

Melbourne, 12<sup>th</sup> May 2015

## Clean TeQ Presents at AeroMat 2015 Conference

In a strong indication of the growing global interest around the emerging Australian Scandium industry, Clean TeQ's Chairman and CEO, Sam Riggall is to present the attached 'Australian Scandium Supply – A Paradigm Shift for a Strategic Metal' to the AeroMat 2015 Conference in Long Beach, California as part of a session focused on advanced aluminium alloys.

For the past twenty-six years, AeroMat has maintained a status of being the preeminent annual forum that facilitates the interchange of technical information on aerospace industry materials and processes. The 2015 event includes over 160 technical presentations and plenary speakers featuring the aerospace industry's leaders in aerospace materials including Airbus, Boeing, Alcoa, NASA, Lockheed Martin and Australia's Monash University and CSIRO.

As announced earlier this year, Clean TeQ has entered into collaboration agreements with Airbus APWorks GmbH (**Airbus**) and KBM Affilips B.V. (**KBM**) relating to Clean TeQ's Syerston Scandium Project in New South Wales. The agreements provide a framework under which Airbus and KBM will work together with Clean TeQ to determine potential demand for scandium and the ability of the Syerston Project to meet those end users' demand, price and quality specifications.

Clean TeQ is in the process of completing a scoping study to define the project economics and a development plan for the Syerston Scandium Project. The scoping study is due for release in the current quarter.

**For more information about Clean TeQ contact:**

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**About Clean TeQ Holdings Limited (ASX: CLQ)** – Based in Melbourne, Clean TeQ, using its proprietary Clean-iX<sup>®</sup> continuous ion exchange technology, is a world leader in resource recovery and industrial water treatment.

For more information about Clean TeQ please visit the Company's website at [www.cleanteq.com](http://www.cleanteq.com).

*This release may contain forward-looking statements. The actual results could differ materially from a conclusion, forecast or projection in the forward-looking information. Certain material factors or assumptions were applied in drawing a conclusion or making a forecast or projection as reflected in the forward-looking information.*



# Australian Scandium Supply

A paradigm shift for a strategic metal

AeroMat Conference, Long Beach CA – 12 May 2015

*Clean TeQ Holdings Limited (ASX: CLQ)*

# Disclaimer and Important information

Certain statements in this presentation are forward looking statements. By their nature, forward looking statements involve a number of risks, uncertainties or assumptions that could cause actual results or events to differ materially from those expressed or implied by the forward looking statements. These risks, uncertainties or assumptions could adversely affect the outcome and financial effects of the plans and events described herein. Forward looking statements contained in this presentation regarding past trends or activities should not be taken as representation that such trends or activities will continue in the future. You should not place undue reliance on forward looking statements, which apply only as of the date of this presentation.

The Syerston Scandium Project is at the Scoping Study phase and although reasonable care has been taken to ensure that the facts in this presentation are accurate and/or that the opinions expressed are fair and reasonable, no reliance can be placed for any purpose whatsoever on the information contained in this document or on its completeness.

Actual results and developments of projects and scandium market development may differ materially from those expressed or implied by these forward looking statements depending on a variety of factors.

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All amounts including “\$” or “A\$” are in reference to Australian Dollars unless stated otherwise.

The information in this document that relates to Exploration Results, Mineral Resources or Ore Reserves is based on information compiled by Sharron Sylvester, who is a Registered Professional Geoscientist (10125) and Member (2512) of the Australian Institute of Geoscientists, and a full time employee of OreWin Pty Ltd. Sharron Sylvester has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the ‘Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves’. Sharron Sylvester, who is a consultant to the Company, consents to the inclusion in the report of the matters based on her information in the form and context in which it appears.

For further details on the content of this presentation, please refer to the ASX releases dated 24<sup>th</sup> November 2014 and 23<sup>rd</sup> January 2015.

# Clean TeQ | Leader in Environmental Technologies



Air purification



Metal recovery



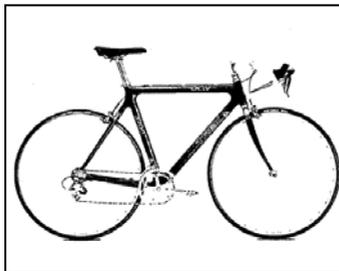
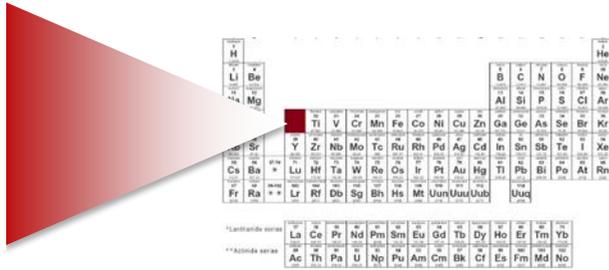
Water treatment



Melbourne HQ



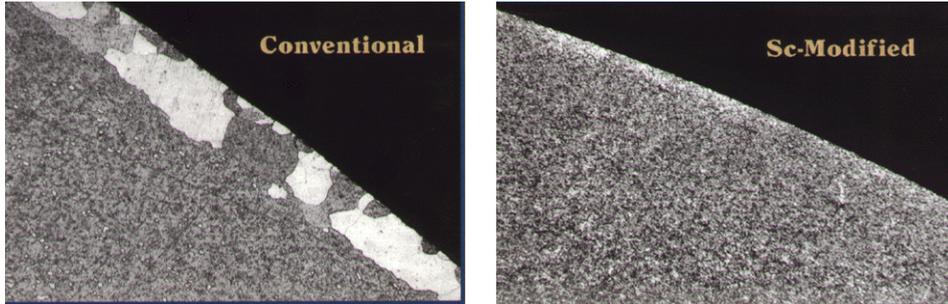
# Scandium | The Next Strategic Metal



- Scandium's value as an alloy of aluminum has been well understood for decades.
- Scandium can play a key role in the development of high performance materials in the aerospace, transport, energy and consumer sectors.
- In aerospace, barriers to scandium's adoption as an alloy for mainstream industrial applications must be addressed.
- Most of these are on the supply side.

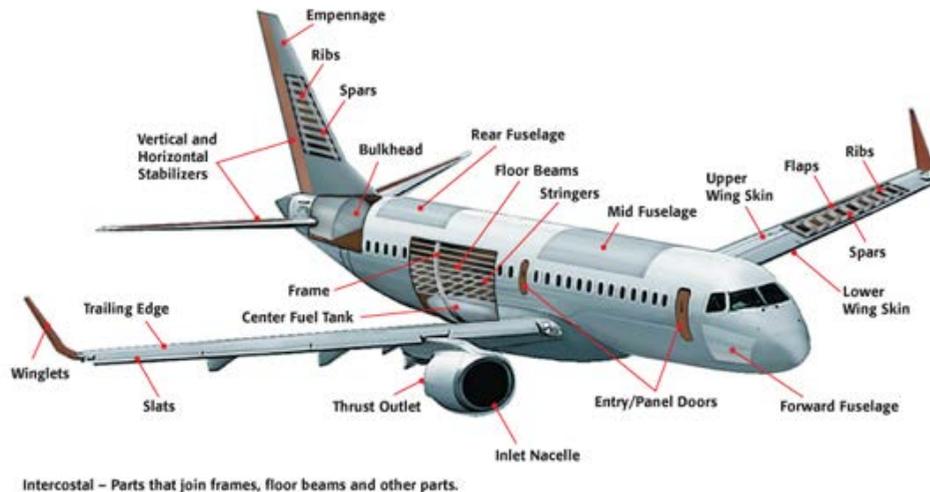
# Al-Sc Alloys | Key Benefits for Aerospace

## Grain Refinement:



(Source: scandium.org)

## Applications of aluminum and alloys to airplanes:

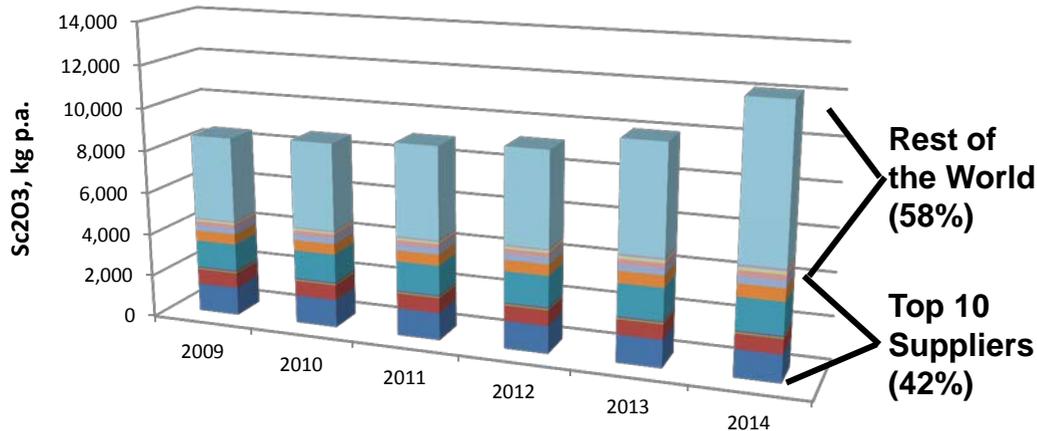


(Source: Kaiser Aluminum)

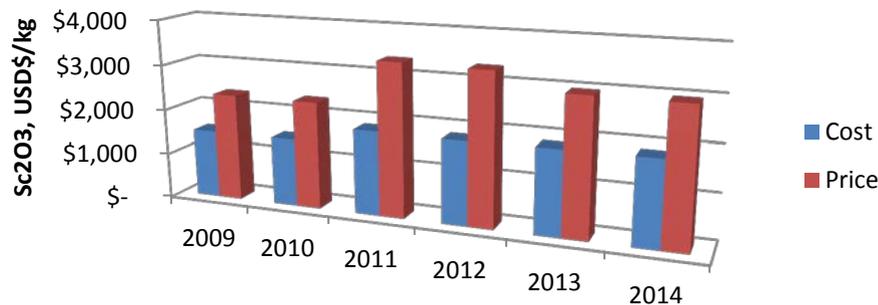
- Al-Sc alloy physical characteristics:
  - **Grain refinement:** smaller evenly shaped grains for increased strength
  - **Superplasticity:** Al-Sc alloys can be subjected to higher stresses to form more complex shapes
  - **Precipitation hardening:** Al-Sc alloys are significantly harder
  - Higher **corrosion resistance** and thermal **conductivity**
  - Increased **weldability** with no loss in strength
- Potential functional benefits of Al-Sc alloys to aircraft:
  - Reduction in overall weight through lighter materials and removal of rivets
  - Additional weight reduction through Al-Sc components made with Additive Layer Manufacturing (ALM)
  - Reduction/elimination of chromium and other harmful corrosion inhibiting chemicals
  - Reduction in overall manufacturing cost
  - Reduction in fuel and maintenance costs

# Scandium | Dysfunctional Supply Chain

Historical Global Scandium Oxide Production



Historical Global Scandium Oxide Price & Cost

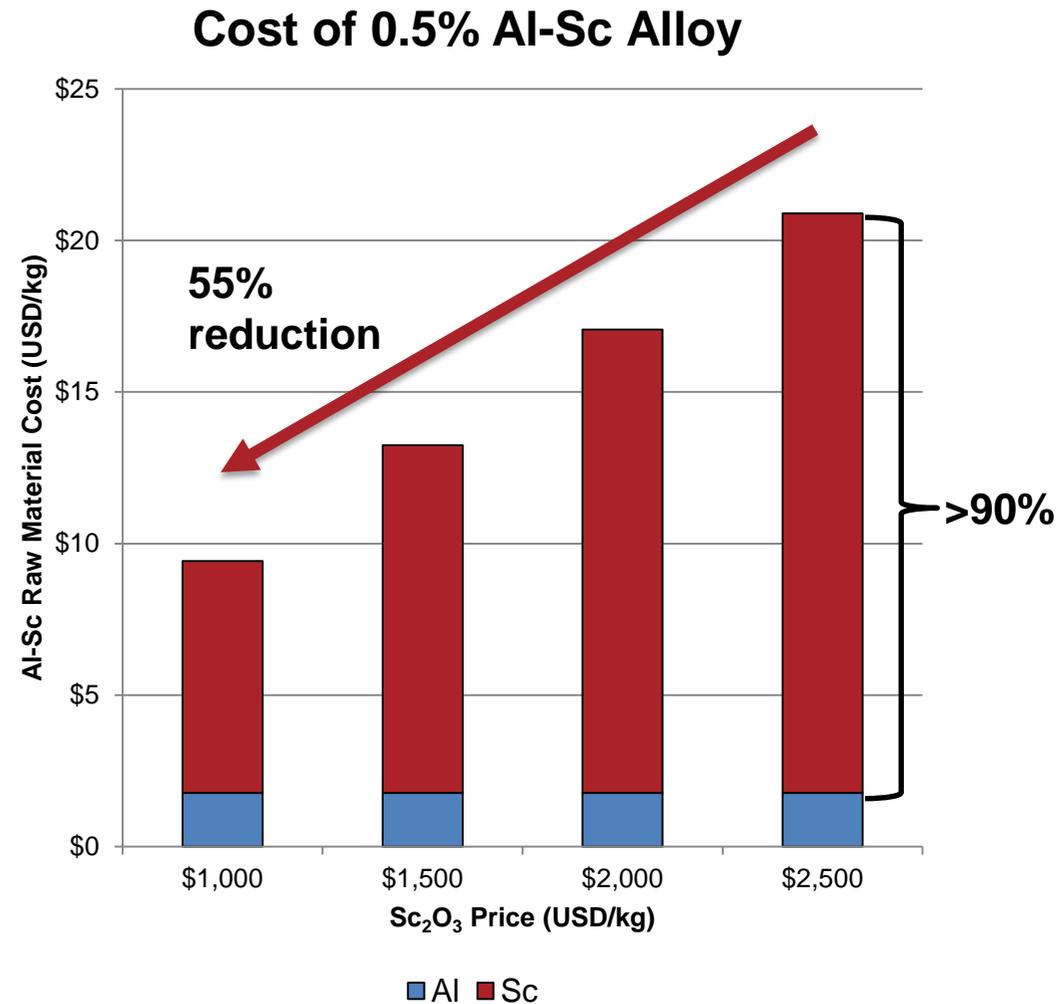


(Source: QY Research Scandium Oxide Research Centre)

- Supply is heavily fragmented, as by-product sources generally contain low concentrations of scandium (~10-30ppm Sc)
- Total global supply of SC<sub>2</sub>O<sub>3</sub> is approx. 15tpa
- 2014 average prices (USD/kg SC<sub>2</sub>O<sub>3</sub>):
  - Price: \$2,000-3,000/kg
  - Production costs: \$1,600 - 1,800/kg
- The majority of the world's SC<sub>2</sub>O<sub>3</sub> is produced in China, Russia or the FSU, which presents inherent sourcing risks.

# Al-Sc Alloys | Prohibitive Pricing

- Due to limited supply, scandium represents 80-95% of the total material cost in a typical Al-Sc alloy.
- At current  $\text{Sc}_2\text{O}_3$  prices, Al-Sc alloys do not provide sufficient 'value in use' to justify substitution.
- Reductions in  $\text{Sc}_2\text{O}_3$  pricing will have a significant impact on the material cost of Al-Sc alloys.



# Scandium | **The Emerging Market**

- Requirements to establish a viable market for scandium oxide for aerospace:
- **Reliable and sustainable long term supply**
  - Large resources, low political risk, supply chain diversity and readily expandable production capacity
- **A significant step change in  $\text{Sc}_2\text{O}_3$  pricing**
  - Identification of higher grade sources of Sc and more efficient extraction technologies
- **End-user preparedness to support new development**
  - Supply chain collaboration, understanding potential market demand and off-take commitments from customers

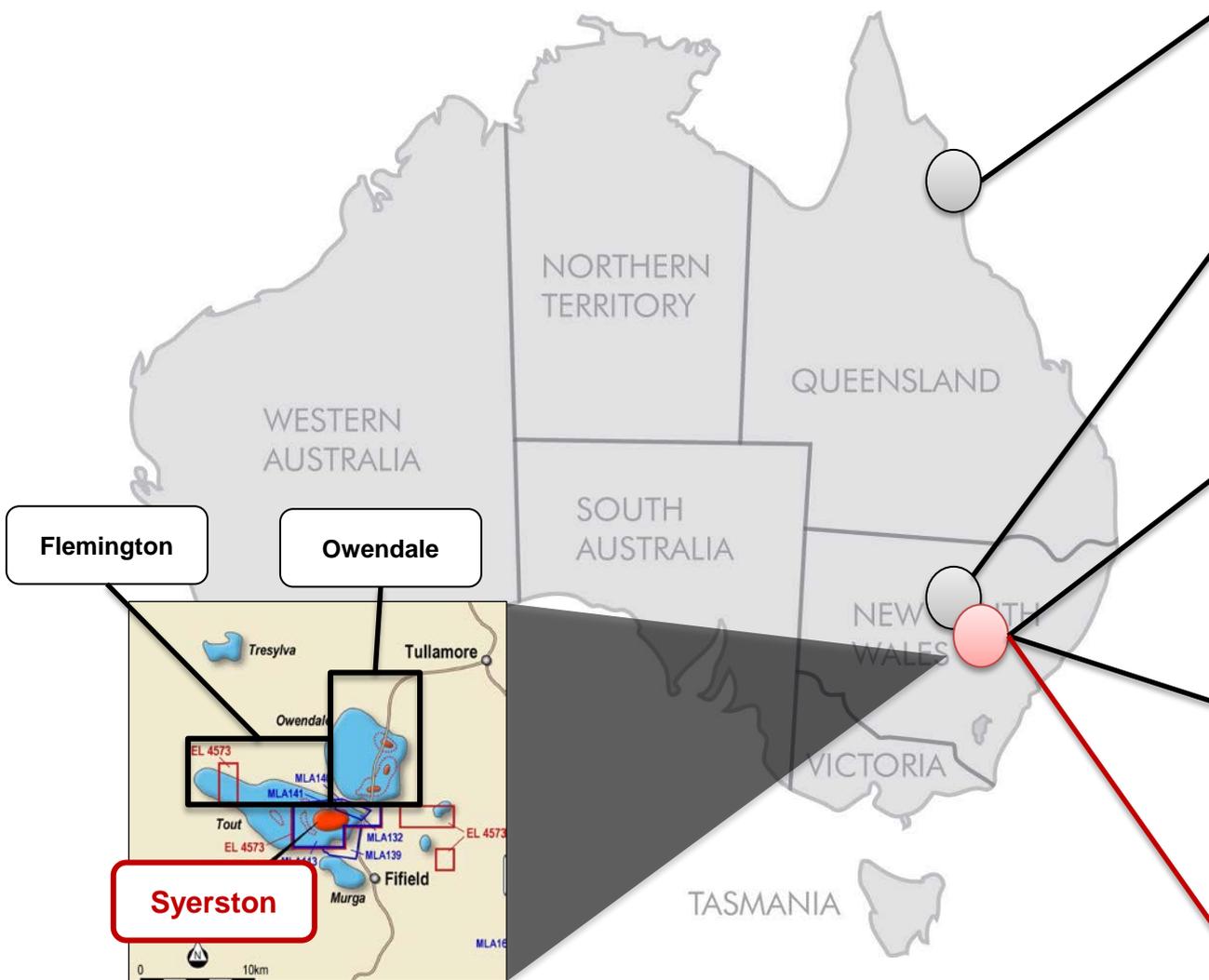
# Scandium | Future Supply Sources

Scandium Source	Titanium Dioxide Waste Streams	Alumina Wastes (Red Mud)	Uranium Ores	Laterite Ores (Nickel & Cobalt)	Laterite Ores (Scandium)
Scandium Production Method	By-product	By-product	By-product	By-product	<b>Primary Product</b>
Scandium Feed Grade, ppm	10-20	50-120	10-100	10-50	<b>400-700</b>
Plant CAPEX Per Unit Scandium	Medium	Medium	Med-High	High	<b>Low</b>
Scandium Production Cost	Med-High	High	Med-High	Med	<b>Low</b>
Time to Produce 40 tons p.a.	10 years	5-10 years	5-10 years	5-10 years	<b>2 years</b>

*Based on internal estimates*

# Australian Scandium | Major Scandium Projects

Approx. 40,000t Sc<sub>2</sub>O<sub>3</sub> in confirmed resources:



Metallica (ASX:MLM) - SCONI			
100ppm Sc cut off	MT	g/t Sc	Sc (ton)
Total (Meas, Ind, Inf)	12.1	162	1,961

Scandium Intl (TSX:SCY) - Nyngan			
200ppm Sc cut off	MT	g/t Sc	Sc (ton)
Total (Meas, Ind, Inf)	12.0	262	3,143

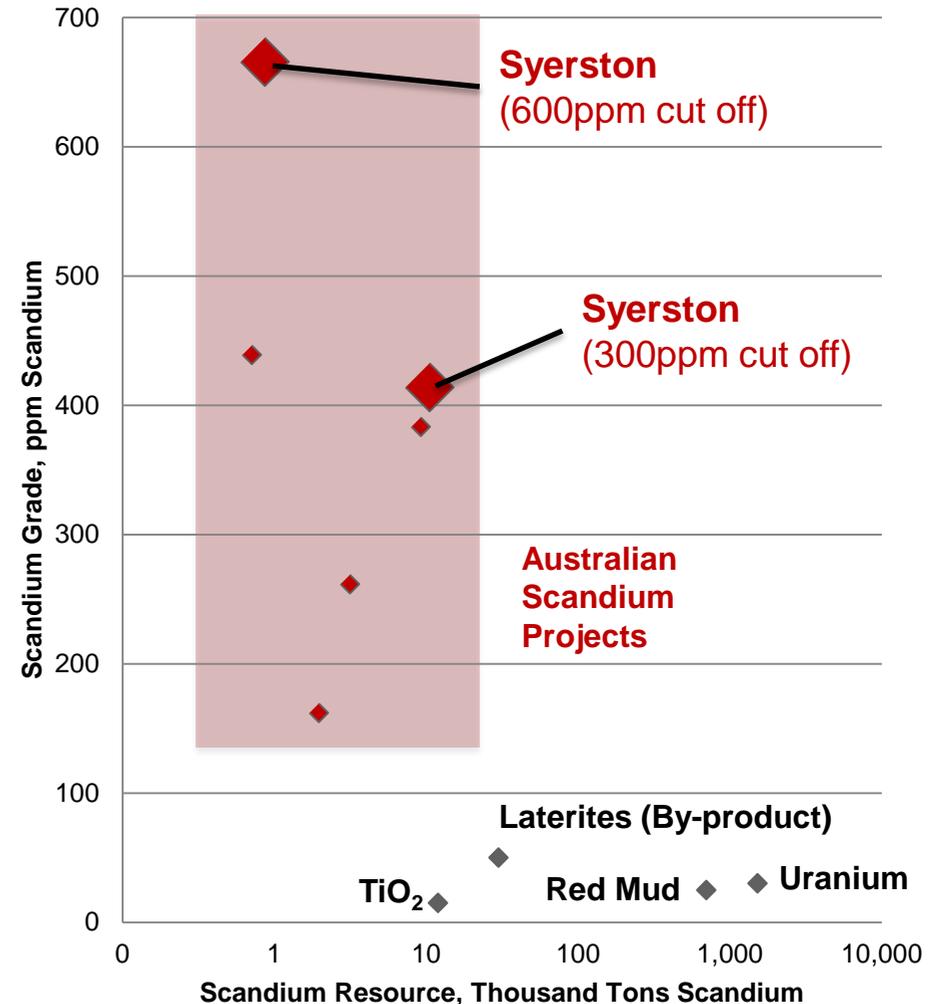
Platina (ASX:PGM) - Owendale			
300ppm Sc cut off	MT	g/t Sc	Sc (ton)
Total (Meas, Ind, Inf)	24.0	383	9,200

Jervois (ASX:JRV) - Flemington			
300ppm Sc cut off	MT	g/t Sc	Sc (ton)
Total (Meas, Ind, Inf)	1.6	439	710

Clean TeQ Metals – Syerston			
300ppm Sc cut off	MT	g/t Sc	Sc (ton)
Total (Meas, Ind, Inf)	25.4	414	10,512

# Australian Scandium | Comparative Benefits

- Unique geological resource with no global analogue
- Stable country with low sovereign risk and a high-tech mining culture
- Well established infrastructure
- Highly qualified workforce for the minerals industry
- Readily expandable projects to meet market growth



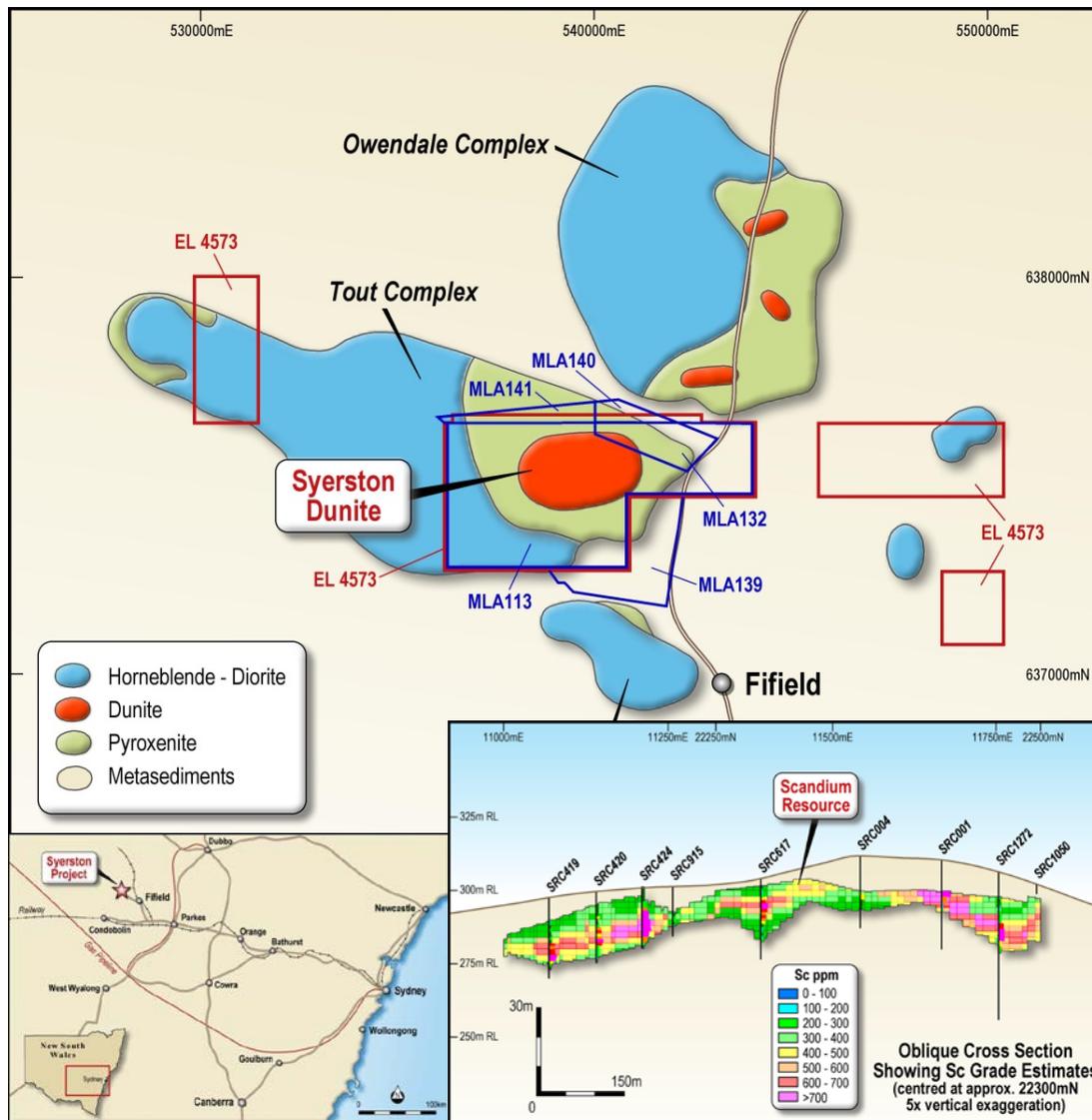
Note: Horizontal axis is log-scale. Resources are Measured and Indicated. TiO<sub>2</sub>, uranium, red mud and laterite global by-product tonnages internal estimate only.

# Australian Scandium | Mine Development Pathway

In order for any of the Australian Sc mines to be developed, the following steps must be taken:

1. Define a measured and indicated mineral resource for the project
2. Progress through scoping, pre-feasibility and feasibility studies to develop a low production cost flow sheet
3. Obtain all necessary environmental approvals and government development consents
4. Secure access to water
5. Finalise off-take agreements with future customers

# Syerston | Simple Mining and Development Ready



- The Syerston Project consists of:
  - Exploration License / Mining Lease Applications;
  - Freehold land over project area;
  - Water borefield south of Project; and
  - Permits / approvals in place.
- Shallow resource (5-30m) amenable to low cost open cut mining
- Recent drilling on site to increase the high grade zones for selective mining in early years of operation
- Significant development to date (1,200+ drill holes and two Feasibility Studies), Environmental Impact Statement (EIS), Development Consent.

# Syerston | Scandium Mineral Resource

- The Syerston Project has almost 200 years supply at a production rate of 40tpa  $\text{Sc}_2\text{O}_3$
- Syerston has the largest and most developed resource of all Australian scandium mines, with over 75% of its scandium resource in the measured and indicated category
- Cut-off grade can be adjusted to accommodate various production scenarios

## Measured, Indicated and Inferred Scandium Resource (JORC 2012):

Scandium cut-off of **300ppm** Sc:

Category	Tonnage, Mt	Sc Grade, ppm	Sc Tonnes	$\text{Sc}_2\text{O}_3$ Equiv Tonnes*
Measured	1.1	411	465	712
Indicated	17.9	424	7,570	11,583
Inferred	6.4	386	2,480	3,795
<b>Total</b>	<b>25.4</b>	<b>414</b>	<b>10,516</b>	<b>16,089</b>

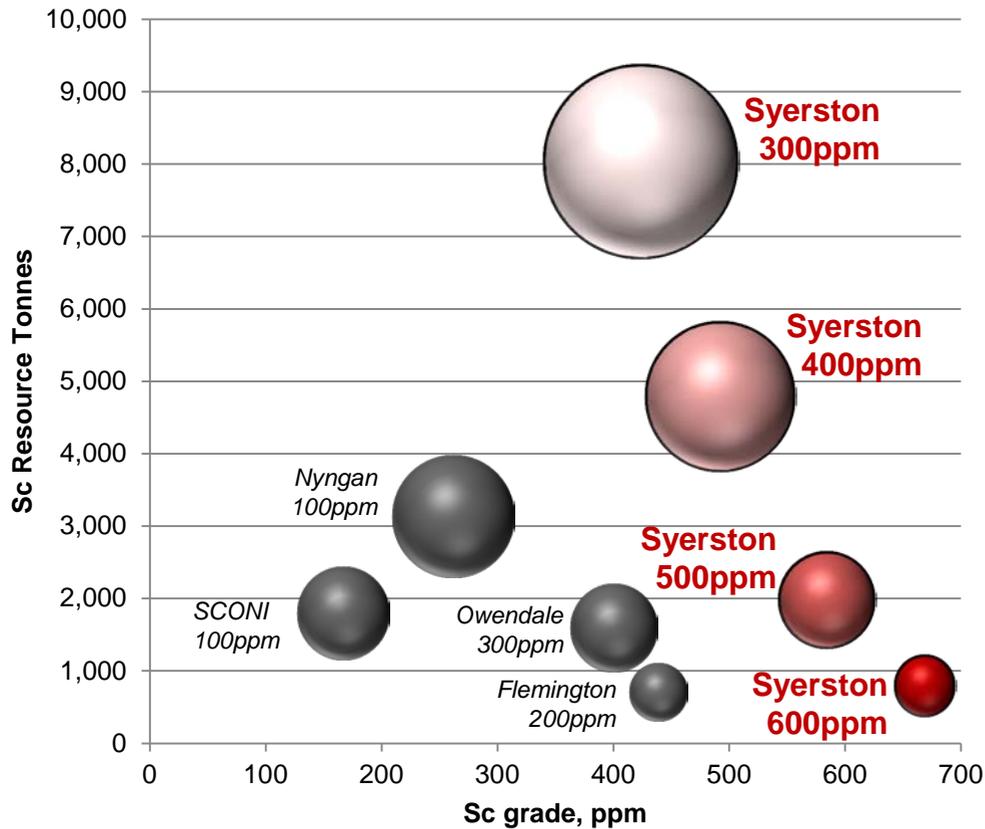
Scandium cut-off of **600ppm** Sc:

Category	Tonnage, Mt	Sc Grade, ppm	Sc Tonnes	$\text{Sc}_2\text{O}_3$ Equiv Tonnes*
Measured	0.1	686	62	95
Indicated	1.1	667	701	1,073
Inferred	0.1	630	55	84
<b>Total</b>	<b>1.2</b>	<b>666</b>	<b>818</b>	<b>1,252</b>

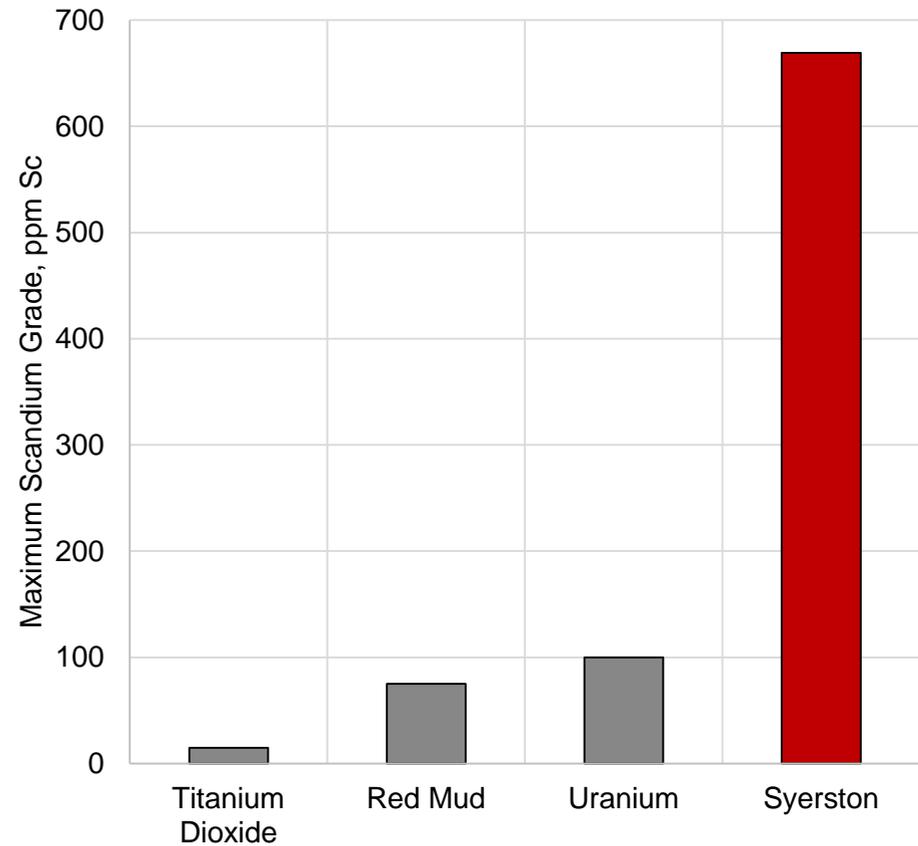
\* Sc multiplied by 1.53 to convert to  $\text{Sc}_2\text{O}_3$ .

# Syerston | Grade is King....

**Australian Sc Mine Measured & Indicated Resource with Scandium cut-off**



**Grade Estimates for Other Scandium Sources**



# Syerston | Fast Track Development Path

- Scoping Study to be released shortly for a ~40tpa Sc<sub>2</sub>O<sub>3</sub> mining operation
- Environmental approvals, Development Consent all granted with Mining Lease Applications lodged
- Infrastructure in place (roads, gas, rail and power)
- Established borefield with a licensed water allocation sufficient for initial production plus expansions
- Commencement of bulk sampling and piloting program underway for customers – first samples delivered in August 2015

Established water bore fields



# Clean TeQ Technology | A Proven Track Record for Sc



## Base Technology Development (ARRICT):

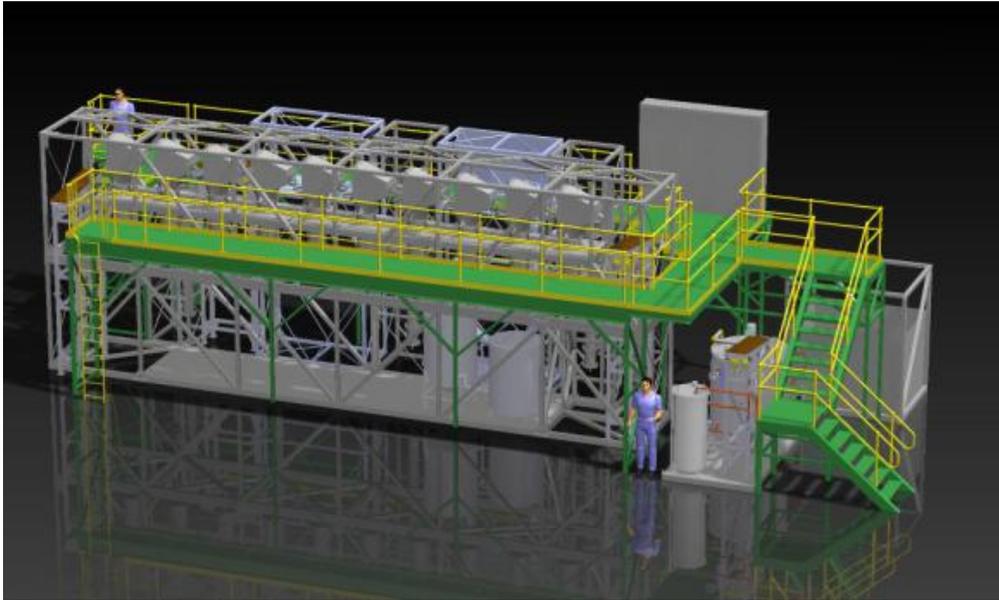
- Over 30 full scale operations over 40 years for uranium and gold recovery.

## Clean-iX<sup>®</sup> Development:

- 2006: Proven extraction of scandium from ore
- 2008: License to BHPB for Nickel and Cobalt recovery, focused on laterite ore
- 2009: Demonstrated uranium and gold recovery from leach solutions
- 2014: Piloting for low grade scandium recovery from TiO<sub>2</sub> process streams

CLQ has filed over 10 patents and has invested over A\$15M on R&D

# Bulk Sample | 99.9% Sc<sub>2</sub>O<sub>3</sub> Product from Syerston



- Clean TeQ's existing Sc pilot plant is being commissioned to produce Sc<sub>2</sub>O<sub>3</sub>
- Bulk sampling will use ore taken from the Syerston site
- Samples to be used for certification and qualification testing
- Samples will be available to potential off-takers by August (first orders have already been placed)
- Pilot plant and mine site visits for off-takers scheduled for mid-2015

Step	May	Jun	Jul	Aug
Plant Set Up				
Plant Operation				
Sc Purification				
Sc <sub>2</sub> O <sub>3</sub> Sample Produced				◊

# Syerston | Near Term Scandium Production

Development Hurdle	Syerston
Measured and Indicated Resource for +100yr of 40tpa $\text{Sc}_2\text{O}_3$	YES
Scandium Oxide production cost	LOW
Proven ability to produce scandium	YES
Environmental Approvals and Development Consent	YES
Access to water for 40tpa $\text{Sc}_2\text{O}_3$ operation	YES
Offtake Agreement(s) for 40tpa $\text{Sc}_2\text{O}_3$	PENDING

Long-term, low-cost scandium supply is now only constrained by commitment from end users

# Building the Market | **The Clean TeQ Approach**

- In order to build the scandium market, supply chain partnerships are key.
- Collaboration with end users to match mine production with demand to meet customers' pricing needs.
- Collaboration with alloy producers to minimise total manufactured cost of Al-Sc alloys.
- Collaboration with industry experts and institutions to quantify functional benefits, develop new alloys and manufacturing methods.
- This will allow customers to gain the confidence to commit to long term offtake agreements.



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Creating environmental and economic outcomes for sustainable mining and processing.