

# **Investor presentation**



October 2018

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#### IMPORTANT: You must read the following before continuing.

#### Summary information in relation to Sheffield

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#### Industry data

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#### Estimates of resources and reserves and exploration results

This presentation contains estimates of Sheffield's Ore Reserve and Mineral Resources and information that relates to exploration results.

The Mineral Resources and Ore Reserves of Sheffield have been extracted from Sheffield's ASX releases;

- "MINERAL RESOURCE AND ORE RESERVE STATEMENT" 3 October 2018
- "THUNDERBIRD ORE RESERVE UPDATE" 16 March 2017
- "SHEFFIELD DOUBLES MEASURED MINERAL RESOURCE AT THUNDERBIRD" 5 July 2016

The exploration results have been extracted from Sheffield's ASX release;

"EXCEPTIONAL RESULTS CONFIRM MAJOR DISCOVERY AT NIGHT TRAIN" 9 October 2018

A copy of these announcements is available at http://www.sheffieldresources.com.au/irm/content/asx-announcements1.aspx?RID=398 or www.asx.com.au.

The Company confirms that it is not aware of new information or data that materially affects the information in these announcements and, in the case of estimates of mineral resources and ore reserves, that all material assumptions and technical parameters underpinning those estimates continue to apply and have not materially changed.

Bankable Feasibility Study ("BFS")

This presentation contains information that relates to a Bankable Feasibility Study. This information was extracted from the following ASX releases by Sheffield:

THUNDERBIRD BFS DELIVERS OUTSTANDING RESULTS" 24 March, 2017

#### Other Extracted Information

This presentation contains information extracted from the following ASX releases:

"FEDERAL ENVIRONMENTAL APPROVAL GRANTED FOR THUNDERBIRD" 28 September 2018

"MINING LEASE GRANTED OVER THUNDERBIRD MINERAL SANDS PROJECT" 26 September 2018

"NAIF APPROVES LOAN FACILITIES TOTALLING A\$95M" 19 September 2018

"NATIVE TITLE UPDATE: SHEFFIELD SIGNS CO-EXISTENCE AGREEMENT" 10 September 2018

"FAVOURABLE NATIONAL NATIVE TITLE TRIBUNAL OUTCOME" 28 August 2018

"STATE MINISTER FOR ENVIRONMENT APPROVES THUNDERBIRD MINERAL SANDS PROJECT" 13 August 2018

"QUARTERLY ACTIVITIES AND CASH FLOW REPORT" 16 July 2018

"GRANT OF MISCELLANEOUS LICENCES" 27 June 2018

"MAIDEN BINDING ILMENITE OFFTAKE AGREEMENT" 21 June 2018

"ADDITIONAL BINDING OFFTAKE SIGNED" 1 February 2018

"BINDING OFFTAKE AGREEMENTS EXCEED 50% OF STG 1 REVENUE" 22 December 2017

"BINDING ZIRCON CONCENTRATE OFFTAKE AGREEMENT SIGNED" 12 December 2017

"COMMENCEMENT OF EARLY WORKS AND TRAINING PROGRAM" 4 December 2017

"SHEFFIELD ANNOUNCES EPC PREFERRED CONTRACTOR" 19 October 2017

"SHEFFIELD MANDATES TAURUS FOR US\$200M DEBT FACILITY" 18 October 2017

"EPA RECOMMENDS APPROVAL OF THUNDERBIRD" 9 October 2017

"SHEFFIELD SECURES SECOND BINDING OFFTAKE AGREEMENT" 25 September 2017

"SHEFFIELD SIGNS MAIDEN BINDING OFFTAKE AGREEMENT" 12 September 2017

"SHEFFIELD LAUNCHES ABORIGINAL EMPLOYMENT PROGRAM" 17 August 2017

"SHEFFIELD SIGNS CORNERSTONE ILMENITE MOU" 29 May 2017

"SHEFFIELD SECURES FURTHER ZIRCON OFFTAKE MOUS" 26 April 2017

"ADDITIONAL ZIRCON OFFTAKE MOU SIGNED" 10 April, 2017

"THUNDERBIRD ILMENITE EXCEEDS PREMIUM SPECIFICATION" 13 March 2017

"OUTSTANDING IMPROVEMENTS IN RECOVERIES AND PRODUCT SPECIFICATIONS FROM THUNDERBIRD BFS" 12 October 2016

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#### Financial data

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#### Future performance, forward-looking statements and key risks

This presentation contains certain "forward-looking statements". Forward-looking statements can generally be identified by the use of forward looking words such as "forecast", "likely", "polieve", "future", "project", "opinion", "guidance", "should", "could", "target", "propose", "to be", "foresee", "aim", "may", "will", "expect", "intend", "plan", "estimate", "anticipate", "continue", "indicative" and other similar words and expressions, which may include, without limitation, statements regarding plans, strategies and objectives of management, anticipated production dates, expected costs or production outputs for the Company, based on (among other things) its estimates of future production of the Thunderbird Project and the future operation of Sheffield and the Thunderbird Project.

To the extent that this presentation contains forward-looking information (including forward-looking statements, opinions or estimates), the forward-looking information is subject to a number of risk factors, including those generally associated with the mineral sands industry. Any such forward-looking statement also inherently involves known and unknown risks, uncertainties and other factors that may cause actual results, performance and achievements to be materially greater or less than estimated. These factors may include, but are not limited to, changes in commodity prices, foreign exchange fluctuations, general economic and share market conditions, increased costs and demand for production inputs, the speculative nature of exploration and project development (including the risks of obtaining necessary licenses and permits and diminishing quantities or grades of reserves), changes to the regulatory framework within which the Company operates or may in the future operate, environmental conditions including extreme weather conditions, geological and geotechnical events, and environmental issues, and the recruitment and retention of key personnel.

Any forward-looking statements are also based on assumptions and contingencies which are subject to change without notice and which may ultimately prove to be materially incorrect, as are statements about market and industry trends, which are based on interpretations of current market conditions. Investors should consider the forward-looking statements contained in this presentation in light of those disclosures and not place reliance on such statements. The forward-looking statements in this presentation are not guarantees or predictions of future performance and may involve significant elements of subjective judgment, assumptions as to future events that may not be correct, known and unknown risks, uncertainties and other factors, many of which are outside the control of Sheffield. The forward-looking statements are based on information available to Sheffield as at the date of this presentation. Except as required by law or regulation (including the ASX Listing Rules), Sheffield undertakes no obligation to provide any additional or updated information or update any forward-looking statements, whether as a result of new information, future events or results or otherwise.

Indications of, and guidance on, future performance are also forward-looking statements, and include statements in this presentation regarding anticipated mine life, expected or indicative costs, indicative revenues, indicative production outputs and anticipated production dates. To the maximum extent permitted by law, Sheffield and its directors, officers, employees, advisers, agents and intermediaries disclaim any obligation or undertaking to release any updates or revisions to the information to reflect any change in expectations or assumptions, or any change in events, conditions or circumstances on which any such information or statement is based. Nothing in this presentation will, under any circumstances (including by reason of this presentation remaining available and not being superseded or replaced by any other presentation or publication with respect to Sheffield on the subject matter of this presentation, create an implication that there has been no change in the affairs of Sheffield since the date of this presentation. To the maximum extent permitted by law, Sheffield makes no representation or warranty (express or implied) as to the fairness, accuracy, reliability, currency or completeness of any forward-looking statements contained in this presentation.

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# **INVESTMENT HIGHLIGHTS**



# 1. Thunderbird is a world-class mineral sands development project

- · Large-scale, high grade, zircon-rich project with low operating costs, strong margins and attractive economics anticipated
- Expected 42 year mine life based on current JORC Ore Reserve<sup>1</sup> and proposed mine schedule
- Conventional processing of Heavy Mineral Sands ("HMS") expected to deliver low cost and simple operation
- Sheffield in the process of seeking to significantly de-risk the development via the progression of a fixed price, lump-sum EPC contract that is expected to cover a substantial portion of estimated development capex for Stage 1<sup>2</sup>
- The high proportion of zircon production relative to TiO<sub>2</sub> differentiates Thunderbird and provides a competitive advantage

# 2. Located in a low risk, mining-focused jurisdiction

- · Located in northern Western Australia, in close proximity to key end-markets
- Certain key existing infrastructure is in place (roads, port, etc.)

# 3. Ideally positioned to meet emerging supply shortages in the global zircon and $TiO_2$ market

- Thunderbird to produce high grade, premium quality zircon and TiO<sub>2</sub> products
- Ilmenite products suitable for both sulfate pigment production and chloride slag markets

# 4. Very strong customer interest in Thunderbird's product

• Binding offtake agreements in place, representing 100% of zircon product and 50% of LTR ilmenite product whilst those agreements are in place<sup>3</sup>

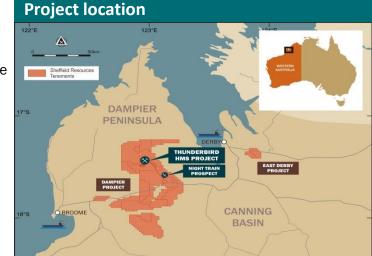
# Fully permitted and construction ready

- All key permits in place
- First production expected in Q4 of 2020

# 6. Potential for material exploration upside

- Exceptional drilling results<sup>4</sup> confirm major new discovery at Night Train
- Regional Thunderbird drilling program suggest an opportunity to define a new mineral sands province

# 7. High quality, experienced board and management in place to deliver project



Refer to Appendix C for details about Thunderbird's Ore Reserves

EPC contract remains subject to finalisation and execution by the parties

<sup>3.</sup> Refer to slide 15 for tenor details for the offtake agreements

<sup>4.</sup> Refer to ASX announcement dated 9 October 2018 for further details about Night Train

# **COMPANY AND PROJECT STATUS**



# Mineral sands pricing environment has strengthened

- Zircon and TiO<sub>2</sub> price environment has strengthened due to ongoing supply constraints and global economic growth
- Material improvement in pricing relative to March 2017 Bankable Feasibility Study ("BFS") assumptions:
  - o March 2017 BFS: US\$1,381/tonne (FOB)¹ for premium zircon and US\$183/tonne (FOB)¹ for LTR ilmenite (long-term assumption)
  - o TZMI long term price estimates (March 2018): US\$1,435/tonne (FOB)<sup>1,2</sup> for premium zircon and US\$208/tonne for LTR ilmenite (FOB)<sup>1,2</sup>
  - o Spot price (October 2018): US\$1,640/tonne (CIF China)<sup>3</sup> for premium zircon

### All key permits now in place, Thunderbird is construction ready to commence

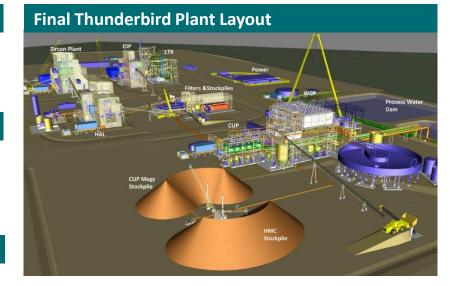
- Mining Lease granted
- Federal and State environmental approvals in place
- Co-existence agreement agreed with Traditional Owner Negotiating Committee and signed by Sheffield<sup>4</sup>

# EPC contract advanced, expected to significantly de-risk project execution

- Engineering, Procurement and Construction ("EPC") contract is advanced<sup>5</sup>
- Expected to be a lump sum, fixed price contract covering a substantial portion of estimated Stage 1 project capital costs, with EPC contractor likely to assume substantial performance responsibility
- Approximately 30% of design and engineering completed as at end of September 2018

### Funding strategy well advanced

- US\$175m debt facility to be provided by Taurus is well progressed<sup>6,7</sup>
- Northern Australia Infrastructure Fund ("NAIF") Board has made an Investment Decision to provide long term debt facilities totalling A\$95m<sup>6,8</sup>



Note: Freight on Board ("FOB") is price payable to a seller which includes the cost of transporting the goods to the nearest port and loading them onto the ship, but the buyer is responsible for the shipping to the final destination. Cost Insurance and Freight ("CIF") is price payable to a seller which includes the cost of the freight to send the goods to its final destination, also including the cost of insurance

- 1 Pricing on a FOR basis
- 2. TZMI's most recent published long-term price assumptions for Thunderbird products, as at March 2018
- 3. Pricing is on a CIF China basis, which includes freight costs. Sheffield estimates zircon freight costs from Broome to China on a break bulk basis to be US\$32-45/tonne, based on a quote from a broker and is for discharge in the port of Xiamen
- The Co-Existence Agreement will become binding on the Traditional Owners once it is signed by them. This will only happen if it is approved at an Authorisation Meeting to be convened by the Kimberly Land Council to consider and approve the Agreement
- 5. EPC contract remains subject to finalisation and execution by the parties
- Refer to Annendix A for details of debt facilities
- 7. The Taurus facility is non-binding and subject to definitive documentation being entered into
- 8. Tenor and other terms for the NAIF facilities are non-binding and subject to definitive documentation being entered into

# ENHANCED FLEXIBILITY FROM PROPOSED NAIF DEBT FACILTIES



# NAIF facility highlights

- NAIF is a corporate Commonwealth entity that was established under the NAIF Act 2016 to provide assistance to the states of Queensland, Western Australia and the Northern Territory for the construction of infrastructure to benefit Northern Australia
- Subject to definitive documentation being entered into and customary conditions precedent to drawdown (including State of Western Australia approval), the NAIF facilities will include:
  - A\$30m Project Development Facility ("Tranche C")
  - A\$65m Infrastructure Development Facility ("Tranche D")
- Facilities would provide ultra long tenor (15 and 20 years for Tranche C and Tranche D respectively)1
- Competitive cost of funding (commercial terms confidential, but based on customary market rates)
- The Sheffield decision represents the single largest NAIF investment decision to date
- Sheffield expects to complete definitive documentation in relation to the NAIF facility in the December quarter 2018

### Enhanced economics via infrastructure ownership

- BFS contemplated the provision of on-site power generation and accommodation facilities by third parties on an outsourced Build-Own-Operate ("BOO") basis, requiring payment of capital recovery charges to third party service providers
- The NAIF facility would enable the Company to now acquire power generation, gas storage, accommodation facilities and other key infrastructure (approximate additional capital expenditure A\$65m)2,3 and reduce overall operating costs following removal of BOO related capital recovery charges
- Would be expected to reduce project operating costs by an amount equal to the BOO capital recovery charge (estimated at A\$7.5m for each of Stage 1 and Stage 2)

### Expected improvements in project scope

- Current EPC contract negotiations include scope changes which are intended to result in a more robust project
- Key improvements include upgrades to throughput, utilisation, inter-plant operability and stockpile management which together materially de-risk the project
- Scope changes expected to result in additional capital expenditure of approximately A\$50m<sup>2,3</sup>

# Additional funding proposed to be provided by NAIF facilities likely to substantially cover total expected increase in capital expenditure

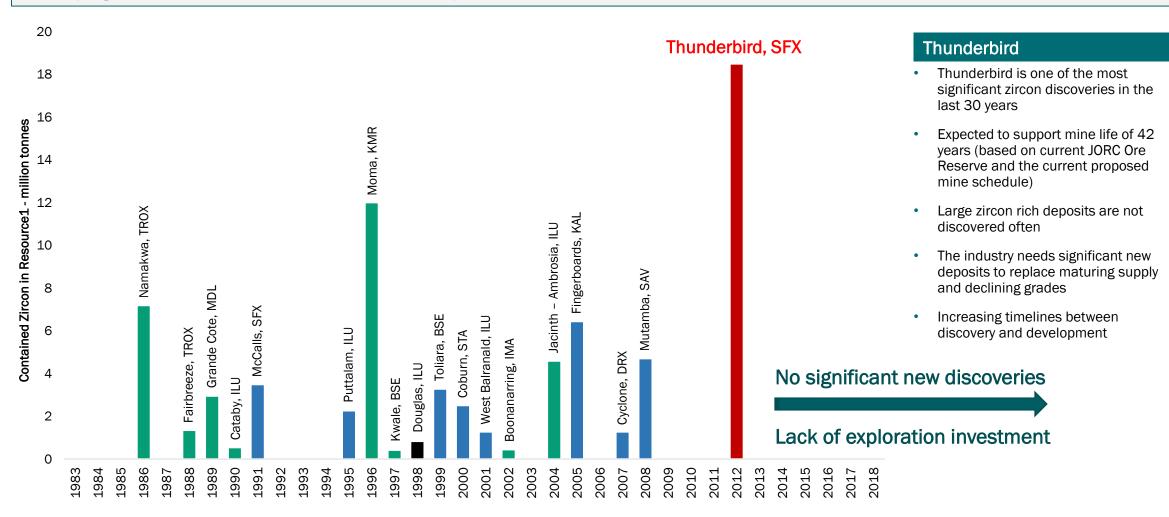
• Total expected increase in capital cost of approximately A\$115m would be approximately 80% covered by the proposed A\$95m NAIF facilities

- Refer to Appendix A for details on debt facilities
- Refer to slide 18 for full details of expected increase in capital expenditure
- Stated increase in expected capital cost are based on current EPC contract negotiations, which are subject to finalisation and execution by the parties.

# A GLOBALLY SIGNIFICANT ZIRCON DISCOVERY



### Globally significant Zircon discoveries over the past 30 years based on published pre-production resources



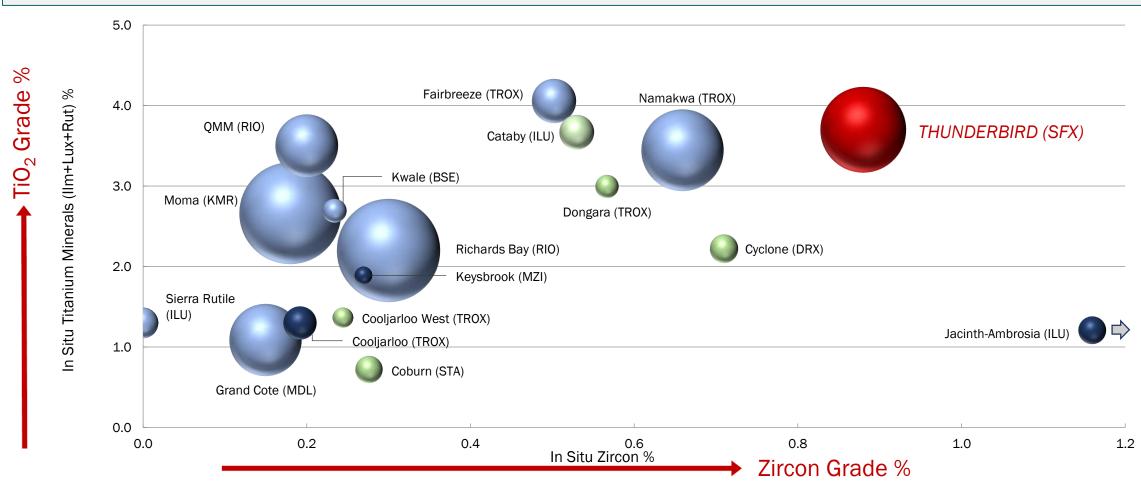
Note: Analysis comprises of Thunderbird and other pre-production published resources. Accordingly, in respect of the green projects referred to in the analysis, it does not set out the current resources for those projects and no account is made for any volumes of Zircon produced following the commencement of production

Thunderbird Mineral Resource as published on the ASX on 5 July 2016. Thunderbird Mineral Resource ranked against published pre-production Mineral Resources of current mineral sands operations and projects > 2M tonnes contained zircon plus selected deposits < 2Mt contained zircon under investigation globally. Data compiled by Sheffield from public sources. BLUE – projects yet to be developed, GREEN – projects in development/production, BLACK – projects mined out, RED - Thunderbird

# A WORLD CLASS, HIGH GRADE ORE RESERVE



# Comparison of Thunderbird's Ore Reserves against latest Ore Reserves for key global mineral sands deposits



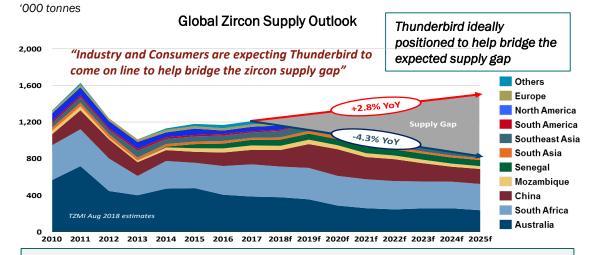
#### Notes:

- 1. Thunderbird Ore Reserve as published on the ASX on 3 October 2018
- 2. Thunderbird Ore Reserves ranked against latest published Ore Reserves of current mineral sands operations and projects under investigation globally. Accordingly, for the blue projects, no account is made for any volumes of product already produced
- 3. Blue bubbles are operating mines, green bubbles are Ore Reserves reported but project is not operating. Light blue bubbles represent operating African mines' Ore Reserves
- 4. Bubble size proportional to tonnes of contained Valuable Heavy Mineral (VHM). Only Ore Reserves > 1.2Mt contained VHM shown
- 5. Data compiled by Sheffield from public sources. This analysis does not illustrate the variance in product value between rutile, leucoxene and ilmenite
- 5. Fraser Institute survey of mining companies 2016

# **ZIRCON INDUSTRY DYNAMICS**

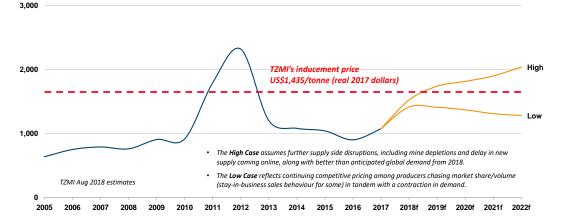


# A substantial supply gap is emerging...



# ...supporting a robust price outlook

(US\$/t, FOB)



Premium Bulk Zircon Price Forecast

# **Key observations**

#### Demand

- 1.2Mtpa global market, expected to grow at 2.8% p.a. to 2026, in line with global GDP growth, driven by demand for ceramics
  - China and Europe represent 47% and 21% of global demand, respectively, driven by urbanisation, industrialisation and demand for ceramics
  - India represents ~10% of the global market, and will be a strong growth market due to urbanisation
  - Demand for ceramics represents ~50% of end-market usage, driven by demand for floor tiles in developing economies (which have the highest proportionate use of floor tiling and sanitary products)

### Supply

- Supply decline of 4.3% per annum to 2026
  - Supply is dominated by Australia and Sub-Saharan Africa material supply deficit emerges from 2019, due to reserve depletion, jurisdictional risks and limited exploration success
  - Zircon supply deficit to increase from 2022 as demand outpaces supply growth (even with the onset of new projects)
- Thrifting and substitution have reached logical limits

### Pricing

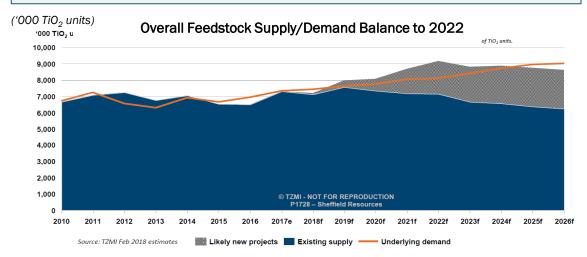
 Reserve depletion of existing projects and jurisdictional risks associated with new projects are expected to tighten supply, supporting zircon's robust price outlook

Source: TZMI March quarter 2018 and September quarter 2018

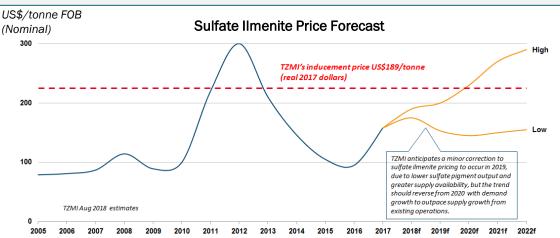
# TITANIUM FEEDSTOCK INDUSTRY DYNAMICS



# TiO<sub>2</sub> feedstock demand and supply dynamics



# The pricing outlook remains upbeat



# Key observations

#### **Demand**

- Approximately 7.3m TiO<sub>2</sub> units global market, expected to grow at 2.3% CAGR from 2017 to 2026, with pigment expected to lead demand growth (~85-90% of end market)
  - Historically, demand growth is in line with global GDP growth
- Pigment output growth led by the chloride process, which will require an increase in chloride slag production
  - China produces pigment predominantly by the sulphate process, while the US and Europe predominantly use the chloride pigment process; however, increased demand for chloride slag and chloride pigment production is expected in China, due to tighter environmental controls

### Supply

- Supply is expected to remain relatively flat in the short- to medium-term, followed by a declining profile if no new supply is brought on stream
- Net sulphate ilmenite is expected to decline without further investment, as more product is utilised to produce chloride slag

#### Pricing

Supply tightness is expected to lead to price appreciation in the medium-term, as new projects are needed to meet the forecast demand profile

Source: TZMI March quarter 2018 and September quarter 2018

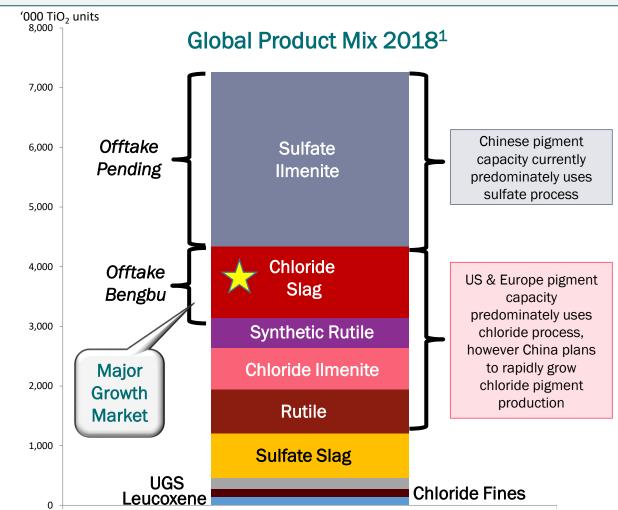
# LTR ILMENITE MARKET OPPORTUNITY



# Thunderbird's LTR Ilmenite product is ideally suited as a direct input to sulfate pigment and chloride slag

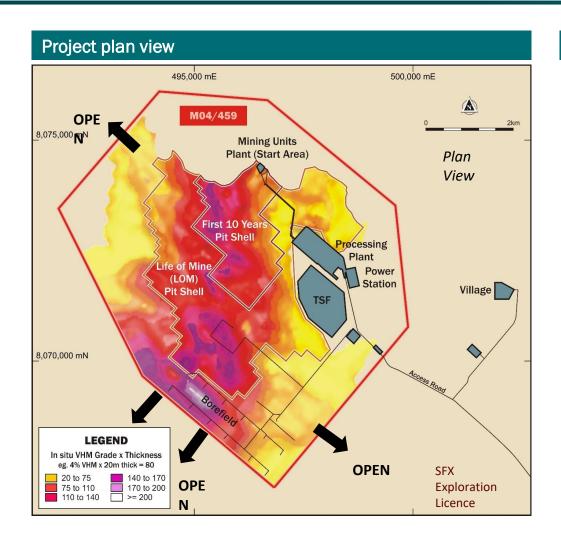
# Thunderbird LTR Ilmenite (57% TiO<sub>2</sub>) Product

- Unlike most global ilmenite supply, Thunderbird LTI ilmenite is suitable for feed to both chloride slag production and sulfate pigment production
- Chloride slag based pigment capacity is increasing globally whilst sulfate based capacity remains static as a consequence of environmental considerations
- Thunderbird is ideally positioned to take advantage of the expected sulfate ilmenite supply deficit, and is positioned to target the high growth chloride slag market



# **HIGH GRADE CONTINUITY x DEPOSIT THICKNESS = VALUE**





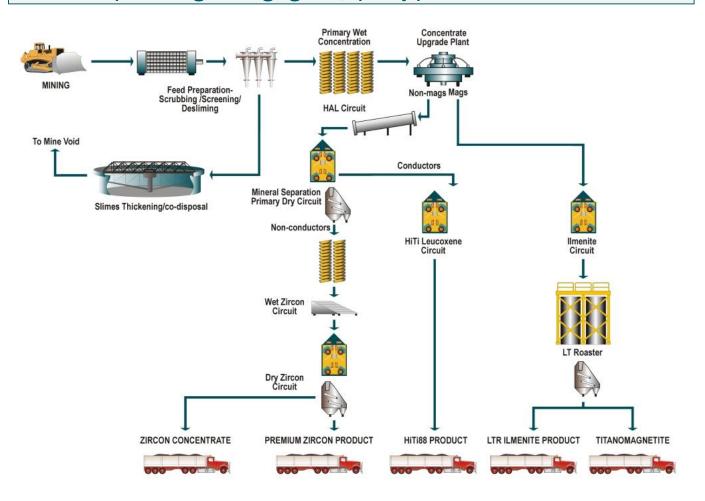
# **Overview**

- Thunderbird contains a continuous high grade zone up to 46m thickness
- Strong continuity and very high Valuable Heavy Mineral ("VHM") grades
- Near-surface high grades to be targeted early in the production schedule
- High grade zone remains open in multiple directions
- · Plan in place to seek to build Mineral Resource base and extend mine life
- Regional exploration results<sup>1</sup> are highly prospective and suggest an opportunity to define a new mineral sands province

# **CONVENTIONAL PROCESSING**



# Flowsheet producing five high grade, quality products



# Flowsheet summary

- Conventional HM sands processing circuit<sup>1</sup>
- Ilmenite upgrade via low temperature roast ("LTR")
- LTR upgrades to > 56% TiO<sub>2</sub> producing premium sulphate ilmenite, and chloride slag feed
- LTR ilmenite is low in chrome and alkalis with marketleading acid solubility
- Flowsheet produces premium zircon and zircon concentrate
- The flowsheet has been constant and stable since the 2015 PFS

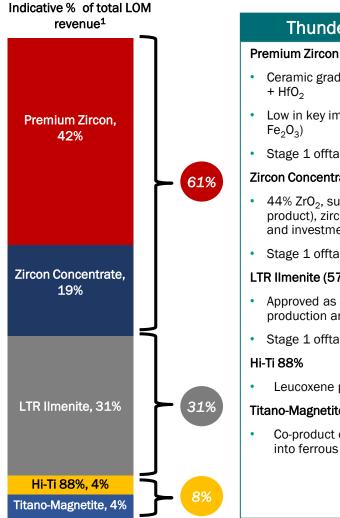
Recoveries <sup>2</sup>	BFS Test work
LTR Ilmenite	71.0%
Zircon Premium (66% ZrO <sub>2</sub> )	56.1%
Zircon Concentrate (44% ZrO <sub>2</sub> )	33.0%
Hi-Ti88 Leucoxene	35.3%

#### Notes

- 1. Process design by Hatch and Robbins Engineering, based on metallurgical testwork carried out on a 40t bulk sample using full scale & scalable equipment
- 2. Total recovery to products from BFS metallurgical test work refer ASX announcement 12 October 2016

# ATTRACTIVE PRODUCT MIX AND PRICING ENVIRONMENT





# Thunderbird's key products

- Ceramic grade zircon product with > 66% ZrO<sub>2</sub>
- Low in key impurities iron and titanium (TiO<sub>2</sub>,
- · Stage 1 offtake fully committed

#### **Zircon Concentrate**

- 44% ZrO<sub>2</sub>, suited to ceramics (as blended product), zirconium chemicals industry, foundry and investment castings
- · Stage 1 offtake fully committed

#### LTR Ilmenite (57.0% TiO<sub>2</sub>)

- Approved as a feed for direct sulfate pigment production and chloride slag production
- Stage 1 offtake 50% committed

Leucoxene product

#### Titano-Magnetite

Co-product of LTR process suitable for sale into ferrous industry

# Pricing methodology

#### **Premium Zircon**

Pricing generally negotiated for individual customers on a quarterly or semi-annual basis. Prices are published for all suppliers as trade data

#### **Zircon Concentrate**

 Priced relative to Premium Zircon reference price, calculated by concentration of zircon (ZrO<sub>2</sub> + HfO<sub>2</sub>) and TiO<sub>2</sub> units

### LTR Ilmenite (57.0% TiO<sub>2</sub>)

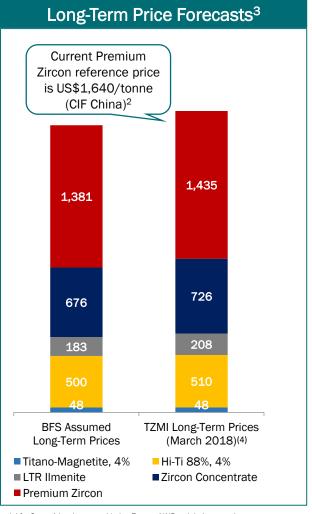
 Ilmenite pricing is driven by the demand for Titanium Dioxide pigment. Price is generally negotiated on a quarterly basis. Premium is applied for high TiO2 content, low impurities and reactivity

#### Hi-Ti 88%

 Price is referenced to other Titanium related products (rutile) and the level of TiO<sub>2</sub> units

### Titano-Magnetite

Prices linked to iron ore pricing with a premium for the TiO<sub>2</sub> units when used for protecting the steel furnace lining and a discount applied when used as a feedstock for steel production



Cautionary statement: This slide sets out revenue information for Stage 1 and Stage 2 of the Thunderbird Project. Such information for Stage 1 and Stage 2 of the Thunderbird Project. The financial model for Stage 1 has been provided to Taurus, NAIF and their respective advisers, to underpin the potential provision of debt finance by Taurus and NAIF for construction of Stage 1. These parties have progressed detailed due diligence on the input assumptions to, and outputs from, this model. The financial model for Stage 2 is based on current Sheffield management estimates, which will be confirmed prior to a Stage 2 investment decision and its implementation. Such estimates are based on, among other things, a detailed mine plan prepared as part of the BFS for the life of mine (including Stage 2) and other BFS assumptions for Stage 2, which, where relevant, have been adjusted to reflect likely contractual outcomes and the results of due diligence on Stage 1 to date. Accordingly, the information set out in this slide is not and should not be interpreted as a forecast or other forward looking statement as to potential revenue. Sheffield does not currently have sufficient certainty (and therefore does not have a reasonable basis) from which to issue any revenue forecasts or other guidance as to potential future outcomes

Chart displays the proportion of total Life Of Mine ("LOM") revenue represented by each product using TZMI's long-term prices estimates of premium zircon US\$1,435/t, zircon concentrate US\$726/t, LTR ilmenite US\$208/t, Hi-Ti 88 US\$510/t and titano-magnetite US\$48/t, calculated on a FOB basis

Pricing is on a CIF China basis, which includes freight costs. Sheffield estimates zircon freight costs from Broome to China on a break bulk basis to be US\$32.45/tonne, based on a quote from a broker and is for discharge in the port of Xiamen

TZMI's most recent published long-term price assumptions for Thunderbird products, as at March 2018

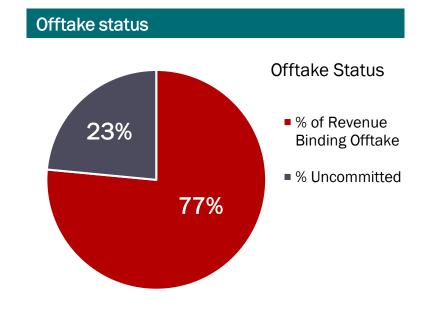
# BINDING OFF-TAKE SUBSTANTIALLY COMPLETE



### Robust demand for Thunderbird offtake

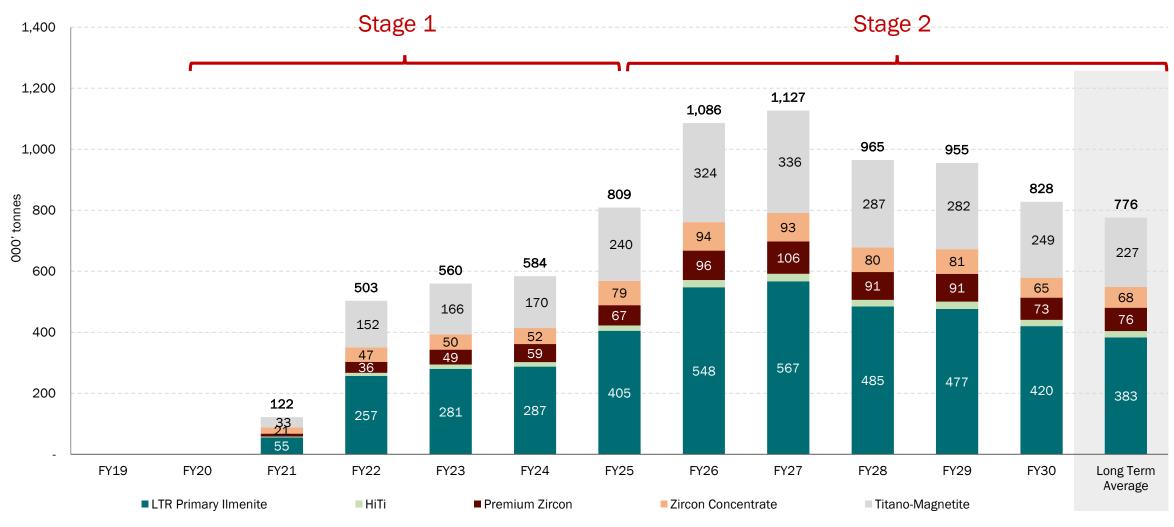
- Thunderbird aims to deliver a secure, consistent supply of high quality products over its expected 42 year mine life
- Thunderbird is located in a low risk jurisdiction, proximal to the largest emerging markets in Asia
- Binding offtake coverage meets condition precedent for debt financing under the proposed Taurus syndicated facility agreement<sup>1</sup>
- Binding, take-or-pay contracts, minimum 2 year tenor, > 90% with 5 year tenor, industry standard pricing by negotiation on a quarterly or six monthly basis with fall-back mechanism to benchmark pricing, no discounts based on quality of products
- Product samples supplied, assessed and fully approved by offtake partners

Offtake summary								
Product	% BFS Revenue	Binding Agreement (% of Stage 1 output)	Offtake Parties					
Premium Zircon	43%	100%	Sukaso, Ruby Ceramics, RZI, Qingyuan Jinsheng, Minchem, CFM, Other					
Zircon Concentrate	19%	100%	Hainan Wensheng, RZI					
LTR Ilmenite	29%	50%	Bengbu					
HiTi-88	5%	In Progress						
Titano-magnetite	4%	In Progress						



# INDICATIVE MINE SCHEDULE





Cautionary statement: This slide sets out production profile information for Stage 1 and Stage 2 of the Thunderbird Project. Such information is derived from the financial model prepared by Sheffield for Stage 1 and Stage 2 of the Thunderbird Project. The financial model for Stage 1 has been provided to Taurus, NAIF and their respective advisers, to underpin the potential provision of debt finance by Taurus and NAIF for construction of Stage 1. These parties have progressed detailed due diligence on the input assumptions to, and outputs from, this model. The financial model for Stage 2 is based on current Sheffield management estimates, which will be confirmed prior to a Stage 2 investment decision and its implementation. Such estimates are based on, among other things, a detailed mine plan prepared as part of the BFS for the life of mine (including Stage 2) and other BFS assumptions for Stage 2, which, where relevant, have been adjusted to reflect likely contractual outcomes and the results of due diligence on Stage 1 to date. Accordingly, the production profile is not and should not be interpreted as a production target or any other projection of likely future outcomes. Actual volumes produced will be subject to a number of risks and uncertainties and therefore may vary materially from this current, indicative profile. Sheffield does not currently have sufficient certainty (and therefore does not have a reasonable basis) from which to issue any production targets in respect of the Thunderbird Project.

# STAGED APPROACH TO PROJECT DEVELOPMENT



# Sheffield's approach

- · Scale of ore body allows for multiple stage development leveraging shared infrastructure and operating footprint
- Current execution strategy is based on two stages of development phased to seek to minimise up front capital and delivery risk whilst leveraging the large-scale Thunderbird deposit
- Stage 1 involves construction of a process plant and all associated site and port infrastructure
- Stage 2 involves construction of a duplicate process plant and leveraging Stage 1 infrastructure to provide significant production capacity increase and unit cost reductions

	Stage 1	Stage 2
Timing	<ul><li>Construction ready</li><li>First production expected in Q4 of 2020</li></ul>	<ul> <li>Following full ramp up of Stage 1</li> <li>Expected to be 2023/2024</li> </ul>
Scope	<ul> <li>Key items include:</li> <li>Mineral Separation Plant ("MSP")</li> <li>Low Temperature Roasting plant ("LTR")</li> <li>Power, gas storage, port, road and non-process related infrastructure</li> <li>Accommodation village</li> <li>All other logistics systems and infrastructure necessary to establish operations</li> </ul>	<ul> <li>Key items include:</li> <li>MSP duplication (excluding LTR)</li> <li>Mining Unit duplication</li> <li>Power station</li> </ul>
Total development capital	A\$463m  • Management estimate based on EPC negotiations to date <sup>1</sup>	<ul> <li>A\$195m - A\$240m³</li> <li>Management estimate based on BFS and EPC negotiations to date.         To be confirmed prior to Stage 2 investment decision and implementation     </li> <li>May be funded from internal cash flow and/or refinance of Stage 1 debt</li> </ul>
Sustaining capital	~A\$4m p.a. <sup>2</sup>	~A\$2m p.a. <sup>4</sup>

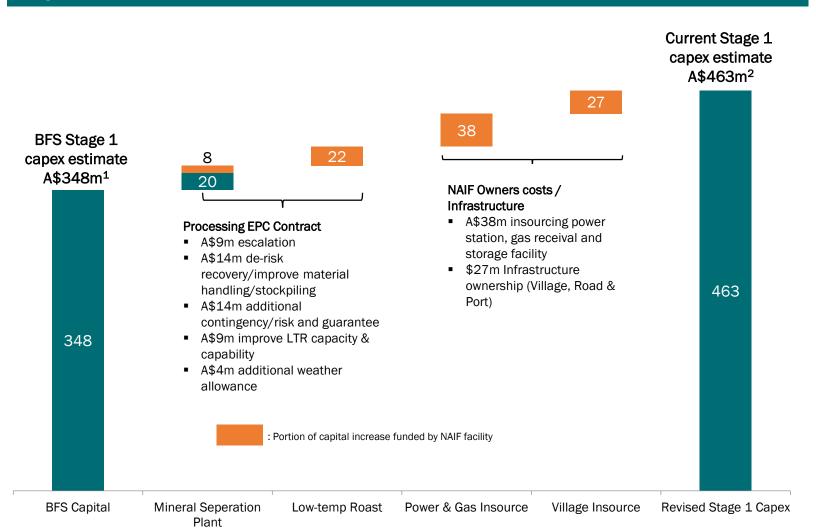
Cautionary statement: This slide sets out the sustaining capital per annum for Stage 1 and Stage 2 of the Thunderbird Project. Such information is derived from the financial model prepared by Sheffield for Stage 1 and Stage 2 of the Thunderbird Project. The financial model for Stage 1 has been provided to Taurus, NAIF and their respective advisers, to underpin the potential provision of debt finance by Taurus and NAIF for construction of Stage 1. These parties have progressed detailed due diligence on the input assumptions to, and outputs from, this model. The financial model for Stage 2 is based on current Sheffield management estimates, which will be confirmed prior to a Stage 2 investment decision and its implementation. Such estimates are based on, among other things, a detailed mine plan prepared as part of the BFS for the life of mine (including Stage 2) and other BFS assumptions for Stage 2, which, where relevant, have been adjusted to reflect likely contractual outcomes and the results of due diligence on Stage 1 to date. Accordingly, the information set out in this slide is not and should not be interpreted as a forecast or other forward looking statement as to potential sustaining capital. Sheffield does not currently have sufficient certainty (and therefore does not have a reasonable basis) from which to issue any sustaining capital forecasts or other guidance as to potential future outcomes

- 1. EPC contract remains subject to finalisation and execution by the parties
- Average FY23-FY24 Stage 1 only
- 3. Bottom end of range is from BFS. Top end of range is a management estimate based on changes to Stage 1 capex, as set out on slide 18
- 4. Average FY26-FY29 assuming Stage 2 expansion occurs

# THUNDERBIRD CAPITAL EXPENDITURE



# Stage 1 Capex Update (A\$m)



# **Additional Funding Requirements**

- In addition to Stage 1 capex, Sheffield will need to fund the following items during the 2 year construction period:
  - Start-up working capital requirements
  - Corporate overheads
  - Financing costs

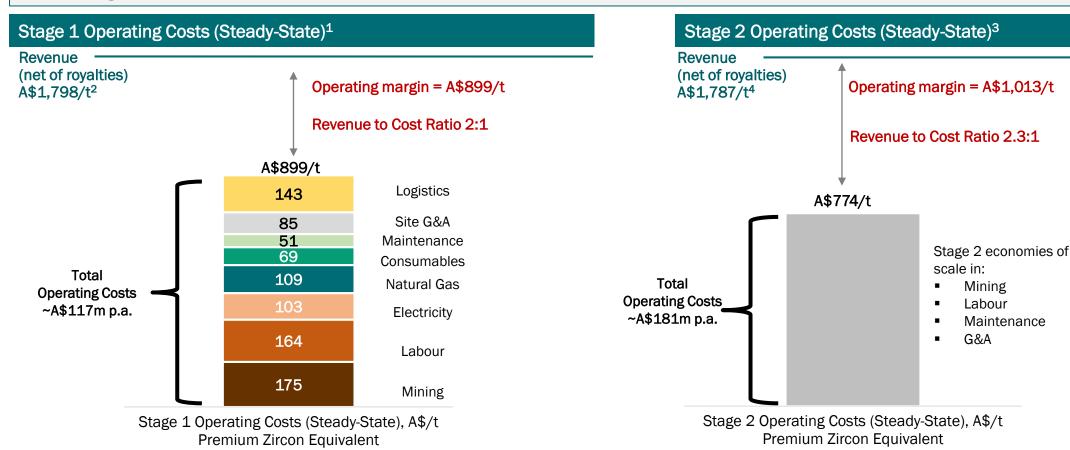
Refer RFS amount

<sup>2.</sup> Current estimate based on EPC contract negotiations to date, subject to finalisation by parties

# INDICATIVE OPERATING COSTS



### **Outstanding Indicative Revenue to Cost Ratio**



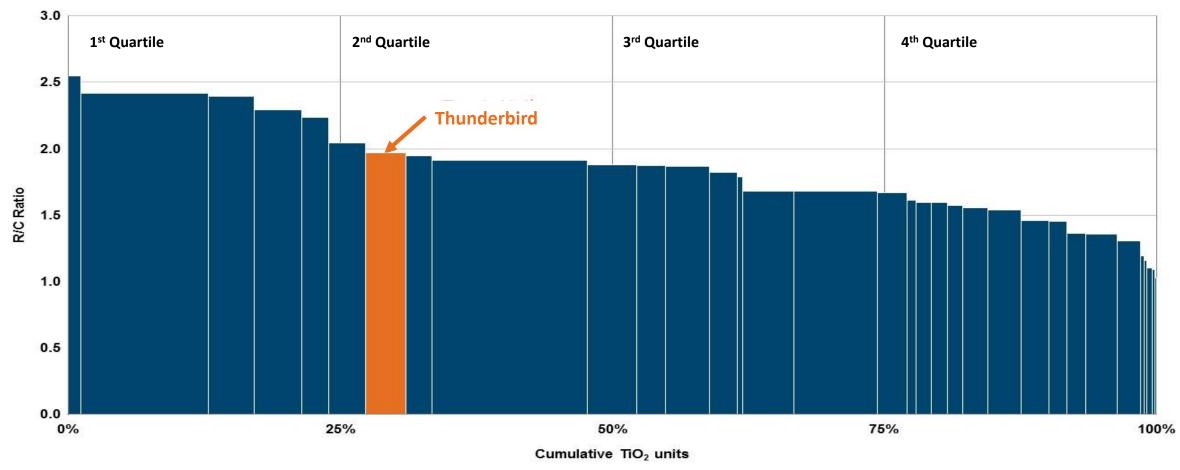
Cautionary Statement: This slide sets out revenue and operating cost information for Stage 1 and Stage 2 of the Thunderbird Project. Such information is derived from the financial model prepared by Sheffield for Stage 1 and Stage 2 of the Thunderbird Project. The financial model for Stage 1 has been provided to Taurus, NAIF and their respective advisers, to underpin the potential provision of debt finance by Taurus and NAIF for construction of Stage 1. These parties have progressed detailed due diligence on the input assumptions to, and outputs from, this model. The financial model for Stage 2 is based on current Sheffield management estimates, which will be confirmed prior to a Stage 2 investment decision and its implementation. Such estimates are based on, among other things, a detailed mine plan prepared as part of the BFS for the life of mine (including Stage 2) and other BFS assumptions for Stage 2, which, where relevant, have been adjusted to reflect likely contractual outcomes and the results of due diligence on Stage 1 to date. Accordingly, the information set out in this slide is not and should not be interpreted as a forecast or other forward looking statement as to potential revenue or cost outcomes. Sheffield does not currently have sufficient certainty (and therefore does not have a reasonable basis) from which to issue any operating cost or revenue forecasts or other guidance as to potential interpreted.

- Average FY23-FY24 Stage 1 only on FOB basis
- 2. FOB basis: Based on average Stage 1 production FY23-FY24 of premium zircon 51ktpa, zircon concentrate 53ktpa, LTR ilmenite 287ktpa, Hi-Ti 88 14ktpa and titano-magnetite 170ktpa, and TZMI's long-term price estimates of premium zircon US\$1,435/t, zircon concentrate US\$726/t, LTR ilmenite US\$208/t, Hi-Ti 88 US\$510/t and titano-magnetite US\$48/t
- Average FY26-FY29 assuming Stage 2 expansion occurs on FOB basis
- FOB basis: Based on average Stage 2 production FY26-FY29 of premium zircon 96ktpa, zircon concentrate 87ktpa, LTR ilmenite 519ktpa, Hi-Ti 88 23ktpa and titano-magnetite 307ktpa, and TZMI's long-term price estimates of premium zircon US\$1,435/t, zircon concentrate US\$726/t, LTR ilmenite US\$208/t, Hi-Ti 88 US\$510/t and titano-magnetite US\$48/t

# A SECOND QUARTILE PRODUCER



# TZMI assess Thunderbird to have a competitive revenue to cost ratio



Source: TZMI

Cautionary Statement: Thunderbird's cost position is as estimated by TZMI and based on the March 2017 Thunderbird BFS, and assuming a 4 year production period following Stage 1 ramp-up (Year 3 to Year 7 of operation) based on Sheffield BFS. Accordingly, the information set out in this slide is not period and should not be interpreted as a forecast. Sheffield does not have sufficient certainty (and therefore does not yet have a reasonable basis) in order to issue any cost or revenue forecasts)

<sup>2020</sup> Cost Curve as presented by TZMI

<sup>.</sup> Note that several of the competitors presented here are integrated producers of downstream feedstock and associated by products

# STAGE 1 EXECUTION STRATEGY



### Sheffield is focused on minimising execution risk and ensuring successful project delivery

# The project will be delivered in 3 key stages

- L. Early works
- 2. EPC Design and Engineering
- 3. Construction

### Sheffield's delivery team

- Sheffield's Project Team is made up of highly credentialed technical, marketing and commercial experts
- Delivery structure will ensure seamless alignment between Owner's team & EPC teams

### **Early works**

- Key processing-related activities include:
  - Process optimisation and documentation
  - Layout optimisation & General Arrangements
  - Equipment specification and vendor selection
  - Peer Review
- Activities undertaken by Sheffield
  - Mine Access Road commence construction
  - Village purchase and commence installation
  - Power, gas, mining & village services contracts
  - Mine plan updated
  - Customer off-take

### **EPC Design and Engineering**

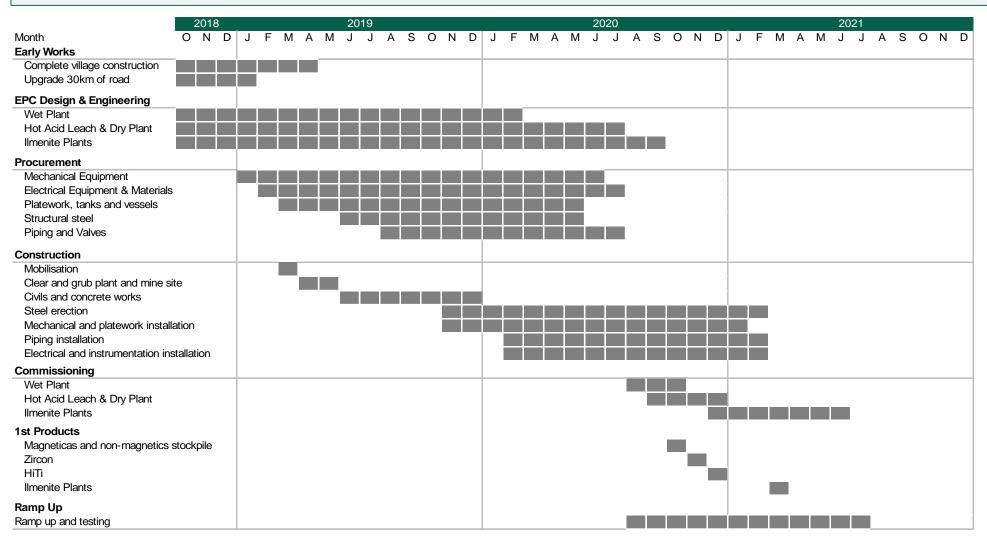
- EPC contract negotiation well advanced<sup>1</sup>
  - Fixed-Price Lump-Sum EPC contract progressed with an ASX listed specialist contractor
  - Contractor has extensive experience in successfully delivering mineral sands projects globally
  - EPC contract expected to cover a substantial portion of Stage 1 development capital expenditure, with significant performance responsibility likely to be assumed by the contractor
  - Draft EPC contract and contractor selection has been subject to due diligence by lenders and their advisers

### Construction

# STAGE 1 DEVELOPMENT & COMMISSIONING TIMELINE



# Engineering, construction and commissioning is expected to take approximately 2 years, followed by a period of production ramp-up



# EXPERIENCED BOARD AND MANAGEMENT





**Will Burbury** *Non-Executive Chairman* 

Previously Chairman of Warwick Resources Limited in 2009 and was formerly a director of Lonrho Mining Limited (ASX: LOM) and an executive of Nkwe Platinum Ltd (ASX: NKP)



Bruce McQuitty
Non-Executive Director

35 years experience in the mining and civil construction industries and was previously Managing Director of Warwick Resources Limited



Jim Netterfield General Manager Process & Engineering

Mechanical engineer with a proven track record in successfully managing mineral development projects through to production



**Geoff Williams**General Manager Operations

Mining engineer with over 25 years mining experience in operational roles. A resident of Broome, having lived and worked in the Kimberley for many years



Bruce McFadzean Managing Director

Mining engineer with over 40 years experience leading the financing, development and operation of mines in Australia and overseas



Mark Di Silvio CFO / Company Secretary

CPA with over 25 years experience in the resources sector working across Africa and Australia



**Neil Patten-Williams** *Marketing Manager* 

Experienced mineral sands marketing and operations manager with over 18 years experience in the mineral sands industry.



TBA
Project Director

Oversee and hold to account, the delivery of the EPC contract for the process plant & other non-processing infrastructure construction works for the Thunderbird Project



**David Archer** Technical Director

Geologist with over 30 years experience Australian resources sector



Stuart Pether
Chief Operating Officer

Mining engineer with over 25 years technical and operating experience in the resources industry, both in Australia and overseas



Vanessa Hughes General Manager People & Community

Qualified human resource executive with more than 25 years experience in Australia and Africa



Justin King Community Superintendent

A trusted community leader in the Kimberley region with experience as Aboriginal Liaison Officer within the mining sector & an abiding commitment to Aboriginal people

# SHEFFIELD COMMUNITY INVESTMENT



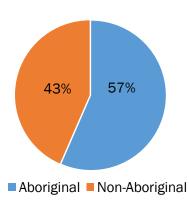
### Our Pledge to the Kimberley Community

- Local Content Employment 280 local jobs
- Intergenerational Employment over expected 42 year mine life
- 40% Aboriginal Employment by Year 8 operations
- Aboriginal Training Fund
- Aboriginal Business \$5m/year from Year 5

# **Our Current Social Licence to Operate**

- Active Group Training Program with Aboriginal participants transferring to permanent employment
- Kimberley spend on early works and local supply contracts >\$4m
   (6 mths to Sept '18) and an additional >\$3m by year end
- Local content strategies agreed with major contractors including EPC and Village
- Upholding high standards to safeguard the environment, water, diversity and Aboriginal heritage

# Kimberley Workforce



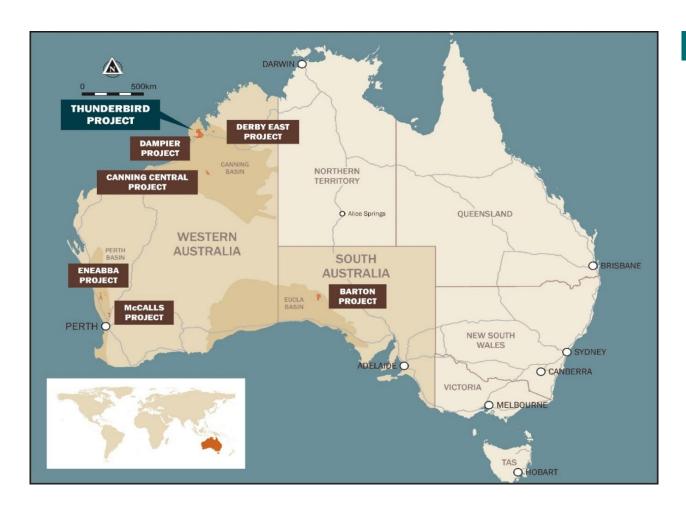






# **EXPLORATION AND MINERAL RESOURCE GROWTH**





# **Exploration Strategy & Progress**

- Targeting large zircon rich deposits in low risk mining jurisdictions
- Large Australian tenement holding in multiple provinces with growing Mineral Resource base
- Exceptional recent drilling results<sup>1</sup> confirm major new discovery at Night Train. Record intersection of;
  - 27m @ 5.29% HM including 22.5m @ 6.17%HM
- Recent drilling supports the view that the Thunderbird regional tenement holding could be a new mineral sands province
- New projects currently under review



# **Appendix A**Other information

# **ROYALTY REGIME AND FISCAL ARRANGEMENTS**



Royalties <sup>1</sup>			
State government	WA State govt. royalty = 5% of Total Sales Revenue	Taurus <sup>3</sup>	<ul> <li>Royalty (Years 1 to 4, starting on first sale) = 0.5% of Total Sales Revenue on FOB basis or equivalent</li> <li>Royalty (Years 5 onwards for a period of to 22.5 years) = 0.75% of Total Sales Revenue on FOB basis or equivalent</li> </ul>
Native title royalty	Calculated as a percentage of total sales revenue (ranges from 0.5% to 1%)	Miscellaneous	Calculated as a percentage (less than 0.1%) of total sales revenue

# Tax Regime

#### Company tax:

- Australian company tax rate is 30%. There is no tax-free threshold for a company business structure
  - o Tax payable is calculated by applying the company tax rate on positive taxable income
- Sheffield Resources Limited and its wholly-owned Australian controlled entities have implemented the tax consolidation legislation. As a consequence, these entities are taxed as a single entity and the deferred tax assets and liabilities of these entities are set off in the consolidated financial statements<sup>2</sup>

#### Available tax losses:

• The Company has tax losses arising in Australia. The tax benefit of these losses of ~\$14m as at 30-Jun-2018 is available indefinitely for offset against future taxable profits of the companies in which the losses arose, subject to ongoing conditions for deductibility being met<sup>3</sup>

<sup>..</sup> Source: Sheffield management

<sup>2.</sup> Sheffield Resources Annual Report, 30-Jun-2018

<sup>3.</sup> The Taurus facility is non-binding and subject to definitive documentation being entered into

# SENIOR DEBT FINANCING SUMMARY



# **US\$175m Taurus facility**

- Lender: Taurus Mining Finance Fund and Taurus Mining Finance Annex Fund
- Syndicated facility agreement which is non-binding and subject to final definitive documentation
- Subject to final definitive documentation, will be underwritten by Taurus, and subsequently expected to be syndicated
- · Some terms are summarised below
- Tranche A:
  - Borrower: Thunderbird Operations Pty Ltd ("TOPL")
  - Amount: US\$75m
  - Interest rate: USD LIBOR + 4.5% p.a.
  - Tenor: 7 years
  - Repayable between Year 3.5 and Year 7
  - Senior secured facility<sup>1</sup>
- Tranche B:
  - Borrower: TOPL
  - Amount: US\$100m
  - Interest rate: 8.5% p.a.
  - Tenor: 7 years
  - Repayable at end of Year 7
  - Senior secured facility<sup>1</sup>
- Revenue royalty of 0.50% (Years 1 4) and 0.75% (Years 5 22.5)
- Conditions precedent to drawdown: customary for a facility of this nature including (but not limited to) final due diligence and agreed equity spend
- Customary fee structure for a debt facility of this nature

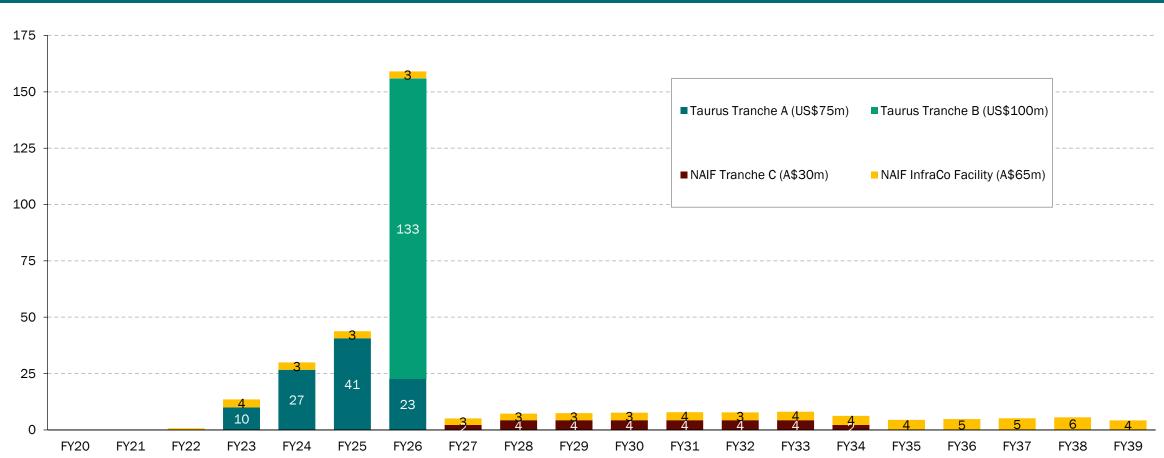
### A\$95m NAIF loan facilities

- Lender: State of Western Australia, under back-to-back loan from Northern Australia Infrastructure Fund ("NAIF") Board
- Non-binding Term Sheet, approved by NAIF Board. Some terms are summarised below
- Tranche C:
  - Borrower: TOPL
  - A\$30m Project Development Facility
  - Tenor: 15 years (from the signing of TOPL Syndicated Facility Agreement)
  - Straight line amortisation between Years 9 15
  - Senior secured<sup>1</sup>
  - Interest rate: Confidential
- Tranche D:
  - Borrower: Thunderbird InfraCo Pty Ltd
  - A\$65m Infrastructure Development Facility
  - Tenor: 20 years (from the signing of TOPL Syndicated Facility Agreement)
  - Approximate credit foncier repayment profile, payable semi-annually, from the earlier of 12 months after Whole Project Completion Date and 3.5 years from signing the TOPL Syndicated Facility Agreement
  - Senior secured<sup>1</sup>
  - To be used for on-site infrastructure, the upgrading of mine site roads, etc.
  - Interest rate: Confidential
- Conditions precedent: customary for a facility of this nature

# **DEBT PRINCIPAL REPAYMENT PROFILE**



# Scheduled Debt Principal Repayment Profile (A\$m)<sup>1,2,3</sup>



<sup>1.</sup> The Taurus facility is non-binding and subject to definitive documentation being entered into

<sup>2.</sup> Tenor and other terms for the NAIF facilities are non-binding and subject to definitive documentation being entered into

<sup>3.</sup> Assumes AUD:USD of 0.75, excludes interest payments and fees. Repayment profile represents scheduled payments which remain subject to final agreement and definitive documentation. Profile shown assumes no cash sweep is triggered for Tranche A, B and C. InfraCo facility has a credit foncier repayment profile, profile shown assumes no debt acceleration is triggered

# **SHEFFIELD SNAPSHOT**

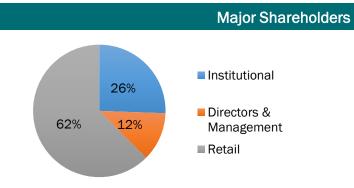


# Sheffield is focused on development of the large scale, high quality Thunderbird mineral sands project

# Last twelve months share price performance



Capitalisation							
Share Price (18-0ct-2018)	A\$/sh	\$1.07					
Ordinary shares outstanding	m	230					
Market capitalisation	A\$m	\$246					
(+) Debt	A\$m	nil					
(-) Cash (30-Sept-2018)	A\$m	14.0					
Enterprise value	A\$m	\$232					



BlackRock	6%
Colonial First State	6%
Other Institutions	14%
Walter Yovich	6%



# **Appendix B Product details**

# PREMIUM ZIRCON<sup>1</sup>



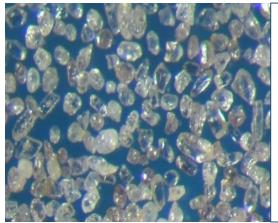
# **Product overview**

- Ceramic Grade Zircon: > 66% ZrO<sub>2</sub>
- Good Opacity
- Low levels of impurities
  - Low  $Fe_2O_3$
  - Low TiO<sub>2</sub>
  - Very Low Al<sub>2</sub>O<sub>3</sub>
  - Moderate U+Th
- Off-take 100% complete

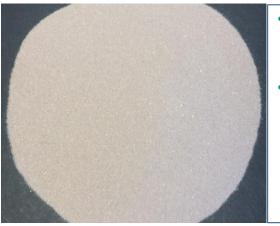
# **Product comparison**

Composition	Thunderbird's Premium Zircon	Typical
ZrO <sub>2</sub> +HfO <sub>2</sub>	66.2 – 66.6%	66.3%
TiO <sub>2</sub>	0.09 - 0.18%	0.14%
Fe <sub>2</sub> O <sub>3</sub>	0.06 - 0.08%	0.08%
SiO <sub>2</sub>	32.5 – 33.5%	32.5%
$Al_2O_3$	0.10 - 0.15%	0.15%

# Thunderbird's Premium Zircon product



- Low levels of impurities
- No iron staining
- Good whiteness important for making a good opacifier



- Meets premium classification for use in the ceramics sector
- Approved after extensive testing by offtake partners

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Refer ASX announcement 12 October 2018

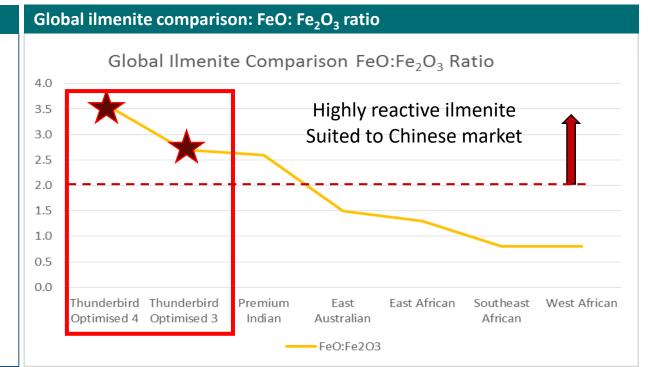
# LTR ILMENITE<sup>1</sup>



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### **Product overview**

- Exceptional Grade: 56-58% TiO<sub>2</sub>
- Suitable for chloride slag production
- Premium feedstock for sulfate pigment production
- High acid solubility
- Good reactivity rate
- Low levels of impurities
- Outstanding FeO:Fe<sub>2</sub>O<sub>3</sub> ratio
- Low Fe20<sub>3</sub> (<13%)</li>
- Low Levels of Cr<sub>2</sub>O<sub>3</sub>
- Very low CaO and MgO



Composition (%)	Thunderbird Optimise 4 ilmenite	Thunderbird Optimise 3 ilmenite	Premium Indian ilmenite	East Australian ilmenite	East African ilmenite	Southeast African ilmenite	West African ilmenite
TiO <sub>2</sub>	58.5	57.9	51.5	50.7	48.2	52.4	53.2
FeO	29.9	28.1	33.5	25-29	25.5	21.4	18.9
Fe <sub>2</sub> O <sub>3</sub>	8.4	10.3	13	16-19	20	27.9	23.3
FeO:Fe <sub>2</sub> O <sub>3</sub>	3.6	2.7	2.6	1.5	1.3	0.8	0.8
Cr <sub>2</sub> O <sub>3</sub>	0.05	0.05	0.04	0.3	0.09	0.09	0.16

1. Refer ASX announcement 13 March 2017



# **Appendix C** *Reserves and resources*

# **ORE RESERVES**



# THUNDERBIRD DEPOSIT ORE RESERVES<sup>1,4</sup>

### Valuable Heavy Mineral (VHM) in-situ grade

Ore Reserve Category	Ore Tonnes In-situ HM Tonne		HM Grade -	Valuable HM Grade (In-situ) <sup>2</sup>				Slimes	Osize
	(millions)	(millions)	(%)	Zircon %	HiTi Leuc %	Leuc %	Ilmenite %	(%)	(%)
Proved	235.8	31.4	13.3	1.00	0.29	0.26	3.55	16.5	13.7
Probable	444.8	45.4	10.2	0.80	0.26	0.26	2.85	15.2	11.0
Total	680.5	76.8	11.3	0.87	0.27	0.26	3.10	15.7	12.0

# Mineral assemblage as percentage of HM grade

Ore Reserve Category	Ore Tonnes In-situ HM Tonnes		HM Grade -		Slimes	Osize			
	(millions)	(millions)	(%)	Zircon (%)	HiTi Leuc (%)	Leuc (%)	Ilmenite (%)	(%)	(%)
Proved	235.8	31.4	13.3	7.5	2.2	1.9	26.7	16.5	13.7
Probable	444.8	45.4	10.2	7.8	2.5	2.6	28.0	15.2	11.0
Total	680.5	76.8	11.3	7.7	2.4	2.3	27.4	15.7	12.0

<sup>1.</sup> Ore Reserves are presented both in terms of in-situ VHM grade, and HM assemblage. Tonnes and grades have been rounded to reflect the relative accuracy and confidence level of the estimate, thus the sum of columns may not equal. Ore Reserve is reported to a design overburden surface with appropriate consideration of modifying factors, costs, mineral assemblage, process recoveries and product pricing.

<sup>2.</sup> The in-situ grade is determined by multiplying the HM Grade by the percentage of each valuable heavy mineral within the heavy mineral assemblage.

<sup>3.</sup> Mineral Assemblage is reported as a percentage of HM Grade, it is derived by dividing the in-situ grade by the HM grade.

<sup>.</sup> Ore Reserves reported for the Dampier Project were prepared and first disclosed under the JORC Code (2012), refer to Sheffield's ASX announcement dated 16 March 2017 for further detail.

# MINERAL RESOURCES



#### THUNDERBIRD DEPOSIT MINERAL RESOURCE1,2,7

						Valuable HM G	able HM Grade (In-situ) <sup>4</sup>	a				
Cut-off (HM%)	Mineral Resource Category	Material Tonnes (millions)	In-situ HM Tonnes (millions)	HM Grade <sup>3</sup> (%)	Zircon (%)	HiTi Leuc (%)	Leuc (%)	llmenite (%)	Slimes (%)	Osize (%)		
	Measured	510	45	8.9	0.71	0.20	0.19	2.4	18	12		
. 20/ LIM	Indicated	2,120	140	6.6	0.55	0.18	0.20	1.8	16	9		
> 3% HM	Inferred	600	38	6.3	0.53	0.17	0.20	1.7	15	8		
	Total	3,230	223	6.9	0.57	0.18	0.20	1.9	16	9		
	Measured	220	32	14.5	1.07	0.31	0.27	3.9	16	15		
7.50/ 1.04	Indicated	640	76	11.8	0.90	0.28	0.25	3.3	14	11		
>7.5% HM	Inferred	180	20	10.8	0.87	0.27	0.26	3.0	13	9		
	Total	1,050	127	12.2	0.93	0.28	0.26	3.3	15	11		
		Metarial Tannas	In city I IM Tonnes	LIM Crada	Mineral Assemblage⁵			Mineral Assemblage <sup>5</sup>			Slimes	Onima
Cut-off (HM%)	Mineral Resource Category M	Material Tonnes (millions)	In-situ HM Tonnes (millions)	HM Grade (%)	Zircon (%)	HiTi Leuc (%)	Leuc (%)	Ilmenite (%)	(%)	Osize (%)		
	Measured	510	45	8.9	8.0	2.3	2.2	27	18	12		
> 3% HM	Indicated	2,120	140	6.6	8.4	2.7	3.1	28	16	9		
> 3 /0 T IIVI	Inferred	600	38	6.3	8.4	2.6	3.2	28	15	8		
	Total	3,230	223	6.9	8.3	2.6	2.9	28	16	9		
•	Measured	220	32	14.5	7.4	2.1	1.9	27	16	15		
>7.5% HM	Indicated	640	76	11.8	7.6	2.4	2.1	28	14	11		
21.J/0 INIVI	Inferred	180	20	10.8	8.0	2.5	2.4	28	13	9		
	Total	1,050	127	12.2	7.6	2.3	2.1	27	15	11		

#### THUNDERBIRD DEPOSIT CONTAINED VALUABLE HM (VHM) IN MINERAL RESOURCES1.2.6

Cut-off (HM%)	Mineral Resource Category	Zircon Tonnes (thousands)	HiTi Leucoxene Tonnes (thousands)	Leucoxene Tonnes (thousands)	Ilmenite Tonnes (thousands)	Total VHM Tonnes (thousands)
`	Measured	3,600	1,000	1,000	12,000	17,700
. 20/ LIM	Indicated	11,800	3,800	4,300	39,100	59,000
>3% HM	Inferred	3,200	1,000	1,200	10,500	15,900
	Total	18,600	5,900	6,500	61,700	92,600
	Measured	2,300	700	600	8,400	12,000
>7.5% HM	Indicated	5,800	1,800	1,600	21,000	30,200
>1.5% ⊞NI	Inferred	1,600	500	500	5,600	8,200
	Total	9,700	3,000	2,700	35,000	50,400

- 1. The Thunderbird Mineral Resources are reported inclusive of (not additional to) Ore Reserves. The Mineral Resource reported above 3% HM cut-off is inclusive of (not additional to) the Mineral Resource reported above 7.5% HM cut-off.
- 2. All tonnages and grades have been rounded to reflect the relative accuracy and confidence level of the estimate and to maintain consistency throughout the table, therefore the sum of columns may not equal.
- 3. Total heavy minerals (HM) is within the 38µm to 1mm size fraction and has been reported as a percentage of the total material quantity.
- 4. The Valuable HM in-situ grade is reported as a percentage of the total material quantity and is determined by multiplying the percentage of total HM by the percentage of each valuable heavy mineral within the HM assemblage at the resource block model scale.
- 5. The Mineral Assemblage is represented as the percentage of HM grade. Estimates of mineral assemblage are determined by screening and magnetic separation. Magnetic fractions were analysed by QEMSCAN for mineral determination as follows: >90% liberation and; Ilmenite 40-70% TiO<sub>2</sub>; Leucoxene 70-94% TiO<sub>2</sub>; High Titanium Leucoxene (HiTi Leucoxene) >94% TiO<sub>2</sub> and Zircon 66.7% ZrO<sub>2</sub>+HfO<sub>2</sub>. The non-magnetic fraction was analysed by XRF and minerals determined as follows: Zircon ZrO<sub>2</sub>+HfO<sub>2</sub>/0.667 and HiTi Leucoxene TiO<sub>2</sub>/O.94
- 5. The VHM inventory is derived from information in the Mineral Resource tables.
- 7. The Mineral Resource estimate was prepared and first disclosed under the JORC Code (2012), refer to Sheffield's ASX announcement dated 5 July 2016 for further detail.