



ASX/Media Announcement

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## **NEW METALLURGICAL TESTWORK RESULTS DELIVER PROCESS IMPROVEMENTS AND OPERATING COST SAVINGS**

*Outstanding results from flotation testwork and pilot program demonstrates the class of Pilgangoora as a large-scale, low cost supplier of quality lithium raw materials*

### **HIGHLIGHTS:**

- Detailed metallurgical test work and flotation pilot program results further improves the operability and reduces the estimated cost of processing at Pilgangoora.
- Savings in excess of ~A\$2.50/t processed (>10% process cost savings) identified in the flotation circuit through reagent optimisation, larger grind size, yield and overall recovery (in-float) improvements.
- Technical grade concentrate (7.22% Lithia, 0.14% Fe<sub>2</sub>O<sub>3</sub>) readily delivered through the first run in the pilot flotation circuit at high recovery rates (+75%).
- Long-lead plant items well advanced and on track for delivery to site from July 2017.

Australian lithium developer, Pilbara Minerals Limited (ASX: PLS) (“Pilbara” or “the Company”), is pleased to report further significant improvements to the process flowsheet for its 100%-owned **Pilgangoora Lithium-Tantalum Project** in WA, including significant reductions in estimated flotation processing costs, as a result of additional metallurgical testwork and pilot scale processing completed since the Definitive Feasibility Study (DFS).

The results continue to demonstrate the world-class nature of the Pilgangoora Project through improved recovery, the expected lower cost of processing and further demonstration of product quality.

Pilbara has continued to further optimise process design and operating parameters subsequent to the DFS completed last year, through continued extensive metallurgical testwork and pilot scale process programs of the Heavy Media Separation (HMS), gravity and flotation circuits.

The Company’s objective in conducting these programs is to further refine design and operating parameters in order to de-risk the plant construction, commissioning and ramp-up. This extensive testwork and pilot program runs well-beyond that contemplated or delivered by recent new lithium processing plant developments.

As a result of amendments to the scope of the processing plant (in part to incorporate the flowsheet and operability improvements outlined in this and prior ASX releases) and additional requirements for the access road rail crossings, Pilbara has modestly revised the final estimated capital cost for the Pilgangoora Project to \$234 million, compared with the original estimate of \$224 million in the DFS. This is well within the DFS levels of accuracy.

The Company is also pleased to report excellent recent progress in the construction and delivery of long-lead items to the Pilgangoora Project. As a result, the Pilgangoora development schedule, which envisages commissioning from the first quarter of 2018, is well supported by key engineering resources and supply initiatives.

Pilbara’s Managing Director, Ken Brinsden, said the latest testwork results demonstrated both the world-class nature of the Pilgangoora Project and the significant progress the Company had made in de-risking and optimising the project prior to the start of development.

“The investment we have made in feasibility studies, test work programs and amassing technical skills to support Pilgangoora’s development runs well beyond that of comparable projects. Pilbara has attracted fantastic people to join our team, including those with a substantial track-record in HMS, gravity and oxide flotation processing – most notably from the Greenbushes mine.

“With that comes confidence in our capacity to deliver successful projects outcomes for our shareholders,” he said.

“Results from the ongoing test work programs further demonstrate the quality of Pilgangoora spodumene and its capacity to deliver high-grade, low-cost products for the market. That’s why we have attracted premium customers in the form of General Lithium and Ganfeng,” Mr Brinsden added.

### **Pilbara Minerals Limited**



## **FURTHER INFORMATION**

### **Flotation Pilot Plant**

Subsequent to the DFS metallurgical test work program, further flotation optimisation test work has continued in support of the Flotation Pilot Plant Program. The Plant has been configured at SGS Australia in Malaga to represent the current flowsheet, with the three main ore domains – Eastern, Western and Central bulk “Marketing” composites – now ready for processing.

These composites have previously been processed through the Heavy Media Separation (HMS) Pilot Plant program with the outcome showing significantly improved results over the DFS test work modelled results (see ASX Announcement, “Outstanding results from pilot plant highlight potential to further improve economics of Pilgangoora lithium project”, dated 1 March 2017).

The Stage 1 HMS floats from the program, in conjunction with the current tantalum gravity pilot work on the -0.5 mm material, created the feed material representing the three main ore domains for the pilot flotation program.

Subsequent to the DFS, further flotation optimisation test work has been undertaken to maximize the value in the pilot program, which has involved deleting a reagent and a change in collector and pH modifier, with the result significantly improving flotation kinetics and reducing reagent consumptions. Pilbara secured key specialist expertise in flotation through the addition of a new employee, Mr Wenbo Wang (previously of Talison Lithium, Greenbushes), at the start of this year.

The benefit of these key flotation methodology changes has been a reduction in the size of the flotation circuit and a reduction in reagent costs in excess of approximately \$2.50 per tonne of ore processed. These process changes have been incorporated in the final process plant design.

The optimisation test work has also seen a relaxation in the final grind size for flotation, which has also contributed to the reduction in reagent consumptions, but with the added downstream benefits of reduced lithia losses through the de-slime process pre-flotation and providing improved settling and filtration characteristics for the concentrate.



**Figure 1: Flotation Pilot Plant – Milling, Conditioning, De-slimes and Reagents**



Figure 2: Flotation Pilot Plant – Commissioning on Bulk Eastern



Figure 3: Flotation Pilot Plant – Rougher Cells



The Flotation Pilot Plant (100kg/hr throughput capacity) was commissioned using 400kg from the 10-tonne bulk sample recently collected from the Eastern Domain, so as to preserve the Marketing Composites reflecting the three main ore domains being tested. The Eastern Domain represents just one of the target mining areas for the envisaged Technical Grade concentrate production. The commissioning was undertaken at a grind size, P80 of 140 micron and was highly successful in meeting the lithia and iron grade specifications with the results summarised in Table 1 and 2 below:

Head Grade, %Li <sub>2</sub> O	Yield, %	Recovery, %	Concentrate Grade, %Li <sub>2</sub> O (pre final iron removal)	Iron Grade, %Fe <sub>2</sub> O <sub>3</sub>
2.60	30	80.0	<b>6.86</b>	0.38

**Table 1: Pilot Plant Commissioning – Bulk Eastern Technical Grade Spodumene Sample 1 (Cleaner Concentrate)**

Head Grade (initial), %Li <sub>2</sub> O	Final Yield, %	Final Recovery, %	Final Concentrate Grade, %Li <sub>2</sub> O	Iron Grade, %Fe <sub>2</sub> O <sub>3</sub>
2.60	26	75.4	<b>7.22</b>	0.14

**Table 2: Pilot Plant Commissioning – Bulk Eastern Technical Grade Spodumene Sample 1 (Final Concentrate)**

It is noted that this sample was whole-of-ore, i.e. not subjected to HMS and gravity prior to flotation, as the HMS circuit will be by-passed in operations to support the processing of Technical Grade spodumene for the Pilgangoora plant.

The processing of the three main ore domains, Eastern, Western and Central, is now scheduled to commence on Monday, May 15 2017 and will be completed over three days. This program is expected to validate the process flowsheet, and, importantly, provide approximately 150kg of concentrate which will provide further samples for the Company's customers as they optimise their current and proposed expansions.

Following from this program, 6.5 tonnes of the bulk Eastern sample will then be processed to produce a further technical grade product sample of nominally 1.5 tonnes, for distribution to potential customers. The Eastern zone has a lower iron content, and with previous bench scale test work has showed that it has the ability to be able to produce "Technical Grade Spodumene" for the glass and ceramics industry.

Following the distribution of these samples, the Company will target the completion of off-take agreements for the Technical Grade spodumene.

### Process Plant – Long-Lead Items

At the end of last year, three major pieces of process plant long lead items were ordered, namely the:

- Concentrate Filter Press – Ishigaki, Japan;
- High Pressure Grinding Rolls, HPGR – Koeppern, Germany; and
- Ball Mill – Metso

The manufacture of all three is progressing well with delivery to Australia on schedule, the Ball Mill is due in October, the HPGR in August and the Filter Press in July.

Pilbara continues to monitor the critical path for development of the Pilgangoora project and is placing orders as and when required to support the current development schedule.



**Figure 4: Concentrate Filter Press.**



**Figure 5: HPGR – Housing**



**Figure 6: HPGR – Tyre shafts**



**Figure 7: Ball Mill – Mill shell section**



## **Additional Information:**

### **ABOUT PILBARA MINERALS**

Pilbara Minerals ("Pilbara" – ASX: PLS) is a mining and exploration company listed on the ASX, specialising in the exploration and development of the specialty metals Lithium and Tantalum. Pilbara owns 100% of the world class Pilgangoora Lithium-Tantalum project which is among the largest Spodumene (Lithium Aluminium Silicate) projects in the world. Pilgangoora is also one of the largest pegmatite hosted Tantalite resources in the world and Pilbara proposes to produce Tantalite as a by-product of its Spodumene production.

### **ABOUT LITHIUM**

Lithium is a soft silvery white metal which is highly reactive and does not occur in nature in its elemental form. It has the highest electrochemical potential of all metals, a key property in its role in Lithium-ion batteries. In nature, it occurs as compounds within hard rock deposits and salt brines. Lithium and its chemical compounds have a wide range of industrial applications resulting in numerous chemical and technical uses. A key growth area is its use in lithium batteries as a power source for a wide range of applications including consumer electronics, power station-domestic-industrial storage, electric vehicles, power tools and almost every application where electricity is currently supplied by fossil fuels.

### **ABOUT TANTALUM**

The Tantalum market is boutique in size with around 1,300 tonnes required each year. Its primary use is in capacitors for consumer electronics, particularly where long battery life and high performance is required such as smart phones, tablets and laptops.

### **FORWARD LOOKING STATEMENTS AND IMPORTANT NOTICE**

This announcement may contain some references to forecasts, estimates, assumptions and other forward-looking statements. Although the Company believes that its expectations, estimates and forecast outcomes are based on reasonable assumptions, it can give no assurance that they will be achieved. They are indicative and may be affected by a variety of variables and changes in underlying assumptions that are subject to risk factors associated with the nature of the business, which could cause actual results to differ materially from those expressed herein. All references to dollars (\$) and cents in this announcement are to Australian currency, unless otherwise stated.

Investors should make and rely upon their own enquiries before deciding to acquire or deal in the Company's securities.

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