

Keysbrook Leucoxene Pty Ltd

ABN 49 137 091 297



Our Reference:

8 September 2016

Manager Licensing – Resource Industries (South)
Licensing and Approvals
Department of Environment Regulation

Via Email: [REDACTED] ; info@der.wa.gov.au

Attention: Tim Gentle

Dear Tim

Addendum to application to amend Licence L8918/2015/1

Keysbrook Mineral Sands Project

We acknowledge receipt of the DER letter CEO2514/16, advising insufficient information to proceed with assessment of the application. We accept the DER's invitation to provide additional information as identified in Schedule 1 of the Letter in order to progress the application. We provide the following information thereto:

Consultation with direct interest parties

The Company has announced the WCP upgrade works in its most recent quarterly activities statement (Attachment 1), which is publicly available via the Company website. This activities statement has been circulated to the Community Consultation Group, a group comprising shire, community and Company representatives.

A letter outlining the WCP upgrade has been sent to the nearest neighbours of the Project, which includes those neighbours who have previously made complaint to the Company with respect to noise. A copy of this letter's content is provided as Attachment 2.

In addition, we are in the process of contacting neighbours within 2,000 metres to discuss the works, however we expect community support given the works are expected to improve/reduce the noise levels.

The Company has also met with the Shires of Serpentine Jarrahdale and Murray to introduce the works and through its consultants Planning Solutions has submitted an application to the Shire of Murray which is expected to be finalised shortly.

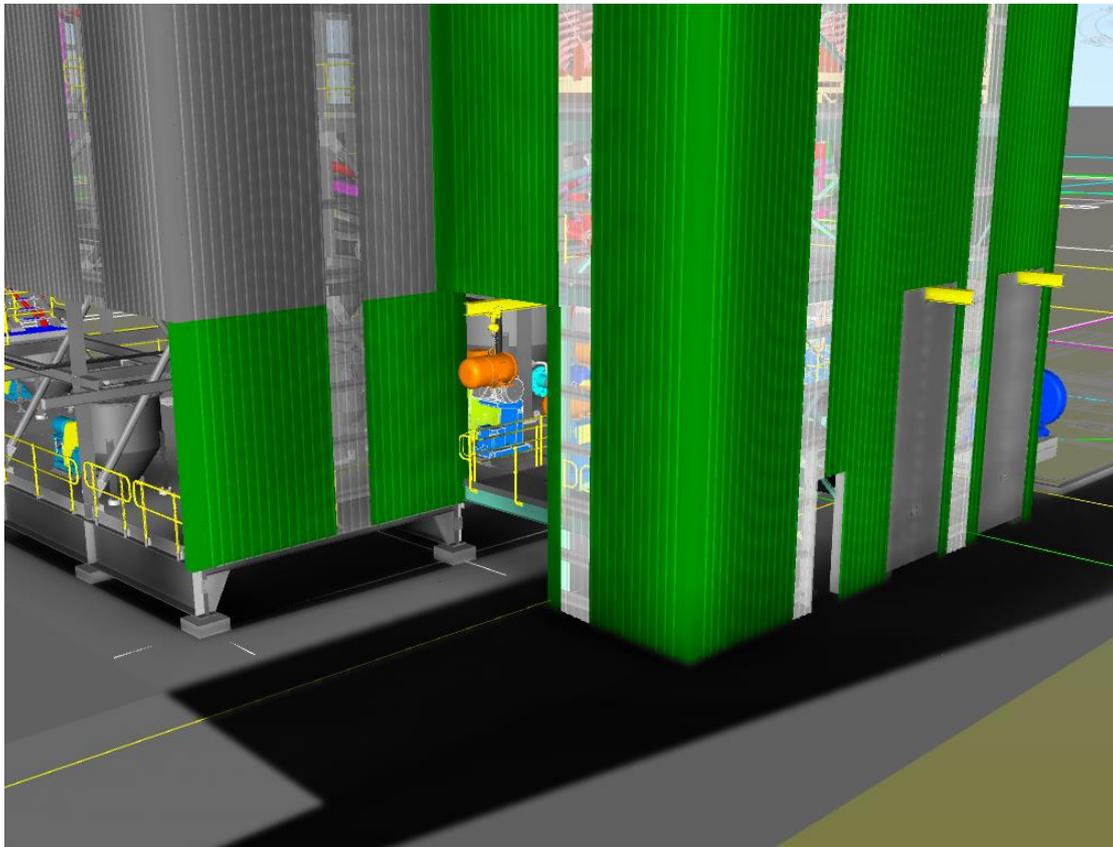
Emissions to air (Noise emissions)

The Company engaged SVT Engineering to undertake noise modelling of the changes to the plant and present attenuation options to ensure a net reduction in WCP noise (Attachment 3).

The study identified that the additional circuit would have a small increase (1dB at the WCP, 0.2dB at the nearest sensitive receptor) to WCP noise and that cladding the southern fascia of both the existing plant and the new annex would result in a 2.1dB net reduction in the noise generated by the WCP. The calculated noise created by the WCP at the nearest sensitive receptor is 22dB, which is significantly below the assigned noise limits of the Noise Regulations. The operation of the upgraded WCP will improve the Operations noise emissions.

Verification monitoring shall be completed on the operating upgraded facility to demonstrate that the net reduction in noise has been achieved. The results of this monitoring shall be provided to the DER.

The cladding of southern fascia has been progressed through engineering design and is shown below:



Compliance with Noise Regulations

- (a) The Company acknowledges that it is incumbent on it that its Operations do not exceed the assigned limits of the Noise Regulations. In this regard the Company confirms receipt of the letter dated 5 September 2016 from Shaun Hodges, the DER Acting Executive Director Compliance and Enforcement, addressed to John Traicos, our Company Secretary, in which doubt is cast on the accuracy of the reports provided by SVT Engineering Consultants and further advises that the DER will be conducting its

own monitoring program in order to investigate whether noise emissions from KLPL's Keysbrook Mine comply with the requirements of the Noise Regulations. The Company will work with the DER to ensure that its operations at the Keysbrook Mine comply with the Noise Regulations.

- (b) However, at this stage, there is no tangible evidence of the Company not having complied with the Noise Regulations and 3 independent reports prepared by SVT Engineering Consultants which have been submitted to the DER since operations commenced indicate that the Company has complied with the Noise Regulations.
- (c) Furthermore, the MBS Report which is attached to our application to amend Licence L8918/2015/1 makes it clear that –
 - i. the Works to be constructed will ensure that noise emissions will not increase from the Concentrator as a result of the proposed changes (section 4.1.5) ;
 - ii. the Works are located a significant distance away from sensitive receptors with the closest receptor being a distance of 1.7km which is well in excess of the modelled 1km distance referred to in section 2.3 of the Report; and
 - iii. the risk assessment in Appendix 1 of the MBS Report confirms the low noise residual risk.
- (d) In addition to the noise monitoring undertaken using directional noise monitoring technology, the Company now uses SVT's Maestromine Planning software to plan its operational activities to ensure its mining is planned and executed in a way that would not exceed the assigned noise limits at neighbouring sensitive receptors under forecast weather conditions. The software considers all fixed and mobile plant in its modelling calculations. The Company expects that its operating performance with respect to Noise will be greatly enhanced as a result of introducing this software. While Maestromine offers benefits to managing placement and utilization of mobile machinery, attenuation of fixed plant requires structural modifications that block and absorb noise. The Company views the WCP upgrades as an important part of its continued attenuation of fixed plant noise which will benefit community stakeholders.

Fee Calculation

A calculated fee of \$1,530 has been estimated as follows:

450 Units (5.25mtpa licensed throughput) x **\$3.40** = \$1,530

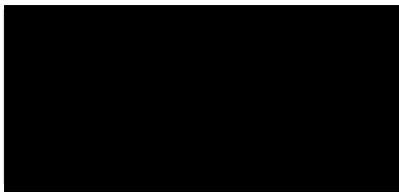
Conclusion

The Company believes that the information set out in its application to amend Licence L8918/2015/1 together with this Addendum and the attachments provided, meets the requirements of section 59 B of the EP Act.

In view of the urgency related to this application and its importance to the timely completion of the work to the concentrator, we would be most grateful if you could immediately advise if you require any further information in support of this application.

The Company wishes to reaffirm that it is well progressed with its preparations to complete the WCP upgrades and appreciates the DER urgent attention to progressing this licence amendment to allow for the operation of the upgraded plant.

Kind Regards,



Marc Morris

HSE Manager

Attachments

- 1 Quarterly activity statement
- 2 Letter to neighbours
- 3 SVT Report

Attachment 1 - Quarterly Activity Statement

HIGHLIGHTS

- Record quarterly product sales of 19,020 tonnes and sales revenue of \$11.4 million
- Record leucoxene shipment and maiden L88 cargo exported in June 2016
- Quarterly saleable production of 10,826 tonnes
- Customer request for increased leucoxene volumes in 2016
- US\$37.5 million RMB Senior Debt Facility restructured to give greater flexibility and improved access to future cashflows
- Ronnie Beevor appointed Non-Executive Director
- Keysbrook Project officially opened April 2016

During the June quarter 2016, MZI's primary focus remained on ramping-up production at the Company's flagship Keysbrook Project to achieve targeted recovery and production rates. The Project was officially opened on 4 April 2016.

Production and sales data for the June quarter are depicted in Table 1 on page 3 of this report.

Comment

MZI Managing Director Trevor Mathews said: *"MZI again achieved good progress on both the operational and corporate fronts during the June Quarter.*

"At the corporate level, the successful restructure of the US\$37.5 million RMB Senior Debt Facility has significantly improved our financial flexibility, whilst the appointment of highly experienced financial markets executive Ronnie Beevor as a Non-Executive Director brings valuable additional expertise to our Board.

"At the operational level, we made further strides toward consolidating Keysbrook's emerging status as a premier global supplier of premium minerals sands products by commencing exports of our premium L88 leucoxene product as part of a record leucoxene shipment in June, and continuing to achieve good progress in our production ramp-up.

"Importantly, we continue to see widespread indicators of improving market fundamentals for titanium dioxide feedstocks, particularly for higher value products such as leucoxene, as demonstrated by a major customer's request for increased deliveries for the remainder of 2016.

"With a promising market outlook for our high quality products, and value-adding plant upgrades scheduled in the current quarter, we can look forward to the new financial year with confidence."

CORPORATE

MZI finished the June 2016 quarter with \$2.5 million in cash and undrawn debt and guarantee facilities of \$6.9 million. Proceeds of \$9.8 million from the record June leucoxene shipment were received in early July and are therefore not included in the quarter end cash position.

In June 2016¹ the Company announced it had successfully restructured the US\$37.5 million RMB Senior Debt Facility to provide greater flexibility, reduced fixed quarterly repayment obligations and increased access to surplus cashflow.

As announced, the term of the restructured facility has been extended by 27 months to 31 December 2021, and includes a six-month deferral of the start of the Company's principal repayment obligations to 31 March 2017. In addition, quarterly principal repayments will be reduced to a flat US\$1 million for the first five quarters, US\$2 million for the following ten quarters, and US\$2.5 million thereafter, significantly increasing the Company's financial flexibility and boosting free cashflow. Previously, quarterly principal repayments averaged US\$2.9 million.

The revised facility significantly reduces cash sweep provisions applying to surplus cashflow generated by the Keysbrook Mineral Sands Project after all quarterly costs and scheduled debt repayments have been met. MZI will now have access to 50% of surplus cashflow generated per quarter, with the remainder reserved for early debt retirement. Previously 70% of any quarterly surplus cashflow generated was applied to senior debt repayment. The Debt Service Reserve Amount will be reduced to US\$3 million from US\$4.5 million and its funding has been delayed by six months to 31 December 2016.

Interest will accrue at a margin of 5.85% per annum above the US LIBOR rate, pre-project completion and 5.35% per annum post project completion, an increase of 1.10%. Other key terms remain unchanged, as detailed in the Company's ASX announcement dated 3 September 2014. The revised agreement is effective as of 29 June 2016.

Early in the quarter², MZI announced the appointment of Mr Ronnie Beevor, a highly experienced financial markets executive and corporate advisor, as a Non-Executive Director. Mr Beevor was appointed as a nominee of RCF and brings strong corporate, resources financing and development expertise to the MZI Board.

Total issued capital at 30 June 2016 was 203,841,970 ordinary shares with a further 8,125,000 unlisted options with varying exercise prices and maturity dates.

OPERATIONS

Production and Costs

The primary focus of activity during the June quarter was the continuing ramp-up of production at the Keysbrook Project.

¹ Refer ASX release dated 29 June 2016

² Refer ASX release dated 15 April 2016

Table 1: Keysbrook Production and Sales

Production	Unit	Dec-Qtr-2015	Mar-Qtr-2016	Jun-Qtr-2016	Total FY2015-16
Ore Mined	dt	618,480	886,357	1,017,474	2,522,311
Ore Processed	dt	599,369	847,995	937,957	2,385,321
Mined Grade	% HM	2.99	2.58	2.47	2.64
WCP Availability	%	82.4	83.5	82.9	82.9
MSP Availability	%	Commissioning	85.7	93.4	89.54
HMC Production (WCP)	dt	16,008	19,566	22,636	58,289
HMC Processed (MSP)	dt	9,011	24,055	20,140	53,206
L70	dt	2,316	6,349	3,475	12,140
L88	dt	1,795	4,943	3,779	10,297
Zircon concentrate	dt	1,775	4,888	3,572	9,663
Sales					
L70	dt	-	6,825	7,000	13,825 ¹
L88	dt	-	-	8,250	8,250
Zircon concentrate	dt	958	4,572	3,770	9,300
Total – all products	dt	958	11,397	19,020	31,375

1. 1,685 tonnes of L88 product blended with L70 to meet customer volume requirements over the half year period.

Mining continued according to plan in the period, with a record of 1,017,474 tonnes mined in the June quarter, compared with 886,357 tonnes in the preceding quarter. The mined grade for the quarter was 2.47% HM, compared with 2.58% in the previous quarter, reflecting the June quarter mine plan. Ore processed increased by approximately 11% to 937,957 tonnes.

Since commissioning and processing commenced in late 2015, the operational focus has been on improving heavy mineral recovery both at the Keysbrook Wet Concentrator Plant (WCP) and Doral's Mineral Separation Plant (MSP) and in achieving long term sustainable throughput rates and plant reliability.

Production of Heavy Mineral Concentrate (HMC) at the WCP totalled 22,636 tonnes in the quarter, an increase of approximately 16% compared with the preceding period. However, HMC processed at the Picton MSP was lower, totalling 20,140 tonnes compared with 24,055 tonnes in the March quarter. This reflected fewer effective MSP processing days in the quarter, including five days of processing time foregone to trial improvement initiatives. Consequently, production of saleable products totalled 10,826 tonnes in the June quarter, compared with 16,168 tonnes in the March quarter, and 5,885 tonnes in the December quarter.

As previously reported, optimisation activities are ongoing as part of the operational ramp-up in order to achieve targeted production rates. This continues to show an improvement trend with HM recovery at the WCP averaging 60% in the June quarter compared with 55% in the preceding period. Plant upgrades to the Keysbrook WCP, costing approximately \$2.3 million, are scheduled in the September quarter to further improve performance, comprising a new WCP screening unit and the addition of 48 large capacity spirals.



The screening unit will increase the HMC grade and lift MSP recoveries. The additional spirals are expected to increase WCP HM recovery to design levels.

Operating expenditure for the June quarter totalled \$8.8 million which includes accruals and current creditors, compared with \$6.7 million in the prior quarter. The expenditure difference reflects increased mining and HMC production volumes, higher materials handling and transport costs related to increased sales, and increased costs for planned and unplanned maintenance. Additional one-off expenditure was also associated with a range of optimisation activities, including an extension of grade control drilling over a broader area to assist with optimisation of the coming years mine production schedule.

Sales

A key operational milestone was achieved in the period, with the maiden shipment of Keysbrook L88 leucoxene exported from the Bunbury Port aboard the MV Thor Infinity in June. The shipment of 8,250 tonnes of L88 was part of a record leucoxene shipment totalling 15,250 tonnes, including 7,000 tonnes of L70. The shipment had a total value of approximately \$9.8 million, proceeds of which were booked in the quarter and received in July.

Total product sales for the quarter was a record 19,020 tonnes, including 3,770 tonnes of zircon concentrate from the Port of Fremantle to major Chinese customer Tricoastal/Wensheng. Record sales revenue totalling \$11.4 million was booked for the June quarter, including revenue from the June leucoxene shipment which was received in early July.

Discussions have continued with potential customers regarding future supply of L88 leucoxene into pigment and welding rod applications. It is intended that some small shipments of Keysbrook L88 will be undertaken over the remainder of the year and subject to plant trial qualification, MZI expects to enter into commercial negotiations regarding offtake agreements.

Subsequent to the end of quarter the Company received notification from its major leucoxene customer of a substantial increase in the customer's requirements³ and requesting an upward revision of the shipping schedule for the remainder of this calendar year. As a result of this revision, and other sales opportunities, the Company expects all production to be fully sold in 2016.

Mineral Sands Market

Mineral sands products such as rutile and leucoxene contain titanium dioxide (TiO₂), which is primarily used in the manufacture of pigments in paints, plastics, inks and coatings. TiO₂ is also used to produce titanium metal which is most commonly associated with aerospace and other specialist applications. Zircon is a major component in ceramics used to manufacture tiles and bathroom furniture and is also used in specialty chemicals, precision castings and specialty metals. Consequently, the mineral sands market is closely aligned with global economic growth and urbanisation.

The mineral sands market showed continued signs of improvement during the June quarter, particularly within the chloride pigment feedstock sector. A strong northern hemispherical painting season exceeded expectations in reducing pigment inventory, which is causing downstream restocking to occur and in turn placing upward pressure on feedstock prices. The outlook for zircon remains mixed with growth in demand

³ Refer ASX release dated 18 July 2016

being reported in western economies while in China demand has remained subdued waiting for recovery in the building and construction sector. There is a continuing sentiment that the mineral sands market cycle has moved through the bottom as the reduction in feedstock supply starts to affect inventory and demand. Prices have stabilised and for some feedstocks are now increasing, meaning the outlook remains positive with continued recovery expected during the remainder of 2016. All major pigment producers have received and continue to announce price increases further signalling the bottom of the price cycle.

The US economy has remained relatively strong which augurs well for pigment consumption in 2016 and 2017. The demand for chloride pigment has been stronger than expected which has reduced inventory, meaning there is now upward price pressure on high-TiO₂ feedstock such as rutile and leucoxene. Economic growth in the US and Europe is expected to continue to remain positive throughout 2016, further supporting overall pigment demand.

Slower than expected recovery in the Chinese building and construction sector has been driving negative sentiment in the zircon and TiO₂ coatings sector, although fresh stimulus is expected to help rebuild confidence. The zircon price slipped during the March quarter but zircon producers continue to manage production to ensure the market is not oversupplied. Major zircon producers have recently announced zircon price increases reversing slippage experienced early in the June quarter reflecting market conditions. Accordingly, the zircon price is expected to remain relatively stable throughout the remainder of 2016 with modest upside possible in 2017.

Health, Safety and Environment

There were no Lost Time Injuries during the reporting period, making it the fifth consecutive LTI-free quarter. The Company wide rolling 12-month Total Recordable Injury Frequency Rate (per 1 million hours worked) was 20.0 at the close of the period. Proactive reporting of potential hazards by employees continued during the period, providing a strong platform for the reduction of the risk of harm, damage or loss.

The progressive rehabilitation of mined areas at the Keysbrook Operations commenced during the period, while rehabilitation and removal of infrastructure continued at the Company's Tiwi Islands operations.

Community

Both the Shire of Murray and Shire of Serpentine Jarrahdale councils and executive toured the Keysbrook site, which included the mining area, the WCP and inspection of the first stages of pastoral rehabilitation. In addition, the Peel Development Commission's full Board also toured the site which included a presentation by MZI's Chairman and Managing Director. Community engagement activities continued throughout the reporting period. Recipients of community partnership funding included the Shire of Murray for fencing of a playground in North Dandalup, the Murray Districts Historical Society and the Jarrahdale Heritage Society for tree planting.

Geology and Regional Exploration

Activities for the quarter were mostly associated with the Keysbrook drilling program, which was expanded to cover a broader area for grade control in addition to the incremental resource expansion drilling undertaken to the north and south of the current resource footprint. A total of 1,109 holes were drilled for

QUARTERLY ACTIVITIES REPORT

FOR THE PERIOD ENDING 30 JUNE 2016



5,177.5 metres during the quarter. Analyses continue to be received, with compositing for metallurgical analysis, geological interpretation and resource estimation to commence in the upcoming quarter.

Other activities were limited during the quarter due to the focus on drilling operations, but included geological support to the Keysbrook operations.

TIWI ISLANDS

The removal of remaining infrastructure at Lethbridge operations was completed during the period. This included the removal of the camp facility and remaining refuse. A review of the rehabilitation progress and activities was conducted during the quarter, with revegetation works to date successfully establishing stable platforms within which vegetation diversity and density will be built in the coming years.

Donation of the Lethbridge camp facilities to the Tiwi College was completed during the quarter. The College is using the camp to develop additional accommodation quarters for the Tiwi College staff.

For further details, please contact:

Trevor Matthews

Managing Director

+61 8 9328 9800



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QUARTERLY ACTIVITIES REPORT

FOR THE PERIOD ENDING 30 JUNE 2016



SCHEDULE OF TENEMENTS AS AT 30 JUNE 2016

Tenement	Location	Status	Registered Holder	Interest at quarter end
E70/2407	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/2610	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/2673	Pinjarra, WA	Application	MZI Resources Ltd	100%
E70/4628	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/4723	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/4725	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/4764	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/4765	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/4766	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/4767	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
E70/4768	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1662	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1663	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1676	Pinjarra, WA	Application	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1677	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1678	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1679	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1680	Pinjarra, WA	Granted	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1682	Pinjarra, WA	Application	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1683	Pinjarra, WA	Application	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1684	Pinjarra, WA	Application	Keysbrook Leucoxene Pty. Ltd.	100%
P70/1685	Pinjarra, WA	Application	Keysbrook Leucoxene Pty. Ltd.	100%
EL23862	Tiwi Islands, NT	Granted	MZI Resources Ltd	100%
EL24329	Tiwi Islands, NT	Granted	MZI Resources Ltd	100%
EL24851	Tiwi Islands, NT	Granted	MZI Resources Ltd	100%
EL25457	Anson Bay, NT	Application	MZI Resources Ltd	100%
EL25458	Anson Bay, NT	Application	MZI Resources Ltd	100%
EL25459	Anson Bay, NT	Application	MZI Resources Ltd	100%
EL25460	Anson Bay, NT	Application	MZI Resources Ltd	100%
EL25461	Anson Bay, NT	Application	MZI Resources Ltd	100%
EL26421	Anson Bay, NT	Application	MZI Resources Ltd	100%
EL29800	Croker Island, NT	Application	MZI Resources Ltd	100%
EL29839	Arnhem Land, NT	Application	MZI Resources Ltd	100%
EL30924	Tiwi Islands, NT	Application	MZI Resources Ltd	100%
ML24510	Tiwi Islands, NT	Granted	MZI Resources Ltd	100%
ML24511	Tiwi Islands, NT	Granted	MZI Resources Ltd	100%
ML27438	Tiwi Islands, NT	Granted	MZI Resources Ltd	100%

Attachment 2 - Letter to Neighbours





7 September 2016

[nearest neighbours]

Dear Sir / Madam

UPGRADE OF THE WET CONCENTRATOR PLANT, KEYSBROOK

The Company, as part of its ongoing optimisation activities, recently reviewed the Wet Concentrator Plant's (WCP) performance at Keysbrook.

As part of this review, a number of key efficiencies and improvements were identified to assist the Company in achieving design recovery targets and reduced noise emissions. This form of review is common for new mining operations in identifying improvements once a site has been operational for a period of time.

Recent test work has focused on determining ways to improve heavy mineral recovery and in reducing noise. This work concluded that improvements could be achieved by installing additional spirals and partially enclosing sections of the lower fascia of the plant. An annex to the existing facility is planned to be constructed to house the new spiral circuit, which includes the spiral assembly, a lower hopper and an electric pump.

The upgrade works will be undertaken towards the end of this month. The transport of the materials to site will result in some additional trucks coming and going from site via Hopelands Road. Six such deliveries are currently expected and these will be spread over several days. The Company's Traffic Management Plan will be applied and trucks will avoid making deliveries during school bus hours.

As a nearby neighbour, we would welcome the opportunity to discuss the proposed activities in further detail and ensure any concerns you may have are reflected in the management measures applied to the WCP upgrade works at Keysbrook.

I look forward to hearing from you if you would like to arrange a meeting or alternatively please contact Marc Morris, HSE Manager on 9328 9800 to discuss in further detail.

Yours sincerely



Jordeana Cain
External Affairs Manager
(Jordeana.Cain@mzi.com.au)

Ref: 118627

Attachment 3 - SVT Report

 FILE NOTE	Keysbrook WCP Proposed Infrastructure Changes Noise Assessment	Doc	1402091-1-100
		Rev.	2
		Page	1 of 5

Title:	Wet Concentrator Plant Proposed Infrastructure Changes Noise Assessment		
Project:	Keysbrook		
Client:	Keysbrook Leucoxene Pty. Ltd.		
SVT Doc No	1402091-1-100	SVT Job No.	1402091.1

Revision	Description	Prepared	Reviewed	Date
1	Issued for Review	Peter Glorie	Greg Stewart	22 nd August 2016
2	Final Issue	Peter Glorie	Greg Stewart	26 th August 2016

1. INTRODUCTION

Keysbrook Leucoxene Pty. Ltd. (KLPL) are proposing the installation of an additional spiral stage to the existing Wet Concentrator Plant (WCP). Details of the proposed changes are contained within the *Keysbrook Mineral Sands Project Environmental Licence Amendment Application L8917/2015/1* (August 2016, MBS Environmental). It is intended that this file note is read in conjunction with the Licence Amendment Application.

The current WCP building is pictured in Figure 1-1. The main components of the proposed changes relevant to the noise emissions include:

- Installation of an additional annex on the south side of the existing WCP building, clad on the walls and roof to the same standards as the existing;
- Additional four banks of heavy mineral separation spirals within the upper levels of the additional annex; and,
- New 132 kW pump located on level 1 within the additional annex.

For the current mining area the nearest noise sensitive receptor to the south is the closest residence without an amenity agreement, located at Lot 20 Hopelands Rd (approximately 1.7 km south-south-west of the WCP). This residence is the primary consideration with regards to any changes in noise emissions.

SVT  ENGINEERING CONSULTANTS A HCSS GROUP COMPANY FILE NOTE	Keysbrook WCP Proposed Infrastructure Changes Noise Assessment	Doc	1402091-1-100
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Figure 1-1: Existing Wet Concentrator Plant building (south side shown)

2. NOISE MEASUREMENT

SVT undertook a field trip to the Keysbrook site on the 9th August 2016 to inspect the construction of, and undertake sound power measurements of, the existing WCP building. The following measurement and sound power calculation methodology were applied:

- Façade sound power levels of the lower part of the building (not cladded) were assumed to be “openings”, and were measured and calculated according to EEMUA¹ *Noise Procedure Specification 140*, “Calculation of Sound Power Level at a distance from an Opening or Fan Intake or Discharge”.
- Façade sound power levels of the upper part of the building (cladded) were calculated based on the average sound pressure level inside the building (measured on all accessible levels), and applying the transmission loss of the cladding. The cladding transmission loss was based on measured data (using sound intensity equipment) for low frequencies, and modelled² data for higher frequencies.

The calculated sound powers for the various façade components are presented in Table 2-1.

¹ Engineering Equipment and Materials Users Association

² Measurement at higher frequencies was not possible due to ambient noise at accessible locations on the outside of the cladding. The transmission loss modelling program Insul was used to calculate the transmission loss of a corrugated steel panel with similar profile to the cladding installed.

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Table 2-1: Measured and calculated façade component sound power levels for the WCP building

Component	Sound Power Level [dBA]
Open lower north side	100.2
Open lower east and west sides (per side)	97.6
Open lower south side	101.7
Subtotal of all open areas	105.6
Cladded upper east and west sides	83.7
Cladded upper north and south sides	84.8
Subtotal of all cladded areas	90.3
Total of entire building	105.8

Additionally, the sound power level of Pump 8 (within the existing WCP) was measured and calculated independently. This pump is expected to be representative of the new pump within the annex. The calculated sound power level for Pump 8 is 97.2 dBA.

3. NOISE IMPACT OF PROPOSED CHANGES

Considering the sound power of the upper cladded building area has a significantly (~15 dB) lower sound power than the lower un-cladded portion, the proposed increase in size of the upper area will be insignificant provided the same building construction is applied. Therefore, the focus of any change in noise emissions will be on the lower portion of the building. Furthermore, the nearest noise sensitive receptor is located south-south-west of the WCP building. Therefore, the focus will be on changes to the south and west facades of the building.

Table 3-1 presents the sound power calculation of the WCP building (south and west façades) when the additional pump is added. The calculated sound power level increase is 1.0 dB.

Table 3-1: Calculation of building sound power increase considering proposed design

Component	Sound Power Level [dBA]
Open lower west side	97.6
Open lower south side	101.7
Subtotal of south and west façades	103.1
New Level 1 pump within annex	97.2
New subtotal of south and east façades	104.1
South and east façade sound power level increase	+ 1.0 dB

The estimated increase is on the contribution from the WCP building (south and west façades) only. The current modelled night time contribution of the WCP at the nearest noise sensitive receptor to the south is

around 22 dBA, where the overall predicted level is over 30 dBA³ (actual level depends on the mining location). By applying a noise increase of 1.0 dB to the WCP noise emissions, the overall level received at the residence would increase by only 0.2 dB. This prediction is conservative, and likely to be the maximum increase expected.

Although the expected overall increase to noise is minimal, KLPL have indicated that their preference is to ensure a net reduction in noise emissions of the WCP, and, that it is their preference to install additional cladding to the WCP building to achieve this. Figure 3-1 presents a plan view schematic of the WCP annex extension, and indicates areas where additional cladding could be applied on the Level 1 open area (labelled as A, B and C).

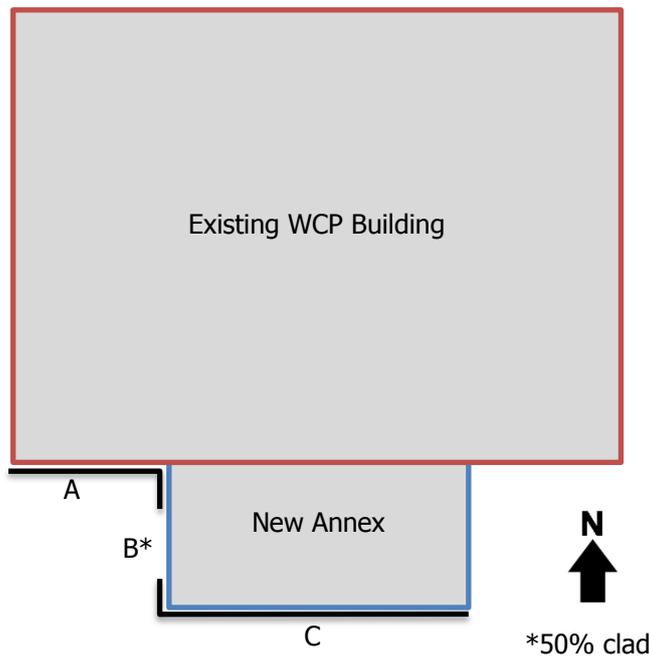


Figure 3-1: Schematic plan of WCP annex extension and proposed cladding on Level 1

Table 3-2 presents two cladding options for covering the open area on the south side of Level 1, of the WCP building (inclusive of the new annex). KLPL have advised that an opening on side “B” is required for a maintenance crane beam, so only 50% cladding on this area has been assumed on this side.

Table 3-2: Level 1 cladding options and potential noise reduction

Cladding Option (ref. Figure 3-1)	% area cladded on Level 1 (east and west façades only)	Potential noise reduction of Level 1 [dB]
Cladding of open areas A + C	33%	-1.7
Cladding of open areas A + B + C	38%	-2.1

³ Refer to SVT report *Keysbrook Environmental Noise Compliance Reporting Q2 2016*, doc. no. 1401854-1-100-Rev4-3.Jun.2016.

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The potential noise reductions achievable should be considered as the maximum reduction possible due to limitations in structural borne and low frequency noise attenuation. But either of these options should be sufficient to counter the increase in the direction of the nearest noise sensitive receptor to the south brought about by the additional pump.

To ensure effectiveness, additional cladding should be installed to the following specifications:

- The cladding should be of a similar standard to the existing insulated cladding used on the building;
- Sections of cladding should extend fully from the bottom of the existing cladding, to the floor of Level 1, with minimal gaps; and,
- The cladding fixing should incorporate vibration isolation from the structure to reduce local structure borne vibration on level 1 passing into the cladding, and to avoid the potential for the cladding become a noise source.

4. CONCLUSION

Installation of the currently proposed changes to the WCP building would likely bring a fractional increase to the overall noise levels (estimated at 0.2 dB) at the nearest noise sensitive receptor to the south.

By installing additional cladding on the open area of the south side on level 1 of the building, an overall noise reduction is anticipated in WCP building noise emissions to the south.