



## MAIDEN ORE RESERVE – THUNDERBIRD PROJECT

### HIGHLIGHTS

- Maiden Ore Reserve of 683 million tonnes @ 11.3% heavy mineral (HM)
- Supports Thunderbird Pre-feasibility Study outcomes
- Confirms Thunderbird as one of the largest undeveloped zircon-rich mineral sands deposits in the world
- Ore Reserve has exceptionally high in-situ zircon grades

Sheffield Resources Limited (“Sheffield” “the Company”) (ASX:SFX) is pleased to announce a maiden Ore Reserve for its world-class Thunderbird mineral sands deposit, located 90km west of Derby in Western Australia. The maiden Ore Reserve supports Thunderbird’s 40-year mine life, detailed in the Pre-feasibility Study (PFS) released on 14 October 2015.

The Ore Reserve estimate was prepared by Entech Pty Ltd, an experienced and prominent mining engineering consultancy with appropriate mineral sands experience.

The Ore Reserve estimate is based on the July 2015 mineral resource estimate generated for Sheffield by QG Pty Ltd. This Mineral Resource estimate has previously been released by Sheffield Resources. Measured and Indicated Mineral Resources were converted to Proved and Probable Ore Reserves respectively, subject to mine designs, modifying factors and economic evaluation. The Ore Reserve estimate for the Thunderbird Project as at January 2016 is outlined in Table 1 below:

**Table 1: Thunderbird Deposit Ore Reserve.**

DEPOSIT	Ore Reserve			Valuable HM Grade (In-Situ)				Oversize (%)	Slimes (%)
	Reserve Category	Material (Mt)	HM (%)	Zircon (%)	HiTi Leuc (%)	Leucoxene (%)	Ilmenite (%)		
Thunderbird	Proved	115.1	13.7	1.01	0.29	0.28	3.67	12.7	17.3
	Probable	567.6	10.9	0.85	0.27	0.29	3.03	10.2	16.1
	<b>Total</b>	<b>682.7</b>	<b>11.3</b>	<b>0.88</b>	<b>0.27</b>	<b>0.29</b>	<b>3.14</b>	<b>10.6</b>	<b>16.3</b>

*Calculations have been rounded to the nearest 100,000t, 0.1 % grade. Differences may occur due to rounding. The in-situ grade is determined by multiplying the percentage of HM by the percentage of each valuable heavy mineral within the heavy mineral assemblage. Ore Reserve is reported by economic cut-off with appropriate consideration of modifying factors, costs, mineral assemblage, process recoveries and product pricing.*

Bruce McFadzean, Sheffield’s Managing Director, said: “Releasing a maiden Ore Reserve is the final step in closing out the Thunderbird PFS and moving to a Bankable Feasibility Study (BFS) on the Project. The maiden Ore Reserve also further supports the quality of the Thunderbird asset as one of the largest undeveloped zircon-rich mineral sands projects in the world.

“Sheffield has finalised the BFS study scope and a tier one study manager will be announced next month. Concurrent with preparation for the BFS, we are continuing Native Title negotiations and work towards securing environmental approvals. Marketing and financing options will also be pursued in parallel with the BFS and approval processes.

“Thunderbird is an exciting, long-life project that has attained ‘Lead Agency’ status with the Western Australian Department of Mines and Petroleum, which supports its significance and the long-term benefits Sheffield believes it will deliver to the state and the communities of the Kimberley”.

The Ore Reserve has been calculated in conjunction with a Pre-Feasibility Study for the Project and is underpinned by that Study. The PFS was compiled by Sheffield in October 2015 for a conventional dozer trap mineral sands mining operation involving an initial 12Mtpa throughput, increasing to 18Mtpa in year eight, and a low risk, conventional processing flow sheet with all infrastructure located on site. Contributions to the PFS were made by a number of suitably qualified independent consultants, experts, vendors and contractors. The October 2015 PFS was an update building upon a technical study finished earlier in 2015.

Bulk mining techniques have been chosen, incorporating dozer traps and in-pit feed preparation units. Overburden and oversize waste will be excavated and transported using conventional earthmoving equipment. Following excavation and classification, ore will be slurried and pumped to a nearby wet concentration plant. The selected mining method is considered appropriate for the large, relatively thick and sheet-like characteristics of the host sand unit. Minimal pre-strip is required to access the ore body.

Independent consultants (ATC Williams and RCR Mining) prepared the geotechnical analysis that forms the basis of pit design criteria including excavatability, trafficability and applicability of the mining method. A mining recovery factor of 98% was applied. No mining dilution factor is applied due to the bulk, non-selective nature of the deposit and proposed mining method. The life-of-mine average strip ratio (waste:ore) is 0.67:1.00.

The Thunderbird mineralisation will be processed through a conventional heavy mineral sands processing circuit to deliver a suite of zircon, ilmenite, and HiTi88 products. The process includes an ilmenite upgrade step using a low temperature roast ("LTR") to upgrade the primary ilmenite by 22% to produce a high grade sulphate ilmenite (56.1%).

To the best of Entech's knowledge, Sheffield Resources is currently compliant with all legal and regulatory requirements. All government permits, licenses and statutory approvals are either granted or in the process of being granted. No risk factors have been applied to the mining rates.

Financial modelling shows that Thunderbird will deliver average annual EBITDA of A\$135 million over LOM. The Project is expected to produce an average annual operating cash flow of A\$149 million. Revenue was based on an AUD:USD exchange rate of 0.74. Commodity pricing is described in the Revenue Factor section of the attached Appendix A.

The total pre-production capital required to build the Thunderbird Project has been estimated at A\$296M. The estimate covers the design and construction of the Project's mining and processing, supporting site infrastructure and off-site infrastructure such as an access road and port facilities at Derby. The capital cost of expansion from 12Mtpa to 18Mtpa throughput in year eight is A\$63.9M and will be met from operating cash flow.

### **Competent Person**

This Ore Reserve has been prepared by Mr. Per Scrimshaw, Entech Pty Ltd, after peer review of the mining section of the Pre-Feasibility Study. Other experts, being QG Pty Ltd, Robbins Engineering, *ecologia*, ATC Williams, Pennington Scott and Northwind have been relied on for information regarding Mineral Resources, Metallurgy & Process Design, environmental, geotechnical, and financial modelling.

ENDS

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## COMPLIANCE STATEMENTS

The information in this report that relates to Ore Reserves is based on information compiled by Mr Per Scrimshaw, who is a Competent Person and a Member of the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Scrimshaw is a consultant to Sheffield Resources Ltd and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken 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'. Mr Scrimshaw consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

## PREVIOUSLY REPORTED INFORMATION

This report includes information that relates to Mineral Resources and Pre-Feasibility Study results which were prepared and first disclosed under the JORC Code 2012. The information was extracted from the Company's previous ASX announcements as follows

- Thunderbird Pre-feasibility study update: *"PRE-FEASIBILITY STUDY UPDATE CONFIRMS THUNDERBIRD AS THE WORLD'S BEST UNDEVELOPED MINERAL SANDS PROJECT"* 14 October 2015
- Thunderbird High Grade Resource Update: *"THUNDERBIRD HIGH GRADE RESOURCE UPDATE"* 31 July 2015
- Thunderbird Pre-feasibility study: *"PRE-FEASIBILITY STUDY CONFIRMS THUNDERBIRD AS NEXT MAJOR MINERAL SANDS PROJECT IN GLOBAL DEVELOPMENT PIPELINE"* 14 May 2015

The Company confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and, in the case of reporting of Mineral Resources and results of Prefeasibility Studies that all material assumptions and technical parameters underpinning the estimates in the relevant market announcements continue to apply and have not materially changed. The Company confirms that the form and context in which any Competent Person's findings are presented have not been materially modified from the original market announcement.

## FORWARD LOOKING AND CAUTIONARY STATEMENTS

Some statements in this report regarding estimates or future events are forward-looking statements. They involve risk and uncertainties that could cause actual results to differ from estimated results. Forward-looking statements include, but are not limited to, statements concerning the Company's exploration programme, outlook, target sizes and mineralised material estimates. They include statements preceded by words such as "anticipated", "expected", "targeting", "likely", "scheduled", "intends", "potential", "prospective" and similar expressions.

## Appendix A - JORC 2012 Checklist of Assessment and Reporting Criteria

### Thunderbird Mineral Resource and Ore Reserve 2015

#### Section 1 Sampling Techniques and Data

Criteria	JORC Code explanation	Commentary
		<ul style="list-style-type: none"><li>This ore reserve is based entirely on previously released Mineral Resources (previously released details are available at <a href="http://www.sheffieldresources.com.au">www.sheffieldresources.com.au</a>). No new Mineral Resources or exploration results are being released.</li></ul>

#### Section 2 Reporting of Exploration Results

Criteria	JORC Code explanation	Commentary
		<ul style="list-style-type: none"><li>This ore reserve is based entirely on previously released Mineral Resources (previously released details are available at <a href="http://www.sheffieldresources.com.au">www.sheffieldresources.com.au</a>). No new exploration results are being released.</li></ul>

#### Section 3 Estimation and Reporting of Mineral Resources

Criteria	JORC Code explanation	Commentary
		<ul style="list-style-type: none"><li>This ore reserve is based entirely on previously released Mineral Resources (previously released details are available at <a href="http://www.sheffieldresources.com.au">www.sheffieldresources.com.au</a>). No new Mineral Resources are being released.</li></ul>



## Section 4 Estimation and Reporting of Ore Reserves

Criteria	JORC Code explanation	Commentary
<b>Mineral Resource estimate for conversion to Ore Reserves</b>	<ul style="list-style-type: none"> <li>• Description of the Mineral Resource estimate used as a basis for the conversion to an Ore Reserve.</li> <li>• Clear statement as to whether the Mineral Resources are reported additional to, or inclusive of, the Ore Reserves.</li> </ul>	<ul style="list-style-type: none"> <li>• This ore reserve is based entirely on the Measured and Indicated portion of the current reported Mineral Resources at Thunderbird (previously released details are available at <a href="http://www.sheffieldresources.com.au">www.sheffieldresources.com.au</a>).</li> <li>• Mineral Resources are reported inclusive of the Ore Reserves.</li> </ul>
<b>Site visits</b>	<ul style="list-style-type: none"> <li>• Comment on any site visits undertaken by the Competent Person and the outcome of those visits.</li> <li>• If no site visits have been undertaken indicate why this is the case.</li> </ul>	<ul style="list-style-type: none"> <li>• The competent person has not visited the site.</li> <li>• The competent person is comfortable relying on reports from other independent consultants who have visited site and other operations in the area respectively.</li> </ul>
<b>Study status</b>	<ul style="list-style-type: none"> <li>• The type and level of study undertaken to enable Mineral Resources to be converted to Ore Reserves.</li> <li>• The Code requires that a study to at least Pre-Feasibility Study level has been undertaken to convert Mineral Resources to Ore Reserves. Such studies will have been carried out and will have determined a mine plan that is technically achievable and economically viable, and that material Modifying Factors have been considered.</li> </ul>	<ul style="list-style-type: none"> <li>• The portion of the mining study supporting the Ore Reserves have been completed to a pre-feasibility level.</li> <li>• Modifying factors accurate to the study level have been applied. The resulting mine plan is technically achievable and economically viable.</li> </ul>
<b>Cut-off parameters</b>	<ul style="list-style-type: none"> <li>• The basis of the cut-off grade(s) or quality parameters applied.</li> </ul>	<ul style="list-style-type: none"> <li>• A cost/value model was formulated using Datamine software, applying cost, recovery and revenue parameters to the Resource model. Ore and waste discrimination is by maximum cashflow. Within the initial mining location (approx. 5 - 6 year pit design) the ore/waste interface is defined predominantly as the interface between the high grade and low grade mineralised domains.</li> </ul>
<b>Mining factors or assumptions</b>	<ul style="list-style-type: none"> <li>• The method and assumptions used as reported in the Pre-Feasibility or Feasibility Study to convert the Mineral Resource to an Ore Reserve (i.e. either by application of appropriate factors by optimisation or by preliminary or detailed design).</li> <li>• The choice, nature and appropriateness of the selected mining method(s) and other mining parameters including associated design issues such as pre-strip, access, etc.</li> <li>• The assumptions made regarding geotechnical parameters (e.g.</li> </ul>	<ul style="list-style-type: none"> <li>• Open pit optimisation studies were conducted using CAE NPVScheduler software to generate Lerch-Grossman shells. An initial high margin area was selected that provided an approximate 5-6 year production profile. Detailed design and scheduling was undertaken in this area including individual mining block definition and sequencing. Beyond this area optimisation shell and aggregated mine paths have been used to schedule the remaining project</li> </ul>

*pit slopes, stope sizes, etc.), grade control and pre-production drilling.*

- *The major assumptions made and Mineral Resource model used for pit and stope optimisation (if appropriate).*
- *The mining dilution factors used.*
- *The mining recovery factors used.*
- *Any minimum mining widths used.*
- *The manner in which Inferred Mineral Resources are utilised in mining studies and the sensitivity of the outcome to their inclusion.*
- *The infrastructure requirements of the selected mining methods.*

duration, constrained by proximity to anticipated WCP locations.

- Bulk mining techniques have been chosen, incorporating dozer traps and in-pit feed preparation units. Overburden and oversize waste will be excavated and transported using conventional earthmoving equipment. Following excavation and classification ore will be slurried and pumped to a nearby wet concentration plant.
- The selected mining method is considered appropriate to the large, relatively thick, and sheet-like characteristics of the host sand unit. Minimal pre-strip is required to access the orebody. The Life-of-Mine average strip ratio (waste: ore) is 0.67: 1.00.
- Independent consultants prepared the geotechnical analysis that forms the basis of pit design criteria including excavatability and trafficability.
- A mining recovery factor of 98% was applied. No mining dilution factor is applied due to the bulk, non-selective nature of the deposit and proposed mining method. Overburden mining takes place prior to exposing the underlying ore and is therefore a spatially discrete mining activity. Minimum mining width considerations are not applicable given the dimensions of the mining blocks guiding pit design. A 0.2m topsoil depth has been allowed for and recovered material excludes material designated as topsoil.
- Only minor Inferred Mineral Resource occurs within the mine design and the Ore Reserve is technically and economically viable without the inclusion of Inferred Mineral Resource.
- The following infrastructure will be required to support the mining method and is included in the PFS capital and operating cost estimate: Mining Units Plant "MUP", Wet Concentration Plant "WCP", Concentrate Upgrade Plant "CUP", Mineral Separation Plant "MSP", Low Temperature Roast Plant "LTR", site buildings, borefield, Power Station and power distribution infrastructure, new and

**Metallurgical factors or assumptions**

- *The metallurgical process proposed and the appropriateness of that process to the style of mineralisation.*
- *Whether the metallurgical process is well-tested technology or novel in nature.*
- *The nature, amount and representativeness of metallurgical test work undertaken, the nature of the metallurgical domaining applied and the corresponding metallurgical recovery factors applied.*
- *Any assumptions or allowances made for deleterious elements.*
- *The existence of any bulk sample or pilot scale test work and the degree to which such samples are considered representative of the orebody as a whole.*
- *For minerals that are defined by a specification, has the ore reserve estimation been based on the appropriate mineralogy to meet the specifications?*

upgraded roads, accommodation camp, upgraded materials handling at Derby Port.

- The metallurgical process was developed to a pre-feasibility level including the development of a flowsheet and capital and operating costs. The flowsheet consists of the following:
  - \* Feed Preparation Process “FPP”
  - \* Wet Concentration Process “WCP”
  - \* Concentrate Upgrade Process “CUP”
  - \* Mineral Separation Process “MSP”The developed process flow sheet is deemed appropriate for the style of mineralisation.
- The process stages are based on well understood conventional unit processes and has been developed using best in class full scale or scale-able equipment. There are no un-tested novel processes or equipment used within the flowsheet. Extensive test work has confirmed the process flowsheet is effective in achieving high recoveries from the ore.
- Extensive metallurgical processing test work has been completed on three bulk samples (comprising samples of 6.0 t, 5.0 t and 12.5 t). Overall Recovery Factors derived from the metallurgical test work as applied are:
  - \* Zircon 67%
  - \* LTR Ilmenite 68%
  - \* Primary Ilmenite 74%
  - \* HiTi88 40%
- Products produced from metallurgical test work, all meet typical market requirements and no assumptions regarding product quality or deleterious elements have been made.
- Three bulk sample test programs on 6.0 t, 5.0 t and 12.5 t have been completed, with the outcomes from these test programs forming the metallurgical basis for the pre-feasibility study.

	<ul style="list-style-type: none"> <li>Characterisation of head samples, intermediate samples and final products to determine mineralogy has been based on the same process as applied for the drill sample analyses. This method includes oversize determination, slimes determination, heavy mineral determination, magnetic fractionation of heavy mineral and XRF/QEMSCAN analyses on resultant fractions.</li> <li>Mineral characterization data derived from bulk sample data is aligned with mineral characterization data derived from drill sample data. As such bulk samples tested are aligned with domain data associated with bulk sample origin and are representative of the orebody.</li> <li>Final product analyses are based on XRF analyses and detailed QEMSCAN analyses which is the same as for the ore reserve</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li><i>The status of studies of potential environmental impacts of the mining and processing operation. Details of waste rock characterisation and the consideration of potential sites, status of design options considered and, where applicable, the status of approvals for process residue storage and waste dumps should be reported.</i></li> <li>Level 1 and 2 biological surveys have been completed, and following a referral document with the EPA, the project will be assessed at the PER level. Tailings Co-disposal tests have been completed with no adverse findings.</li> </ul>
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li><i>The existence of appropriate infrastructure: availability of land for plant development, power, water, transportation (particularly for bulk commodities), labour, accommodation; or the ease with which the infrastructure can be provided, or accessed.</i></li> <li>The site is located 98 km northeast of Broome and 72 km west of Derby in Western Australia. There is currently no substantial on-site infrastructure, and the PFS study estimates the costs for the development of all necessary infrastructure items.</li> </ul>
<b>Costs</b>	<ul style="list-style-type: none"> <li><i>The derivation of, or assumptions made, regarding projected capital costs in the study.</i></li> <li><i>The methodology used to estimate operating costs.</i></li> <li><i>Allowances made for the content of deleterious elements.</i></li> <li><i>The source of exchange rates used in the study.</i></li> <li><i>Derivation of transportation charges.</i></li> <li><i>The basis for forecasting or source of treatment and refining charges, penalties for failure to meet specification, etc.</i></li> <li><i>The allowances made for royalties payable, both Government and private.</i></li> <li>Central to the development of the Processing Plant Capital Cost estimate was the completion of preliminary PFDs, mechanical equipment lists, plant layouts and an overall mine site layout which was sufficient to define plant and equipment scope and sizing. This data was then considered during the preparation of preliminary Material Take-Off (MTO) lists. Direct processing plant capital estimates are based on a mixture of estimating methods such as the fielding of selected Request for Quotations (RFQs), recent historical pricing (i.e.; &lt;15 months old), factored cost estimates and the input of applied rates for off-shore fabrication of steelwork and</li> </ul>

platework (applied to MTO lists). Major plant equipment costs are based on the fielding of selected RFQs and recent historical pricing (i.e.; <12 months old). Installation costs are based on factored cost estimates, then compared with similar known costs as a check measure. Indirect costs have been built up based on factored cost estimates, then compared with similar known costs as a check measure.

- Capital costs for the Stage 2 upgrade were estimated by Northwind by scaling Robbins' pre-production capital estimate equipment lists appropriate to the increases in materials flows for the upgrade, and then applying Robbins' equipment pricing, and factors for installation and indirect costs.
- Mining operating costs were largely sourced from quotations provided by mining contractors and first principles estimations by independent consultants.
- Central to the development of the Processing Plant Operating Costs was the completion of pump calculations (to assess power demand), Mechanical Equipment lists (to assess power demand), manning schedules (to assess operating labour), mobile equipment and duty schedules (to assess fuel demand) and supporting calculations for all other consumables (such as coal, LNG, flocculants etc.). Processing Operating Costs unit factors were based on independent investigations or recent historical pricing (i.e. <12 months old).
- General and administration operating costs were built up on a first principles basis from manning schedules, labour work rosters (FIFO and DIDO), quotations for air travel and supply and operation of on-site camp facilities, light vehicle and mobile equipment requirements and associated leasing and running costs and other administration-related fixed costs such as communications, IT, consultants, recruitment, annual tenement costs and the like.
- The product price has been assigned based on its full expected elemental makeup including all revenue drivers and deleterious components.

	<ul style="list-style-type: none"> <li>• An A\$/US\$ exchange rate of US\$0.74 is assumed for the life of mine, based on Consensus forecasts.</li> <li>• All infrastructure components and consumables are assumed delivered to site at estimated road haulage rates. Product is considered sold FOB.</li> <li>• There are no TC/RC charges applicable, and minerals are sold as finished products.</li> <li>• Appropriate allowance has been made for Western Australian State royalties. No allowances have been made for possible access payments or royalties that may be payable to Traditional Owners pending the conclusion of negotiations. Permitting discussions are not yet at a stage to enable estimation of likely contributions to the State's Mine Rehabilitation Fund.</li> </ul>
<p><b>Revenue factors</b></p> <ul style="list-style-type: none"> <li>• <i>The derivation of, or assumptions made regarding revenue factors including head grade, metal or commodity price(s) exchange rates, transportation and treatment charges, penalties, net smelter returns, etc.</i></li> <li>• <i>The derivation of assumptions made of metal or commodity price(s), for the principal metals, minerals and co-products.</i></li> </ul>	<ul style="list-style-type: none"> <li>• The revenue is a function of block modelled grade and mineral assemblage, modelled comprehensively through the mining, mineral processing and transportation chain where it is expected to be delivered to an offtaker at a forecast price.</li> <li>• The mine planning underpinning the Ore Reserves was conducted using preliminary product pricing that was suitable for block model coding and mine design. In the final financial analysis, revenue from Ore deliveries were then recalculated using an updated pricing model. The Ore Reserves are feasible and economic under both pricing schedules</li> <li>• Prices for products are based on a combination of industry sources, and market evaluations of quality by external consultants TZMI and Ruidow Information Technology Pty Ltd, and are assumed fixed over the life of mine and on a FOB basis: <ul style="list-style-type: none"> <li>○ IDP Ilmenite \$US 136 per tonne</li> <li>○ LTR Ilmenite \$US 185 per tonne</li> <li>○ HiTi 80 leucoxene \$US 700 per tonne</li> <li>○ Primary Zircon \$US 1371 per tonne</li> <li>○ Secondary Zircon \$US 1028 per tonne</li> <li>○ Special Zircon \$US 823 per tonne</li> </ul> </li> </ul>
<p><b>Market</b></p> <ul style="list-style-type: none"> <li>• <i>The demand, supply and stock situation for the particular commodity, consumption trends and factors likely to affect supply</i></li> </ul>	<ul style="list-style-type: none"> <li>• Market analysis commissioned for SFX suggests long term demand growing at between 2 and 5%</li> </ul>

<p><b>assessment</b></p>	<p><i>and demand into the future.</i></p> <ul style="list-style-type: none"> <li>• <i>A customer and competitor analysis along with the identification of likely market windows for the product.</i></li> <li>• <i>Price and volume forecasts and the basis for these forecasts.</i></li> <li>• <i>For industrial minerals the customer specification, testing and acceptance requirements prior to a supply contract.</i></li> </ul>	<p>CAGR and surpluses for ilmenite and zircon post 2019-2020.</p> <ul style="list-style-type: none"> <li>• Market analysis commissioned for SFX suggests zircon is largely of premium quality suitable for the ceramic market. Upgraded Ilmenite should command a premium in the sulfate ilmenite market and is an ideal chloride slag feedstock. HiTi is expected to be sold into the welding rod market.</li> <li>• SFX forecasts average annual production of 382,000 tonnes of high grade sulphate ilmenite, 100,000 tonnes of zircon and 26,000 tonnes of HiTi 80 leucoxene. This forecast is based on a mining and processing schedule ramping up to a steady state annual ore production of 18 Mt.</li> <li>• TZMI have reviewed the proposed product specifications of the Thunderbird ilmenite, zircon and HiTi and have verified that they will meet various market uses and typical specifications required for those markets.</li> </ul>
<p><b>Economic</b></p>	<ul style="list-style-type: none"> <li>• <i>The inputs to the economic analysis to produce the net present value (NPV) in the study, the source and confidence of these economic inputs including estimated inflation, discount rate, etc.</i></li> <li>• <i>NPV ranges and sensitivity to variations in the significant assumptions and inputs.</i></li> </ul>	<ul style="list-style-type: none"> <li>• For the purpose of estimating an Ore Reserve, an NPV was estimated at a discount rate of 10%. The confidence in the inputs is consistent with a pre-feasibility level of study. The project has a positive NPV.</li> <li>• Financial outcomes of the pre-feasibility study were stress tested by varying revenue and cost factors. The Ore Reserve was cash flow positive for revenue factors less than 55% of those assumed in the base case and for operating costs greater than 185% of those assumed in the base case.</li> </ul>
<p><b>Social</b></p>	<ul style="list-style-type: none"> <li>• <i>The status of agreements with key stakeholders and matters leading to social licence to operate.</i></li> </ul>	<ul style="list-style-type: none"> <li>• Engagement with key stakeholders, including Traditional Owners, pastoralists and government agencies, has been ongoing and will continue in parallel with further technical studies and approvals processes.</li> </ul>
<p><b>Other</b></p>	<ul style="list-style-type: none"> <li>• <i>To the extent relevant, the impact of the following on the project and/or on the estimation and classification of the Ore Reserves:</i></li> <li>• <i>Any identified material naturally occurring risks.</i></li> <li>• <i>The status of material legal agreements and marketing arrangements.</i></li> </ul>	<ul style="list-style-type: none"> <li>• All naturally occurring risks are assumed to have adequate prospects for control and mitigation.</li> <li>• There are no material agreements and/or marketing arrangements currently in place.</li> <li>• Exploration Licence E04/2083 is the primary</li> </ul>

	<ul style="list-style-type: none"> <li>• <i>The status of governmental agreements and approvals critical to the viability of the project, such as mineral tenement status, and government and statutory approvals. There must be reasonable grounds to expect that all necessary Government approvals will be received within the timeframes anticipated in the Pre-Feasibility or Feasibility study. Highlight and discuss the materiality of any unresolved matter that is dependent on a third party on which extraction of the reserve is contingent.</i></li> </ul>	<p>tenement. Sheffield has applied for Mining Lease M04/459 over the Thunderbird deposit, and Miscellaneous Licences L04/82, L04/83, L04/84, L04/85 and L04/86 to cover ancillary infrastructure. There are no grounds to believe that remaining required approvals will not be successfully granted.</p>
<b>Classification</b>	<ul style="list-style-type: none"> <li>• <i>The basis for the classification of the Ore Reserves into varying confidence categories.</i></li> <li>• <i>Whether the result appropriately reflects the Competent Person's view of the deposit.</i></li> <li>• <i>The proportion of Probable Ore Reserves that have been derived from Measured Mineral Resources (if any).</i></li> </ul>	<ul style="list-style-type: none"> <li>• The Proved and Probable Ore Reserve is based on that portion of the Measured and Indicated Mineral Resources within the mine designs that may be economically extracted.</li> <li>• The result appropriately reflects the Competent Persons view of the deposit.</li> <li>• None of the Probable Ore Reserves have been derived from Measured Mineral Resource.</li> </ul>
<b>Audits or reviews</b>	<ul style="list-style-type: none"> <li>• <i>The results of any audits or reviews of Ore Reserve estimates.</i></li> </ul>	<ul style="list-style-type: none"> <li>• This Ore Reserve has been prepared by Mr Per Scrimshaw, Entech Pty Ltd, after peer review of the mining section of the Pre-Feasibility Study. Other experts, being Quantitative Geoscience, Robbins Engineering, Ecologia, ATC Williams, Pennington Scott and Northwind have been relied on for information regarding Mineral Resources, Metallurgy &amp; Process Design, environmental, geotechnical, and financial modelling.</li> <li>• GR Engineering Services conducted an external review of the engineering and mining aspects of the Pre-Feasibility Study and concluded that the capital and operating cost estimate were within the stated limits of study accuracy and that the mining method was technically viable.</li> <li>• SRK consulting completed an external review of the metallurgical process development test work and concluded that was sound, credible and technically viable.</li> </ul>
<b>Discussion of relative accuracy/confidence</b>	<ul style="list-style-type: none"> <li>• <i>Where appropriate a statement of the relative accuracy and confidence level in the Ore Reserve estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the reserve within stated confidence limits, or, if such an approach is not deemed</i></li> </ul>	<ul style="list-style-type: none"> <li>• This Ore Reserve is attributed a confidence classification of "Proved" and "Probable" Ore Reserve. There is a degree of uncertainty associated with the Mineral Resource estimate and the modifying factors.</li> </ul>

*appropriate, a qualitative discussion of the factors which could affect the relative accuracy and confidence of the estimate.*

- *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.*
- *Accuracy and confidence discussions should extend to specific discussions of any applied Modifying Factors that may have a material impact on Ore Reserve viability, or for which there are remaining areas of uncertainty at the current study stage.*
- *It is recognised that this may not be possible or appropriate in all circumstances. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.*

- Overall accuracy of the cost estimate is considered to be +/- 25%
- Stress testing of operating cashflow shows this remains positive well beyond the stated accuracy of the cost estimates.
- No production data is available against which the Ore Reserve estimates may be reconciled.

## Appendix B: Thunderbird Deposit Mineral Resource 31 July 2015

Table 1: Thunderbird Deposit Mineral Resource Summary

Resource Category	Cut-off HM%	Mineral Resources		Valuable HM Grade (In-situ)			
		Material Million Tonnes	HM %	Zircon %	HiTi Leucoxene %	Leucoxene %	Ilmenite %
Measured	3.0	230	9.4	0.74	0.21	0.20	2.5
Indicated	3.0	2,410	6.9	0.58	0.19	0.22	1.9
Inferred	3.0	600	5.6	0.47	0.16	0.20	1.5
<b>Total</b>	<b>3.0</b>	<b>3,240</b>	<b>6.9</b>	<b>0.57</b>	<b>0.18</b>	<b>0.21</b>	<b>1.9</b>
Measured	7.5	110	14.9	1.09	0.31	0.28	4.0
Indicated	7.5	850	11.8	0.90	0.28	0.25	3.3
Inferred	7.5	130	10.7	0.82	0.25	0.23	3.0
<b>Total</b>	<b>7.5</b>	<b>1,090</b>	<b>11.9</b>	<b>0.91</b>	<b>0.28</b>	<b>0.25</b>	<b>3.3</b>

Table 2: Thunderbird Deposit Mineral Resource

Resource Category	Cut off (HM%)	Mineral Resources					In-situ HM (Mt)	Mineral Assemblage			
		Material (Mt)	Bulk Density	HM %	Slimes %	Osize %		Zircon %	HiTi Leuc %	Leuc %	Ilmenite %
Measured	3.0	230	2.1	9.4	19	10	21	7.9	2.2	2.1	27
Indicated	3.0	2,410	2.0	6.9	16	8	167	8.4	2.7	3.1	28
Inferred	3.0	600	2.0	5.6	16	9	33	8.4	2.8	3.5	28
<b>Total</b>	<b>3.0</b>	<b>3,240</b>	<b>2.1</b>	<b>6.9</b>	<b>16</b>	<b>9</b>	<b>222</b>	<b>8.3</b>	<b>2.7</b>	<b>3.1</b>	<b>28</b>
Measured	7.5	110	2.2	14.9	17	13	16	7.3	2.1	1.9	27
Indicated	7.5	850	2.1	11.8	15	10	100	7.6	2.4	2.2	28
Inferred	7.5	130	2.0	10.7	14	9	14	7.6	2.3	2.2	28
<b>Total</b>	<b>7.5</b>	<b>1,090</b>	<b>2.1</b>	<b>11.9</b>	<b>15</b>	<b>10</b>	<b>131</b>	<b>7.6</b>	<b>2.3</b>	<b>2.1</b>	<b>28</b>

**Table 3: Thunderbird Deposit Contained Valuable HM (VHM) Resource Inventory**

Resource Category	Cut off (HM%)	Zircon (kt)	HiTi Leucoxene (kt)	Leucoxene (kt)	Ilmenite (kt)	Total VHM (kt)
Measured	3.0	1,700	500	500	5,800	8,400
Indicated	3.0	14,000	4,500	5,300	46,700	70,500
Inferred	3.0	2,800	900	1,200	9,300	14,200
<b>Total</b>	<b>3.0</b>	<b>18,500</b>	<b>5,900</b>	<b>6,900</b>	<b>61,800</b>	<b>93,100</b>
Measured	7.5	1,200	300	300	4,300	6,100
Indicated	7.5	7,700	2,400	2,200	27,800	40,000
Inferred	7.5	1,100	300	300	3,900	5,700
<b>Total</b>	<b>7.5</b>	<b>9,900</b>	<b>3,000</b>	<b>2,800</b>	<b>36,000</b>	<b>51,700</b>

All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus sum of columns may not equal. The in-situ grade in Table 1 is determined by multiplying the percentage of HM by the percentage of each valuable heavy mineral within the heavy mineral assemblage at the resource block model scale. Estimates of Mineral Assemblage in Table 2 are presented as percentages of the Heavy Mineral (HM) component of the deposit, as determined by magnetic separation, QEMSCAN and XRF. Magnetic fractions were analysed by QEMSCAN for mineral determination as follows: Ilmenite: 40-70% TiO<sub>2</sub> >90% Liberation; Leucoxene: 70-94% TiO<sub>2</sub> >90% Liberation; High Titanium Leucoxene (HiTi Leucoxene): >94% TiO<sub>2</sub> >90% Liberation; and Zircon: 66.7% ZrO<sub>2</sub>+HfO<sub>2</sub> >90% Liberation. The non-magnetic fraction was submitted for XRF analysis and minerals determined as follows: Zircon: ZrO<sub>2</sub>+HfO<sub>2</sub>/0.667 and High Titanium Leucoxene (HiTi Leucoxene): TiO<sub>2</sub>/0.94. Information in Tables 1 and 2 is used to calculate values in Table 3.

## ABOUT SHEFFIELD RESOURCES

Sheffield Resources Limited (Sheffield) is focused on developing its 100% owned, world class Thunderbird Mineral Sands Project, located near Derby in Western Australia.

ASX Code:	SFX	Market Cap @ 37cps:	\$54.4m
Issued shares:	147.0m	Cash:	\$8m (approx.)

## THUNDERBIRD MINERAL SANDS

Thunderbird is one of the largest and highest grade mineral sands discoveries in the last 30 years.

The deposit is rich in zircon, which sets it apart from many of the world's operating and undeveloped mineral sands projects which are dominated by lower value ilmenite.

Sheffield's Pre-feasibility study shows Thunderbird is a modest capex project that generates strong cash margins from globally significant levels of production over a 40 year mine life.

The Company is targeting project construction commencing 2017 and initial production in 2019. The initial planned production profile is aligned with expected emerging supply gaps in global mineral sands markets.

## NICKEL-COPPER

Sheffield has over 1,900km<sup>2</sup> of 100% owned tenure in the Fraser Range region of Western Australia, including the Red Bull project which is within 20km of the Nova Ni-Cu deposit. The Company is exploring the region for magmatic nickel deposits similar to Nova.