Our Ref: SAE.0483 / R.16483
Your ref: L4476/1984/12

3 February 2017

Mr Jason Banks
Director General
Department of Environment Regulation
Locked Bag 33 Cloisters Square
Perth WA 6850

Dear Mr Banks,

NOTIFICATION OF MATERIAL CHANGE - KWINANA BULK TERMINAL (L4476/1984/12) - TRIAL SHIPMENT OF SPODUMENE

In accordance with Condition 2 and Schedule 2 of the Environmental Licence L4476/1984/12 for Kwinana Bulk Terminal please accept this notification of a Material Change, specifically the trial export shipment of a new commodity, spodumene (run of mine) coarse grade.

In support of this notification find attached the following documents:

1. Site plan showing location of EC03 underground conveyor system and stockpile pad (Attachment 1): note the existing EC03 conveyor system is not listed in Schedule 2, Table 4 of Licence L4476/1984/12, and will need to be included in any future licence amendment. The EC03 conveyor system ties into the existing export system at the T1 transfer tower, then onto the JC01 and JC03 conveyors and the cargo discharged using the AL04 ship loader. The loading rate will be decreased to approximately 1,300 tonnes per hour for the trial.

2. Material Safety Data Sheet (Attachment 2): Lithium Concentrate 4.0 - 6.5%

3. Environmental and Health Risk Assessment (Attachment 3): identifies and rates inherent risks, and rates the residual risk after existing and proposed control measures are implemented to mitigate them. Given the physical and chemical properties of the cargo, and the existing and proposed risk mitigation measures, Fremantle Ports considers there to be a very low environmental and public health risk associated with the receival, storage and export of spodumene.

4. Report from consultant Coffey - Total Silica and Total and Respirable Quartz Analysis of Spodumene Concentrate Stockpiles at Kwinana Bulk Terminal, Fremantle Ports (Attachment 4): summary of results:

- Total Quartz as SiO_2 - 10 - 12% by weight
- Respirable Quartz - 0.05%

5. ALS Environmental Certificate of Analysis for Heavy Metals (Attachment 5): most concentrations of heavy metals were found to be at or below the limit of reporting (LoR), with some having low levels above the LoR. Manganese was found to have the highest levels in the samples taken (54 - 467 mg/kg). However leachate testing undertaken of the cargo (Attachment 6) shows very low levels of leaching of heavy metals from the spodumene, including manganese. Existing loading controls, along with the reduced loading rate, will prevent any material entering the marine environment. Should spodumene become an ongoing export cargo, manganese will be added to the heavy metal analytes in our annual marine monitoring program, Condition 9, Table 2 of Licence L4476/1984/12.

6. Dust extinction moisture (DEM) level (Attachment 7): a DEM assessment has been undertaken in accordance with AS-4156.6-2000. The assessment found the coarse spodumene material to have a DEM of 0.5%. The moisture content of the material to be loaded during the trial is 3 - 5%.

7. Assay Results including Uranium (U) and Thorium (Th) (Attachment 8): assay results show no elevated Uranium or Thorium.

8. Transportable Moisture Limit, Angle of Repose, Moisture Content and Bulk Density (Attachment 9) - this analysis was undertaken to determine the safe moisture content of the cargo as it relates to vessel stability. The transportable Moisture Limit was found to be 16.6%, well above the practicable level the spodumene will contain when it arrives on-site and is loaded onto the vessel.

The vessel for the trial shipment, to be loaded with approximately 15,000 tonnes, is expected to arrive at KBT berth KBB2 on the 5 February 2017. During the cargo loading operations further personal respirable dust monitoring will be undertaken of Fremantle Ports operational staff, along with the continuous boundary dust monitoring for total suspended particulates (TSP) which is undertaken in accordance with Licence L4476/1984/12. The results of this monitoring will be provided to your Department on completion of the trial shipment. Should the trial be successful and it is intended to export spodumene on an ongoing basis, an application for a licence amendment will be submitted.

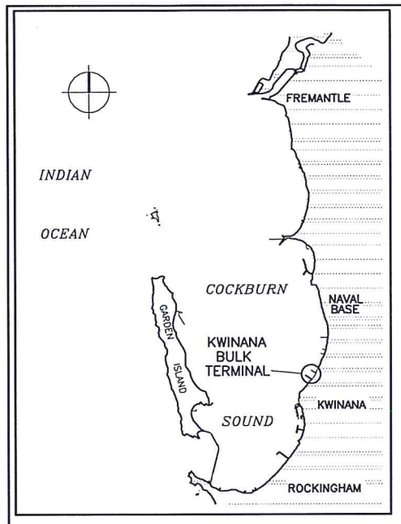
If you require further information or clarification relating to this correspondence please don't hesitate to contact me on [redacted]

Yours sincerely,

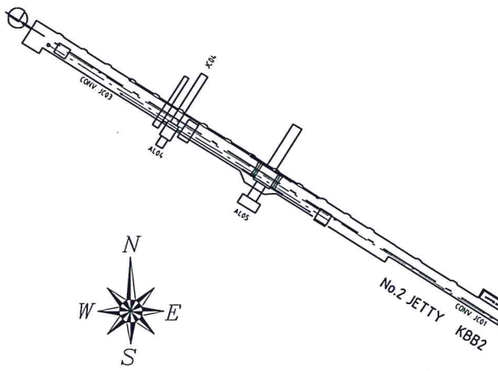
[redacted]

Denis Doak

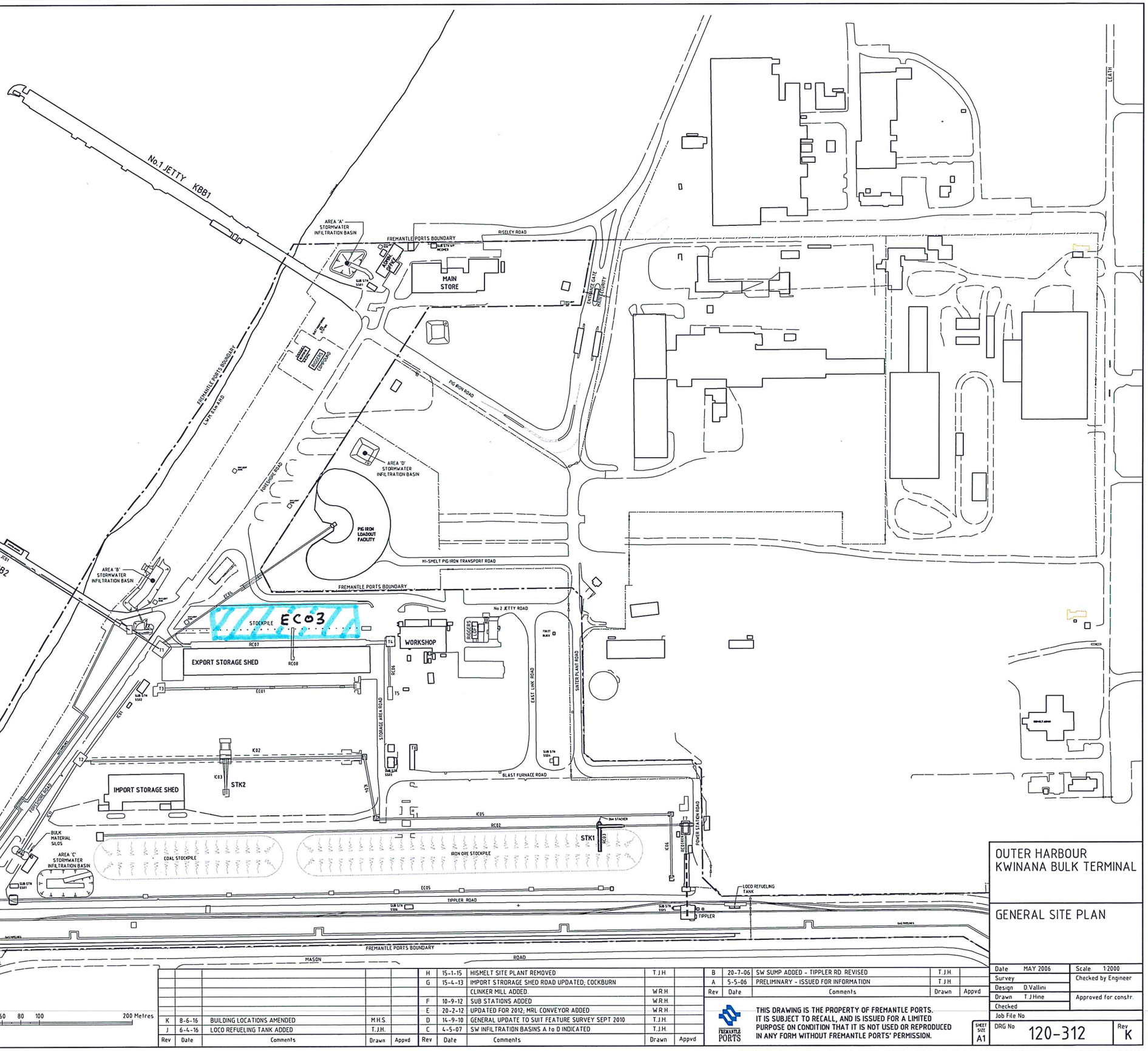
Environmental Manager



LOCALITY PLAN



ECO3 UNDERGROUND CONVEYOR SYSTEM AND STOCKPILE PAD.



Rev	Date	Comments	Drawn	Appvd
K	8-6-16	BUILDING LOCATIONS AMENDED	M.H.S.	
J	6-4-16	LOCO REFUELING TANK ADDED	T.J.H.	
H	15-1-15	HISMELT SITE PLANT REMOVED	T.J.H.	
G	15-4-13	IMPORT STORAGE SHED ROAD UPDATED; COCKBURN CLINKER MILL ADDED.	W.R.H.	
F	10-9-12	SUB STATIONS ADDED	W.R.H.	
E	20-2-12	UPDATED FOR 2012; MRL CONVEYOR ADDED	W.R.H.	
D	14-9-10	GENERAL UPDATE TO SUIT FEATURE SURVEY SEPT 2010	T.J.H.	
C	4-5-07	SW INFILTRATION BASINS A to D INDICATED	T.J.H.	
B	20-7-06	SW SUMP ADDED - TIPPLER RD. REVISED	T.J.H.	
A	5-5-06	PRELIMINARY - ISSUED FOR INFORMATION	T.J.H.	

OUTER HARBOUR KWINANA BULK TERMINAL

GENERAL SITE PLAN

Date MAY 2006	Scale 1:2000
Survey	Checked by Engineer
Design D.Vallini	
Drawn T.J.Hine	Approved for constr.
Checked	
Job File No	
DRG No 120-312	Rev K
SHEET SIZE A1	

Process Minerals International

SAFETY DATA SHEET

PRODUCT NAME **LITHIUM CONCENTRATE (4.0-6.5%)**

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Supplier name	**PROCESS MINERALS INTERNATIONAL PTY LTD**
Address	1 Sleat Rd, Applecross, Perth, WA, 6163, AUSTRALIA
Telephone	+618 9329 3600
Fax	+618 9329 3603
Emergency	+618 9329 3600
Web site	http://www.processminerals.com.au
Synonym(s)	SPODUMENE CONCENTRATE
Use(s)	LITHIUM SOURCE • ORE PROCESSING
	An inorganic material used in manufacturing of ceramics, glass, glazes, foundry, steel, aluminum and lithium products.
SDS date	21 August 2015

2. HAZARDS IDENTIFICATION

NOT CLASSIFIED AS HAZARDOUS ACCORDING TO SAFE WORK AUSTRALIA CRITERIA

Risk Phrases

None allocated

Safety Phrases

None allocated

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE

UN Number	None Allocated	**Transport Hazard Class**	None Allocated
Packing Group	None Allocated	**Hazchem Code**	None Allocated

3. COMPOSITION/ INFORMATION ON INGREDIENTS

Ingredient	CAS Number	EC Number	Content
QUARTZ (CRYSTALLINE SILICA)	14808-60-7	238-878-4	5 to 10%
SPODUMENE	-	-	75 to 85%
FELDSPAR-GROUP MINERALS	68476-25-5	270-666-7	<20%
NON HAZARDOUS INGREDIENTS	Not Available	Not Available	Remainder

Ingredient notes No respirable crystalline silica quartz present.

4. FIRST AID MEASURES

Eye	If in eyes, hold eyelids apart and flush continuously with running water. Continue flushing until advised to stop by a Poisons Information Centre, a doctor, or for at least 15 minutes.
Inhalation	If inhaled, remove from contaminated area. Apply artificial respiration if not breathing.
Skin	If skin or hair contact occurs, remove contaminated clothing and flush skin and hair with running water. Continue flushing with water until advised to stop by a Poisons Information Centre or a doctor.
Ingestion	For advice, contact a Poison Information Centre on 13 11 26 (Australia Wide) or a doctor (at once). If swallowed, do not induce vomiting.
Advice to doctor	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Flammability Non flammable. May evolve toxic gases if strongly heated.

Fire and explosion No fire or explosion hazard exists.

Extinguishing Use an extinguishing agent suitable for the surrounding fire.

Hazchem code None allocated.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions Wear Personal Protective Equipment (PPE) as detailed in section 8 of the SDS. Clear area of all unprotected personnel. Contact emergency services where appropriate.

Environmental precautions Prevent product from entering drains and waterways.

Methods of cleaning up Contain spillage, then collect and place in suitable containers for reuse or disposal. Avoid generating dust.

References See Sections 8 and 13 for exposure controls and disposal.

7. STORAGE AND HANDLING

Storage Store in a cool, dry, well ventilated area, removed from incompatible substances and foodstuffs. Ensure containers are adequately labelled, protected from physical damage and sealed when not in use.

Handling Before use carefully read the product label. Use of safe work practices are recommended to avoid eye or skin contact and inhalation. Observe good personal hygiene, including washing hands before eating. Prohibit eating, drinking and smoking in contaminated areas.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure standards

Ingredient	Reference	TWA		STEL	
		ppm	mg/m³	ppm	mg/m³
Quartz (respirable dust)	SWA (AUS)	--	0.1	--	--

Biological limits No biological limit allocated.

Engineering controls Avoid inhalation. Use in well ventilated areas. Where an inhalation risk exists, mechanical extraction ventilation is recommended.

PPE

Eye / Face Wear dust-proof goggles.

Hands Wear PVC or rubber gloves.

Body When using large quantities or where heavy contamination is likely, wear coveralls.

Respiratory Where an inhalation risk exists, wear a Class P1 (Particulate) respirator. At high dust levels, wear a Powered Air Purifying Respirator (PAPR) with Class P3 (Particulate) filter or a Full-face Class P3 (Particulate) respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance GRANULAR SOLID
Odour VERY FAINT FATTY ODOUR
Flammability NON FLAMMABLE
Flash point NOT RELEVANT
NOT RELEVANT

Boiling point	
Melting point	NOT AVAILABLE
Evaporation rate	NOT RELEVANT
pH	NOT RELEVANT
Vapour density	NOT AVAILABLE
Specific gravity	3
Solubility (water)	INSOLUBLE
Vapour pressure	NOT RELEVANT
Upper explosion limit	NOT RELEVANT
Lower explosion limit	NOT RELEVANT
Partition coefficient	NOT AVAILABLE
Autoignition temperature	NOT AVAILABLE
Decomposition temperature	NOT AVAILABLE
Viscosity	NOT AVAILABLE
Explosive properties	NOT AVAILABLE
Oxidising properties	NOT AVAILABLE
Odour threshold	NOT AVAILABLE

10. STABILITY AND REACTIVITY

Chemical stability	Stable under recommended conditions of storage.
Conditions to avoid	Avoid contact with incompatible substances.
Material to avoid	Incompatible with acids (e.g. nitric acid).
Hazardous Decomposition Products	May evolve toxic gases if heated to decomposition.
Hazardous Reactions	Polymerization is not expected to occur.

11. TOXICOLOGICAL INFORMATION

Health Hazard Summary	Low toxicity. Under normal conditions of use, adverse health effects are not anticipated. Adverse health effects associated with silica, such as the development of silicosis (lung fibrosis) are not anticipated, unless respirable quartz dust is created and chronic exposure occurs.
Eye	Low to moderate irritant. Contact may result in mild irritation, lacrimation and redness.
Inhalation	Irritant. Over exposure may result in irritation of the nose and throat, with coughing. Avoid dust generation / inhalation.
Skin	Low irritant. Prolonged or repeated exposure to dust may result in mechanical irritation and dermatitis.
Ingestion	Low toxicity. Ingestion may result in gastrointestinal irritation, nausea and vomiting. However, due to product form ingestion is considered unlikely.
Toxicity data	No LD50 data available for this product.

12. ECOLOGICAL INFORMATION

Toxicity	This product is not anticipated to cause adverse effects to animal or plant life if released to the environment in small quantities.
Persistence and degradability	Not applicable.
Bioaccumulative potential	This product is not expected to bioaccumulate.
Mobility in soil	This product has low mobility in soil.
Other adverse effects	No information provided.

13. DISPOSAL CONSIDERATIONS

Waste disposal	Ensure product is covered with moist soil to prevent dust generation and dispose of to approved Council landfill. Contact the manufacturer/supplier for additional information (if required).
Legislation	Dispose of in accordance with relevant local legislation.

14. TRANSPORT INFORMATION

NOT CLASSIFIED AS A DANGEROUS GOOD BY THE CRITERIA OF THE ADG CODE, IMDG OR IATA

	LAND TRANSPORT (ADG)	SEA TRANSPORT (IMDG / IMO)	AIR TRANSPORT (IATA / ICAO)
UN Number	None Allocated	None Allocated	None Allocated
Proper Shipping Name	None Allocated	None Allocated	None Allocated
Transport Hazard Class	None Allocated	None Allocated	None Allocated
Packing Group	None Allocated	None Allocated	None Allocated

Environmental hazards No information provided

Special precautions for user

Hazchem code None Allocated

15. REGULATORY INFORMATION

Poison schedule A poison schedule number has not been allocated to this product using the criteria in the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP).

Inventory Listing(s) **AUSTRALIA: AICS (Australian Inventory of Chemical Substances)**
All components are listed on AICS, or are exempt.

16. OTHER INFORMATION

Additional information

RESPIRATORS: In general the use of respirators should be limited and engineering controls employed to avoid exposure. If respiratory equipment must be worn ensure correct respirator selection and training is undertaken. Remember that some respirators may be extremely uncomfortable when used for long periods. The use of air powered or air supplied respirators should be considered where prolonged or repeated use is necessary.

PERSONAL PROTECTIVE EQUIPMENT GUIDELINES:
The recommendation for protective equipment contained within this report is provided as a guide only. Factors such as method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made.

HEALTH EFFECTS FROM EXPOSURE:
It should be noted that the effects from exposure to this product will depend on several factors including: frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a ChemAlert report which would encompass all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists
CAS #	Chemical Abstract Service number - used to uniquely identify chemical compounds
CNS	Central Nervous System
EC No.	EC No - European Community Number
EMS	Emergency Schedules (Emergency Procedures for Ships Carrying Dangerous Goods)
GHS	Globally Harmonized System
GTEPG	Group Text Emergency Procedure Guide
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration, 50% / Median Lethal Concentration
LD50	Lethal Dose, 50% / Median Lethal Dose
mg/m³	Milligrams per Cubic Metre
OEL	Occupational Exposure Limit
pH	relates to hydrogen ion concentration using a scale of 0 (high acidic) to 14 (highly alkaline).
ppm	Parts Per Million
STEL	Short-Term Exposure Limit
STOT-RE	Specific target organ toxicity (repeated exposure)
STOT-SE	Specific target organ toxicity (single exposure)
SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
SWA	Safe Work Australia
TLV	Threshold Limit Value
TWA	Time Weighted Average

Report status

This document has been compiled by RMT on behalf of the manufacturer, importer or supplier of the product and serves as their Safety Data Sheet ('SDS').

It is based on information concerning the product which has been provided to RMT by the manufacturer, importer or supplier or obtained from third party sources and is believed to represent the current state of knowledge as to the appropriate safety and handling precautions for the product at the time of issue. Further clarification regarding any aspect of the product should be obtained directly from the manufacturer, importer or supplier.

While RMT has taken all due care to include accurate and up-to-date information in this SDS, it does not provide any warranty as to accuracy or completeness. As far as lawfully possible, RMT accepts no liability for any loss, injury or damage (including consequential loss) which may be suffered or incurred by any person as a consequence of their reliance on the information contained in this SDS.

Prepared by

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Web: www.rmt.com.au.

[End of SDS]

Risk Assessment Record / Risk Reduction Plan

Location / Work Area :	Kwinana Bulk Terminal / EC03 - Receival, handling and exporting of Coarse Grade Spodumene Concentrate (Run of Mine)
Assessment Team :	Denis Doak (Environment Manager), Ben Morrison (Safety & Development Officer), Melissa Manns (Environmental Advisor - Outer Harbour)

RISK ASSESSMENT RECORD								RISK REDUCTION PLAN				
Hazard	Unwanted Event (or risk)	Inherent Risk					Existing Controls	Residual Risk				
		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	INHERENT RISK		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	RESIDUAL RISK
Trucks delivering Lithium	Vehicle interaction with vehicle/pedestrian (personnel impact)	Major	Once per day	A few people	Unlikely	**Moderate (7)**	1. KBT Traffic Management Plan 2. Speed signs 3. FP Operational Induction 4. Drivers License 5. Contractor Management System 6. Permit to Work System 7. PPE 8. Operational vehicle requirements 9. Operational vehicle prestarts	Major	Once per day	A few people	Very unlikely	**Moderate (7)**
Unloading product from trucks	Generation of dust (personnel impact)	Moderate	Once per day	A few people	Possible	**Low (5)**	1. PPE including Dust mask 2. Moisture content of coarse spodumene at or above DEM level (0.5%) on arrival 3. Muscovite <5% by weight 4. Respirable silica <1% by weight 5. Water truck 6. FEL Verification of Competency (VoC), CONTAM monitoring (personal dust monitoring program) 7. Third-party mineralogy assessment 8. FP Safety & Environment assessment of new bulk products 9. FEL fitted with seals and air filters 10. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 11. FP complaints management system.	Moderate	Once per day	A few people	Unlikely	**Low (2)**
Unloading product from trucks	Generation of dust (environmental impact)	Moderate	Once per day	A few people	Possible	**Low (5)**	1. Moisture content of coarse spodumene at or above DEM level (0.5%) on arrival 2. Water truck 3. FP Environment Inspections 4. Third-party mineralogy assessment 5. FP Safety & Environment assessment of new bulk products 6. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 7. FP complaints management system 8. TSP boundary dust monitoring network & reporting required by L4476/1984/12 9. Real-time dust alarms 10. FP Dust Management Strategy	Moderate	Once per day	A few people	Very unlikely	**Low (2)**
Product stored in Stockpile	Dust generation (personnel impact)	Moderate	Once per day	A few people	Possible	**Low (5)**	1. PPE 2. Moisture content of coarse spodumene at or above DEM level (0.5%) 3. Muscovite <5% by weight 4. Respirable silica <1% by weight 5. Water truck 6. CONTAM monitoring (personal dust monitoring program) 7. Third-party mineralogy assessment 8. FP Safety & Environment assessment of new bulk products 9. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 10. FP complaints management system.	Moderate	Once per day	A few people	Unlikely	**Low (2)**
Product store in Stockpile	Dust generation (environmental impact)	Moderate	Once per day	A few people	Possible	**Low (5)**	1. Moisture content of coarse spodumene at or above DEM level (0.5%) on arrival 2. Water truck 3. Stockpile sprinklers 4. FP Environment Inspections 5. Mineralogy assessment 6. FP Safety & Environment assessment of new bulk products 7. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 8. FP complaints management system 9. TSP boundary dust monitoring network & reporting required by L4476/1984/12 10. Real-time dust alarms 11. FP Dust Management Strategy	Moderate	Once per day	A few people	Unlikely	**Low (2)**

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		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	INHERENT RISK		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	RESIDUAL RISK
Product stored in Stockpile	Contaminated stormwater runoff (environmental impact)	Moderate	Weekly	A few people	Possible	**Low (2)**	1. Site stormwater drains to site infiltration basins 2. No stormwater drained directly to Cockburn Sound 3. Third-party mineralogy assessment 4. FP Safety and Environment Assessment of new bulk products 5. EC03 stormwater contained within tunnel 6. FP Environment Inspection 7. Heavy Metals assessment 8. Third-party Mineralogy assessment	Moderate	Weekly	A few people	Very unlikely	**Low (2)**
Front End Loader (FEL) placing product onto EC03 conveyor	FEL interaction with pedestrians/vehicles (personnel impact)	Major	Once per day	A few people	Unlikely	**Moderate (7)**	1. KBT Traffic Management Plan 2. Speed signs 3. Stockpile entry procedure 4. Signage 5. Exclusion Zones 6. FEL Verification of Competency (VoC) 7. FP Operational Induction 8. Operational vehicle pre-starts 9. Drivers License 10. Operational vehicle requirements	Major	Once per day	A few people	Very unlikely	**Moderate (7)**
Front End Loader (FEL) placing product onto EC03 conveyor	Generation of dust (environmental impact)	Moderate	Once per day	A few people	Possible	**Low (5)**	1. Moisture content of coarse spodumene at or above DEM level (0.5%) 2. Water truck 3. Stockpile sprinklers 4. FP Environment Inspections 5. FP Safety & Environment assessment of new bulk products 6. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 7. FP complaints management system 8. TSP boundary dust monitoring network & reporting required by L4476/1984/12 9. Real-time dust alarms 10. FP Dust Management Strategy	Moderate	Once per day	A few people	Very unlikely	**Low (2)**
Front End Loader (FEL) placing product onto EC03 conveyor	Generation of dust (personnel impact)	Moderate	Once per day	A few people	Possible	**Low (5)**	1. PPE including Dust mask 2. Moisture content of coarse spodumene at or above DEM level (0.5%) 3. Muscovite <5% by weight 4. Respirable silica <1% by weight 5. Water truck 6. Stockpile sprinklers 7. FEL Verification of Competency (VoC), CONTAM monitoring (personal dust monitoring program) 8. Third-party mineralogy assessment 9. FP Safety & Environment assessment of new bulk products 10. FEL fitted with seals and air filters 11. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 12. FP complaints management system.	Moderate	Once per day	A few people	Unlikely	**Low (2)**
Product transported on EC03 conveyor	Generation of dust (personnel impact)	Moderate	Weekly	A few people	Unlikely	**Low (2)**	1. PPE including Dust mask 2. Moisture content of coarse spodumene at or above DEM level (0.5%) 3. Muscovite <5% by weight 4. Respirable silica <1% by weight 5. Water sprays on EC03 conveyor 6. Underground enclosed conveyor system 7. Dust extraction system fitted on T1 8. CONTAM monitoring (personal dust monitoring program) 9. Third-party mineralogy assessment 10. FP Safety & Environment assessment of new bulk products 11. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 12. FP complaints management system	Moderate	Weekly	A few people	Very unlikely	**Low (2)**

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		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	INHERENT RISK		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	RESIDUAL RISK
Product transported on EC03 conveyor	Generation of dust (environmental impact)	Moderate	Weekly	A few people	Unlikely	**Low (2)**	1. Moisture content of coarse spodumene at or above DEM level (0.5%) 2. Water sprays on EC03 conveyor 3. Underground enclosed conveyor system 4. Dust extraction system fitted on T1 5. FP Environment Inspections 6. FP Safety & Environment assessment of new bulk products 7. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 8. FP complaints management system 9. TSP boundary dust monitoring network & reporting required by L4476/1984/12 10. Real-time dust alarms 11. FP Dust Management Strategy	Moderate	Weekly	A few people	Very unlikely	**Low (2)**
Loading of product onto ship via AL04	Generation of dust (personnel impact)	Moderate	Weekly	A few people	Possible	**Low (2)**	1. PPE including Dust mask 2. Moisture content of coarse spodumene at or above DEM level (0.5%) 3. Muscovite <5% by weight 4. Respirable silica <1% by weight 5. CONTAM monitoring (personal dust monitoring program) 6. Third-party mineralogy assessment 7. FP Safety & Environment assessment of new bulk products 8. AL04 Verification of Competency (VoC) 9. Conveyor system water sprays 10. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 11. FP complaints management system	Moderate	Weekly	A few people	Unlikely	**Low (2)**
Loading of product onto ship via AL04	Generation of dust (environmental impact)	Moderate	Weekly	A few people	Possible	**Low (2)**	1. Conveyor system water sprays 2. AL04 Verification of Competency (VoC) 3. FP Environment Inspections 4. Third-party mineralogy assessment 5. Moisture content of coarse spodumene at or above DEM level (0.5%) 6. FP Safety & Environment assessment of new bulk products 7. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 8. FP complaints management system 9. TSP boundary dust monitoring network & reporting required by L4476/1984/12 10. Real-time dust alarms 11. FP Dust Management Strategy	Moderate	Weekly	A few people	Very unlikely	**Low (2)**
Loading of product onto ship via AL04	Spillage of product onto ships deck entering marine environment (environmental impact)	Moderate	Weekly	A few people	Possible	**Low (2)**	1. Spilt products cleaned utilising dry methods and contained 2. AL04 Verification of Competency (VoC) 3. Stevedore to monitor discharge rate to mitigate spillage 4. Loading procedure 5. Incident Control System 6. Outer Harbour EMP 7. FP Environment Inspections 8. Third-party mineralogy assessment 9. Heavy metals assessment 10. FP Safety & Environment assessment of new bulk products	Moderate	Weekly	A few people	Unlikely	**Low (2)**
Loading of product onto ship via AL04	Uncontrolled release of product into the marine environment (environmental impact)	Moderate	Weekly	A few people	Possible	**Low (2)**	1. Berth containment 2. Maintenance of conveyor system 3. Spill plates on loader 4. AL04 Verification of Competency (VoC) 5. Stevedore to monitor discharge rate to mitigate spillage 6. Loading procedure 7. Incident Control System 8. Outer Harbour EMP 9. CCTV 10. FP Environment Inspections 11. Third-party mineralogy assessment 12. Heavy metals assessment 13. FP Safety & Environment assessment of new bulk products	Moderate	Weekly	A few people	Unlikely	**Low (2)**

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RISK ASSESSMENT RECORD								RISK REDUCTION PLAN					
Hazard	Unwanted Event (or risk)	Inherent Risk					Existing Controls	Residual Risk					
		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	INHERENT RISK		Consequence	Exposure Frequency	Workforce Exposure	Likelihood	RESIDUAL RISK	
Noise generated from loading operations	Increased noise levels (environmental impact)	Moderate	Once per day	A few people	Unlikely	**Low (2)**	1. Long distance from the operation to the nearest receivers (closest residential premises is 3,130 meters, while the closest industrial neighbour is 600m) 2. Infrastructure maintenance program 3. HV access route through industrial area 4. FP complaints management system	Moderate	Once per day	A few people	Very unlikely	**Low (2)**	

2 February 2017

Fremantle Port Authority
Kwinana Bulk Terminal

1 Riley Road

KWINANA WA 6966

Attention: Denis Doak
Environmental Manager

Dear Denis?

Subject: **Total Silica and Total and Respirable Quartz Analysis of Spodumene Concentrate Stockpiles at Kwinana Bulk Terminal, Fremantle Port**

Coffey has completed an assessment of the information provided regarding the Silica content of the Spodumene Concentrate (-6 +0.5mm) product currently stored at Kwinana Bulk Terminal. The Quartz content was also assessed to determine Total Quartz and Respirable Quartz Fraction.

Information sources included a physical sample obtained from the stockpile by Coffey on 16 December 2016 and analytical report from Microanalysis provided by MPI.

The table below outlines these results:

Mineral	**Percentage**
Total Silica as SiO_2 equivalent	Approx. 66% by weight
Total Quartz as SiO_2	10 – 12% by weight
Respirable Quartz	0.05%* by volume

Note * - Respirable Quartz was determined by combining the following information in the Microanalysis report Size Fraction and Mineral Phase Tables. The concentration of Quartz in the Mineral Phase was identified at approximately 10% by weight and the percentage of respirable material (PM4) was provided as 0.51% by volume which equates to approximately 0.05% by volume.

Coffey Environments Australia Pty Ltd ABN 65 140 765 902
Suite 2, 53 Burswood Road, Burswood WA 6100 Australia
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Silica was identified as the predominate mineral within the ore sample at 66% and consisted of the following minerals:

- Spodumene (Li Al Si2O6)
- Quartz (SiO2)
- K-Feldspar (KAlSi3O8)
- Clinochlore Mg5 Al (Si , Al)4 O10 (O H)8
- Albite, ordered (Na Al Si3O8)
- Muscovite ((K , Na) (Al , Mg , Fe)2 (Si3.1 Al0.9) O10 (O H)2
- Actinolite Ca2 (Mg , Fe +2)5 Si8 O22 (O H)2
- Microcline (K0.964 Na0.036 Al Si3 O8)

Attached are the relevant analyst documents from Greencap and Microanalysis.

Please find attached the Analytical Report and Explanatory Notes on the analytical method.

If you require any further information, please do not hesitate to contact the undersigned on (08)[redacted].

For and on behalf of
Coffey

Mr Fred Easton	**Dr Laurie Glossop**
Practice Leader, WHS	Consulting Occupational Hygienist

Attachments: Analytical Reports

Record of Distribution

No. of copies	Report File Name	Report Status	Date	Prepared for:	Initials
1	ENAUPERT04930AALA	Final	02 Feb 2017	FPA KBT	FE

Greencap
AEC Environmental
12 Greenhill Road
Wayville SA 5034
P: (08) 8299 9955
E: adelaide@greencap.com.au

CRYSTALLINE SILICA ANALYSIS - REPORT No. 21557

CLIENT:	MPL Laboratories	**JOB NO:**	189767
ATTENTION:	Meredith Conroy	**RECEIVED IN LAB:**	16 December 2016
SAMPLED BY:	As-received	**REPORT DATE:**	16 December 2016

PROCEDURE

The samples were lightly pulverized, then analyzed by X-ray diffraction to determine the minerals present. Quartz was detected and its content determined by XRD measurements of the sample and of a pure quartz standard. No correction was applied for the X-ray absorbency of the samples, which were considered to be similar to that of quartz.

RESULTS

Although the abundances of the other minerals (spodumene, albite, K-feldspar, muscovite, amphibole and chlorite) appear to vary from sample to sample, the quartz contents are very similar

Sample	**Quartz content (estimated wt%)**
189767-1	12
189767-2	12
189767-3	12
189767-4	12

Suite 6
642 Albany Hwy
Victoria Park
WA 6100

Client: NAGROM
Job number: 15_1489
Date: 11/01/2016
Analysis: Respirable alpha-quartz concentration analysis by x-ray diffraction (XRD) and scanning electron microscopy (SEM) using the modified SWeRF method

Sample Preparation
The sample was supplied to Microanalysis Australia as a particulates in a plastic bag.

A representative sub-sample was wet sieved at 2 mm, 1 mm and 500 µm, and the < 500 µm fraction (suspension) was thoroughly homogenized and sized by laser diffraction reporting size between 500 µm and 20 nm.

The respirable fraction was abstracted from the < 500 µm suspension by settling and decantation, and the abstracted particle size, composition and morphology was verified by scanning electron microscope (SEM) for equivalent aerodynamic diameter (EAD).

Once the equivalent aerodynamic size was verified, the abstracted fraction was analysed qualitatively and quantitatively by x-ray diffraction to assess the alpha-quartz concentration.

Analysis
The wet sieving was conducted using a light-flow (approximately 1 L /min) water spray jet on a nested stack of stainless steel Endecotts sieves at 2 mm, 1 mm and 500 µm. The < 500 µm fraction was collected in a 25L bucket. Each size fraction was oven dried at 105 °C. The dried weights of each of the fractions were noted and the fraction percentage calculated based on the original dried starting weight.

The laser diffraction size distribution analyses were conducted using a Malvern Mastersizer MS2000 calibrated using QAS3002 certified reference material and certified within specification. The analyses were conducted following ISO13320-1:1999.

For the sedimentation, the time for a specific fall height for PM4 (EAD) particles was calculated using Stokes Law. The samples were then homogenised and allowed to settle for the calculated time before the supernatant was decanted off, down to the limit of the fall height. The density and viscosity of water at 21 °C, and an assumed particle density were used.

The electron microscope used was a Carl Zeiss EVO50 equipped with an Oxford Instruments INCA energy dispersive spectrometer (EDS). All images were acquired using backscatter electrons, unless otherwise specified to highlight particle composition. The contrast in backscatter electron images is proportional to average elemental composition i.e. the brighter the particle the higher the atomic number. Some images with contrasting brightness particles were examined by EDS for elemental composition.

The extracted fraction was deposited on a filter membrane for XRD analysis. A calibration suite of known alpha-quartz content, PM4 sized alpha-quartz particulate, loaded membranes were used as a calibration series against which the abstracted respirable fines on the filter membranes from the processed sample were compared. Additional scan time was undertaken to achieve better signal to noise ratios in the spectrum.
Quantification was by the peak area integration method. Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search

match software used was EVA (Bruker). The ICDD card set was ICDD PDF4/Minerals 2014. The x-ray source was cobalt radiation. ICCD match probabilities are reported as an indication of how well the diffraction peaks of this sample compare with currently published literature on the quoted mineral. No Rietveld refinement was conducted on the acquired spectrum unless otherwise stated.

The respirable quartz concentration of the bulk was calculated by multiplying the volume percent of the respirable-only fraction by the alpha-quartz concentration of the respirable only fraction.

Summary

The size distribution of the sample by wet sieving and laser diffraction is shown below:

Sample	Size fraction (by aerodynamic diameter) volume percent			
	Non-inhalable	Inhalable, PM100	Thoracic, PM10	Respirable, PM4
-6+2 mm TBE Sinks (T496)	91.67	8.33	1.46	0.51

The interpreted semi-quantitative mineralogy by X-ray diffraction of the abstracted PM4 is shown below:

Mineral phase	Concentration (wt %)	ICDD match probability
Clinochlore-1MIIb, ferroan ((Mg , Fe)6 (Si , Al)4 O10 (O H)8)	39	medium
Microcline, sodian (K0.95 Na0.05 Al Si3 O8)	34	low
Muscovite-3T ((K , Na) (Al , Mg , Fe)2 (Si3.1 Al0.9) O10 (O H)2)	18	medium
Quartz, syn (Si O2)	10	medium

The respirable crystalline silica concentrations are shown below:

Lab number	Client ID	% α-quartz of bulk material	% cristobalite of bulk material	% tridymite of bulk material
15_1489_2	**-6+2 mm TBE Sinks (T496)**	0.004	<0.001	<0.001

Analysed: Owen Carpenter

Reported: Owen Carpenter

Approved: Michael Simeoni, B.Sc.(Chemistry), M.Sc. (Science Administration), Ph.D.

NAGROM
the mineral processors

A.C.N. 008 868 335
A.B.N. 55 008 868 335

T: 08 9399 3934
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PO Box 66
Kelmscott WA 6991

49 Owen Road,
Kelmscott WA 6111

Certificate of Analysis

XRF / ICP Assays

Sample Identification: T2131 4% Lithium Concentrate
Nagrom Sample ID: Pit Testwork Composite C P100 0.3mm Float Feed Comp Locked Cycle Float Cycle 6 Re-Cleaner Con 3

Sample Preparation and Analysis:

The feed sample was sourced from Mineral Resources Mt Marion minesite.

The analysis was performed in Nagrom's Laboratories using fused bead/XRF and Peroxide Fusion/ICP (Li, U and Th via Peroxide Fusion/ICP).

We certify the following test data.

Analyte	Assay (%)
Li_2O	3.922
Fe	0.562
Al_2O_3	21.595
SiO_2	67.851
TiO_2	0.008
CaO	0.22

Issued by:

Nagrom
Metallurgical Laboratory
Kelmscott, Western Australia

Date of Issue	January 31 2017
Shane Wilson Authorising Officer	[redacted] Signature

NAGROM
the mineral processors

A.C.N. 008 868 335
A.B.N. 55 008 868 335

T: 08 9399 3934
F: 08 9497 1415

PO Box 66
Kelmscott WA 6991

49 Owen Road,
Kelmscott WA 6111

Certificate of Analysis

XRF / ICP Assays

Sample Identification: T2131 6% Lithium Concentrate
Nagrom Sample ID: Pit Testwork Comp P100 5.6mm +0.3mm Ro DMS SG 2.95 UF Batch RC Flow 13 (Remains)

Sample Preparation and Analysis:

The feed sample was sourced from Mineral Resources Mt Marion minesite.

The analysis was performed in Nagrom's Laboratories using fused bead/XRF and Peroxide Fusion/ICP (Li, U and Th via Peroxide Fusion/ICP).

We certify the following test data.

Analyte	Assay (%)
Li_2O	6.006
Fe	0.795
Al_2O_3	24.466
SiO_2	65.485
TiO_2	0.006
CaO	0.237

Issued by:

Nagrom
Metallurgical Laboratory
Kelmscott, Western Australia

Date of Issue	January 31 2017
Shane Wilson Authorising Officer	[redacted] Signature

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP1700602**	Page	: 1 of 2
Client	: **FREMANTLE PORTS**	Laboratory	: Environmental Division Perth
Contact	: DENIS DOAK	Contact	: Customer Services EP
Address	: 1 CLIFF STREET FREMANTLE WA, AUSTRALIA 6160	Address	: 10 Hod Way Malaga WA Australia 6090
Telephone	: 94303327	Telephone	: +[redacted]
Project	: ----	Date Samples Received	: 23-Jan-2017 11:25
Order number	: ----	Date Analysis Commenced	: 27-Jan-2017
C-O-C number	: ----	Issue Date	: 01-Feb-2017 21:41
Sampler	: DENIS DOAK		
Site	: ----		
Quote number	: EP/203/16		
No. of samples received	: 4		
No. of samples analysed	: 4		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Bek Simpfendorfer	Inorganic Supervisor	Perth Inorganics, Malaga, WA
Jeremy Truong	Laboratory Manager	Perth Inorganics, Malaga, WA

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG005T (Total Metals): Poor spike recovery for antimony and selenium due to posssible sample matrix interference.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Client sample ID	**NE1**	**NW1**	**SW1**	**SE1**	**----**
			Client sampling date / time	20-Jan-2017 12:00	20-Jan-2017 12:05	20-Jan-2017 12:10	20-Jan-2017 12:15	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP1700602-001**	**EP1700602-002**	**EP1700602-003**	**EP1700602-004**	**--------**
				Result	Result	Result	Result	----
EA055: Moisture Content								
Moisture Content (dried @ 103°C)	----	1	%	<1.0	<1.0	<1.0	<1.0	**----**
EG005T: Total Metals by ICP-AES								
Antimony	7440-36-0	5	mg/kg	<5	<5	<5	<5	**----**
Arsenic	7440-38-2	5	mg/kg	<5	<5	<5	<5	**----**
Beryllium	7440-41-7	1	mg/kg	<1	**2**	<1	<1	**----**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	**----**
Chromium	7440-47-3	2	mg/kg	**3**	**4**	**4**	<2	**----**
Copper	7440-50-8	5	mg/kg	<5	<5	<5	<5	**----**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	**----**
Manganese	7439-96-5	5	mg/kg	**73**	**467**	**54**	**89**	**----**
Nickel	7440-02-0	2	mg/kg	<2	**7**	**4**	<2	**----**
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	**----**
Zinc	7440-66-6	5	mg/kg	**7**	**11**	**6**	**8**	**----**
EG020T: Total Metals by ICP-MS								
Lithium	7439-93-2	0.1	mg/kg	**7.1**	**6.5**	**5.5**	**8.3**	**----**

ASLP Laboratory Report

Job Number: 16-01510
Revision: 00
Date: 1 March 2016

ADDRESS: **Nagrom the Mineral Processor**
PO Box 66
Kelmscott WA 6991

ATTENTION: Heidi Brooks

DATE RECEIVED: 25 February 2016

YOUR REFERENCE: T2058

PURCHASE ORDER:

APPROVALS: [redacted]
DouglasTodd
Laboratory Manager

REPORT COMMENTS:

Extractions performed according to ARL No. 069 - Preparation of Leachates - Bottle Leaching Procedure
ASLP Extraction Fluid: pH 5 Solution
Samples are analysed on an as received basis unless otherwise noted.

METHOD REFERENCES:

ARL No. 29/402/403	Metals in Water by AAS/ICPOES/ICPMS
ARL No. 040	Arsenic by Hydride Atomic Absorption
ARL No. 406	Mercury by Cold Vapour Atomic Absorption Spectrophotometry

NATA
WORLD RECOGNISED ACCREDITATION
Accredited for compliance with ISO/IEC 17025
NATA Accreditation No. 2377

Analytical Reference Laboratory (WA) Pty. Ltd.
46-48 Banksia Road, Welshpool, Western Australia 6106 Telephone: 08 6253 4444 Facsimile: 08 6253 4440
www.arlwa.com.au ABN: 91 050 159 898

ASLP ***LABORATORY REPORT***
Nagrom the Mineral Processor
ARL Job No: 16-01510 *Revision: 00* *Date:* 1 March 2016

ASLP for Metals Sample No: Sample Description:	LOR	UNITS	16-01510-1 P100 0.212mm CUF Cleaner Float A-1 Conc Comp	16-01510-2 -6 + 2mm TBE Sinks (T496)	16-01510-3 PMI November Shipment Comp 10 Vessels (Nat. State)
Silver - Dissolved	0.01	mg/L	<0.01	<0.01	<0.01
Aluminium - Dissolved	0.1	mg/L	<0.1	0.6	0.1
Arsenic - Dissolved	0.001	mg/L	0.030	0.003	<0.001
Barium - Dissolved	0.01	mg/L	0.13	0.03	0.07
Cadmium - Dissolved	0.002	mg/L	0.006	<0.002	<0.002
Cobalt - Dissolved	0.01	mg/L	0.03	<0.01	<0.01
Chromium - Dissolved	0.01	mg/L	<0.01	<0.01	<0.01
Copper - Dissolved	0.01	mg/L	0.06	0.01	<0.01
Mercury - Dissolved	0.0002	mg/L	<0.0002	<0.0002	<0.0002
Manganese - Dissolved	0.01	mg/L	2.5	0.17	0.21
Nickel - Dissolved	0.01	mg/L	0.05	0.02	0.02
Lead - Dissolved	0.01	mg/L	<0.01	<0.01	<0.01
Zinc - Dissolved	0.01	mg/L	0.40	0.07	0.04
Iron - Dissolved	0.01	mg/L	0.02	0.03	0.21

Result Definitions

LOR Limit of Reporting
[ND] Not Detected at indicated Limit of Reporting
[NR] Analysis Not Requested
(SS) Surrogate Standard Compound

Analytical Reference Laboratory (WA) Pty. Ltd.
46-48 Banksia Road, Welshpool, Western Australia 6106 Telephone: 08 6253 4444 Facsimile: 08 6253 4440
www.arlwa.com.au ABN: 91 050 159 898

TUNRA BULK SOLIDS HANDLING RESEARCH ASSOCIATES
(a division of Newcastle Innovation Ltd - inc. in NSW. ABN 97 000 710 074)

in association with the

Centre for Bulk Solids & Particulate Technologies
At The University of Newcastle

Spodumene Coarse and Fines Test Work

Report No. 8782 April, 2016

Client: **Process Minerals International**

Address: **1 Sleat Rd**
Applecross WA 6153

Telephone: [redacted]

Facsimile: 08 9329 3801

Attention: Mark Davidson

This report has been checked and authorised by the undersigned

Signed [redacted]

Tobias Krull

for TUNRA Bulk Solids Handling Research Associates

Users of this report are invited to contact TUNRA Bulk Solids if clarification of any aspect is required.

The test results presented are for a client supplied bulk material sample. Should the material handled in practice vary from this test sample then the results in this report may be far from optimal. In addition, any extrapolation of the data and / or recommendations to situations other than those for which they were specifically intended without confirmation by TUNRA Bulk Solids may lead to erroneous conclusions.

This investigation was performed using the facilities of the Bulk Solids Handling Laboratories of TUNRA Bulk Solids Handling Research Associates and the Centre for Bulk Solids & Particulate Technologies at The University of Newcastle

POSTAL ADDRESS:

Dr Tobias Krull
TUNRA Bulk Solids Research Associates
University Drive, Callaghan
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Fax: +61 2 4033 9044
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TABLE OF CONTENTS

1 INTRODUCTION

This report has been commissioned by Process Minerals International to determine the Dust Extinction Moisture (DEM) of a sample of Spodumene Coarse and Fines.

2 DUST EXTINCTION MOISTURE

The moisture content at which a material is deemed to emit no dust was determined using a procedure set down in Australian Standard AS-4156.6-2000 [1]. This standard was written specifically for coal but has been utilised for other bulk materials by modifying the quantity of sample placed in the test rig. The Standard calls for 1 kg of coal, so to make the standard applicable for iron ore fines, am amount of 2.5kg is used which in an approximate equivalent volumetric amount. The actual weight of the sample is taken into account when determining the dust number. AS-4156-2000 should be referred to for a complete explanation of the general test procedure, however, a concise description is as follows. The test rig shown in Figure 1 consists of a rotating drum in which the sample of material to be tested, at a pre-measured moisture level, is placed. The drum is rotated at a speed of 30 RPM for a period of 10 minutes while an air flow rate of 170 l/m is drawn through a hole in the drum lid, through a hollow drive shaft and a paper filter bag which collects the dust generated in the drum. The weight of the filter bag is measured before and after the test to determine the quantity of dust collected. A dust number is then calculated using the formula given in Equation 1.

Figure 1 – DEM Test Rig

$$\text{Dust Number} = \frac{M_b - M_a}{M_s} \times 100{,}000 \qquad (1)$$

Where

Mb	=	Mass of filter bag and dust (grams)
Ma	=	Mass of filter bag (grams)
Ms	=	Mass of sample in drum (grams)

The test work is conducted on a number of samples over a range of moistures. The dust numbers obtained are plotted on a log linear graph where a line of best fit crosses the dust number of 10 is deemed to be the Dust Extinction Moisture (DEM). The test is performed within a climate controlled chamber with a regulated humidity of between 61-65% RH and a temperature of 20-22°C.

The dust numbers obtained for the two Spodumene samples are plotted in Figure 2 & Figure 3 with the DEM values summarised in Table 1.

Table 1 – DEM test results

Sample	*DEM*
Spodumene Fines	1.5%
Spodumene Coarse	0.5%

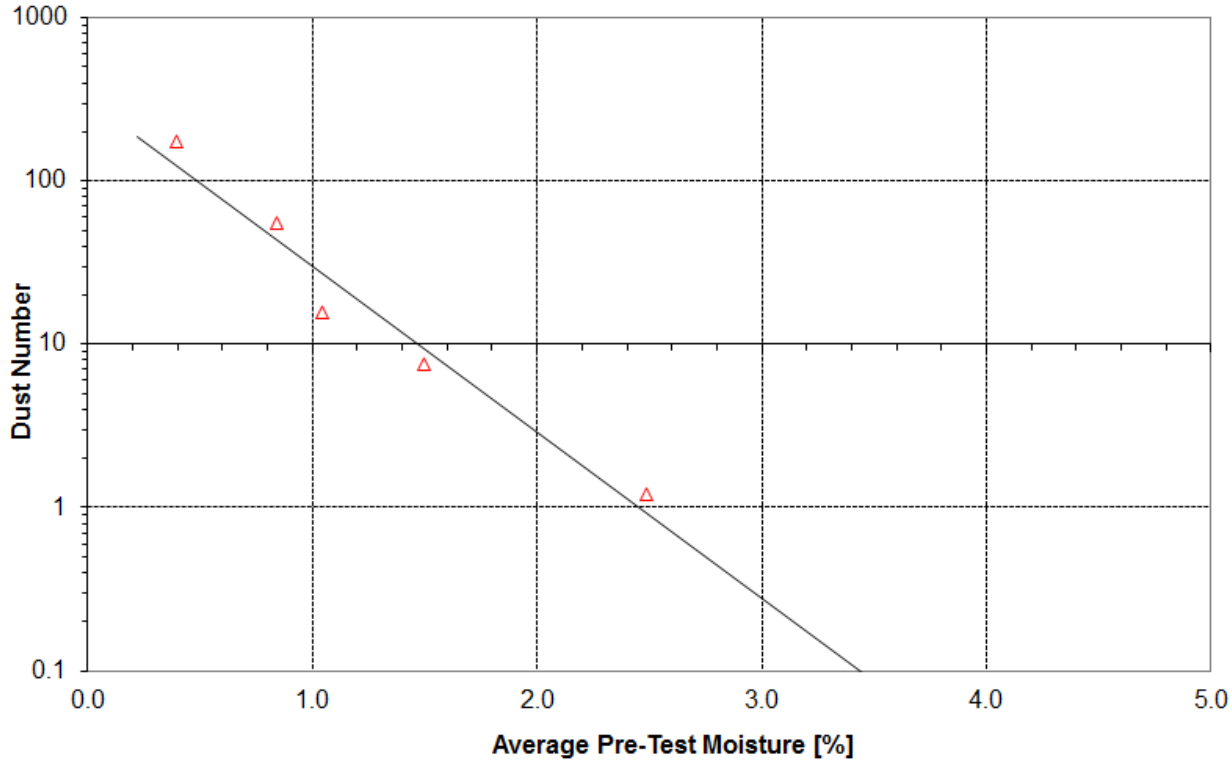

Figure 2 – Dust Measurement Results for Spodumene Fines

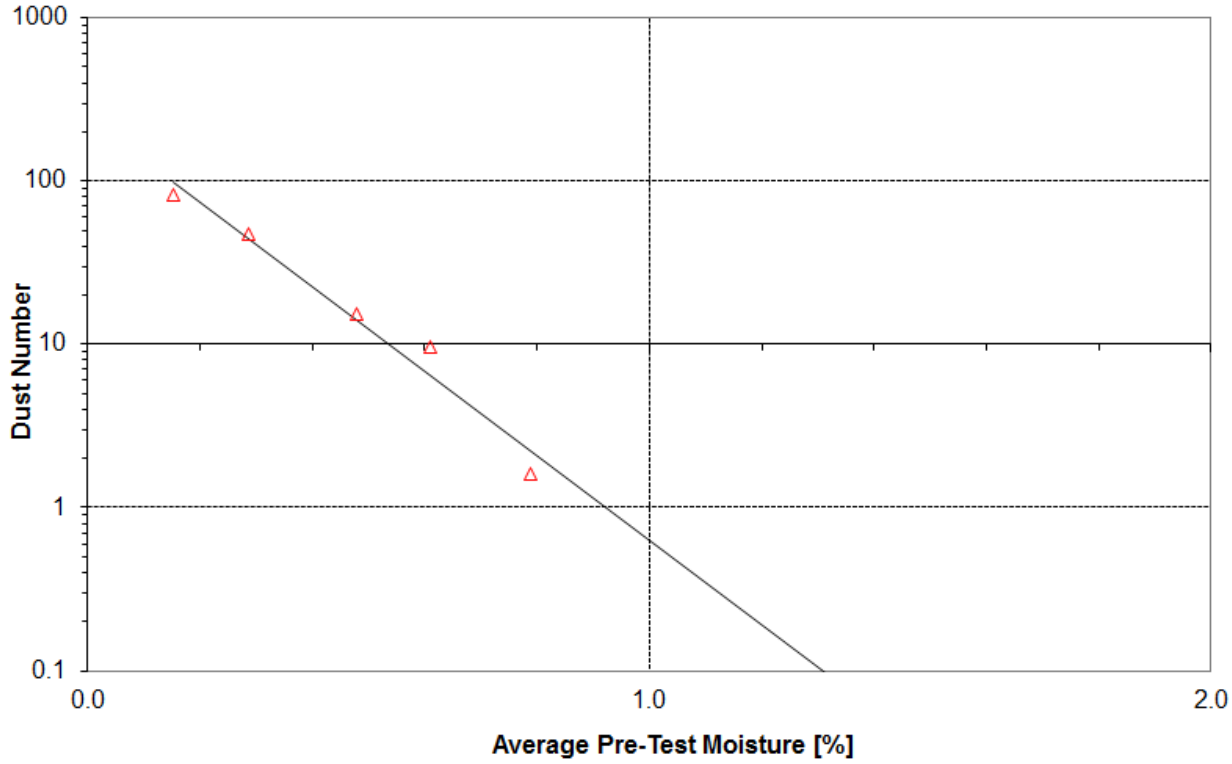

Figure 3 – Dust Measurement Results for Spodumene Coarse

3 REFERENCES

[1] Australian Standard AS-4156.6-2000, 'Coal Preparation Part 6: Determination of dust/moisture relationship for coal'

NAGROM
the mineral processor

Process Minerals International

Analytical Report

REFERENCE	KM-1602-019795
REPORT DATE	February 10 2016
SAMPLES	3
DATE RECEIVED	February 09 2016
AUTHORISATION	[redacted]
	Shane Wilson - Senior Chemist

CLIENT	Process Minerals International
ADDRESS	1 Sleat Road, Applecross Locked Bag 3, Canning
CONTACT	
PROJECT	PTH.MET
P/O#	T2058 SUB#19 ANALYSIS

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NAGROM
the mineral processor

ABN 55 008 868 335

T2058 SUB#19 ANALYSIS	Li2O	Fe	Al2O3	SiO2	TiO2	Mn	S	P	SnO2	Ta2O5	Nb2O5	Na2O	PbO	CaO	MgO	K2O	Pb	LOI1000	U	Th
Method	ICP004	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	XRF007	TGA002	XRF008	XRF008
Units	ppm	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
LLD	10	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.001	0.001
Float A-1 Conc Comp	51320	2.533	25.045	58.257	0.093	0.309	0.036	0.083	0.015	0.025	0.064	0.704	0.007	0.947	0.768	1.289	0.006	2.89	<0.001	0.001
-6+2mm TBE Sinks (T496)	66440	0.805	25.460	65.174	0.014	0.158	<0.001	0.017	0.013	0.007	0.007	0.493	0.002	0.071	0.062	0.272	0.002	0.27	<0.001	0.001
-6+2mm TBE Sinks (T496) REP	--	0.797	25.285	65.405	0.007	0.158	<0.001	0.018	0.012	0.007	0.013	0.509	0.003	0.073	0.060	0.266	0.003	0.29	<0.001	0.001
-6+2mm TBE Sinks (T496) REP	67370	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nov ShipComp 10 Vessels	20	58.546	1.302	3.756	0.117	0.152	0.072	0.068	0.002	<0.001	0.001	0.102	<0.001	0.058	0.170	0.008	<0.001	10.34	<0.001	0.001
GIOP75 STD	--	57.231	2.653	5.762	0.150	0.086	0.010	0.034	0.002	<0.001	<0.001	0.019	<0.001	0.154	0.174	0.021	<0.001	8.98	<0.001	<0.001
TAN1 STD	--	0.256	15.117	74.321	0.023	0.039	0.010	0.184	0.095	0.290	0.028	6.288	0.008	0.366	0.009	1.784	0.008	N.A.	<0.001	<0.001
10NLI_1 STD	15500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
181LI2O STD	64060	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Suite 6
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Victoria Park
WA 6100

Client: Nagrom
Job number: 16_0197
Sample: 16_0197_01
Client ID: T2058-0.5mm P100 0.212 mm CUF Bulk Rougher Float 1
Date: 15/03/2016
Analysis : Transportable Moisture Limit, Angle of Repose, Moisture Content and Bulk Density

Sample preparation

The sample was supplied by the client to Microanalysis Australia on 42429 for the above mentioned analyses. The sample was tested as received.

Results

Transportable moisture limit:	16.6 %	
Moisture before flow point:	18.4 %	
Moisture after flow point:	18.5 %	
Total moisture (as received):	13.6 %	(average of two measurements)
Angle of repose:	53.0 °	
Bulk density:	1.423 mt/m^3	
Stowage factor:	0.703 m^3/mt	

Analyst: Owen Carpenter

Approved by: Michael Simeoni

Signed: [redacted]

Notes

1. The FMP/TML was conducted in accordance with the 'IMO Code of Safe Practice for Solid Bulk Cargoes – 2015, Appendix 2'.
2. The bulk density was conducted in accordance with the 'IMO Code of Safe Practice for Solid Bulk Cargoes- 2015, Appendix 4'.
3. The Angle of Repose was conducted in accordance with the 'IMO Code of Safe Practice for Solid Bulk Cargoes – 2015, Appendix 2'.
4. The results are only indicative of the sample supplied.
5. A tamping pressure of 20 KgF was used correlating with a hold height of 10 m unless otherwise specified by the client.

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Client: NAGROM
Job number: 16_0196
Sample: 16_0196_01
Client ID: Cleaner Float A-1 Conc Comp
Date: 11/03/2016
Analysis : Quantitative XRD analysis

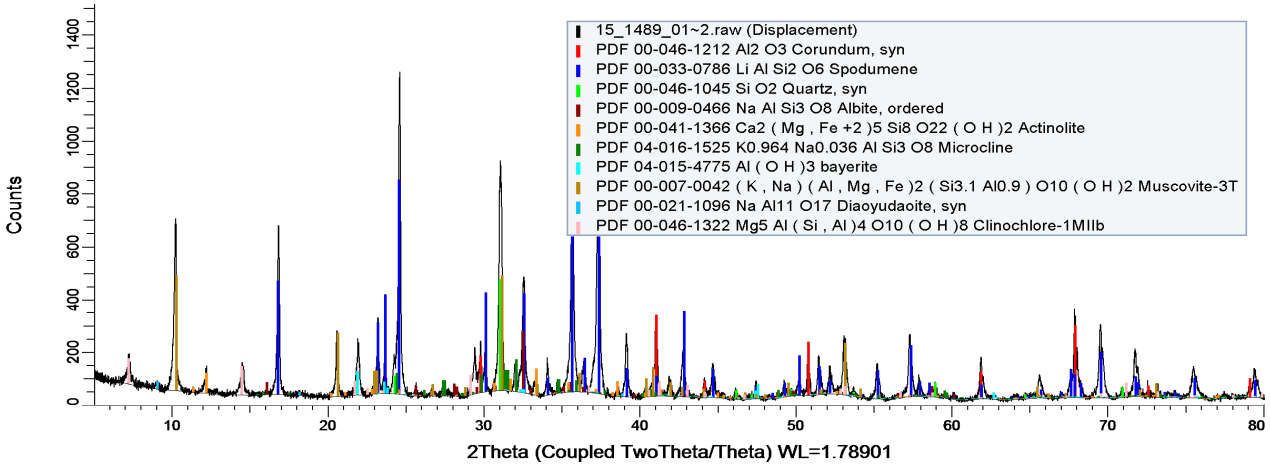
Sample preparation
The sample was supplied by the client to Microanalysis Australia on 29th February 2016 for the above mentioned analyses. A representative sub –sample was removed and lightly ground such that 90% was passing 20 µm. Grinding to this size helps eliminate preferred orientation.

Analysis
Only crystalline material present in the sample will give peaks in the XRD scan. Amorphous (non crystalline) material will add to the background. The search match software used was Eva 3.1. An up-to-date ICDD card set was used. The X-ray source was cobalt radiation.

An internal corundum standard was used in the quantification process. The concentrations were calculated by full Rietveld refinement. This method takes into account preferred orientation, substitution and lattice strain.

Summary
The phases are listed in order of interpreted concentration:

Mineral phase	Concentration	Uncertainty
Spodumene (Li Al Si2 O6)	77.02%	14.43%
Quartz, syn (Si O2)	7.35%	1.38%
Clinochlore-1MIIb (Mg5 Al (Si , Al)4 O10 (O H)8)	5.69%	1.07%
Albite, ordered (Na Al Si3 O8)	1.31%	0.25%
Muscovite-3T ((K , Na) (Al , Mg , Fe)2 (Si3.1 Al0.9) O10 (O H)2)	0.71%	0.13%
bayerite (Al (O H)3)	0.54%	0.10%
Actinolite (Ca2 (Mg , Fe +2)5 Si8 O22 (O H)2)	0.34%	0.06%
Microcline (K0.964 Na0.036 Al Si3 O8)	0.27%	0.05%
Amorphous	6.77%	-



Analyst: Owen Carpenter
Reported: Owen Carpenter
Approved: Michael Simeoni, B.Sc.(Chemistry), M.Sc. (Science Administration), Ph.D.