0.98 kgCO_2-e/kWh as shown in Table 2.

Table 2 **Emission factors and energy content for GHG emission sources**

Emission source	Scope	Energy content	Units	Emission factor	Units
Diesel (stationary)	1	38.6	GJ/kL	70.2	kgCO_2-e/GJ
Diesel (transport)	1	38.6	GJ/kL	70.5*	kgCO_2-e/GJ
Electricity (Victoria)	2	3.6	MJ/kWh	0.98	kgCO_2-e/kWh
Forest clearing	1	61.1	tC/ha	224	tCO_2-e/ha
Grazing land clearing	1	28.2	tC/ha	103	tCO_2-e/ha

Sources: NGER Determination (July 2019), FullCAM Model

* Conservative assumption as this applies to Euro i class trucks. Trucks will are likely to be Euro V equivalent (emission factor of 70.4).

28. The annual energy use and annual GHG emissions associated with the Project is provided in Table 3 and Table 4, respectively. Annual energy use associated with the Project ranges from 23,651 GJ (Year 16) to 626,951 GJ (Year 11).

Table 3 Summary of annual energy use (GJ) production for the Project

Year	Diesel				Electricity	TOTAL
	Mining equipment	Rehab	Light vehicles	Generators		
Year 0	185,277	-	3,926	1,240	-	190,443
Year 1	240,345	2,968	7,852	-	321,804	572,969
Year 2	267,037	3,957	7,852	-	321,804	600,650
Year 3	267,502	3,957	7,852	-	321,804	601,115
Year 4	268,618	3,957	7,852	-	321,804	602,231
Year 5	288,938	3,957	7,852	-	321,804	622,551
Year 6	282,844	3,957	7,852	-	321,804	616,456
Year 7	284,141	3,957	7,852	-	321,804	617,753
Year 8	282,652	3,957	7,852	-	321,804	616,265
Year 9	273,313	3,957	7,852	-	321,804	606,925
Year 10	279,474	3,957	7,852	-	321,804	613,086
Year 11	293,338	3,957	7,852	-	321,804	626,951
Year 12	292,821	3,957	7,852	-	321,804	626,434
Year 13	283,210	3,957	7,852	-	321,804	616,823
Year 14	283,769	3,957	7,852	-	321,804	617,381
Year 15	274,063	3,957	7,852	-	321,804	607,676
Year 16	153,289	3,957	3,926	-	15,768	23,651
Year 17	240,345	3,957	3,926	-	15,768	23,651
TOTAL	**4,347,341**	**66,283**	**129,550**	**1,240**	**4,858,596**	**9,403,010**

Table 4 **Summary of annual GHG emissions (tCO_2-e) associated with the Project (Scope 1 and 2)**

Year	Diesel				Electricity	Land clearing	TOTALS		
	Mining equipment	Rehab	Light vehicles	Generators			Scope 1	Scope 2	TOTAL
Scope	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**1**	**1+2**
Year 0	13,006	-	277	87	-	0	13,370	-	13,370
Year 1	16,872	208	554	-	87,602	9,575	27,209	87,602	114,812
Year 2	18,746	278	554	-	87,602	9,575	29,153	87,602	116,755
Year 3	18,779	278	554	-	87,602	9,575	29,185	87,602	116,788
Year 4	18,857	278	554	-	87,602	5,325	25,013	87,602	112,615
Year 5	20,283	278	554	-	87,602	5,325	26,439	87,602	114,042
Year 6	19,856	278	554	-	87,602	(862)	19,825	87,602	107,427
Year 7	19,947	278	554	-	87,602	(862)	19,916	87,602	107,519
Year 8	19,842	278	554	-	87,602	(862)	19,812	87,602	107,414
Year 9	19,187	278	554	-	87,602	(862)	19,156	87,602	106,758
Year 10	19,619	278	554	-	87,602	(862)	19,589	87,602	107,191
Year 11	20,592	278	554	-	87,602	4,502	25,926	87,602	113,528
Year 12	20,556	278	554	-	87,602	4,502	25,890	87,602	113,492
Year 13	19,881	278	554	-	87,602	4,502	25,215	87,602	112,817
Year 14	19,921	278	554	-	87,602	4,502	25,254	87,602	112,857
Year 15	19,239	278	554	-	87,602	4,502	24,573	87,602	112,175
Year 16	-	278	277	-	4,292	-	555	4,292	4,847
Year 17	-	278	277	-	4,292	-	555	4,292	4,847
TOTAL	305,183	4,653	9,133	87	1,322,618	57,579	376,636	1,322,618	1,699,254

Notes: Land clearing during the construction period (Year 0) is anticipated to occur towards the end of the construction period, consequently GHG emissions associated with land clearing during construction have been accounted for in Year 1 of the Project.

29. Annual GHG emissions resulting from mining operations range from 106,758 tCO2-e (Year 9) to 116,788 tCO2-e (Year 3). With annual emissions from the construction and decommissioning periods resulting in GHG emissions of 13,370 tCO2-e and 4,847 tCO2-e (Year 0 and Year 17), respectively.

30. Figure 1 provides a summary of cumulative GHG emissions for the Project according to the source and scope of the GHG emissions. Diesel usage in mining equipment accounts for the vast majority of Scope 1 GHG emissions (85%) and approximately 18% of life of Project GHG emissions. Diesel usage during operations is predominantly associated with mining equipment (96%) with rehabilitation operations and light vehicles making up the remaining 3%. All of Scope 2 GHG emissions and approximately 78% of life of Project GHG emissions are associated with the use of grid electricity. Land clearing accounts for approximately 15% of Scope 1 emissions and 3% of life of Project emissions.

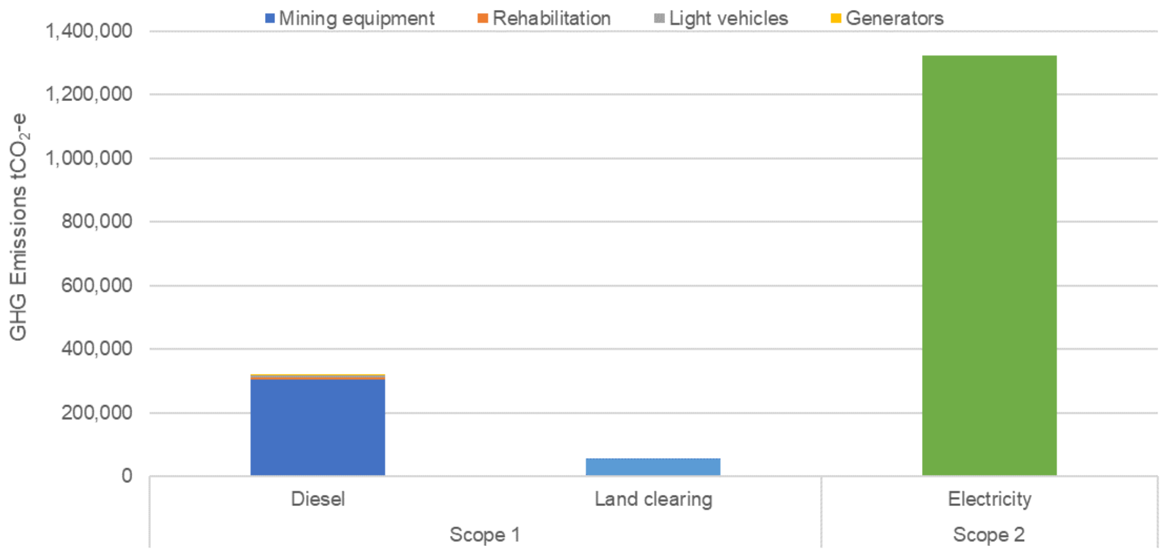

Figure 1 Project GHG emissions by emission source and emission scope

31. GHG emissions from the Project will contribute to State and National GHG inventories. A summary of Victoria's and Australia's most recently published GHG emissions inventories including categories relevant to the Project is provided in Table 5.

Table 5 Summary of GHG emissions for Australia and Victoria – 2019

Category	Australia	Victoria	
	Emissions ($MtCO_2$-e)	Emissions ($MtCO_2$-e)	Contribution to national emissions
Inventory Total	529.3	91.3	17%
Manufacturing and construction	68.3	9.6	14%
Transport	33.6	6.6	20%
Data source: Department of Industry, Science, Energy and Resources, National Greenhouse Accounts 2019, available online: https://www.industry.gov.au/data-and-publications/national-greenhouse-accounts-2019			

32. By way of comparison the maximum annual GHG emissions (Scope 1 + Scope 2) of 116,788 CO_2-e represent 0.02% and 0.13% of national and state emissions inventories, respectively.

33. The EES scenario with corrected power demand of 9 MW results in maximum annual GHG emissions (Scope 1 + Scope 2) of 129,560 CO2-e, which represents 0.02% and 0.14% of national and state emissions inventories, respectively. Maximum annual GHG emissions from the Project with centrifuges are, therefore, expected to be lower than the EES proposal by approximately 10%.

4.3 Off-site haulage of HMC

34. Scope 3 emissions and associated energy use due to the off-site haulage of HMC to the Fernbank East rail siding (the preferred option), and the alternative option of off-site haulage of HMC to Bairnsdale are presented in Table 6. These emissions are not affected by the centrifuge proposal.

Table 6 Annual GHG emissions and energy use for off-site haulage of HMC

Transport option	HMC (Mtpa)	Diesel Usage (kL/y)	Energy use (TJ)	GHG (tCO_2-e)
Fernbank East	0.55	1,995	77	5,406
Bairnsdale	0.55	2,476	96	6,708

ATTACHMENT – ENERGY USE AND GHG EMISSIONS ESTIMATION

35. Equipment utilisation rates and diesel fuel usage that reflect the mine with centrifuges operating are presented in Table A1,

36. Table A2 and Table A3. This data has been used to prepare the revised greenhouse gas inventory.

Table A1 Annual utilisation rates for equipment and machinery

Component	Equipment		Year																	
	Machine	Model	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Construction	Generator	20 KW	33%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Topsoil	Tractor Scoop	650 hp	33%	8%	9%	10%	12%	21%	21%	13%	10%	5%	15%	12%	16%	11%	12%	0%	-	-
Overburden	Excavator	Cat 6030	63%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	-	-
	Dump Truck	Cat685	200%	134%	134%	134%	134%	134%	134%	134%	134%	134%	134%	134%	134%	134%	134%	134%	-	-
	Dozer	D9	63%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	-	-
	Grader	12	63%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	-	-
	Compactor	825H	63%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	-	-
	Water Truck	Cat 777	63%	83%	83%	83%	83%	125%	125%	125%	125%	125%	125%	125%	125%	125%	125%	125%	-	-
	Scraper dozer	D9	21%	32%	32%	32%	32%	65%	32%	57%	57%	19%	29%	108%	97%	57%	57%	33%	-	-
Ore	Dozer	D9	0%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	95%	-	-
	Dozer	D10	16%	110%	190%	190%	190%	190%	190%	190%	190%	190%	190%	190%	190%	190%	190%	190%	-	-
	Loader	960	0%	25%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	-	-
Plantsite	Loader	960	13%	25%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	38%	-	-
Tailings cake transport	Dump Truck	Cat685	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	-	-
	Loader		92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	92%	-	-
Light Vehicles	Landcruiser Ute		90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	90%	45%	45%
Rehab Contour	Dozer	D9	0%	16%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%

Notes: Year 0 – construction occurs in the second half of Year 0.

Table A2 Annual diesel consumption for earthmoving equipment (kL/y)

Component	Equipment	Year															
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Topsoil	Tractor Scoop	366	88	96	108	137	231	236	145	106	52	164	133	171	120	135	-
Overburden	Excavator	1,117	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340	1,340
	Dump Truck	1,883	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266	1,266
	Dozer	309	371	371	371	371	371	371	371	371	371	371	371	371	371	371	371
	Grader	112	134	134	134	134	134	134	134	134	134	134	134	134	134	134	134
	Compactor	368	442	442	442	442	442	442	442	442	442	442	442	442	442	442	442
	Water Truck	406	539	539	539	539	809	809	809	809	809	809	809	809	809	809	809
	scraper dozer	103	156	156	156	156	319	156	282	282	94	141	532	480	282	282	165
Ore	Dozer	-	469	469	469	469	469	469	469	469	469	469	469	469	469	469	469
	Dozer	110	766	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323	1,323
	Loader	-	50	151	151	151	151	151	151	151	151	151	151	151	151	151	151
Plantsite	Loader	25	50	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Tailings cake transport	Dump Truck	-	369	369	369	369	369	369	369	369	369	369	369	369	369	369	369
	Loader	-	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185
TOTAL		**4,800**	**6,227**	**6,918**	**6,930**	**6,959**	**7,485**	**7,328**	**7,361**	**7,323**	**7,081**	**7,240**	**7,599**	**7,586**	**7,337**	**7,352**	**7,100**

Table A3 Annual diesel consumption for rehabilitation works, light vehicles and generators (kL/y)

Component	Year																	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Rehab Contour	-	77	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103
Light Vehicles	102	203	203	203	203	203	203	203	203	203	203	203	203	203	203	203	102	102
Generator	32	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-