

## ORE RESERVE AND MINERAL RESOURCE STATEMENT

Sheffield's inventory of Mineral Resource and Ore Reserve comprises;

- **Thunderbird Ore Reserve** of 680.5 million tonnes @ 11.3% HM (Proved and Probable) (refer to ASX announcement 16 March 2017).
- **Thunderbird Mineral Resource** of 3.23 billion tonnes @ 6.9% HM above a 3% HM cut-off (Measured, Indicated and Inferred) (refer to ASX announcement 5 July 2016).
- **Eneabba Project Mineral Resource** of 193.3 million tonnes @ 3.0% HM above a variable HM cut-off (Measured, Indicated and Inferred) (refer to this announcement).
- **McCalls Project Mineral Resource** of 5.8 billion tonnes @ 1.4% HM above a 1.1% HM cut-off (Indicated and Inferred) (refer to this announcement).

A summary of Sheffield's Mineral Resource and Ore Reserve Inventory as at 1 October 2018 is given below. (refer to ASX announcement 3 October 2018 for further details)

## SHEFFIELD HM ORE RESERVE

### 1) DAMPIER PROJECT

#### SHEFFIELD ORE RESERVE FOR DAMPIER PROJECT AT 01 OCTOBER 2018 (in-situ assemblage)

Summary of Ore Reserve <sup>1,2,3,4</sup>				In-situ Assemblage <sup>5</sup>					
Deposit	Ore Reserve Category	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	HiTi Leuc (%)	Leuco-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
Thunderbird	Proved	235.8	13.3	1.00	0.29	0.26	3.55	13.7	16.5
	Probable	444.8	10.2	0.80	0.26	0.26	2.85	11.0	15.2
Total		680.5	11.3	0.87	0.27	0.26	3.10	12.0	15.7

#### SHEFFIELD ORE RESERVE FOR DAMPIER PROJECT AT 01 OCTOBER 2018 (HM assemblage)

Summary of Ore Reserve <sup>1,2,3,4</sup>				HM Assemblage <sup>6</sup>					
Deposit	Ore Reserve Category	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	HiTi Leuc (%)	Leuco-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
Thunderbird	Proved	235.8	13.3	7.5	2.2	1.9	26.7	13.7	16.5
	Probable	444.8	10.2	7.8	2.5	2.6	28.0	11.0	15.2
Total		680.5	11.3	7.7	2.4	2.3	27.4	12.0	15.7

Notes:

<sup>1</sup>The Ore Reserve estimate was prepared by Entech Pty Ltd and first disclosed under the JORC Code (2012), refer to ASX announcement 16 March 2017 for further details including Table 1. 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>Ore Reserve is a sub-set of Mineral Resource

<sup>3</sup>THM is within the 38µm to 1 mm size fraction and reported as a percentage of the total material, slimes is the -38µm fraction and oversize is the +1mm fraction.

<sup>4</sup>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.

<sup>5</sup>The in-situ assemblage grade 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.

<sup>6</sup>Mineral Assemblage is reported as a percentage of HM Grade, it is derived by dividing the in-situ grade by the HM grade.

The Ore Reserve estimate was prepared by Entech Pty Ltd, an experienced and prominent mining engineering consultancy with appropriate mineral sands experience in accordance with the JORC Code (2012 Edition) and announced to the ASX on 16 March 2017. The Ore Reserve is estimated using all available geological and relevant drill hole and assay data, including mineralogical sampling and test work on mineral recoveries and final product qualities. The Company is not aware of any new information or data that materially affects the information included in the Ore Reserve estimate and confirms that all material assumptions and technical parameters underpinning the estimate continue to apply and have not materially changed. The Ore Reserve estimate is based on the current, July 2016 Thunderbird Mineral Resource estimate, announced to the ASX on 5 July 2016. Measured and Indicated Mineral Resources were converted to Proved and Probable Ore Reserves respectively, subject to mine design, modifying factors and economic evaluation.



Figure 1: Location of Sheffield's Mineral Sands Projects

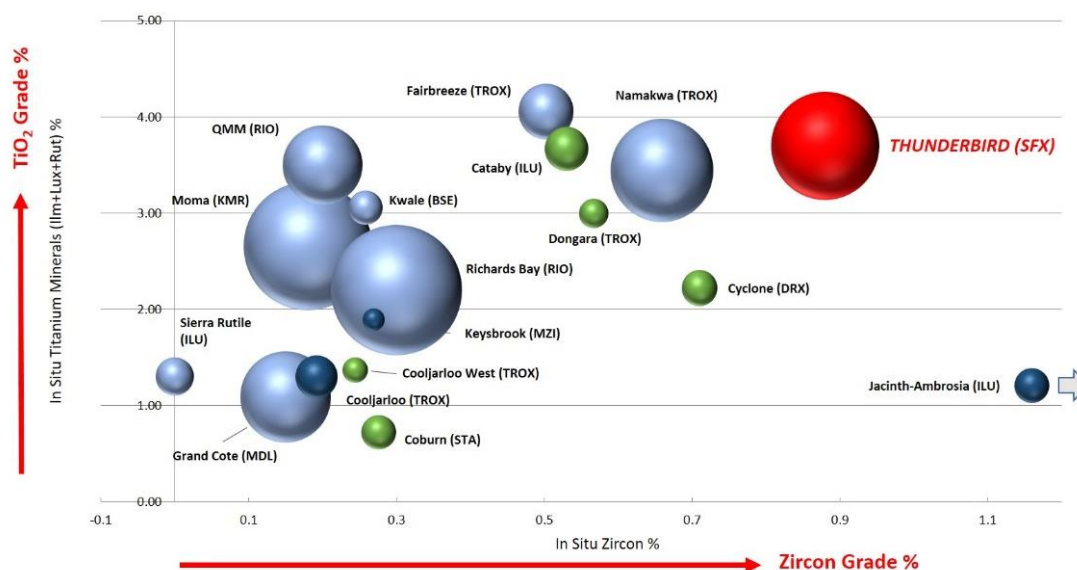


Figure 2: Thunderbird Ore Reserve<sup>1</sup> ranked against published Ore Reserves of current mineral sands operations and projects under investigation globally

<sup>1</sup>Thunderbird Ore Reserve as published on the ASX on 16 March 2017. Thunderbird Ore Reserve ranked against published Ore Reserves of current mineral sands operations and projects under investigation globally. Blue bubbles are operating mines, green bubbles are Ore Reserves reported, but projects are not operating. Light blue bubbles represent operating African mines' Ore Reserves. Bubble size proportional to tonnes of contained VHMs. Only Ore Reserves > 1.2Mt contained VHMs shown. Data compiled by Sheffield from public sources. This analysis does not illustrate the variance in product value between rutile, leucoxene and ilmenite.

## SHEFFIELD HM MINERAL RESOURCE

### 1) DAMPIER PROJECT

#### SHEFFIELD MINERAL RESOURCE FOR DAMPIER PROJECT AT 01 OCTOBER 2018 (in-situ assemblage)

Summary of Mineral Resource <sup>1,2,3</sup>					In-situ Assemblage <sup>5</sup>					
Deposit	Mineral Resource Category	Cut off (THM%)	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	HiTi Leuc (%)	Leuco-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
Thunderbird	Measured	3.0	510	8.9	0.71	0.20	0.19	2.4	12	18
	Indicated	3.0	2,120	6.6	0.55	0.18	0.20	1.8	9	16
	Inferred	3.0	600	6.3	0.53	0.17	0.20	1.7	8	15
	<b>Total</b>	3.0	3,230	6.9	0.57	0.18	0.20	1.9	9	16
Thunderbird	Measured	7.5	220	14.5	1.07	0.31	0.27	3.9	15	16
	Indicated	7.5	640	11.8	0.90	0.28	0.25	3.3	11	14
	Inferred	7.5	180	10.8	0.87	0.27	0.26	3.0	9	13
	<b>Total</b>	7.5	1,050	12.2	0.93	0.28	0.26	3.3	11	15

#### SHEFFIELD MINERAL RESOURCES FOR DAMPIER PROJECT AT 01 OCTOBER 2018 (HM assemblage)

Summary of Mineral Resource <sup>1,2,3</sup>					HM Assemblage <sup>4</sup>					
Deposit	Mineral Resource Category	Cut off (THM%)	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	HiTi Leuc (%)	Leuco-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
Thunderbird	Measured	3.0	510	8.9	8.0	2.3	2.2	27	12	18
	Indicated	3.0	2,120	6.6	8.4	2.7	3.1	28	9	16
	Inferred	3.0	600	6.3	8.4	2.6	3.2	28	8	15
	<b>Total</b>	3.0	3,230	6.9	8.3	2.6	2.9	28	9	16
Thunderbird	Measured	7.5	220	14.5	7.4	2.1	1.9	27	15	16
	Indicated	7.5	640	11.8	7.6	2.4	2.1	28	11	14
	Inferred	7.5	180	10.8	8.0	2.5	2.4	28	9	13
	<b>Total</b>	7.5	1,050	12.2	7.6	2.3	2.1	27	11	15

Notes:

<sup>1</sup>The Mineral Resource estimate was prepared by Optiro Pty Ltd and first disclosed under the JORC Code (2012) refer to ASX announcement 5 July 2016 for further details including Table 1. The Dampier Project 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.

<sup>2</sup> THM is within the 38µm to 1mm size fraction and reported as a percentage of the total material, slimes is the <38µm fraction and oversize is the >1mm fraction.

<sup>3</sup>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.

<sup>4</sup>Estimates of Mineral Assemblage 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; Leuco-xene: 70-94% TiO<sub>2</sub> >90% Liberation; High Titanium Leuco-xene (HiTi Leuco-xene): >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 Leuco-xene (HiTi Leuco-xene): TiO<sub>2</sub>/0.94.

<sup>5</sup>The in-situ assemblage grade 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.

**SHEFFIELD MINERAL RESOURCE FOR THUNDERBIRD PROJECT AT 01 OCTOBER 2018 (in-situ tonnes)**

Summary of Mineral Resource <sup>1,2,3</sup>			In-situ Tonnes <sup>4</sup>					
Deposit	Mineral Resource Category	Cut off (THM%)	THM Tonnes Millions (Mt)	Zircon (kt)	HiTi Leuc (kt)	Leuco-xene (kt)	Ilmenite (kt)	Total VHM (kt)
Thunderbird	Measured	3.0	45	3,600	1,000	1,000	12,000	17,700
	Indicated	3.0	140	11,800	3,800	4,300	39,100	59,000
	Inferred	3.0	38	3,200	1,000	1,200	10,500	15,900
	<b>Total</b>	<b>3.0</b>	<b>223</b>	<b>18,600</b>	<b>5,900</b>	<b>6,500</b>	<b>61,700</b>	<b>92,600</b>
Thunderbird	Measured	7.5	32	2,300	700	600	8,400	12,000
	Indicated	7.5	76	5,800	1,800	1,600	21,000	30,200
	Inferred	7.5	20	1,600	500	500	5,600	8,200
	<b>Total</b>	<b>7.5</b>	<b>127</b>	<b>9,700</b>	<b>3,000</b>	<b>2,700</b>	<b>35,000</b>	<b>50,400</b>

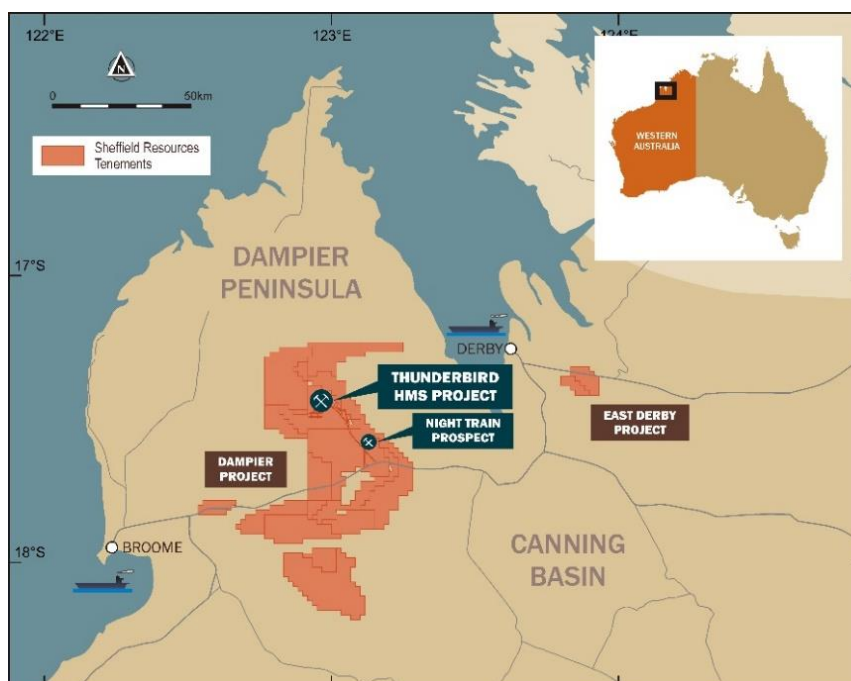
**Notes:**

<sup>1</sup>The Mineral Resource estimate was prepared by Optiro Pty Ltd and first disclosed under the JORC Code (2012) refer to ASX announcement 5 July 2016 for further details including Table 1. The Dampier Project 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.

<sup>2</sup> THM is within the 38µm to 1mm size fraction and reported as a percentage of the total material, slimes is the -38µm fraction and oversize is the +1mm fraction.

<sup>3</sup>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.

<sup>4</sup>The contained in-situ tonnes for the valuable heavy minerals were derived from information from the Mineral Resource tables



**Figure 3: Location of Thunderbird, East Derby and Dampier Mineral Sands Project**



**Figure 4: Drilling at the Thunderbird Mineral Sands Project**



## 2) ENEABBA PROJECT

### SHEFFIELD MINERAL RESOURCES FOR THE ENEABBA PROJECT AT 01 OCTOBER 2018 (in-situ assemblage)

Summary of Mineral Resource <sup>1,2</sup>					In-situ Assemblage <sup>11</sup>					
Deposit	Mineral Resource Category	Cut off (THM %)	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	Rutile (%)	Leuco-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
Yandanooka <sup>4,6,8</sup>	Measured	1.4	2.6	4.3	0.44	0.09	0.10	3.08	11.3	15
	Indicated	1.4	57.7	3.0	0.37	0.11	0.11	2.08	11.4	15
	Inferred	1.4	0.4	1.5	0.16	0.05	0.07	1.01	21.9	20
	<b>Total</b>	1.4	60.8	3.0	0.37	0.11	0.11	2.11	11.5	15
Durack <sup>4,6,7,8</sup>	Indicated	1.4	20.7	2.9	0.40	0.09	0.11	2.07	14.7	14
	Inferred	1.4	5.6	2.6	0.37	0.07	0.19	1.68	18.3	16
	<b>Total</b>	1.4	26.3	2.8	0.39	0.08	0.13	1.99	15.5	14
Drummond Crossing <sup>3,4, 6,8</sup>	Indicated	1.4	35.5	2.4	0.33	0.24	0.08	1.26	7.7	14
	Inferred	1.4	3.3	2.3	0.26	0.21	0.06	1.31	7.2	12
	<b>Total</b>	1.4	38.8	2.4	0.33	0.24	0.08	1.26	7.7	14
Robbs Cross <sup>5,6,8</sup>	Indicated	1.4	14.0	1.9	0.27	0.24	0.09	0.88	6.2	6
	Inferred	1.4	3.8	2.0	0.29	0.22	0.08	1.02	8.1	6
	<b>Total</b>	1.4	17.8	1.9	0.28	0.23	0.09	0.91	6.6	6
Thomson <sup>5,8</sup>	Inferred	1.4	26	2.0	0.38	0.28	0.11	0.85	6.9	18
	<b>Total</b>	1.4	26	2.0	0.38	0.28	0.11	0.85	6.9	18
West Mine North <sup>3,4,6,9</sup>	Indicated	2.0	10.2	7.3	0.43	0.48	0.13	3.51	2.3	11
	Inferred	2.0	1.8	2.7	0.25	0.23	0.06	1.31	3.0	17
	<b>Total</b>	2.0	12.0	6.6	0.40	0.44	0.12	3.18	2.4	12
Ellengail <sup>3,4,9,10</sup>	Indicated	2.0	6.5	5.3	0.53	0.43	0.55	3.49	3.2	15
	Inferred	2.0	5.3	4.1	0.41	0.34	0.35	2.55	2.5	15
	<b>Total</b>	2.0	11.8	4.8	0.47	0.39	0.46	3.07	2.9	15
Total	Measured	1.4	2.6	4.3	0.44	0.09	0.10	3.08	11	15
	Indicated	Various	144.6	3.1	0.37	0.19	0.12	1.92	9	14
	Inferred	Various	46.0	2.4	0.36	0.24	0.14	1.21	8	16
	<b>Total</b>	Various	193.3	3.0	0.36	0.20	0.13	1.77	9	14

<sup>1</sup>The Mineral Resource estimates were prepared by Optiro Pty Ltd and first disclosed under the JORC Code (2012) refer to this ASX announcement and December 2017 Quarterly Activities Report for Robbs Cross and Thomson deposits for further details

<sup>2</sup>All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus the sums of columns may not equal.

<sup>3</sup>THM %: Samples from 1989 and 1996 (Drummond Crossing, Ellengail and West Mine North) were analysed using a -75 µm slimes / +2 mm oversize screen. Separation of HM% was by heavy liquid TBE (density 2.84 g/ml) from the -710µm+75µm fraction.

<sup>4</sup>THM %: RGC samples from 1998 and Iluka samples (Drummond Crossing, Durack, Ellengail, West Mine North and Yandanooka) were analysed using a -53 µm slimes / +2 mm oversize screen. Separation of total HM% was by heavy liquid TBE (density 2.90 g/ml) from the -710µm+53µm fraction.

<sup>5</sup>THM %: Samples from Robbs Cross and Thomson analysed by Diamantina Laboratories in Perth using a -45 µm slimes / +1 mm oversize screen (method DIA\_HLS\_45µm\_1mm). Separation of total HM% was by heavy liquid TBE (density 2.96g/ml) from the -45 µm+1mm fraction.

<sup>6</sup>THM %: Samples from Drummond Crossing, Durack, West Mine North and Yandanooka were analysed by Western Geolabs in Perth using a -53 µm slimes / +1 mm oversize screen. Separation of total HM% was by heavy liquid TBE (density 2.96 g/ml) from the +53µm-1mm fraction.

<sup>7</sup>Reported below an upper cut-off grade of 35% slimes.

<sup>8</sup>Estimates of mineral assemblage are presented as percentages of the total heavy mineral (THM) component of the deposit, as determined by QEMSCAN analysis. For the TiO<sub>2</sub> minerals specific breakpoints are used to distinguish between rutile (>95% TiO<sub>2</sub>), leucocoxene (85-95% TiO<sub>2</sub>) and ilmenite (<55-85% TiO<sub>2</sub>).

<sup>9</sup>At West Mine North and Ellengail mineral assemblage data determined by Iluka using Method 4 (HMC is separated into magnetics and non-magnetics) was used with the Sheffield QEMSCAN data

<sup>10</sup>At Ellengail mineral assemblage data determined by Iluka using Method 3 (magnetic separation and XRF analysis) was used with the Sheffield QEMSCAN data and Iluka Method 4 data

<sup>11</sup>The in-situ assemblage grade 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.



SHEFFIELD MINERAL RESOURCE FOR ENEABBA PROJECT AT 01 OCTOBER 2018 (HM assemblage)

Summary of Mineral Resource <sup>1,2</sup>					HM Assemblage <sup>8,9,10</sup>					
Deposit	Mineral Resource Category	Cut off (THM %)	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	Rutile (%)	Leuc-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
Yandanooka <sup>4,6,8</sup>	Measured	1.4	2.6	4.3	10	2.1	2.3	72	11.3	15
	Indicated	1.4	57.7	3.0	12	3.6	3.7	69	11.4	15
	Inferred	1.4	0.4	1.5	11	3.0	4.4	68	21.9	20
	<b>Total</b>	1.4	60.8	3.0	12	3.5	3.6	70	11.5	15
Durack <sup>4,6,7,8</sup>	Indicated	1.4	20.7	2.9	14	2.9	3.7	71	14.7	14
	Inferred	1.4	5.6	2.6	14	2.6	7.4	64	18.3	16
	<b>Total</b>	1.4	26.3	2.8	14	2.9	4.4	70	15.5	14
Drummond Crossing <sup>3,4, 6,8</sup>	Indicated	1.4	35.5	2.4	14	10.3	3.4	53	7.7	14
	Inferred	1.4	3.3	2.3	11	9.0	2.7	56	7.2	12
	<b>Total</b>	1.4	38.8	2.4	14	10.2	3.4	54	7.7	14
Robbs Cross <sup>5,6,8</sup>	Indicated	1.4	14.0	1.9	15	12.7	5.0	47	6.2	6
	Inferred	1.4	3.8	2.0	14	10.9	4.1	50	8.1	6
	<b>Total</b>	1.4	17.8	1.9	15	12.3	4.8	48	6.6	6
Thomson <sup>5,8</sup>	Inferred	1.4	26	2.0	19	13.8	5.4	42	6.9	18
	<b>Total</b>	1.4	26	2.0	19	13.8	5.4	42	6.9	18
West Mine North <sup>3,4,6,9</sup>	Indicated	2.0	10.2	7.3	6	6.5	1.8	48	2.3	11
	Inferred	2.0	1.8	2.7	9	8.6	2.1	50	3.0	17
	<b>Total</b>	2.0	12.0	6.6	6	6.6	1.8	48	2.4	12
Ellengail <sup>3,4,9,10</sup>	Indicated	2.0	6.5	5.3	10	8.0	10.4	66	3.2	15
	Inferred	2.0	5.3	4.1	10	8.2	8.4	62	2.5	15
	<b>Total</b>	2.0	11.8	4.8	10	8.1	9.6	64	2.9	15
Total	Measured	1.4	2.6	4.3	10	2.1	2.3	72	11	15
	Indicated	Various	144.6	3.1	12	6.1	3.9	62	9	14
	Inferred	Various	46.0	2.4	15	10.3	5.8	51	8	16
	<b>Total</b>	Various	193.3	3.0	12	6.8	4.2	60	9	14

<sup>1</sup>The Mineral Resource estimates were prepared by Optiro Pty Ltd and first disclosed under the JORC Code (2012) refer to this ASX announcement and December 2017 Quarterly Activities Report for Robbs Cross and Thomson deposits for further details

<sup>2</sup>All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus the sums of columns may not equal.

<sup>3</sup>THM %: Samples from 1989 and 1996 (Drummond Crossing, Ellengail and West Mine North) were analysed using a -75 µm slimes / +2 mm oversize screen. Separation of HM% was by heavy liquid TBE (density 2.84 g/ml) from the -710µm+75µm fraction.

<sup>4</sup>THM %: RGC samples from 1998 and Iluka samples (Drummond Crossing, Durack, Ellengail, West Mine North and Yandanooka) were analysed using a -53 µm slimes / +2 mm oversize screen. Separation of total HM% was by heavy liquid TBE (density 2.90 g/ml) from the -710µm+53µm fraction.

<sup>5</sup>THM %: Samples from Robbs Cross and Thomson analysed by Diamantina Laboratories in Perth using a -45 µm slimes / +1 mm oversize screen (method DIA\_HLS\_45µm\_1mm). Separation of total HM% was by heavy liquid TBE (density 2.96g/ml) from the -45 µm+1mm fraction.

<sup>6</sup>THM %: Samples from Drummond Crossing, Durack, West Mine North and Yandanooka were analysed by Western Geolabs in Perth using a -53 µm slimes / +1 mm oversize screen. Separation of total HM% was by heavy liquid TBE (density 2.96 g/ml) from the +53µm-1mm fraction.

<sup>7</sup>Reported below an upper cut-off grade of 35% slimes.

<sup>8</sup>Estimates of mineral assemblage are presented as percentages of the total heavy mineral (THM) component of the deposit, as determined by QEMSCAN analysis. For the TiO<sub>2</sub> minerals specific breakpoints are used to distinguish between rutile (>95% TiO<sub>2</sub>), leucocoxene (85-95% TiO<sub>2</sub>) and ilmenite (<55-85% TiO<sub>2</sub>).

<sup>9</sup>At West Mine North and Ellengail mineral assemblage data determined by Iluka using Method 4 (HMC is separated into magnetics and non-magnetics) was used with the Sheffield QEMSCAN data

<sup>10</sup>At Ellengail mineral assemblage data determined by Iluka using Method 3 (magnetic separation and XRF analysis) was used with the Sheffield QEMSCAN data and Iluka Method 4 data

<sup>11</sup>The in-situ assemblage grade 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.



SHEFFIELD MINERAL RESOURCE FOR ENEABBA PROJECT AT 01 OCTOBER 2018 (in-situ tonnes)

Summary of Mineral Resource <sup>1,2,3</sup>			In-situ Tonnes					
Deposit	Mineral Resource Category	Cut off (THM%)	THM Tonnes Millions (kt)	Zircon (kt)	Rutile (kt)	Leuco-xene (kt)	Ilmenite (kt)	Total VHM (kt)
Yandanooka <sup>4,6,8</sup>	Measured	1.4	112	12	2	3	81	98
	Indicated	1.4	1,726	212	63	63	1,197	1,535
	Inferred	1.4	7	1	0.2	0.3	4	6
	<b>Total</b>	1.4	1,845	224	65	66	1,283	1,639
Durack <sup>4,6,7,8</sup>	Indicated	1.4	600	82	18	22	429	551
	Inferred	1.4	148	21	4	11	95	130
	<b>Total</b>	1.4	748	104	21	33	523	681
Drummond Crossing <sup>3,4,6,8</sup>	Indicated	1.4	838	118	86	29	447	680
	Inferred	1.4	77	9	7	2	43	61
	<b>Total</b>	1.4	915	127	93	31	490	741
Robbs Cross <sup>5,6,8</sup>	Indicated	1.4	261	38	33	13	123	208
	Inferred	1.4	77	11	8	3	39	61
	<b>Total</b>	1.4	338	50	41	16	162	269
Thomson <sup>5,8</sup>	Inferred	1.4	516	97	71	28	219	415
	<b>Total</b>	1.4	516	97	71	28	219	415
West Mine North <sup>3,4,6,9</sup>	Indicated	2.0	748	44	49	13	359	465
	Inferred	2.0	48	5	4	1	24	34
	<b>Total</b>	2.0	796	48	53	14	383	498
Ellengail <sup>3,4,9,10</sup>	Indicated	2.0	346	34	28	36	227	325
	Inferred	2.0	218	22	18	18	136	193
	<b>Total</b>	2.0	565	56	46	54	363	519
<b>Total</b>	Measured	1.4	112	12	2	3	81	98
	Indicated	Various	4,519	529	276	176	2,782	3,764
	Inferred	Various	1,091	165	113	64	559	900
	<b>Total</b>	Various	5,723	705	392	242	3,423	4,762

Notes:

<sup>1</sup>The Mineral Resource estimates were prepared by Optiro Pty Ltd and first disclosed under the JORC Code (2012) refer to this ASX announcement and December 2017 Quarterly Activities Report for Robbs Cross and Thomson deposits for further details

<sup>2</sup>All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus the sums of columns may not equal.

<sup>3</sup>THM %: Samples from 1989 and 1996 (Drummond Crossing, Ellengail and West Mine North) were analysed using a -75 µm slimes / +2 mm oversize screen. Separation of THM% was by heavy liquid TBE (density 2.84 g/ml) from the -710µm+75µm fraction.

<sup>4</sup>THM %: RGC samples from 1998 and Iluka samples (Drummond Crossing, Durack, Ellengail, West Mine North and Yandanooka) were analysed using a -53 µm slimes / +2 mm oversize screen. Separation of total HM% was by heavy liquid TBE (density 2.90 g/ml) from the -710µm+53µm fraction.

<sup>5</sup>THM %: Samples from Robbs Cross and Thomson analysed by Diamantina Laboratories in Perth using a -45 µm slimes / +1 mm oversize screen (method DIA\_HLS\_45µm\_1mm). Separation of total HM% was by heavy liquid TBE (density 2.96g/ml) from the -45 µm+1mm fraction.

<sup>6</sup>THM %: Samples from Drummond Crossing, Durack, West Mine North and Yandanooka were analysed by Western Geolabs in Perth using a -53 µm slimes / +1 mm oversize screen. Separation of total HM% was by heavy liquid TBE (density 2.96 g/ml) from the +53µm-1mm fraction.

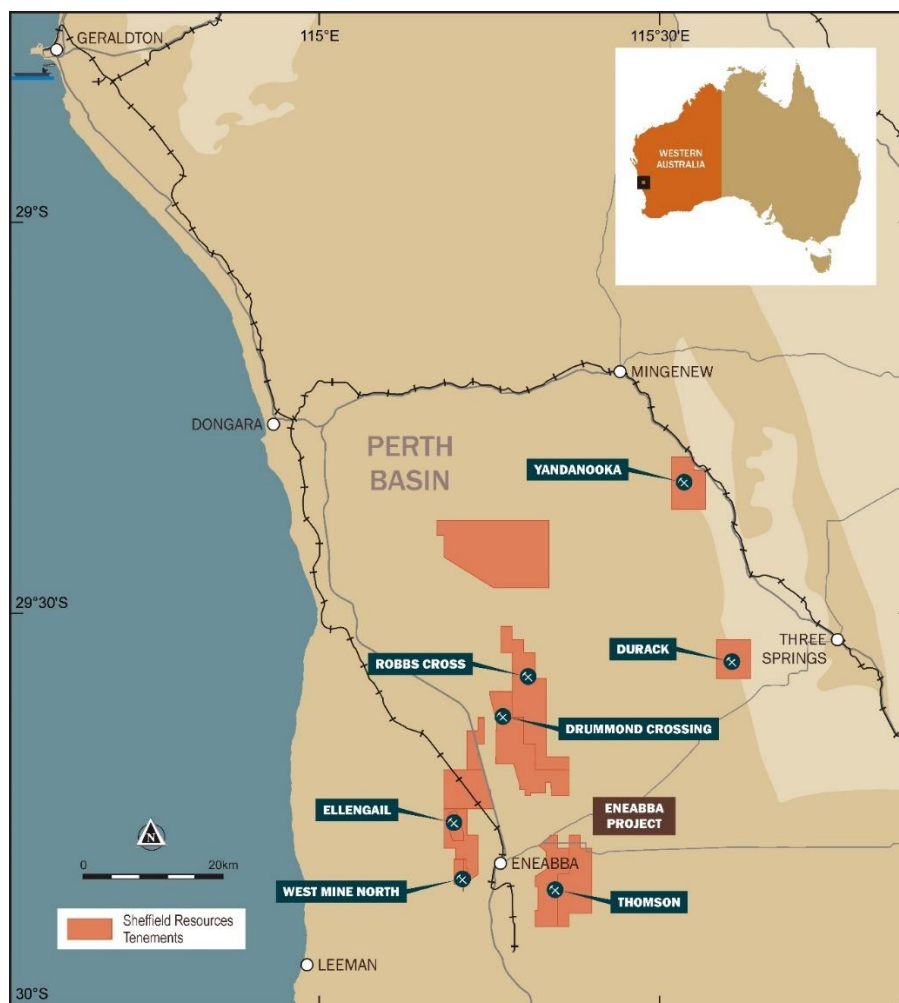
<sup>7</sup>Reported below an upper cut-off grade of 35% slimes.

<sup>8</sup>Estimates of mineral assemblage are presented as percentages of the total heavy mineral (THM) component of the deposit, as determined by QEMSCAN analysis. For the TiO<sub>2</sub> minerals specific breakpoints are used to distinguish between rutile (>95% TiO<sub>2</sub>), leucosene (85-95% TiO<sub>2</sub>) and ilmenite (<55-85% TiO<sub>2</sub>).

<sup>9</sup>At West Mine North and Ellengail mineral assemblage data determined by Iluka using Method 4 (HMC is separated into magnetics and non-magnetics) was used with the Sheffield QEMSCAN data

<sup>10</sup>At Ellengail mineral assemblage data determined by Iluka using Method 3 (magnetic separation and XRF analysis) was used with the Sheffield QEMSCAN data and Iluka Method 4 data

<sup>11</sup>The in-situ assemblage grade 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.



**Figure 5: Location of the Eneabba Mineral Sands Project**

The Eneabba Mineral Sands Project (Eneabba), located near Geraldton in Western Australia's Mid West region, has a combined Mineral Resource totalling 193 million tonnes @ 3.0% HM (Measured, Indicated and Inferred) containing 4.8 million tonnes of VHM, across seven deposits.

The McCalls Mineral Sand Project (McCalls), located 110km to the north of Perth near the town of Gingin, has a combined Mineral Resource totalling 5.8 billion tonnes @ 1.4% HM (Indicated and Inferred) containing 75 million tonnes of VHM across two deposits. McCalls contains over 67 million tonnes of chloride ilmenite grading 59-66%  $\text{TiO}_2$  and is considered a longer-term strategic asset.



**Figure 6: Drilling at the Yandanooka Deposit**



### 3) McCALLS PROJECT

#### SHEFFIELD MINERAL RESOURCES FOR McCALLS PROJECT AT 01 OCTOBER 2018 (in-situ assemblage)

Summary of Mineral Resources <sup>1,2,3,4,7</sup>					In-situ Assemblage <sup>6</sup>					
Deposit	Mineral Resource Category	Cut off (THM%)	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	Rutile (%)	Leuco-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
McCalls	Indicated	1.1	1,630	1.4	0.07	0.05	0.04	1.10	1.1	21
	Inferred	1.1	1,980	1.2	0.06	0.05	0.04	1.00	1.1	26
	<b>Total</b>	<b>1.1</b>	<b>3,600</b>	<b>1.3</b>	<b>0.07</b>	<b>0.05</b>	<b>0.04</b>	<b>1.05</b>	<b>1.1</b>	<b>24</b>
Mindarra Springs	Inferred	1.1	2,200	1.6	0.07	0.01	0.05	1.32	5.1	20
	<b>Total</b>	<b>1.1</b>	<b>2,200</b>	<b>1.6</b>	<b>0.07</b>	<b>0.01</b>	<b>0.05</b>	<b>1.32</b>	<b>5.1</b>	<b>20</b>
<b>Total</b>	Indicated	1.1	1,630	1.4	0.07	0.05	0.04	1.10	1.1	21
	Inferred	1.1	4,180	1.5	0.07	0.03	0.05	1.17	3.2	23
	<b>Total</b>	<b>1.1</b>	<b>5,800</b>	<b>1.4</b>	<b>0.07</b>	<b>0.03</b>	<b>0.04</b>	<b>1.15</b>	<b>2.6</b>	<b>22</b>

#### SHEFFIELD MINERAL RESOURCES FOR McCALLS PROJECT AT 01 OCTOBER 2018 (HM assemblage)

Summary of Mineral Resources <sup>1,2,3,4,7</sup>					HM Assemblage <sup>5</sup>					
Deposit	Mineral Resource Category	Cut off (THM%)	Material Tonnes Millions (Mt)	THM (%)	Zircon (%)	Rutile (%)	Leuco-xene (%)	Ilmenite (%)	Oversize (%)	Slimes (%)
McCalls	Indicated	1.1	1,630	1.4	5.2	3.3	2.8	77	1.1	21
	Inferred	1.1	1,980	1.2	5.0	3.8	3.2	81	1.1	26
	<b>Total</b>	<b>1.1</b>	<b>3,600</b>	<b>1.3</b>	<b>5.1</b>	<b>3.6</b>	<b>3.0</b>	<b>79</b>	<b>1.1</b>	<b>24</b>
Mindarra Springs	Inferred	1.1	2,200	1.6	4.2	0.9	3.1	80	5.1	20
	<b>Total</b>	<b>1.1</b>	<b>2,200</b>	<b>1.6</b>	<b>4.2</b>	<b>0.9</b>	<b>3.1</b>	<b>80</b>	<b>5.1</b>	<b>20</b>
<b>Total</b>	Indicated	1.1	1,630	1.4	5.2	3.3	2.8	77	1.1	21
	Inferred	1.1	4,180	1.5	4.5	2.1	3.2	81	3.2	23
	<b>Total</b>	<b>1.1</b>	<b>5,800</b>	<b>1.4</b>	<b>4.7</b>	<b>2.4</b>	<b>3.1</b>	<b>79</b>	<b>2.6</b>	<b>22</b>

#### SHEFFIELD MINERAL RESOURCES FOR McCALLS PROJECT AT 01 OCTOBER 2018 (in-situ tonnes)

Summary of Mineral Resources <sup>1,2,3,4,7</sup>				In-situ Tonnes				
Deposit	Mineral Resource Category	Cut off (THM%)	THM Tonnes Millions (Mt)	Zircon (kt)	Rutile (kt)	Leuco-xene (kt)	Ilmenite (kt)	Total VHM (kt)
McCalls	Indicated	1.1	23.3	1,210	770	650	17,940	20,570
	Inferred	1.1	24.4	1,210	930	790	19,790	22,720
	<b>Total</b>	<b>1.1</b>	<b>47.7</b>	<b>2,430</b>	<b>1,700</b>	<b>1,430</b>	<b>37,730</b>	<b>43,290</b>
Mindarra Springs	Inferred	1.1	36.3	1,520	320	1,130	29,080	32,050
	<b>Total</b>	<b>1.1</b>	<b>36.3</b>	<b>1,520</b>	<b>320</b>	<b>1,130</b>	<b>29,080</b>	<b>32,050</b>
<b>Total</b>	Indicated	1.1	23.3	1,210	770	650	17,940	20,570
	Inferred	1.1	60.7	2,740	1,250	1,920	48,860	54,770
	<b>Total</b>	<b>1.1</b>	<b>84.0</b>	<b>3,950</b>	<b>2,020</b>	<b>2,570</b>	<b>66,810</b>	<b>75,340</b>

<sup>1</sup>The Mineral Resource estimates were prepared by Optiro Pty Ltd and first disclosed under the JORC Code (2012) refer to this ASX announcement

<sup>2</sup>All tonnages and grades have been rounded to reflect the relative uncertainty of the estimate, thus the sums of columns may not equal.

<sup>3</sup>THM is within the 45µm to 1mm size fraction and reported as a percentage of the total material, slimes is the <45µm fraction and oversize is the >1mm fraction.

<sup>4</sup>Reported below an upper cut-off grade of 35% slimes.

<sup>5</sup>Estimates of mineral assemblage (Sheffield) are presented as percentages of the total heavy mineral (THM) component of the deposit, as determined by QEMSCAN analysis. For the TiO<sub>2</sub> minerals specific breakpoints are used to distinguish between rutile (>95% TiO<sub>2</sub>), leucoxene (85-95% TiO<sub>2</sub>) and ilmenite (<55-85% TiO<sub>2</sub>). Estimates of mineral assemblage (BHP) HM assemblage determination was by magnetic separation and observation (grain-counting)

<sup>6</sup>The in-situ assemblage grade 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.

<sup>7</sup>Excludes Mineral Resources within the Mogumber Nature Reserve

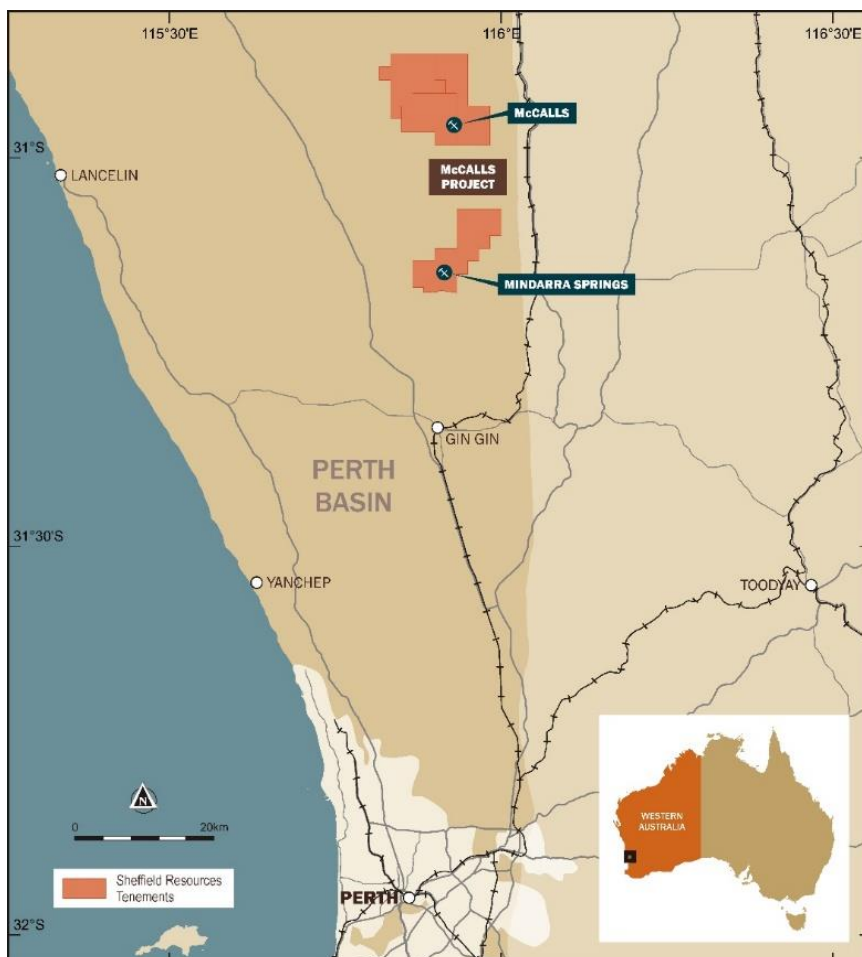


Figure 7: Location of the McCall's Mineral Sands Project



Figure 8: McCall's HM deposit - photo of wet shaking table (left) and photomicrograph of HM (right)

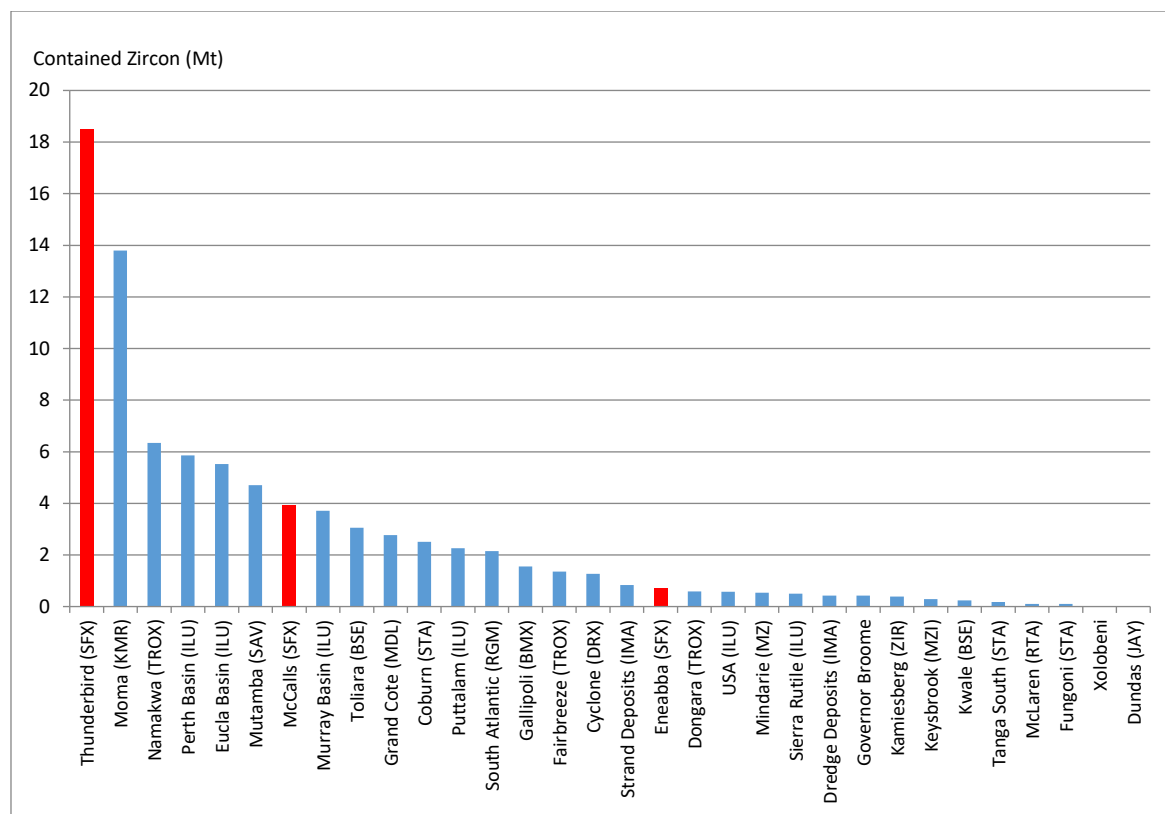


Figure 9: Sheffield Mineral Resources<sup>1</sup> by project displayed as contained zircon ranked against contained zircon within Mineral Resources of significant mineral sands operations and projects under investigation globally

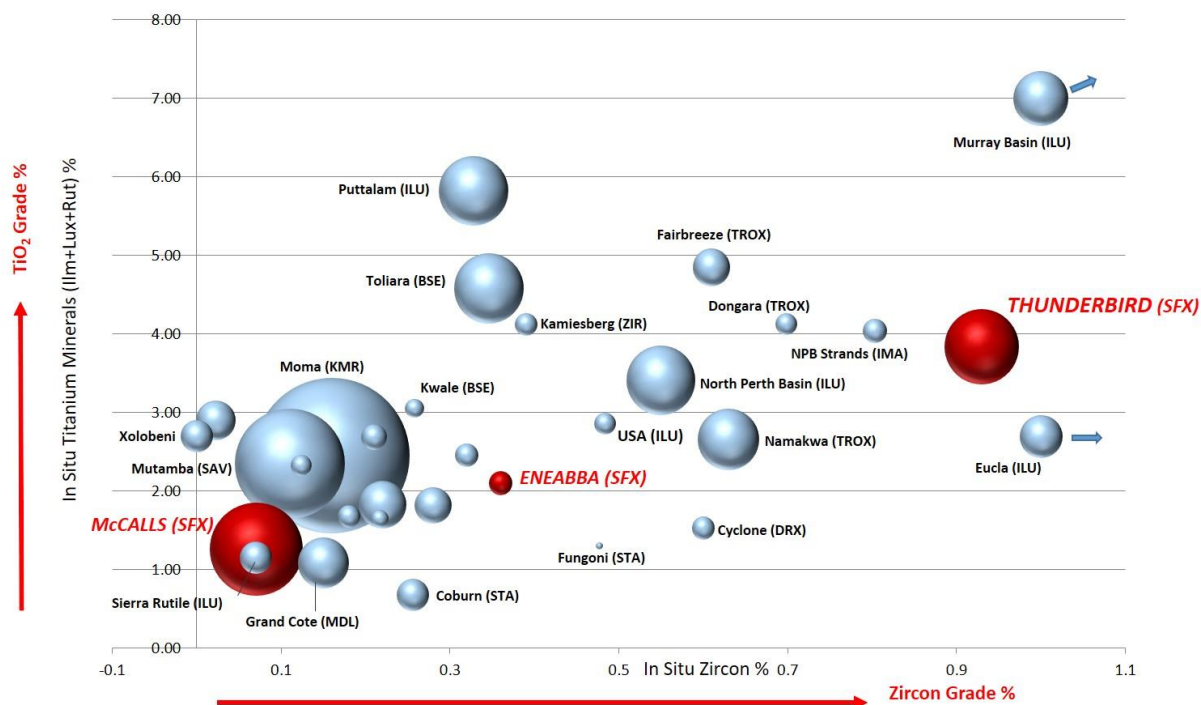


Figure 10: Sheffield Mineral Resources<sup>1</sup> ranked against published Mineral Resources of current mineral sands operations and projects under investigation globally

<sup>1</sup>Sheffield's Mineral Resources are published in this Ore Reserve and Mineral Resource Statement. Sheffield Mineral Resource ranked against Mineral Resources of current mineral sands operations and projects under investigation globally. Red bubbles are Sheffield's Mineral Resources. Bubble size proportional to tonnes of contained VHM. Data compiled by Sheffield from public sources. This analysis does not illustrate the variance in product value between rutile, leucoxene and ilmenite. Some Mineral Resources are excluded due to lack of JORC compliant or detailed reporting.

## GOVERNANCE AND INTERNAL CONTROLS

Mineral Resource and Ore Reserve are compiled by qualified Sheffield personnel and/or independent consultants following industry standard methodology and techniques. The underlying data, methodology, techniques and assumptions on which estimates are prepared are subject to internal peer review by senior Company personnel, as is JORC compliance. Where deemed necessary or appropriate, estimates are reviewed by independent consultants. Competent Persons named by the Company are members of the Australasian Institute of Mining and Metallurgy and/or the Australian Institute of Geoscientists and qualify as Competent Persons as defined in the JORC Code 2012.

## COMPETENT PERSONS AND COMPLIANCE STATEMENTS

The information in this report that relates to Exploration Results is based on information compiled by Mr David Archer, a Competent Person who is a Member of Australian Institute of Geoscientists (AIG). Mr Archer is a full-time employee of 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 Archer consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

The Company's Ore Reserves and Mineral Resources Statement is based on information first reported in previous ASX announcements by the Company. These announcements are listed below and are available to view on Sheffield's website [www.sheffieldresources.com.au](http://www.sheffieldresources.com.au). Mineral Resources and Ore Reserves reported for the Dampier Project and Mineral Resources reported for the Eneabba and McCalls Projects, are prepared and disclosed under the JORC Code 2012. The Company confirms that it is not aware of any new information or data that materially affects the information included in the relevant original market announcements and that all material assumptions and technical parameters underpinning the estimates in the relevant original market announcement continue to apply and have not materially changed.

The information in this report that relates to the estimation of the Ore Reserve is based on information compiled by Mr Per Scrimshaw, a Competent Person who is a Member of the Australasian Institute of Mining and Metallurgy. Mr Scrimshaw is employed by Entech Pty 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.

The information in this report that relates to the estimation of the Mineral Resources is based on information compiled by Mrs Christine Standing, a Competent Person who is a Member of the Australian Institute of Geoscientists (AIG) and the Australasian Institute of Mining and Metallurgy (AusIMM). Mrs Standing is a full-time employee of Optiro Pty Ltd and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which she is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Mrs Standing consents to the inclusion in this report of the matters based on her information in the form and context in which it appears.

The information in this report that relates to the Thunderbird Mineral Resource is based on information compiled under the guidance of Mr Mark Teakle, a Competent Person who is a Member of the Australian Institute of Geoscientists (AIG) and the Australasian Institute of Mining and Metallurgy (AusIMM). Mr Teakle is a full-time employee of 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 Teakle consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.

The Competent Persons for reporting of Mineral Resources and Ore Reserves in the relevant original market announcements are listed below. The Company confirms that the form and context in which the Competent Persons' findings are presented have not been materially modified from the relevant original market announcement.

### Ore Reserves and Mineral Resources prepared and first disclosed under the JORC Code 2012):

Item	Report title	Report Date	Competent Person(s)
Thunderbird Ore Reserve	Thunderbird Ore Reserve Update	16 March 2017	P. Scrimshaw
Thunderbird Mineral Resource	Sheffield Doubles Measured Mineral Resource At Thunderbird	5 July 2016	M. Teakle, C. Standing
Robbs Cross Mineral Resource	Quarterly Activities Report For The Period Ended 31 December 2017	25 January 2017	C. Standing
Thomson Mineral Resource	Quarterly Activities Report For The Period Ended 31 December 2017	25 January 2017	C. Standing
Yandanooka Mineral Resource	Mineral Resource and Ore Reserve Statement	3 October 2018	C. Standing
Durack Mineral Resource	Mineral Resource and Ore Reserve Statement	3 October 2018	C. Standing

Drummond Crossing Mineral Resource	Mineral Resource and Ore Reserve Statement	3 October 2018	C. Standing
West Mine North Mineral Resource	Mineral Resource and Ore Reserve Statement	3 October 2018	C. Standing
Ellengail Mineral Resource	Mineral Resource and Ore Reserve Statement	3 October 2018	C. Standing
McCalls Mineral Resource	Mineral Resource and Ore Reserve Statement	3 October 2018	C. Standing
Mindarra Springs Mineral Resource	Mineral Resource and Ore Reserve Statement	3 October 2018	C. Standing

Item	Name	Company	Professional Affiliation
Exploration Results	Mr David Archer	Sheffield Resources	MAIG
Mineral Resource Reporting	Mr Mark Teakle	Sheffield Resources	MAIG, MAusIMM
Mineral Resource Estimation	Mrs Christine Standing	Optiro	MAIG, MAusIMM
Ore Reserve	Mr Per Scrimshaw	Entech	MAusIMM

## SUPPORTING INFORMATION REQUIRED UNDER ASX LISTING RULES, CHAPTER 5

The supporting information below is required, under Chapter 5 of the ASX Listing Rules, to be included in market announcements reporting estimates of Mineral Resources and Ore Reserves.

Section 1, Section 2, Section 3 and Section 4 of JORC Table 1 can be found in Appendices 1 and 2.

## PREVIOUSLY REPORTED INFORMATION

This report includes information that relates to Exploration Results, Mineral Resources and Ore Reserves prepared and first disclosed under the JORC Code 2012 and a Bankable Feasibility Study. The information was extracted from the Company's previous ASX announcements as follows:

- Mineral resource and Ore Reserve Statement: *"MINERAL RESOURCE AND ORE RESERVE STATEMENT"* 3 October 2018
- Thomson and Robbs Cross Mineral Resources: *"QUARTERLY ACTIVITIES REPORT FOR THE PERIOD ENDED 31 DECEMBER 2017"* 30 January, 2018
- Thunderbird Ore Reserve: *"THUNDERBIRD ORE RESERVE UPDATE"* 16 March, 2017
- Thunderbird Bankable Feasibility Study: *"THUNDERBIRD BFS DELIVERS OUTSTANDING RESULTS"* 24 March, 2017
- McCalls Mineral Resource: *"QUARTERLY ACTIVITIES REPORT FOR THE PERIOD ENDED 30 JUNE 2016"* 25 July 2016.
- Thunderbird Mineral Resource: *"SHEFFIELD DOUBLES MEASURED MINERAL RESOURCE AT THUNDERBIRD"* 5 July, 2016
- Robbs Cross and Thomson Discovery: *"NEXT GENERATION OF MINERAL SANDS DISCOVERIES AT ENEABBA"* 23 July, 2015.

These announcements are available to view on Sheffield's website [www.sheffieldresources.com.au](http://www.sheffieldresources.com.au).

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

## FORWARD LOOKING AND CAUTIONARY STATEMENTS

The contents of this report reflect various technical and economic conditions at the time of writing. Given the nature of the resources industry, these conditions can change significantly over relatively short periods of time. Consequently, actual results may vary from those contained in this report.

Some statements in this report regarding estimates or future events are forward-looking statements. They include indications of, and guidance on, future earnings, cash flow, costs and financial performance. Forward-looking statements include, but are not limited to, statements preceded by words such as "planned", "expected", "projected", "estimated", "may", "scheduled", "intends", "anticipates", "believes", "potential", "predict", "foresee", "proposed", "aim", "target", "opportunity", "could", "nominal", "conceptual" and similar expressions. Forward-looking statements, opinions and estimates included in this report are based on assumptions and contingencies which are subject to change without notice, as are statements about market and industry trends, which are based on interpretations of current market conditions. Forward-looking statements are provided as a general guide only and should not be relied on as a guarantee of future performance. Forward-looking statements may be affected by a range of variables that could cause actual results to differ from estimated results and may cause the Company's actual performance and financial results in future periods to materially differ from any projections of future performance or results expressed or implied by such forward-looking statements. So there can be no assurance that actual outcomes will not materially differ from these forward-looking statements.