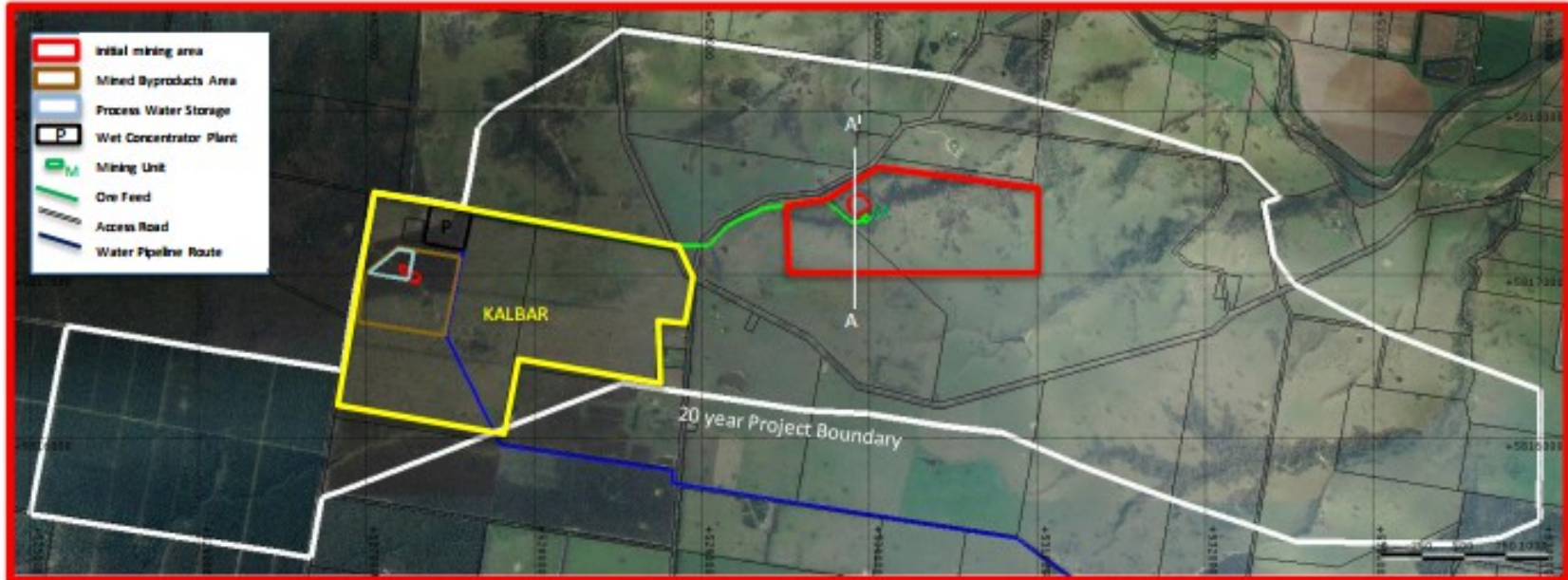


Fingerboards
Mineral Sands

Project
Comments by Andrew
Helps
UNEP Global Mercury
Partnership

Project Footprint Grazing and Plantation



Wet concentrator plant and associated infrastructure on land purchased by Kalbar in 2015 and 2016
Project is entirely on grazing and plantation land.

Refer Previous for section A-A'

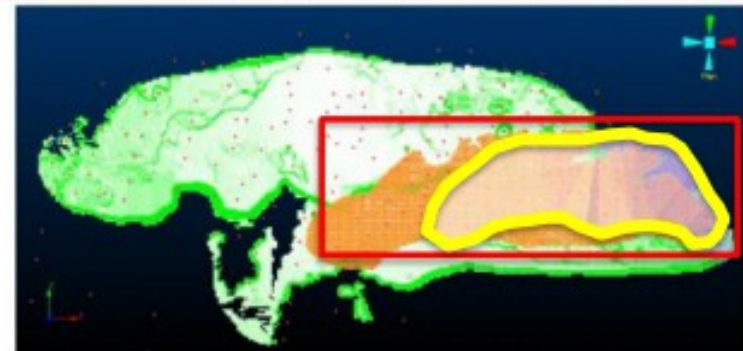


Figure 13-28: Indicated material within the optimised pit shell (Green – optimised pit, orange – Indicated, blue - Fingerboards Area)

Airborne Metallic Carcinogens

- The only publicly available data comes from an Analysts presentation that Kalbar issued in May 2017
- Page 22 “Mineral product qualities” provides some key data
- HOWEVER the data is after a laboratory metals separation process and is not the key analysis of the drill stem material.
- The veracity of this analysis data has obviously been approved by the Kalbar Directors.

Mineral product qualities

Premium Zircon		
ZrO2	%	>68.0
SiO2	%	32.5
Al2O3	%	0.1
Fe2O3	%	0.04
TiO2	%	<0.1
MgO	%	0.01
MnO	%	<0.01
CeO2	%	0.02
P2O5	%	0.22
Th	ppm	300
U	ppm	420

Aperture (µm)	Wt%	Cum Wt%
150	0.0%	0.0%
106	0.8%	0.8%
90	6.5%	7.3%
75	18.2%	25.5%
63	36.9%	62.4%
45	35.1%	97.5%
0	2.5%	100.0%
TOTAL	100.0%	

Primary Ilmenite				
		Year 1	Year 2	Year 3-5
TiO2	%	54.3	54.2	53.8
Fe2O3(calc)	%	16.9	16.3	15.2
FeO	%	23.2	23.9	25.8
SiO2	%	0.3	0.4	0.4
Al2O3	%	0.3	0.4	0.3
Cr2O3	%	0.25	0.26	0.22
MgO	%	1.5	1.5	1.4
MnO	%	1.4	1.4	1.4
ZrO2	%	0.15	0.14	0.14
P2O5	%	0.04	0.04	0.04
U XRF	ppm	0	14	0
Th XRF	ppm	46	64	58
V2O5	%	0.29	0.28	0.27
Nb2O5	%	0.07	0.07	0.07
CaO	%	0.03	0.02	0.02
SO3	%	-	-	-
K2O	%	0.01	0.01	0.01
CeO2	%	-	-	-

Cum Wt%			
Aperture (µm)	Year 1	Year 2	Year 3-5
+ 150µm	0.4%	0.2%	0.2%
- 150µm, + 106µm	6.0%	3.7%	4.5%
- 106µm, + 90µm	19.7%	15.5%	19.4%
- 90µm, + 75µm	44.7%	41.9%	45.5%
- 75µm, + 63µm	79.7%	76.9%	77.1%
- 63µm, + 45µm	96.8%	97.1%	96.3%
- 45µm	100.0%	100.0%	100.0%

Rare Earth Concentrate		
REO	%	45.63
ReO + Y2O3	%	54.00%
La2O3	%	8.72%
CeO2	%	19.36%
Pr6O11	%	2.18%
Nd2O3	%	7.73%
Sm2O3	%	1.50%
Eu2O3	%	0.08%
Gd2O3	%	1.35%
Tb4O7	%	0.21%
Dy2O3	%	1.60%
Ho2O3	%	0.36%
Er2O3	%	1.16%
Tm2O3	%	0.18%
Yb2O3	%	1.0%
Lu2O3	%	0.2%
Y2O3	%	8.4%

Aperture (µm)	Wt%	Cum Wt%
106	1.1%	1.1%
90	10.8%	11.9%
75	27.6%	39.5%
63	31.3%	70.8%
45	27.6%	98.3%
0	1.7%	100.0%
TOTAL	100.0%	

Rutile 92		
TiO2	%	92.7
Fe2O3	%	0.5
SiO2	%	3.7
Al2O3	%	0.6
Cr2O3	%	0.1
MgO	%	0.1
MnO	%	0
ZrO2	%	1.1
P2O5	%	0
U XRF	ppm	41
Th XRF	ppm	75
V2O5	%	0.3
Nb2O5	%	0.3
CaO	%	0
SO3	%	-
K2O	%	0.1
CeO2	%	0
SnO2	%	0.05

Cum Wt%		
Aperture (µm)	HiTi 92	
+ 150µm	0.0%	
- 150µm, + 106µm	7.9%	
- 106µm, + 90µm	24.3%	
- 90µm, + 75µm	54.8%	
- 75µm, + 63µm	87.5%	
- 63µm, + 45µm	99.3%	
- 45µm	100.0%	

What does the data tell us?

- The page 22 data provides an insight to the toxic metal levels at a percentage level
- The Air Screening levels required by Vic EPA SEPP Air Quality Management (Publication 1191 December 2007) (The PEM) are at Parts per billion (PPB)
- The proposed Kalbar operations are clearly a Level 1 operation as defined on page 6 of the PEM
- There is no indication that the EPA is updating the PEM as required by the legislated 10 year rule.

Table 1: Criteria for determining level of assessment required.

	Large Mine or quarry greater than 500,000 tonnes/yr extraction	Medium Mine or quarry between 150,000 tonnes/yr and 500,000 tonnes/yr extraction	Small Mine or quarry between 50,000 tonnes/yr and 150,000 tonnes/yr extraction	Mine or quarry with yearly extraction below 50,000 tonnes/yr extraction
Urban area	Level 1	Level 1	Level 2	No assessment – application of best practice management
Rural area close to residences (less than 500m from the limit of work described in the approved DPI work plan or final EES)	Level 1	Level 2	Level 3	No assessment – application of best practice management
Rural area (residences more than 500m from the limit of work described in the approved DPI work plan or final EES)	Level 2	Level 3	No assessment – application of best practice management	

Notes: 1. Criteria apply where EPA or DPI determine that an assessment is required (refer to required).

2. A level 1 assessment is the most rigorous.

For the purposes of this PEM extraction means:

- for quarries the amount of soil and rock that is moved or extracted per year

Depending on the operation: These include:

- are

PM₁₀ and lead are identified as a Class 1 indicator under the SEPP (AQM) and PM_{2.5}, antimony and cyanide are Class 2 indicators. Control practices for emissions of these indicators require the application of best practice for the industry.

Respirable crystalline silica, arsenic, PAHs, asbestos, radionuclides and hydrogen cyanide are Class 3 indicators and require control to the Maximum Extent Achievable (MEA) due to the seriousness of the potential health effects associated with exposure to these substances. MEA goes beyond best practice and considers what can be done on a site-specific basis rather than an industry wide scenario. Best practice and MEA go beyond consideration of technological control and include application of the wastes hierarchy with avoidance being the primary aim.

Additional EPA Failures

- State Environment Protection Policy (SEPP) 240 Air Quality Management was due for renewal (updating) by December 2011
- SEPP 160 Groundwaters of Victoria was due to be updated by December 2007
- SEPP 95 Prevention/Management of contamination of land) was due to be updated by June 2012
- SEPP 107 (Waters of Victoria) was due to be updated by August 2009.

EPA Failures

- The fact that these five critical SEPP's will be expired before the Panel hearing for this proposal, exposes the community to a higher risk and over a long period of time.
- The community needs to be putting public pressure on the Environment Minister to step in and force the EPA to update these critical SEPP's

The page 22 Data

- My concerns are based on the data in the second column “Primary Ilmenite”
- This data has obviously been laboratory separated for an ore sample or a mixture of ore samples.
- This data gives a good indication of the carcinogenic metals that are in the Kalbar ore
- I have further concerns that the consultant employed by the proponents (Kalbar) is actively demonstrating that he does not understand the risks from airborne toxicants

The Measurement Levels

- The Kalbar Resources page 22 data is in percentage terms (parts per 100)
- Normal pollution measurements for metals from a laboratory are:
 - Parts per million for soil samples (mg/kg)
 - Parts per billion for air samples (ug/m³)
 - Part per billion for water samples (ug/L)

5 km Radius from initial mine site



In Douglas, tanks at 5km distance measured 20 times acceptable radiation levels

Airborne Carcinogens

- TiO₂ (Titanium) is quoted at 54% in the primary Ilmenite.
- California EPA in June 2015 classed airborne unbound particles of respirable size Titanium Dioxide as a carcinogen.
- The USEPA Regional Screening levels set a trigger level of 0.0100 ug/m³ for residential air and 0.0440 ug/m³ for industrial air

The Other Residents



Indicator Species

The Costerfield Experience

- Costerfield is a farming area and the most common mammal in this area is Sheep.
- In China, the common indicator species in the vicinity of antimony mines is Goat.
- Sheep have a well understood physiology – the amount of air they breathe at any given age is known, they graze at ground level which is important because both Antimony and Arsenic in their gaseous forms are much heavier than air.

Indicator Species

- Any consultant experienced in toxic metal impacts from Antimony mines would have focussed on obtaining tissue samples from lambs of known age at Costerfield.
- This data from the indicator species would have provided the hard data to inform the public health advice
- The DSDBI chosen consultant did not do this.
- Interestingly, and shamefully for Golder, the Costerfield residents have obtained this data!

Indicator Species

- 3 x 8 month old lambs were selected at random from 3 sites – 2 close to the mine crusher and 1 animal 4.5 km from the crusher and in a location that is sheltered from the prevailing winds blowing over both the mine crusher and the mine vent pipe.

Indicator Species Data

- Testing was carried out by the Australian Government National Measurement Institute (NMI)
- 45 kg live weight animals
- 5 samples from each lamb were tested:
 - Loin Muscle;
 - Liver;
 - Lung;
 - Kidney;
 - Heart.

Minimal Risk Levels (MRL's)

- The Human Minimal Risk Levels for the 4 toxic metals in these samples are:
 - Antimony 0.4ug/kg/day - Oral
 - Arsenic 0.3 ug/kg/day - Chronic Oral
 - Cadmium 0.01ug/m³ - Renal
0.1ug/kg/day Chronic Oral
 - Lead 4.6 ug/kg/day
2.5 ug/m³

Indicator Species Data #1

Lamb - 4.5 km from Mine Crusher - All ug/kg

Organ	Antimony	Arsenic	Cadmium	Lead
Muscle	42	<10	<10	<10
Liver	60	<10	240	20
Lung	11	14	<10	<10
Kidney	29	<10	260	26
Heart	25	<10	<10	<10

Indicator Species Data #1

- Antimony and Arsenic are clearly being inhaled, e.g., it must be airborne contamination either dust or gaseous forms – the dam on this property is below the ADWGL.
- Only Antimony is accumulating in the muscle
- Antimony, Cadmium and Lead levels in the Liver and Kidney indicate a pathway from grass probably by ingestion of dust on the grass
- Antimony is accumulating in the heart muscle which may be an indicator for humans in the area

Indicator Species Data #2

Lamb - Free Range 500 meters from Crusher

Organ	Antimony	Arsenic	Cadmium	Lead
Muscle	42	<10	<10	<10
Liver	150	18	100	19
Lung	29	23	12	<10
Kidney	81	<10	210	17
Heart	22	<10	<10	<10

Indicator Species Data #2

- Antimony, Arsenic and Cadmium are clearly being inhaled, e.g., it must be airborne contamination.
- Only Antimony is accumulating in the muscle
- Antimony, Arsenic, Cadmium and Lead levels in the Liver and Kidney indicate a pathway from grass, probably by ingestion of dust on grass
- Antimony is accumulating in the heart muscle which may be an indicator for humans in the area

Indicator Species Data # 3

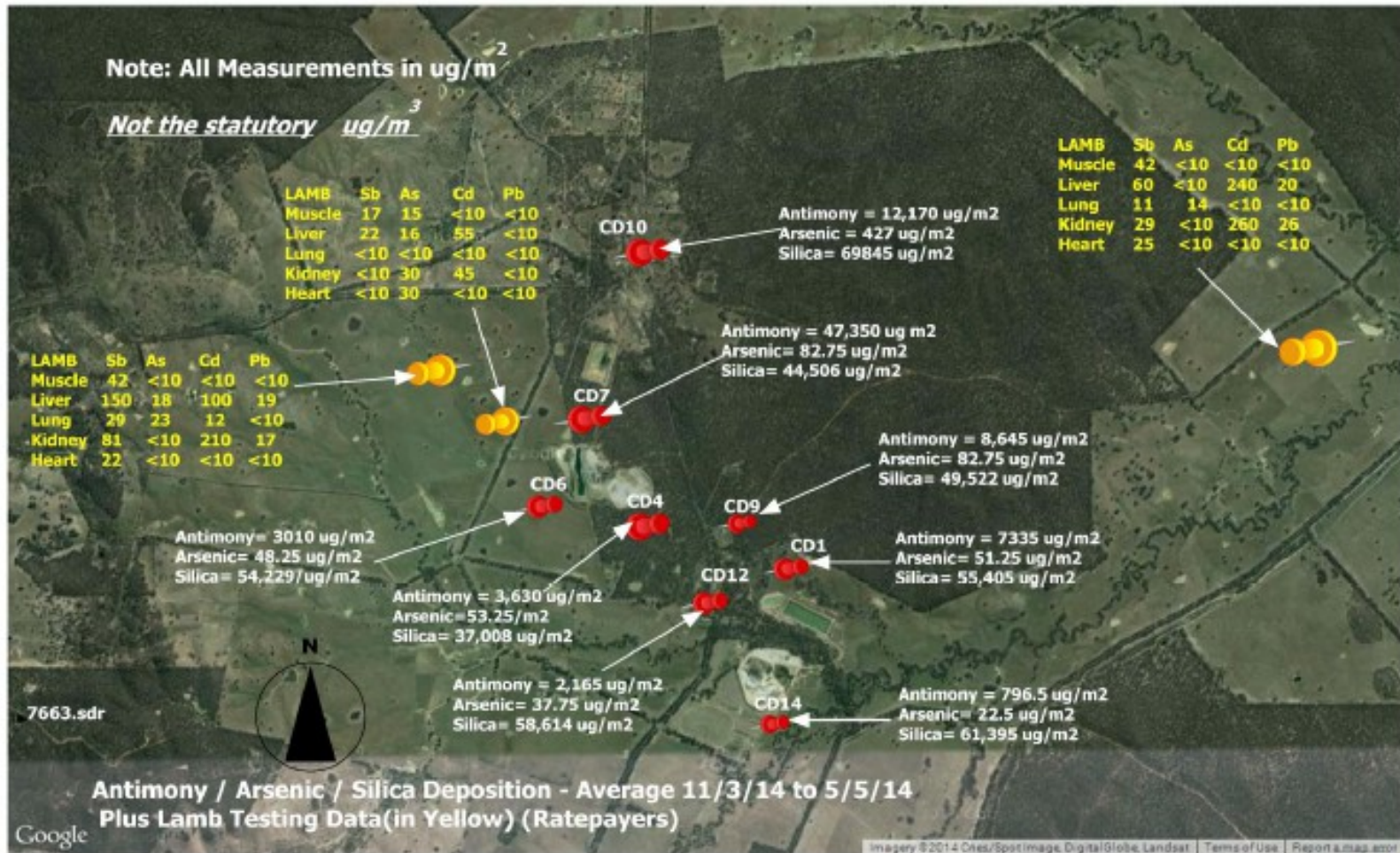
Lamb - Feedlot 500m from Crusher				
Organ	Antimony	Arsenic	Cadmium	Lead
Muscle	17	15	<10	<10
Liver	22	16	55	<10
Lung	<10	<10	<10	<10
Kidney	<10	30	45	<10
Heart	<10	30	<10	<10

Indicator Species Data # 3

- The lambs from this location are being fed pellets and have no access to local grasses
- Antimony and Arsenic is accumulating in muscle tissue
- Antimony, Arsenic and Cadmium are accumulating in the Liver indicating an inhalation pathway for dust and toxic gases in addition to ingestion
- Arsenic and Cadmium are accumulating in the Kidneys – Antimony may be accumulating below the PQL

- Arsenic is accumulating in the heart which is at add

Lamb Testing / 2 months Av Data



Bottled water stays on Costerfield menu

by THE MCIVOR TIMES | OCTOBER 12, 2016



 SHARE

 SHARE

 SHARE

Known Airborne Carcinogens at the Fingerboards

- Cr₂O₃ (Chromium) is quoted at 0.25% in the primary Ilmenite
- Chromium is a USEPA classed carcinogen with male and female developmental impacts
- The USEPA Regional Screening levels set a trigger level of 0.0100 ug/m³ for residential air and 0.0440 ug/m³ for industrial air

Airborne Carcinogens

- V_2O_5 (Vanadium pentoxide) is quoted at 0.29% in the primary Ilmenite
- Vanadium pentoxide is a USEPA classed carcinogen
- The USEPA sets a trigger level of 0.000 $\mu\text{g}/\text{m}^3$ in residential air and 0.0015 $\mu\text{g}/\text{m}^3$ in Industrial air

Airborne Carcinogens

- Th (Thorium) is quoted at 46 ppm
- Thorium is a California EPA class 1 carcinogen
- The USEPA PDRV (Prioritised Dose Response Value) is 0.000185 pCi/m³

The Risk to Residents

- Kalbar is proposing to mine on average 7 million tons per year (page 13).
- On a 24X7 basis this is 800 tons per hour
- The material will be mined by open cut methods
- The proposal is to transport the ore to a processing plant via truck
- With at least 4 airborne carcinogens in the ore the public health risks are very significant (similar to black lung disease)

The Risks to the Environment

- The Carcinogenic metals are all capable of bio-accumulating through food chains.
- Grazing animals are of particular risk as they inhale air from ground level whilst feeding.
- Titanium in particular bio-accumulates through vegetation food chains.
- A grave risk that export foods from the area will be subject to import restriction in Asia
- This issue has already emerged at the Costerfield mine in Central Victoria.

The Risks to the Environment

- The area is subject to mercury pollution for the Gippsland Power stations and historical mining in the catchments.
- The down wind areas from the mine will rapidly accumulate all the polluting metals deposited out of the air
- The Mitchell River catchment is already mercury polluted from historical mining operations and natural degradation of Cinnabar in two of the upper sub catchments.

The EES Process

- There are 21 paid bureaucrats on the TCG, 4 representatives of the proponent and no representation from the local community or independent technical and disaster management experience.
- The big risk of this proposal is to the local farmers and residents and the Government has clearly moved to avoid input and or difficult questions from the impacted community.

The EES Process

- As this proposal has the potential to wipe out farming in the area and significantly damage the already highly polluted Gippsland Lakes RAMSAR the Minister should direct the EPA Chief Scientist to attend and provide scientific input to the TCG.

Public Liability

- Is the proponent going to hold public liability insurance for this project?
- If so how has the risk been costed?
- As some of these carcinogens have long latency periods who is going to hold the long term public liability?

Questions