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SHEFFIELD RESOURCES LTD (SFX AU, $0.49. Market cap A$170m)

Thunderbird now fully financed. SFX remains a deep value play

Sheffield have just announced a US$110m facility with Orion Resource Partners. Together with the previously approved NAIF debt there is ca. A$317m in debt funding now available, as we expected. Note that the Orion deal is non-binding, but we see this outcome as little more than a formality.

Together with equity raised with the 50% sell-down of Thunderbird (held in Kimberley Mineral Sands/KMS) to Yansteel, the two debt facilities will allow the world-class Thunderbird project to move to FID and construction. First production remains on schedule for late 2023, just 15 months away. SFX's requirement for an additional $36m equity contribution into the project had already been flagged by the company. This can be funded from SFX's $40m cash position.

Cost of the Orion debt is SOFR (ex LIBOR) plus 5% with a 7-year tenor, with the potential for prepayment. There is a royalty attached (1.6% of revenue) but this does not start until year 7 (early 2030s) and is for a period of 25 years with an option to buy-back half of the royalty. We estimate the total cost of the debt to be around 12%, and we understand was competitive with other sources of debt available to SFX.

We like the idea that royalties are not paid in the earlier years for two reasons: (1) this is the time of greatest cashflow risk as the project ramps up, and (2) the best part of the orebody will be mined first. This is an excellent outcome, in our view.

Final due diligence, definitive documentation, etc should occur by the end of September, with FID, financial close, and draw down all expected to be broadly contemporaneous. The company remains on track for production at the end of 2023.

Importantly, KMS has been advancing construction with ca. $100m in equity already spent on the project. Access roads and the camp have been built and civils are well advanced.

Our valuation is now $2.25/share (previously $2.00), assisted by a change in our FX assumptions (AUDUSD now 0.70, previously 0.75) offset by our estimate of increasing operating costs (+10%, largely driven by fuel and labour costs in WA). Our zircon price assumption remains unchanged at US$1,600/t (FOB) against current spot prices of around US$2,500/t.

Sum-of-the-Parts	A$m	Equity	Risk	A$m	A$/share
Thunderbird	1,484	50%	100%	742	2.10
Exploration	74	50%	100%	37	0.10
Corporate Costs	(18)	100%	100%	(18)	(0.05)
Net Cash (Debt)	40	100%	100%	40	0.11
Total	**1,581**			**802**	**2.25**
WACC					**8.0%**
FPO Shares					347
Options					2
Performance Rights					5
Fully Diluted SOI					**354**

SFX remains a deeply undervalued company, despite the fact that it is now positioned to emerge as one of the preeminent suppliers of zircon to global markets. As we've discussed in many of our research notes, the zircon industry is mature with major producers (the likes of Richards Bay Minerals and Iluka) now in decline. This to us suggests that prices of mineral sand commodities zircon, ilmenite and rutile, will remain stronger for longer to incentivise new production. Yet another positive for SFX, one of our preferred investments.

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Overview

- Our NPV_8 for a fully funded Stage 1+Stage 2 development of Thunderbird is now A$1.46bn with a long term US$1,600/t FOB zircon price (against the TZMI/SFX DFS estimate of $1,516/t) and FX of 70c with an IRR of 30% (both post-tax).
- Thunderbird will produce zircon and ilmenite concentrates, the latter to be sold at a fixed price to partner Yansteel, thereby removing the need for the low temperature roaster and an upgrading circuit which simplifies the process flowsheet and significantly reduces preproduction capex.
- The project will be developed in two stages (Stage 2 from Year 5 in the current plan). The mine life is now 36 years in the current configuration. Cash costs now boast a revenue/costs (R/C) ratio of over 2. This is a high margin, long mine life project.
- Finalisation of the debt facility will allow construction of the Stage 1 project to continue uninterrupted. Until now it has been funded by Yansteel's equity contribution. Assuming no delay to the availability of debt the bulk of the civil work will be completed before the wet season, allowing completion of the project next year, with first product available towards the end of 2023.
- We understand the new debt facility has Orion credit committee approval and funds have been allocated, so we think there is a low risk the deal is not consummated.
- We were on site three months ago and noted that excellent progress was being made with early works. EPC contractor GRES was just mobilising to site. Importantly initial concrete pours are well advanced. It is essential that the project is 'out of the ground' to allow work to continue during the wet season, which doesn't start in earnest until December.
- In his recent presentation, SFX's Executive Chairman commented the last capex estimate for Thunderbird was late 2021 / early 2022, so inflationary pressures have been largely captured. Around $100m of the capex is not covered by fixed price contracts / already spent capex. He noted that SFX has $33m contingency factored into its numbers, and a $40m cost overrun facility.
- We have chosen to escalate our costs by 10% going forward to allow for what we see as a structural shift in diesel pricing together with increasing labour costs. The bulk of Thunderbird's energy needs is satisfied by LNG trucked from the NW Shelf operations. Here gas prices have been locked in (thanks to WA's foresight to put in place a domestic gas policy in the 1980s).
- We note that Strandline (STA.ASX), which is building the low-grade Coburn mineral sands project to the south, is talking 'on budget and on schedule' in its latest quarterly, which presents an encouraging outlook for Thunderbird.
- On the following page, we summarise our earnings outlook for SFX's 50% share of Kimberley Mineral Sands, the joint venture company. We report these estimates in a 'non-accounting standard' format to provide full transparency for SFX's earnings. Statutory accounting requirements will see KMS's earnings reported as equity accounts by SFX, with just the flow of dividends, net of SFX's modest overheads into P&L and cashflow statements. We see equity accounting as delivering poor disclosure to investors.

We urge investors to make a comparison of SFX, with 50% of a Tier 1 mineral sand orebody, now likely to be fully financed, with Strandline (ASX:STA) which is moving its 100%-owned Coburn project towards production. Refer to details presented in Appendix 1 which compares Thunderbird and Coburn. We are firmly of the view that Coburn should be regarded as a relatively modest, mid-cost zircon/feedstock producer. To us it is a not a premier mineral sands project. STA's market capitalisation is now around A$500m, a substantial premium to that of SFX.

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FINANCIAL SUMMARY — Sheffield Resources Limited (SFX.AX)

Share Price	A$/sh	0.49
Shares on Issue	m	354
Market Cap (A$m)	A$m	173
Net Debt / (Cash) (A$m)	A$m	(40)
Enterprise Value (A$m)	A$m	133

Target Price	2.25
Upside / (Downside)	359%
Dividend Yield	0%
Total Return Forecast	359%

Profit & Loss	Units	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
Sales and Other Income	A$m	50	174	192	184	238
Expenses	A$m	(40)	(97)	(104)	(104)	(126)
EBITDA	**A$m**	**10**	**77**	**88**	**80**	**112**
D&A	A$m	(12)	(22)	(18)	(18)	(22)
EBIT	**A$m**	**(2)**	**55**	**70**	**62**	**90**
Interest	A$m	(11)	(12)	(10)	(13)	(12)
Tax	A$m	-	(13)	(18)	(15)	(23)
NPAT	**A$m**	**(13)**	**30**	**42**	**34**	**54**

Per Share Data	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
Shares Out (m)	354	354	354	354	354
EPS (¢)	(3.5¢)	8.4¢	11.8¢	9.7¢	15.4¢
Dividend (¢)	-	-	-	-	-
Payout Ratio (%)	0%	0%	0%	0%	0%
Book Value (A$/share)	0.64	0.72	0.84	0.94	1.08
Operating Cash Flow (A$/share	(0.01)	0.13	0.17	0.16	0.19
Free Cash Flow (A$/share)	(0.18)	0.10	0.12	(0.05)	0.08
EBITDA (A$/share)	0.03	0.22	0.25	0.23	0.32

Cashflow	Units	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
Cash From Operations	A$m	10	77	88	80	112
Interest	A$m	(11)	(12)	(10)	(13)	(12)
Tax	A$m	-	(13)	(18)	(15)	(23)
Working Capital	A$m	(3)	(6)	(2)	3	(8)
Net Cash From Operations	**A$m**	**(3)**	**45**	**59**	**56**	**68**
Capex	A$m	(60)	(9)	(17)	(73)	(41)
Exploration	A$m	-	-	-	-	-
Acquisitions / Investments	A$m	-	-	-	-	-
Free Cash Flow	**A$m**	**(63)**	**37**	**41**	**(18)**	**27**
Borrowings (repaymnt of borrowings)	A$m	69	(18)	(35)	107	(41)
Equity	A$m	-	-	-	-	-
Dividend	A$m	-	-	-	-	-
Net Increase / (Decrease) in Cash	**A$m**	**5**	**18**	**6**	**89**	**(14)**

Valuation Metrics	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
P/E (x)	(13.8)x	5.9x	4.1x	5.0x	3.2x
Dividend Yield (%)	0.0%	0.0%	0.0%	0.0%	0.0%
EV / Sales	2.6x	0.8x	0.7x	0.7x	0.6x
EV / EBITDA	12.8x	1.7x	1.5x	1.7x	1.2x
EV / EBIT	(66.9)x	2.4x	1.9x	2.1x	1.5x
FCF Yield (%)	-36.4%	21.1%	23.7%	-10.3%	15.6%

Operating Metrics (%)	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
EBITDA Margin	21%	44%	46%	43%	47%
EBIT Margin	-4%	31%	36%	34%	38%
Net Profit Margin	-25%	17%	22%	19%	23%
ROIC	-1%	21%	27%	20%	27%
Return on Assets	-3%	7%	10%	6%	10%
Return on Equity	-6%	12%	14%	10%	14%
Effective Tax Rate	0%	30%	30%	30%	30%

Balance Sheet	Units	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
Cash	A$m	105	123	129	218	204
Receivables	A$m	4	14	15	15	19
Inventory	A$m	3	9	10	9	12
PP&E	A$m	148	135	134	189	208
Other	A$m	116	116	116	116	116
Assets	**A$m**	**376**	**397**	**404**	**548**	**560**
Creditors	A$m	4	14	15	15	19
Borrowings	A$m	145	127	92	199	158
Other	A$m	1	1	1	1	1
Liabilities	**A$m**	**150**	**142**	**108**	**214**	**178**
Net Assets	**A$m**	**226**	**255**	**296**	**333**	**382**

Key Assumptions	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
Non-mag Concentrate (US$/t)	852	887	828	759	739
Mag Con (US$/t)	119	137	133	131	111
NM Finisher mag (US$/t)	115	117	113	109	104
AUDUSD	0.70	0.70	0.70	0.70	0.70

Production	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
Mag Con (kt)	211	654	747	759	1,058
Non-mag Concentrate (kt)	55	179	209	213	297
Paramagnetic Concentrate (kt)	23	77	90	91	127

Liquidity & Leverage	Units	Jun-24e	Jun-25e	Jun-26e	Jun-27e	Jun-28e
Borrowings	A$m	145	127	92	199	158
Net Debt / (Cash)	A$m	40	4	(37)	(19)	(46)
Gearing: Net Debt / (Net Debt + Equity)	%	15%	1%	-14%	-6%	-14%
Net Debt / EBITDA	x	3.9x	0.0x	(0.4)x	(0.2)x	(0.4)x
EBIT Interest Cover	x	(0.2)x	4.4x	7.0x	4.9x	7.3x

Valuation	A$m	Equity	Risk	A$m	A$/share
Thunderbird	1,484	50%	100%	742	2.10
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Corporate Costs	(18)	100%	100%	(18)	(0.05)
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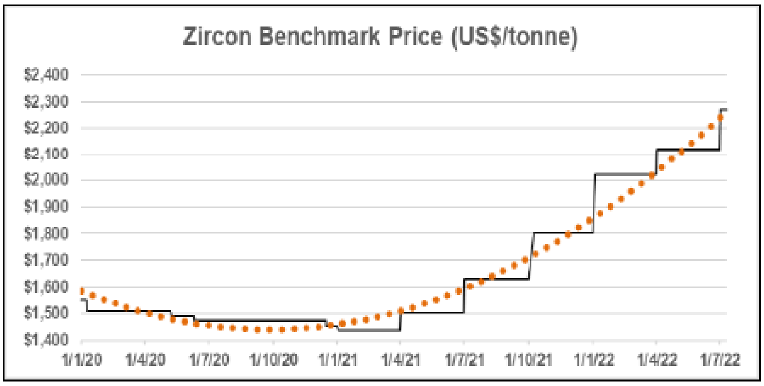
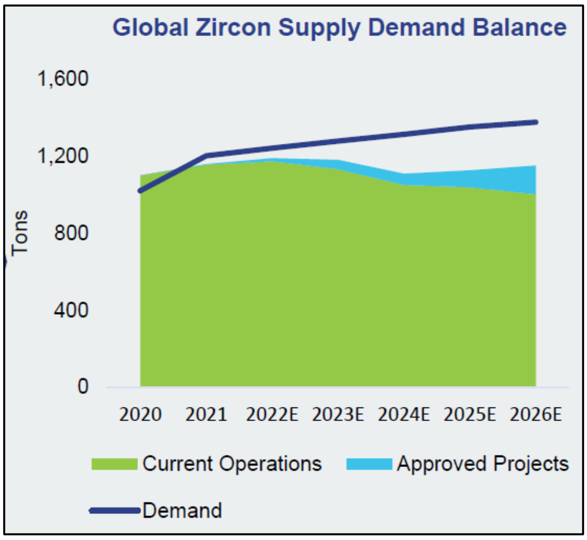
Note: *Our SFX forecasts are based on a 50% equity share of KMS which owns 100% of the Thunderbird project. The data displayed represents 50% of all components of the production, P&L, cashflow and balance sheet (adding assets as at December 2021). Accounting standards will require SFX to equity account its interest in KMS, which will therefore report dividend and interest income and overhead costs* *only. This standard provides limited transparency and so we have decided to proceed with this more visible reporting method*.

Commodity outlook

Our underlying zircon assumptions are based on a premium zircon price of US$1,600/t (FOB). As shown in the chart below, the zircon price has been marching forward, in part driven by the increasing maturity of the sector, in part by the exceptional discipline shown by the likes of Iluka and Tronox, the major suppliers. We see upside potential to our underlying assumptions.



At its recent Investor Day, the world's second largest producer of zircon, Tronox, focussed on the existing supply gap, the declining quality of industry reserves and lagging reinvestment.

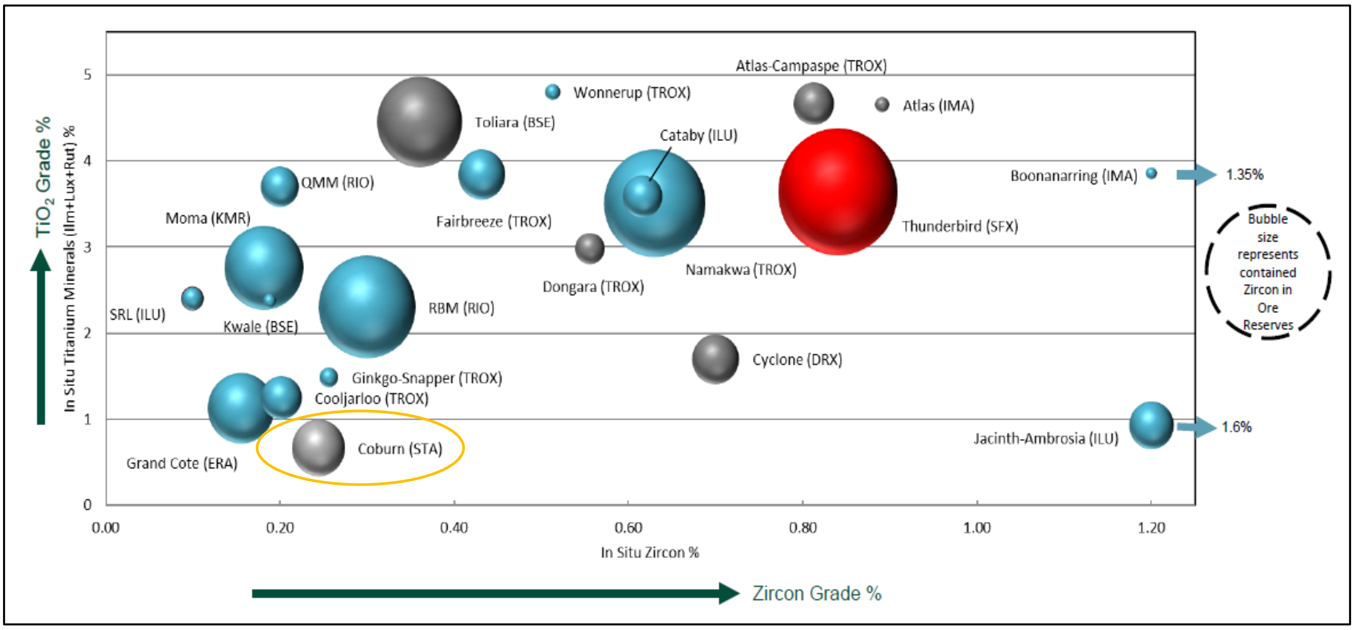


Source: Tronox Investor day, June 2022.
We assume "Tons" should be "Tons x1000"

The next significant source of zircon will be the commissioning of Strandline's Coburn project in WA, which is forecast to produce 60ktpa of zircon. This hardly moves the needle in a global context. The next major source with be from Thunderbird with the ramp up of Stage 1 commencing in late 2023, with a steady state production rate of around 150ktpa (pure zircon basis). This represents around 8-10% of global supply. Beyond this we can see that WIM Resources' Avonbank project in the Murray Basin of Victoria may be in production in 2025/26. Again, a 150ktpa producer. Other significant projects in Victoria appear to have stalled due to permitting issues. Outside Australia, we see no change to the status of the massive Zulti South project and permitting issues continuing for the Toliara project in Madagascar.

Thunderbird is the world's largest reserve of zircon

Thunderbird is now the most significant new source of zircon for the next 3-4 decades at least. The much smaller and lower grade Coburn project of Strandline Resources (STA ASX 100%; currently being constructed) is used in this report to provide line-by-line comparisons with the Thunderbird proposal. This is presented in Appendix 1 of our report.



Source: SFX presentation 2022

The Thunderbird BFS – a simplified, lower capex project with robust returns

New process flowsheet

In summary:

- A two-stage development, initially mining at a 1,250 tph rate and expanding to 1,750tph from year 5 (largely unchanged).
- Processing rate of 1,085tph (Stage 1), duplicated for Stage 2 (unchanged).
- Scrubbing, screening, desliming (unchanged)
- Primary wet concentration followed by concentrate upgrade plant (unchanged)
- Magnetic separation with non-magnetics (mainly zircon) to finisher spirals to produce a zircon-rich concentrate. This section of the flowsheet has been significantly simplified with the removal of a hot acid leach circuit and final dry plant which produced a final pure zircon stream.
- The magnetic fraction reports straight to a TiO_2 rich (ilmenite) concentrate for sale to Yansteel as feedstock for its new pigment plant, currently under construction. This significantly simplifies the flowsheet with the removal of the low temperature roaster and ilmenite upgrading circuits.

This has resulted in a +8% reduction in capital for the project, with the simplification of the process flowsheet, and a significantly lower start-up risk for the project.

Our production estimates, earnings and cashflow for SFX's 50% share of Kimberley Mineral Sands (100% of Thunderbird) are summarised on page 2 of this report. The following table summarises commodity prices and operating inputs to our valuation for 100% of the Thunderbird project.

Key Assumptions	**Jun-24e**	**Jun-25e**	**Jun-26e**	**Jun-27e**	**Jul-28e**
Non-mag Concentrate (US$/t)	852	887	828	759	739
Mag Concentrate (US$/t)	119	137	133	131	111
Paramagnetic Con (US$/t)	115	117	113	109	104
AUDUSD	0.75	0.75	0.75	0.75	0.75
Sales By Product	**Jun-24e**	**Jun-25e**	**Jun-26e**	**Jun-27e**	**Jul-28e**
Non-mag Concentrate (kt)	62	212	231	215	293
Mag Concentrate (kt)	34	119	133	133	157
Paramagnetic Concentrate (kt)	4	12	13	13	18
Zircon as a % of revenue	69%	65%	65%	63%	66%
Operating Metrics (%)	**Jun-24e**	**Jun-25e**	**Jun-26e**	**Jun-27e**	**Jul-28e**
EBITDA Margin	29%	52%	53%	51%	54%
Revenue/Opex	1.4	2.1	2.1	2.0	2.2

Source: BSCP estimates

Thunderbird can be characterised as a high-EBITDA margin project, with revenue/costs at over 2x. This is a therefore a top-margin quartile project with well over 60% of total revenues in the early years from zircon. The current mine plan provides for a 36-year mine life.

Our commodity price assumptions largely reflect those presented by SFX (sourced from TZMI), with an increase in the base pricing of zircon from year 4 (US$1,600/t against the TZMI long term estimate of $1,516/t). Note that we follow TZMI's methodology and provide some 'shape' to the near term forecasts, with premium zircon prices declining from US$1800/t to 1600/t from 2024 to 2026.

Concentrate products

- **Zircon**: As already proposed by SFX, the source of the bulk of the project's revenue, zircon, will be sold to Asian concentrators as a non-magnetic concentrate. Key elements are:
  - Around 200ktpa (Stage 1) expanding to ca. 300ktpa in Stage 2.
  - Concentrate comprises around 37% ZrO_2, 26% TiO_2, 1% monazite.
  - Binding contracts with 3 customers, 5 years take or pay for 170ktpa. Here the price is linked to the market price for contained valuable minerals.
  - Life of mine non-mag concentrate is estimated to represent over 60% of total revenue using BSCP forecasts.
- **Ilmenite**: The recent announcement (March 2022) highlights the removal of the low temperature roaster (LTR) from the circuit. This will result in a magnetic concentrate with the following key features:
  - The production of ca. 750ktpa (Stage 1) expanding to over 1,000ktpa in Stage 2.
  - Concentrate is made up of around 39% TiO_2 and >50% total iron.
  - Life of mine mag concentrate is estimated to represent around 30-35% of total revenue.
  - A 100% binding offtake is in place with Yansteel for this material.

- **Other revenue**: Less than 5% of revenue is estimated to come from a so-called paramagnetic concentrate (low Zr, low Ti, medium Fe).

Capital, operating costs, mine life

- Simplification of the flowsheet had enabled the pre-production capex for Stage 1 of Thunderbird to be reduced from that estimated in the 2019 BFSU. Pre-production capex is now estimated at A$361m. This is some 8-9% lower than the BFSU and has had to absorb quite significant cost inflation which is currently ravaging the WA mining industry.
- The operating costs on an R/C metric have improved slightly, from 2.3 to 2.4 (as quoted by SFX, years 1-10). This cements Thunderbird in the most attractive quartile of the global mineral sands cost curve.
- The mine life is now 36 years, down a year from the BFSU and 7 years from the original BFS. As we know the exploration potential to the south of Thunderbird is excellent. Mine life is the least of our concerns.

Funding Thunderbird

- The following table summarises the sources and uses of funds as it was presented earlier in the year by SFX. These forecasts have proved to be quite accurate.

Thunderbird project, sources and uses of funds (KMS JV basis)	
Uses of funds	(m)
Pre-production capex	$361
Working capital	$20
Financing costs	$62
Cost overrun	$40
	$484
Sources of funds	
Senior debt (approx.)	$317
JV cash on hand (approx)*	$105
Additional equity (approx)**	$62
	$484
*JV cash at 12/21 was $107m. This has largely been drawn down.	
**Contribution from SFX	$36

Source: SFX presentation and 2022 interim report

- So assuming no capital increases, the project is now fully funded, subject of course to a final sign-off by Orion.
- We understand that the bulk of Yansteel's $130m equity has largely been spent, so the partners will need to fund the ca. $62m equity top up. SFX's cash balance is currently around $40m so sufficient to fund their $36m top-up for the JV.
- SFX's CEO at a recent presentation noted that built into the pre-production capex is a $33m contingency and a $40m overrun facility. Hopefully these will not need to be used, however, they do provide a $73m buffer against cost escalation for the remaining $100m capex not covered by fixed price contracts.

The importance of Yansteel as off-takers for the magnetic concentrate
The sale of 50% of the Thunderbird project to Yansteel resolved the equity component of Thunderbird, from SFX's perspective and it has provided the opportunity to sell an ilmenite/titanomagnetite/iron concentrate directly to Yansteel at a fixed price.

SFX state that pricing of the mag con – clearly a very important outcome of this new offtake agreement – is based on an arm's-length fixed price reflecting contained TiO_2 content for an initial five-year period and an arm's-length market price for the remaining mine life (should that material be contracted).

In an early 2022 presentation, SFX state that the price achieved will be in the range of US$119-138/t (FOB) for the first 10 years. If we look back on our earnings/valuation model from 3 years ago, we were then forecasting prices of around US$125/t for an ilmenite concentrate, but we assumed fewer tonnes were to be sold. So, net/net this looks to have been a positive outcome, and a win/win for both sides. SFX state that the outcome is margin-neutral for the JV.

Our take on this is that the outcome is a significant positive for the project:

- The sale of 100% of the mag con is now locked in, pretty well at a fixed price for the next 5 years, take or pay. This will no doubt have facilitated the debt negotiations.
- The process flowsheet is greatly simplified and what could have been a commissioning issue, the LTR, has been eliminated. Yansteel now takes on this risk at their Chinese plant.
- Start-up risk is reduced.
- Project capex has been reduced.
- Power requirements for the LTR are eliminated, so costs will come down.

Timetable

- Finalisation of the debt package has taken longer than was originally thought. This has not slowed construction of the project which has seen the following take place, funded by the equity injection by Yansteel:
    - Completion of an access road.
    - Mobilisation of EPC contractor, GR Engineering.
    - Completion of the site village.
    - Commissioning of a concrete batch plant and gravel quarry.
    - Civil earthworks at the plant site.
    - Pouring of concrete foundations for the plant.
- With four months now remaining before the onset of the wet season, it looks like KMS are well prepared. With the completion of the civils, the contractor will be able to continue with the construction of the plant during the wet season, with minimal disruption.
- Commissioning and first production remain scheduled for 4Q23.

Appendix 1: A comparison of Thunderbird and Strandline/Coburn

Strandline (ASX STA) took the jump on SFX as it rapidly concluded its debt and equity for the WA Coburn project. This was an excellent achievement.

Coburn represents quite a similar mineral sands concept to Thunderbird, so it is worth comparing and contrasting the two operations from publicly available information to understand the drivers for each project.

The most important characteristics of both projects are summarised in the following table. Note that the comparison is on a project level basis, with SFX owning 50% of Thunderbird.

100% project basis,		Thunderbird	Coburn	Difference
TZMI assumptions for zircon, AUDUSD 0.75				
Ownership		SFX 50%	STA 100%	
Reserves				
Tonnes	Mt	754	523	44%
Zircon grade	%	0.84%	0.24%	244%
Contained zircon	Mt	6.3	1.3	396%
Ti grade	%	3.6%	0.67%	447%
Contained Ti feedstock	Mt	27.4	3.5	688%
Mine life	Years	36	22.5	60%
Mine life (extension case)*			37.5	
Strip ratio (LOM)	X:1	0.84	0.7	20%
Ore throuput - stage 1	Mtpa	8.7	23.4	-63%
- stage 2	Mtpa	17.4	-	
Concentrate production (av. LOM)	Ktpa	1430	220	550%
Zircon production**	Ktpa	146	60	143%
Zircon as % of revenue	%	62%	60%	3%
Capex - stage 1	A$m	361	260	39%
- stage 2	A$m	258	-	-
Total capex	A$m	619	260	138%
Capital intensity/ annual t zircon	A$/t	4240	4333	-2%
Mining cost/t material moved	A$/t	**2.41**	**0.63**	283%
Mining cost/t mill feed	A$/t	**3.0**	**1.1**	186%
Processing cost/t mill feed	A$/t	**3.8**	**1.6**	142%
C1 cost/t mill feed	A$/t	**11.1**	**2.7**	316%
Basket price/t mill feed	A$/t	**21.7**	**6.0**	264%
Cash margin/ t mill feed	A$/t	**10.6**	**3.3**	222%
Power useage and costs				
Power source		LNG	LNG	
Power station capacity	MW	14.0	16.0	-13%
Average load	MW	8.6	12.0	-28%
Cost of power	A$/KWh	0.20	0.17	18%
Trucking distance to port	km	148	240	-38%
Revenue/cost***	x	2.1	2.2	-5%
NPV_8 (post tax)	A$m	1279	367	249%
NPV_8 (pretax)*	A$m		825	
NPV/capex		2.1	1.4	46%
* Based on upgrading Amy South resource to Measured and Indicated; post tax VPV not available.				
** pure zircon equivalent				
*** based on LT zircon pricing of US$1516/t FOB, ilmenite, etc as DFS, FX of 0.75				

Source: Company disclosures, BSCP estimates

- STA claims Coburn to be a world-class mineral sands export project. (While a solid project, we're not quite sure it meets the conditions of "world-class"). It is targeting the production of around 58ktpa contained zircon (comparable to Image's Boonanarring Project) for a 22-year mine life using conventional open pit mining and wet and dry concentration methods.
- Coburn is aiming to produce a premium zircon product from the dry plant as well as a zircon concentrate. By-products will include ilmenite and rutile. We estimate zircon revenues will represent around 60% of Coburn's revenues.

Resources and production

- Thunderbird is a significantly larger deposit with 44% more tonnes in reserves and much higher grades (especially zircon grades: 0.84% vs 0.24% at Coburn).
- This leads to nearly 5 times the amount of contained zircon at Thunderbird, and nearly 8 times the amount of contained Ti feedstock. (Coburn's Ti feedstock is of higher quality than that of Thunderbird).
- This leads to a significantly longer mine life at Thunderbird, based on current reserves. However, note comments below on Coburn's proposed extension, which is stated to deliver a 37-year mine life.
- With the Stage 2 expansion, Thunderbird will be producing over twice the amount of zircon compared with Coburn and doing that with a 26% lower throughput rate.
- Strip ratios for the mines are similar as is the proportion of revenue delivered by zircon (in the case of Coburn pure zircon plus low-grade concentrate; in the case of Thunderbird, high grade concentrate).

Capital

- Total capital for Stages 1 and 2 of Thunderbird is significantly higher than Coburn (+138%).
- However capital intensity expressed on a 'per annual tonne of zircon' basis is almost identical.
- In a recent release STA state that the Coburn project is 65% constructed and is on time and on budget, a creditable result. This bodes well for Thunderbird achieving its capex goals.

Operating costs and cash margins

- This seems to be where the largest differences lie. On a $/t of material moved, Thunderbird's mining costs are estimated at $2.41/t against 63c/t for Coburn. Both projects will use dozer trap mining methods.
- We are aware that Thunderbird's ore is harder than typical mineral sand mines and in the upper sections will require ripping by a D11 dozer. However, we find it hard to imagine how earthmoving costs could be nearly 4 times that of Coburn.
- Processing costs appear to be similarly skewed, with Thunderbird nearly two and a half times the cost of Coburn. And Coburn includes a dry plant to produce premium zircon. We are puzzled by this.
- Power costs are important as they could make up as much as 25-30% of total costs. Power will be generated using LNG at both projects, with top up power from solar at Coburn. STA quotes A$0.17/kwh for its power costs, against 20c for Thunderbird. The reason for the difference is not clear to us but might in part be driven by the use of solar at Coburn.

- Transport costs will be higher for Thunderbird. With 100% of the material shipped as concentrate, Thunderbird will truck over 6 times the volume of Coburn. However, Thunderbird is much closer to a port than Coburn (by around 90km). This we estimate will add 75c/t to Thunderbird's costs per tonne of ore processed compared with Coburn (using a transport cost of 10c/t/km).
- C1 costs for Thunderbird are estimated to be over 4 times that of Coburn. Again, this tests the credibility of these estimates. Has the Thunderbird project had particularly conservative costs applied, or are Coburn costs stretch targets? The transport costs for final product don't make that much of a difference.
- Both projects offer very attractive revenue to cost ratios and if correct, both will be in the highest margin quartile at over 2x. (Note we have recalculated Coburn's economics to the current long term zircon price assumption of US$1,516/t FOB and have used commodity price assumptions from the respective project feasibility studies).
- In total, Thunderbird's margin is A$10.60/t (revenue – C1 cost) against A$3.30/t for Coburn. The latter leaves less room for error or slippage.

Project economics

- A common financing metric, NPV/capex, both appear quite attractive with Thunderbird at 2.1x against Coburn at 1.8x.
- Thunderbird's NPV_8 is 2.8x that of Coburn for 2.4x the capex, in part reflecting Thunderbird's longer mine life and higher production rates.
- By comparison, Thunderbird looks to be a very robust project, and by our judgement certainly is a Tier 1 asset. Coburn, based on the DFS release, appears to be an attractive project, but we are concerned that costs may have been underestimated. Time will tell.

In conclusion, this comparison raises some interesting issues for us. Thunderbird is exploiting the increasingly attractive zircon-concentrate path, eliminating a relatively high capex dry plant. SFX argues that with the emergence of large Asian concentrators, returns from a dry plant don't warrant their installation. We believe that zircon concentrates now make up over 50% of all imports into Asia. This is a very liquid market.

Despite the additional capex for a dry plant at Coburn, capital intensity for both projects is about the same. This gives us additional comfort that the Thunderbird capex is achievable, despite inflationary pressures in Western Australia.

Of greatest concern to us are the large differences in operating cost estimates. We are left to conclude that the Thunderbird DFS has been very conservatively estimated and see the opportunity of even higher margins from this world-class project.

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Appendix 1

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