



ALIGN
RESEARCH

Pathfinder Minerals

6th April 2020

With a deal on the key mineral sands licence now seemingly on the cards, Pathfinder is in the enviable position of being on the cusp of a journey which could create material shareholder value

Pathfinder Minerals originally acquired a large African mineral sands project in Mozambique back in 2011 for £34 million via a paper reverse takeover transaction. These licences have been subject to dispute for 9 years trying to regain control of them through the courts. Recent news indicates that Pathfinder, finally, looks to be making serious progress at long last. A deal seems to be fast evolving on the licences with the key difference that there appears to be the buy in of all parties. Such developments would seem to herald a basis change for long suffering shareholders.

■ Potentially world class minerals sands ex-BHP Billiton project

BHP invested US\$29m on drilling/infrastructure to prove up an impressive resource in the mid-1990s. Back then, commercial circumstances did not merit future development. But now, Pathfinder is set to benefit from improved demand for ilmenite, the pigment for brilliant white paint.

■ Team set to rapidly increase shareholder value via spreadsheet mining

The 2019 updated Scoping Study determined an NPV(10) of US\$1.05bn. Pathfinder could benefit from the big uplift in value seen in mining projects in the early stages to smartly push the project up the valuation curve.

■ Based just 50km from Kenmare's Moma Mine suggests a natural buyer

We believe Pathfinder has all the hallmarks of being Kenmare mark II. Pathfinder's neighbour has more than a decade of operating experience in Mozambique and its close proximity creates unparalleled upside potential.

■ Risked conservative NPV suggests considerable upside potential

Our conservative valuation shows the potential. We update coverage of Pathfinder with an initial target price of 7.23p and **Conviction Buy** stance.

Table: Financial overview. Source: Company accounts & Align Research

Year to end Dec	2017A	2018A	2019E	2020E
Revenue (£'000)	-	-	-	-
PTP (£'000)	(615)	(645)	(600)	(750)
EPS (p)	(0.33)	(0.26)	(0.20)	(0.18)

This investment may not be suitable for your personal circumstances. If you are in any doubt as to its suitability you should seek professional advice. This note does not constitute advice and your capital is at risk. This is a marketing communication and cannot be considered independent research.

CONVICTION BUY
– initial target price
7.23p



Key data

EPIC	PFP
Share price	0.525p
52 week high/low	2.75p/0.35p
Listing	LSE
Shares in issue	318.69m
Market Cap	£1.67m
Sector	Mining

12 month share price chart



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IMPORTANT: Pathfinder Minerals is a research client of Align Research. Align Research & a Director of Align Research hold interests in the shares of PFP. For full disclaimer information please refer to the last page of this document.

Business overview

Pathfinder Minerals Operations

Pathfinder Minerals Plc (Pathfinder) is an AIM-listed natural resources company where the board is seeking to optimise the prospects of realising value from its disputed mining licences in Mozambique.

- **Mozambique Heavy Mineral Sands Project** – Companhia Mineira de Naburi S.A.R.L. (CMDM), which is a subsidiary of Pathfinder, was issued mining concession licences 760C and 4623C in 2004 and 2011 respectively. Each of these licences have a twenty-five year life. However, since 2012 the ownership of these licences had been in dispute. At that time, unbeknown to board, these two licences had been combined as a single licence 4623C and transferred to a company which was unconnected with Pathfinder. Only recently it has looked as though ownership issues might eventually become resolved.

Licence 4623C covers some 32,000 hectares of land on the Indian Ocean coast of the Zambezia province of Mozambique, which is known to contain the heavy minerals sands, namely ilmenite, rutile and zircon, used in the manufacture of a wide range of products across a number of industrial sectors.

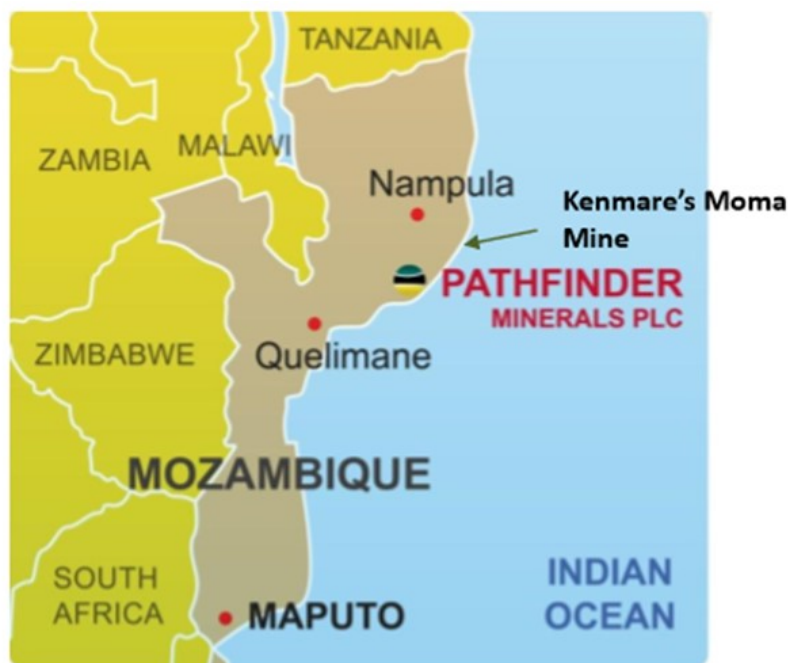


View across Pathfinder's licence area. Source: Company

Mozambique

The Republic of Mozambique lies in SW Africa and is bordered by the Indian Ocean. The country covers an area of more than 800,000km² and is sparsely populated. Mozambique is thought to be one of the poorest nations in Africa as more than 50% of its population of 28 million people are living below the poverty line.

In 1975, the country gained independence from Portugal, but is affected to this day by the 16-year civil war, even though it ended in 1992. Filipe Nysui was re-elected in 2019. Importantly, Max Temala, Minister for Energy and Mineral Resources, retained his position which is significant given his pragmatism and deemed commercial outlook.



Location of Pathfinder's Mineral Sands Project and Kenmare's Moma Mine.

Source: Company

Mozambique is a democracy which actively encourages foreign investment. **There is no doubt that the country is an attractive location for foreign investment due to the attractive combination of low corporation taxes and mineral royalties.**

Mozambique has an abundance of natural resources including: iron ore, gold, bauxite, and graphite, as well as some rare but important minerals like tantalite and ilmenite which is the source of the world's titanium. Successful mining operators include Kenmare Resources, whose Moma Mine lies just 50km north.

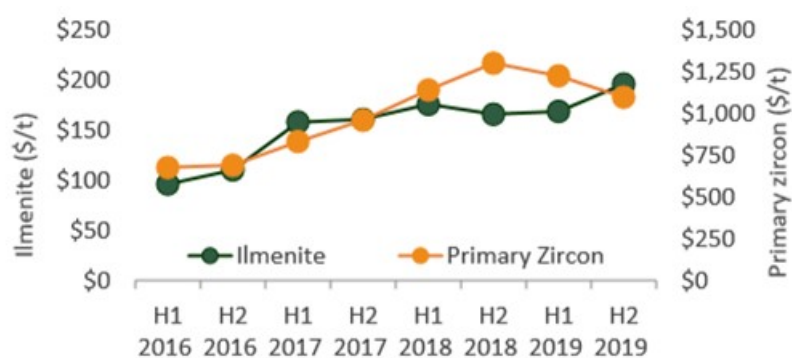
Oil companies with operations in the country include: ExxonMobil, BP and Anadarko. The discovery of natural gas in 2011 off the coast of Mozambique has led to substantial funds coming into the country and ushers in the prospect of the country potentially one day joining the big league of gas-exporting countries like Qatar and Australia.

Heavy Minerals

The main raw products from the mineral sands industry are the heavy minerals of ilmenite, rutile and zircon, which are used in the manufacture of a wide range of products across a number of industrial sectors. Ilmenite and rutile are used as feedstocks to produce titanium dioxide pigment. Ilmenite is titanium-iron oxide (FeTiO_2) which is the most important ore of titanium and has a wide range of uses. Rutile is the most common natural form of TiO_2 .

These titanium feedstocks are used to produce titanium dioxide pigment which is favoured for its brilliant whiteness due to its high refractive index. The demand for the bulk of titanium-bearing mineral feedstock is used in the production of such pigments, with more than 90% used in paint, plastics and paper products, with the remainder being used in aerospace metals and welding.

Zircon is a mineral that belongs to the group of neosilicates (which in the past were termed orthosilicates) with a chemical name of zircon silicate (ZrSiO_4). Zircon is mainly used as an opacifer (a substance that is added to material to make it opaque) in the production of ceramic tiles. Other applications include zircon's use in refractories and foundry castings.



*Recent price trend of ilmenite & zircon (US\$/t)
Source: Kenmare Resources 13-02-2020*

As far as titanium resources are concerned, there are two different sources. Firstly, mineral sands production is relatively concentrated in countries/regions like Australia and southern Africa. The second source being via hard rock mining in Canada and Scandinavia. **Mineral sands are a much easier source to mine as sands can be dredged without any crushing being required.**

There are strong fundamentals for TiO_2 feedstocks as legacy inventories are now depleted and high-quality ilmenite is under supplied. At the same time supply from existing mines is expected to decline further, with new projects seem to be facing significant hurdles to development. All this is happening against a backdrop of significant new pigment capacity which is expected to ramp up in 2020 leading to increased demand for ilmenite.

Increasing demand is being driven by not just increased urbanisation and global growth but also by the extensive range of applications. **Currently, there is no viable substitute for TiO_2 and it cannot be recycled.** Existing mining operations are reaching full capacity and have limited scope for expansion, which means that new supply is required. However, there seem to be only a limited number of known new sources of significant supply, which is probably a direct result of the lack of investment in exploration and project development over the past decades.

Background

Pathfinder Minerals PLC was previously called Pathfinder Properties PLC, a residential property developer which had been trading on the AIM market for a number of years until 2009 when measures were adopted at the AGM with the aim of improving shareholder value. At that time, a new board took control with a new strategy of focusing on mineral exploration and development in sub-Saharan Africa and Central Asia.

Subsequently, there was a 1-for-10 share consolidation, a £0.5 million raise by issuing Convertible Loans Notes and the acquisition of 80,000 shares (which represented a 4.67% interest) in IM Minerals Limited (IM), a company whose subsidiaries held licences to mine heavy mineral sands in Mozambique. In 2011, the remaining interest in IM was acquired for £34.6 million, paid for via the issuing 728.56 million shares at 4.75p. A further £0.5 million was raised by issuing 11.05 million shares at 4.75p, which at the placing price gave the company a then market capitalisation of £38.4 million.

May 2011 saw the announcement of a Scoping Study carried out by consultants URS Scott Wilson which was based on historic BHP Billiton geological and engineering information on these heavy minerals sand licences in Mozambique. URS Scott Wilson estimated an NPV(10) of \$529 million and an IRR of 18.8% for a 30 year life on mine (LOM) project. In July 2011, the company was issued with a brand new 25-year Mining Licence by the Ministry of Mineral Resources, Natural Directorate of Mines of Mozambique which combined the Moebase and Naburi licences. The board saw this move as forming the basis for Pathfinder to move forward with certainty of tenure on this world class asset.

By December 2011, it became apparent that licences 4623C (Moebase) and 760C (Naburi) had been combined into a single licence (4623C) which had been legally registered in the name of Pathfinder's subsidiary Companhia Mineira de Naburi S.A.R.L. (CMDN), had been transferred to Pathfinder Moçambique SA, a company not connected to the Pathfinder Minerals group. The company was advised that, in the absence of such authority, any such transfer would be unlawful and began pursuing the return of these licences largely through the courts in London and Mozambique.

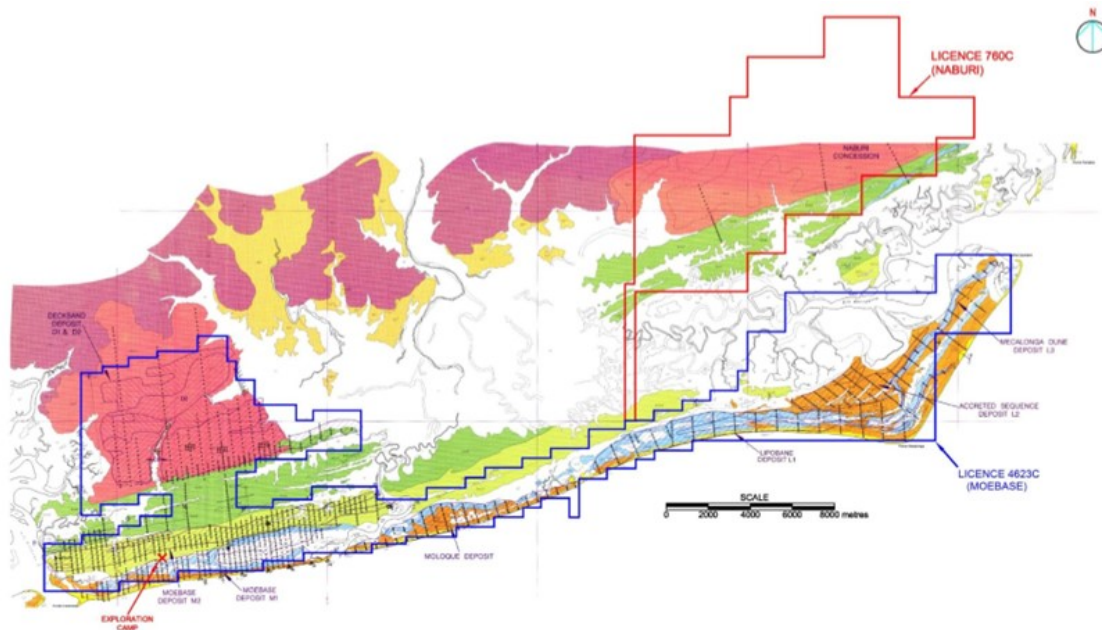
Since that time, all legal avenues have been pursued and there has been regular fund-raising exercises to pay administration charges and mounting legal bills. It was unfortunate for early shareholders that that the pursuit for the return of the licence has unsuccessfully dragged for so many years. In the summer of 2018, shareholder pressure of which we as a company led, resulted in changes in the boardroom and the company gaining new leadership.

There was a further management change in June 2019 when John Taylor became CEO & heavyweight mining exec Dennis Edmonds got involved in September 2019. Over the last 6-9 months, developments have become far more positive concerning the licence negotiations. **On 1 April 2020, it was reported that the company's dialogue with General Jacinto Veloso (a 50% shareholder in the current licence-holding entity) remains constructive with the two parties working towards a transaction to bring an end to this saga.**

At this stage, there was also news that the other 50% stake in the current-licence holding entity had been transferred to a Chinese state-owned third party; and that the company has established a dialogue with them with a view to securing its participation in a proposed multi-party transaction involving the licence.

Geology

The project is located in the northern regions of the Mozambique Basin. This is one of a series of sedimentary basins which have formed on the eastern continental margin of Africa resulting from the rifting followed by a break-up of the Gondwana super-continent. A direct result of this rifting was the formation of sedimentary basins that became filled with a mixture of conglomerates, sand, shale and marine limestones. Something like 65 million years ago, as the continents were moving apart, a stable passive continental margin was formed along the coastal basins.



Geological map of the Moebase and Naburi licence areas. Source: Scott Wilson's Valuation Report on the Naburi and Moebase Minerals Sands Deposits, Mozambique (August 2010)

This was followed by the major river systems flushing large amounts of sediments into the Mozambique Basin. This sedimentary cycle ended with the formation of heavy mineral sands placers stretching out along the coastline.

By and large, heavy minerals sands are deemed to be those with a specific gravity of 2.9 or more, with the valuable components of such deposits being the titanium dioxide minerals ilmenite and rutile, zircon along with garnets, monazites and xenotime. Normally, the heavy mineral sand deposits which are concentrated in such locations can either be paleo or modern age. Essentially, modern beach deposits are seen to accumulate as foredunes which lie along the coastline. Work has shown that the titanium placer deposits at Moebase are typical coastal formations from the Quaternary Period which are basically beach dunes.

The mineralised areas of the property can be spit up into nine separate deposits which have various types of formation. The oldest sand formation being the decksand in the Moebase area which date from the early Pleistocene era. This decksand formation lies around 5km inland from the modern beach in the Moebase area.

No	Deposit	Formation
1	Moebase M1	Emergent coastal dune formation
2	Moebase M2	Inland costal mobile dune formation
3	Molocue M0	Emergent coastal dune formation
4	Lipobane L1	Emergent coastal dune formation
5	Lipobane L2	Accreted dune formation'
6	Lipobane L3	Accreted dune formation'
7	Decksand D1	Paleo dune formation
8	Decksand D2	Paleo dune formation inland of D1 deposit
9	Naburi	Paleo dune formation (decksand)

' – formed by gradual accumulation

Mineralised areas in the licence area can be divided into nine deposits. Source: URS Scott Wilson IM Minerals Valuation Report (August 2011)

Past exploration

The licence has long been known to contain heavy mineral sands with exploration work from the mid-1980s through to 2002 identifying significant mineralisation. The first exploration work was carried out in 1988 by Edlow Resources, which was followed a year later by reconnaissance drilling on a 1,000 metre by 1,000 metre grid using reverse circulation equipment. Edlow completed a total of 427 Reverse Circulation drill holes to an average depth of 15 metres for resource evaluation on the Moebase and Molocue deposits, with 70% of the drilling effort concentrated on Moebase (288 holes for 4,690 metres).

In 1991, Edlow commissioned a Pre-Feasibility Study by Mineral Deposits Ltd for the development of the Moebase deposit based on an historical Indicated Resource of 239.9 million tonnes grading at 5.17% heavy minerals. An earn-in deal was struck with Genmin (a subsidiary of Gencor which subsequently became BHP Billiton) in 1983 to advance the project through to a Full Feasibility Study and development. This led to more detailed exploration program requiring extensive RC evaluation drilling being undertaken by Gencor between 1994 – 1998.

Deposit	Tonnage Mt	Grade (% hm)	Heavy Mineral Tonnage Mt	TiO2 Tonnage Mt	Mine life years	Resource classification'
Moebase	205.4	4.6	9.45	4.03	8	Measured
Lipobase	193.6	4.7	9.10	3.88	7	Inferred
Molocue	67.4	5.3	3.57	1.52	3	Inferred
Moebase intertidal	3.3	9.1	0.3	0.1		Inferred
Total Coastal	469.7	4.77	22.42	9.53		
Decksand	1,147.1	3.1	35.56	16.29	30	Measured/Inferred
Naburi	404	3.4	13.74	5	13	Inferred
Total Project	2,020.8	3.55	71.72	30.82		

' – Billiton resource classification which does not conform to the current AusIMM, CIM or SAMREC resource classification codes

Historical Mineral Resource based on modelling by Gencor. Source: Shown in URS Scott Wilson IM Minerals Valuation Report (August 2011) where the original source Billiton, TiGen Detailed Feasibility Study (February 1998); TiGen Detailed Geological Report September 1997.

In 1995, Gencor set up a spiral concentrator plant at the Moebase to allow the preparation of large bulk samples for metallurgical test work. A Pre-Feasibility Study (PFS) was completed in 1995 followed by a full Feasibility Study (FS), which included environmental assessment, which was completed three years later in 1998.

The focus of both these studies was the production of a chloride grade titanium slag formed from the ilmenite. The strategy seemed to be that the iron would be sold as a co-product from the slag with both ilmenite and rutile sold as mineral concentrates.

BHP (which was divested from Gencor in 1997), invested a total of US\$29 million in infrastructure and exploration. Infrastructure built at the site included a site camp, bridges and an airstrip. Exploration work consisted of drilling more than 3,000 boreholes, followed by detailed geological interpretation, data analysis and preliminary test processing work.

Bulk sampling and metallurgical test work conducted by Gencor/BHP for the PFS and FS in the mid-1990s did demonstrate that valuable heavy minerals could be recovered using conventional dredge mining, wet concentrate and dry mineral separation processes. However, commercial circumstances at that time did not merit further development of the deposit and the project was placed on a care and maintenance basis by BHP Billiton in 2004.

There was to be no further exploration effort before Pathfinder acquired the Moebase and Naburi licences. Ahead of the acquisition and since that time there have been a number of reports commissioned from consultants.

Valuation report I

Scott Wilson prepared a valuation report (entitled in “*Valuation Report on the Naburi and Moebase Mineral Sands Deposits, Mozambique*”) August 2010 for IM Minerals Ltd. This used a Market Approach to estimate a range of values. Market comparable transactions for heavy minerals sand properties in Kenya, Mozambique and Australia from 2002 to July 2010 were analysed to estimate a Market Value range of US\$1.50 – 2.50/t of contained heavy minerals (HM). This range was applied to the 71.72 tonnes of contained HM on the IM Minerals properties to derive a Market Value range of US\$107.6 – 179.3 million. **The consultants went on to estimate that the most likely value of the property was approximately US\$1.80/t contained heavy minerals of US\$129.1 million for the 100% interest held by IM Minerals.**

Competent Person’s Report

The Competent Person’s Report (CPR) by URS Scott Wilson dated 9th December 2010 (entitled “*Mineral Expert’s Report on the Naburi and Moebase Minerals Sands Deposits, Mozambique*”) gave the licenced area a Mineral Resources Estimate (MRE) that was based on that determined in 1998 which formed part of BHP FS. However, URS Scott Wilson downgraded BHP Billiton’s previous Measured resource category to Indicated in the absence of physical core samples in order to conform with current Canadian Institute of Mining, Metallurgy and Petroleum (CIM) mineral resource estimate standards.

Category	Tonnage Mt	Grade (% Heavy Minerals)	Contained Heavy Minerals (Mt)
Measured	0	0	0
Indicated	1,353	3.33	45.01
Inferred	668	4.00	26.71
Total	2,021	3.55	71.72

Mineral Resources Estimated in CPR where URS Scott Wilson had reclassified the resources to CIM. Source: URS Scott Wilson Mineral Expert's Report on the Naburi and Moebase Minerals Sands Deposits, Mozambique Scoping Study Report (December 2010).

The MRE of 2.02 billion tonnes with a 3.55% heavy mineral content included areas within the Moebase deposit showing average heavy mineral content of 4.7% and some areas within the deposit showing heavy mineral content as high as 9.1%. The estimated mineral content split was ilmenite (93.4%), rutile (1.74%) and zircon (4.78%).

Scoping Study

In May 2011, the company announced the results of a Scoping Study to develop the Moebase and Naburi Mineral Sands deposits by consultants URS Scott Wilson, based on the MRE outlined in late-2010.

The study looked at a project where annual production consisted of 1.245Mtpa ilmenite, 24,000tpa rutile and 65,000tpa zircon. **Estimated annual revenues from this level of production were US\$246 million based on the following commodity prices: ilmenite (US\$125/t), rutile (US\$677/t) and zircon (US\$1,148/t).** The commodity prices used were considerably below the then market forecast for each product.

Based on an estimated Run of Mine (ROM) production of 47Mtpa, estimated mine life of 30 years, and an estimated direct capital expenditure of US\$553 million, the project was determined to have a NPV(10) of US\$529 million and an IRR of 18.8%.

At that stage Pathfinder intended to undertake confirmatory drilling and a metallurgical test work programme to allow conversion of the historic mineral resource into a current estimate. This work programme which was to form part of the feasibility study was designed to improve the company's understanding of the mineral resource potential, the process flowsheet, final product qualities and confirm the prospect of economically producing saleable product streams.

Detailed Feasibility Study

In October 2011, Pathfinder Minerals commenced a detailed feasibility study (DFS), with a view to developing a mine for commercial extraction. This study was placed on hold a few months later when, in late 2011, Pathfinder discovered that the licences had been misappropriated.

Valuation Report II

The board commissioned Wardell Armstrong International (WAI) to prepare a valuation report, which is dated April 2017. **The existence of this document was never reported to shareholders.** It is thought that this report was commissioned following some Chinese interest, with the board needing an up-to-date valuation figures to use in negotiations.

WAI's valuation report was based on the earlier work of URS Scott Wilson and brought up-to-date with publicly available information from five heavy mineral sand projects namely: Base Resources, Kenmare Resources, Strandline Resources, Iluka and Sheffield Resources. Essentially, WAI's methodology was to adopt a combination of the Income and Market approaches.

Company	Country	Status	HM Grade (%)	Material (Mt)	In-situ HM (Mt)
Base Resources	Kenya	Producing	4.2	134.6	5.62
Iluka Resources	USA, Australia & Sri Lanka	Producing	7	2,424	170.5
Kenmare Resources	Mozambique	Producing	2.9	6,507	188
Sheffield Resources	Australia	DFS completed	6.9	3,230	223
Strandline Resources ¹	Australia & Tanzania	DFS completed	1.42	1,052	14.9
Pathfinder Minerals	Mozambique	Mineral Resource/PFS	3.55	2,021	71.72

¹ – Strandline was only used in WAI's analysis for purely for comparison purposes

List of the selected heavy sands project used in WAI's valuation. Source: Wardell Armstrong International's "Valuation Report on the Naburi and Moebase Mineral Sands Deposits" (April 2017)

This peer group of companies was used to determine an average cost of goods sold and an average gross product revenue was chosen due to there being limited comparable property sales in the 2014 and 2017 period. **WAI derived an NPV(10) valuation of US\$179.4 million for the project based on DCF analysis.**

Updated Scoping Study No 2

In April 2019, the company announced the results of an updated Scoping Study which had been commissioned from independent technical consultant, 2M Mineral Services Limited. Basically, it was a revised Scoping Study on the licence which included revised capital and operating costs as well as revised pricing assumptions that were presented in the URS/Scott Wilson 2011 Scoping Study report.

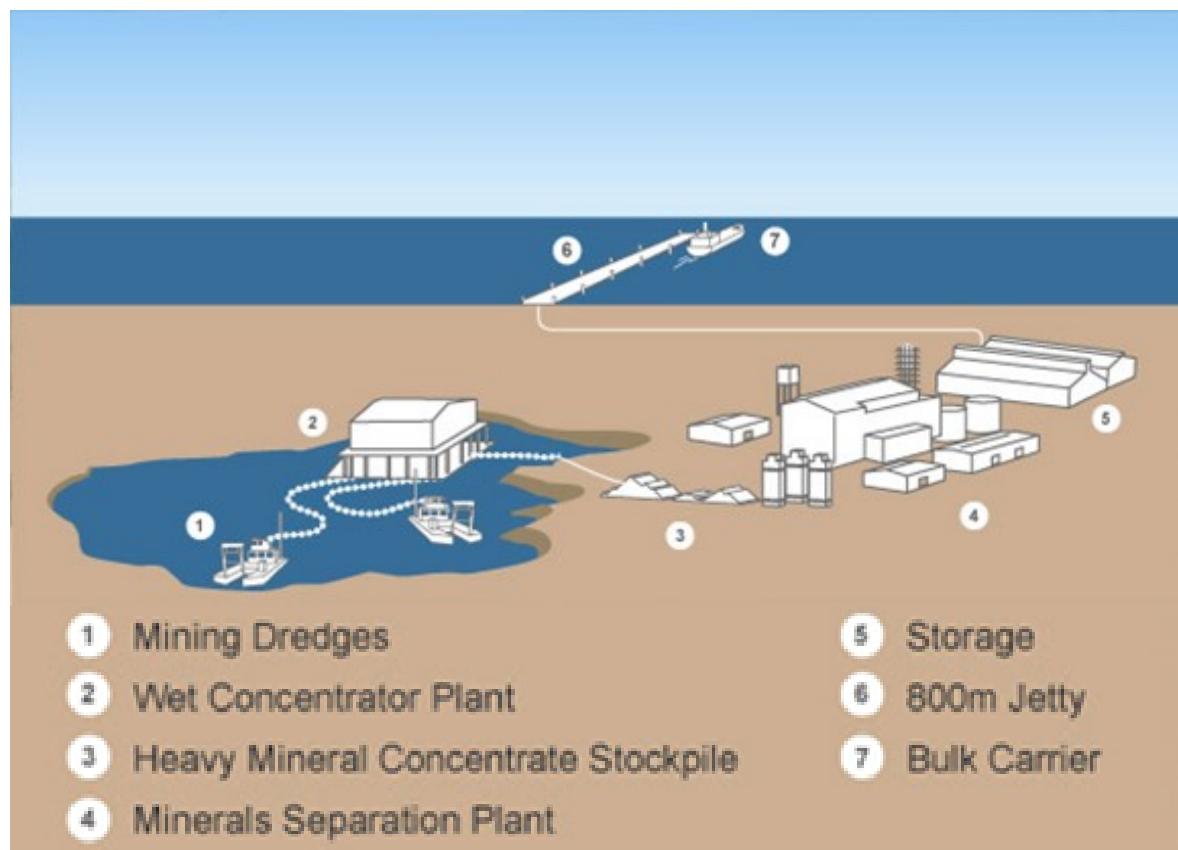
This updated Scoping Study resulted in an estimated pre-tax NPV(10) of US\$1.05 billion, with projected annual revenues of US\$323 million over a mine life of 30 years. The revised findings represented a near doubling of the previously reported equivalent NPV and the IRR increasing from 18.8% to 24.9%.

Project Design

One of the most cost-effective methods that has been developed over the years for mining heavy minerals sands is through the creation of a man-made lake and the use of wet dredges. This style of mining provides for better economies of scale than those of surface sand removal techniques.

The initial mining development will concentrate on the higher average grades with floating dredges mining the heavy mineral sands which are then fed through to a wet floating concentrator plant, with the material then piped to dry land. The heavy mineral concentrate is stockpiled to provide a continuous feed to the Mineral Separation Plant which uses a combination of magnetic, gravity and electrostatic circuits in order separate the sands into the various finished products rutile, zircon and different grades of ilmenite.

The first stage would involve the magnetic separation of ilmenite from the zircon and rutile. That is subsequently followed by the processing of the magnetic fractions using an electrostatic circuit to produce a final ilmenite product.



Likely configuration of mining and processing at the heavy minerals sands project (the precise methodology being determined by the Feasibility Study). Source: Company

The products then are planned to be conveyed to the company's own dedicated 800 metre jetty and from here barges will transport the products to a Panamex-type vessel anchored further offshore.

Strategy for growth

A new dawn looks like it is now about to begin at Pathfinder with the resolution of the ownership issues over the Moebase and Naburi licences seemingly about to be resolved. It does look as though all parties are now in a dialogue and focused on a proposed multi-party transaction associated with the licence. Obviously any proposed transaction will need to involve a funding partner and commercial discussions are continuing with the preferred partner to provide the financing not just for the proposed transaction but also for the future developments costs associated with the development of the licence. **However, the resolution of the issue is creating the prospect of binary returns for recent investors.**

Once these agreements are concluded, work on the project can recommence with the company probably emerging with a significant interest in the project with a free carried interest through the feasibility studies. Following detailed planning, it is likely that the partners will undertake confirmatory drilling and metallurgical test work programme. This very much represents the partners picking up from where the company left off in late-2010 at the beginning of the Definitive Feasibility Study (DFS).

Such a confirmatory drilling programme will be designed to ensure the conversion of the historic MRE into a current estimate. It has got to be remembered that the Scoping Study and other work by URS Scott Wilson was based on a downgraded version of BHP Billiton's MRE where the previously Measured Resource category had been moved down to the lower category of Indicated Resources, which was due to the absence of physical core samples. **We would expect that the corroborative drilling programme will enable this to be re-categorised as the all important Measured resource.**

All this work, which will feed ultimately into the DFS, will serve to improve the partners' understanding of the mineral resource potential, the process flowsheet and final product qualities. Mostly importantly, the work will confirm the prospect of economically producing saleable product streams. **These all represent important steps to being able to place a reliable valuation on the project based on current forecasts for heavy mineral prices over the coming decades.**

The biggest uplift in value in mining projects comes during the early stage and this is called "spreadsheet mining". We expect that the partners will do enough to outline the scale of the value using a DFS to provide a number against which to negotiate a sale of the project. The scale of project that was previously outlined in the Scoping Study is on a par with Kenmare's Moma Mine which provides something like 7% of the world's ilmenite. **So, Pathfinder's project could be truly seen as an important global resource for the future; and little surprise that it has been dubbed Kenmare mark II in the past. Lying just 50km away from the Moma Mine, Kenmare does seem to be the natural buyer.**

Titanium dioxide is used as a pigment because of its brightness and finds its way into a wide variety of products from paints and coatings to toothpaste and cosmetics. There are strong fundamentals for TiO₂ feedstocks as legacy inventories are now depleted and high-quality ilmenite is under supplied. At the same time supply from existing mines is expected to decline further, with new projects seem to be facing significant hurdles to development which has begun to be reflected in rising market prices. **It thus looks as though the partners will be exploring the available options to maximise value with enviable timing, which should serves to benefit Pathfinder's shareholders.**

Recent developments

On 1 April 2020, it was reported that the company's dialogue with General Jacinto Veloso (a 50% shareholder in the current licence-holding entity) continued to be constructive. In addition, the two parties were working towards a transaction to bring an end to this saga. **This announcement also brought news that the other 50% stake in the current-licence holding entity had been transferred to a Chinese state-owned third party; and that the company had established a dialogue with them as well, with a view to securing the participation of the Chinese in a proposed multi-party transaction involving the licences.**

At this time, John Taylor, CEO, made the following comment: *".....I am pleased to report that we are making real progress towards securing that multi-party alignment.It is apparent from our discussions that the Licence, as a substantial undeveloped mineral sands resource, remains of considerable interest to the industry and prospective financiers. **I am also pleased that we have been able to ensure the Pathfinder issue continues to be in focus within the Mozambique Government as we work towards securing the involvement of all the stakeholders required to facilitate a resolution.** Independently of the Mozambique Licence, progress is being made in assessing other opportunities, whose near-term cash generation potential would support the Company's main objective in respect of the Mozambique Licence. I look forward to reporting any further developments when appropriate."*

On the 3rd April 2020 a £175k funding package in which debt with warrant attachments was injected into the company and with the participation of CEO John Taylor being announced. The warrants having a 2 year life and a strike price of 0.6p with the expectation that this will provide a continued runway to conclude a tri-party deal.

Risks

Geological risks

There are a series of risk factors concerning the amount of understanding of the geology of the project areas, the mineralisation being targeted and the distribution and magnitude of heavy mineral sands that have been identified in exploration work.

Political risk

There are political risks involved in companies operating in the Mozambique. The mining industry is arguably the most susceptible sector of the market to political risk largely due to its importance to the host country's economy.

Heavy minerals pricing risks

Heavy mineral prices are highly cyclical. Changes in these prices could have a negative or positive impact on the valuation of the company's projects and revenue from the sales of the final products of heavy mineral sands.

Exchange rate risks

Movements in the value of currencies will have an effect on the company's accounts from the translation of sales of heavy minerals internationally in US dollars and costs in both US dollars and the local currency Mozambican metical into sterling. Fluctuations in the value of these currencies against the pound may have an effect on the valuation that Pathfinder is awarded by the UK stock market.

Future funds

The market for raising funds for small cap companies look to have had improved from the worse conditions a couple of years ago, however the global spread of the COVID-19 infection has meant that equity markets have become extremely difficult. Even ahead of the arrival of this pandemic, some recent fund raisings in the resources sector have seen share prices being undermined by incoming investors demanding substantial discounts to provide the necessary capital.

Board of Directors

Sir Henry Bellingham – Non-Executive Co-Chairman

Sir Henry Bellingham was, between May 2010 and September 2012, Under Secretary of State at the Foreign and Commonwealth Office with ministerial responsibility for Africa, the United Nations, Overseas Territories, economic issues, conflict resolution and climate change. He first entered Parliament in 1983 as the member for North West Norfolk, which seat he held until 1997. He regained the seat in 2001 and continues to hold it today following re-elections in 2005, 2010 and 2015.

In opposition, Sir Henry served successively as a Shadow Minister for Small Business and Enterprise, Opposition Whip and Shadow Minister for Legal Services. He is the chairman of the Westminster Foundation for Democracy, the UK's leading democracy-building foundation which provides expertise in developing parliaments, political party structures and civil society organisations in emerging democracies – the key institutions that make up a functioning democracy.

Prior to entering Parliament, Sir Henry practiced as a barrister. He is an independent member of the board of Pathfinder Minerals Plc. Among his key responsibilities are the chairing of the company's board meetings and providing advice to Executive Directors on matters including corporate governance and general strategic direction. Sir Henry brings extensive knowledge of Africa, the continent in which the company is seeking to operate

John Taylor– Chief Executive Officer

John is experienced in assisting small cap quoted companies with their development. He has previously worked in private equity backed portfolio companies, driving operational turnaround initiatives and implementing costing systems. He spent over 20 years in the Army Air Corps, leaving in 2015 with the rank of Lieutenant Colonel. Between 2013 and 2015 he was senior strategic communications officer for the Ministry of Defence. John is also a Non-Executive Director of Two Shields Investments plc, Bidstack Group plc and Sabien Technology Group plc.

Dennis Edmonds – Non-Executive Director

Dennis has significant commercial and corporate experience in Southern Africa, having practiced as a corporate solicitor in South Africa - and subsequently in the United Kingdom - specialising in structuring and executing corporate transactions. He has also been employed at board level in the investment banking and venture capital industries. Over the past 15 years Dennis has been a director of public and private companies, including those operating within the mineral resources sectors in emerging markets.

Valuation

We have sought to value Pathfinder by determining a valuation on the mineral sands project in Mozambique. **In our analysis we have assumed that following agreements with its new partners, that Pathfinder has a 30% residual interest in the project.** It is on that basis we have attempted to determine a realistic valuation for the project and hence the company. As mentioned earlier on, the project has been the subject of four valuations.

The first estimate was in August 2010, when consultants Scott Wilson prepared a valuation report for IM Minerals Ltd. This used a market approach to estimate a range of values. Market comparable transactions for heavy minerals sand properties in Kenya, Mozambique and Australia from 2002 to July 2010 were analysed to estimate a market value range of US\$1.50 – 2.50/t of contained heavy minerals (HM). **This range was applied to the 71.72m tonnes of contained HM on the IM Minerals properties to derive a market value range of US\$107.6 – 179.3 million.** The consultants went on to estimate that the most likely value of the property was approximately US\$1.80/t contained heavy minerals giving a derived value of US\$129.1 million for the 100% interest held by IM Minerals.

The second estimate was the URS Scott Wilson Scoping Study dated May 2011, which was based on 71.7Mt of contained economic heavy minerals determined a NPV(10) of US\$529 million.

Assumptions and estimates		
	2011 Scoping Study	2019 updated Scoping Study
Run of Mine production	47mtpa	47mtpa
Life of Mine	30 years	30 years
Mineral content split of the final product	Ilmenite: 93.4% Rutile: 1.8% Zircon: 4.8%	Ilmenite: 93.4% Rutile: 1.8% Zircon: 4.8%
Annual production	Ilmenite: 1.245Mtpa Rutile: 24,000tpa Zircon: 65,000tpa	Ilmenite: 1.245Mtpa Rutile: 24,000tpa Zircon: 65,000tpa
Mineral prices	Ilmenite: US\$125/t Rutile: US\$677/t Zircon: US\$1,148/t	Ilmenite: US\$173/t Rutile: US\$908/t Zircon: US\$1,320/t
Projected annual revenues	US\$247 million	US\$323 million
Initial Capital Cost	US\$686 million	US\$742 million
ROM mining costs	1.80/t	n/a
IRR	18.8%	24.9%
NPV (10)	US\$529 million	US\$1,046 million

Summary of Scoping Studies. Source: Company, URS Scott Wilson Scoping Study May 2011 & 2M Mineral Services updated Scoping Study April 2019

Valuation number three was by WAI in April 2017. The analysis used average cost of goods sold and an average gross product revenue for a number of operations of both those in production and those at a pre-production with number from the DFS. **Based on this analysis, WAI derived a NPV(10) figure of US\$179.4 million.**

Valuation number 4 was contained in the updated Scoping Study (April 2019) by 2M Mineral Services using revised of capital and operating costs as well as pricing assumptions that were presented in the 2011 Scoping Study report. **This gave an estimated pre-tax NPV(10) of**

US\$1.05 billion, with projected annual revenues of US\$323 million over a mine life of 30 years and an IRR of 24.9%.

Peer comparisons

In the heavy minerals sector, there are some fairly chunky valuations. Looking at the Enterprise Value (EV) per tonne of heavy minerals resources suggests a range of valuations. **Those EV/t figures do show how valuations can increase as a project climbs the valuation curve and moves from the DFS stage to production.**

Company	Share price	EV (£m)	Country	Status	Total resources			EV/t (£)
					HM Grade (%)	Material (Mt)	In-situ HM (Mt)	
Iluka Resources (ASX:ILU)	A\$7.08	1,460	USA, Australia & Sri Lanka	Producing	7.1	2,363	167.8	8.70
Kenmare Resources (LON:KMR)	189.95p	195.6	Mozambique	Producing	2.9	6,333	181	1.08
Base Resources (ASX:BSE)	A\$0.145	53.7	Kenya	Kwale Producing + Toliara Sands progressing to construction	4.6	1,578	72	0.75
Sheffield Resources (ASX:SFX)	A\$0.098	10.8	Australia	DFS completed	6.9	3,230	223	0.48
Strandline Resources (ASX:STA)	A\$0.085	13.4	Tanzania ¹ & Australia ²	DFS completed at both Fungoni & Coburn projects	1.7	2,380	41.4	0.32
Pathfinder Minerals ¹ (AIM:PFM)	0.425	1.25	Mozambique	Scoping Study completed	3.55	606	21.5	0.06

¹The project has a total of 2,021Mt of material @ 3.55% HM and in our analysis we use the company's 30% attributable share.

Peer group comparisons. Source: Align Research

As the company moves ahead and emerges from feasibility studies we believe it could gain a rating of £0.32 - £0.48/t similar to that awarded to Strandline Resources and Sheffield Resources, which would suggest a valuation of anywhere between £6.8 million and £10.3 million for Pathfinder's assumed 30% interest in the project. This gives a clear indication of the immediate value uplift at hand here for equity holders.

We should report that we carried out the same analysis in October 2018, in what might be judged to be far more normal market conditions. At that time Strandline Resources and Sheffield Resources and Strandline Resources attracted ratings of £1.48/t and £0.55/t respectively, which would suggest a valuation of anywhere between £11.2 million and £30.3 million for the Pathfinder's assumed 30% interest in the project.)

DCF analysis

Peer comparisons make for interesting reading, but we believe that at the company's current stage of development a more robust valuation would be achieved by undertaking a DCF analysis. Our financial model has been based on the MRE outlined by URS Scott Wilson and we have also employed a number of similar assumptions that were used in the updated Scoping Study.

So, we have used a LOM of 30 years with the mine producing at a rate of 47Mtpa ROM for most of its life and the same schedule of mining across the various deposits that make up the project. We also used the same percentage split of the final product (i.e. ilmenite 93.4%, Rutile 1.74% and Zircon 4.78%) and the annual production of 1.245Mtpa Ilmenite, 24,000tpa Rutile and 65,000tpa Zircon.

In our model, it was elected to use a flat price for the heavy minerals over the thirty-year life of the project. We employed prices which were close to recent pre-COVID 19 market prices at US\$200/t for Ilmenite, US\$1,100/t for Rutile and US\$1,200/t for Zircon. Based on the above split for the final product gives an average revenue per tonne figure of US\$241.35.

The capital expenditure determined in updated Scoping Study (April 2019) by 2M Mineral Services of US\$742 million was used in our analysis. We have looked at the capex being project financed at the asset level over the life of the mine with a flat interest charge of 10% per annum.

Operating costs over the LOM were selected by reference to the recent and project cash operating costs at Kenmare's Moma Mine which just lies 50 kilometers north of Pathfinder's project. In its 2019 Results Presentation, Kenmare gives guidance that its cash operating costs per tonne would decrease to US\$125-135/t (in 2020 real terms) from 2021. Looking at this guidance provided and levels of production, we elected to use a flat US\$130/t figure for operating costs. This equates to US\$3.69/t of ROM, which is more than double the figure of US\$1.80/t ROM which was a key assumption in the Scoping Study.

Our financial model generated a series of pre-tax NPVs for the project using discount rates of 8%, 10% and 12%. **We choose to use the most conservative NPV(12) of US\$147.52million (£118.02 million), and which we have further risked to give a number to carry into our SOTP valuation.**

100%	Discount rate		
	8%	10%	12%
NPV US\$m	925.67	673.11	491.75
NPV £m	752.57	547.24	399.80
Pathfinder 30% interest			
NPV US\$m	277.70	201.93	147.52
NPV £m	225.77	164.17	119.94

Net Present Values at various discount rates. Source: Align Research

A highly valid rule of thumb in valuing mining projects is that companies at the Scoping Study stage should attract a valuation akin to 20-25% of the NPV, which rises to 30-35% for those at the PFS stage as projects are driven up the valuation curve. The Moebase and Naburi Mineral Sands Project has a Scoping Study in place and work briefly began on feasibility studies in late-2011. **On this basis we have further risked the valuation by 75%,**

giving a figure of US\$36.88 million or £29.98 million at prevailing FX rates. This equates to 9.41p per share based on the current number of shares in issue (318,685,370) and 7.23p per share on a fully diluted basis (414,666,374).

Conclusion

The Moebase and Naburi Mineral Sands Project represents a large resource and Pathfinder is well-positioned to capitalise on the emerging structural supply gap which seems to be emerging in TiO₂ feedstock. **With an all parties deal on the licence appearing to be in the offing – something which has not been the case for the last 9 years as far as we are aware, light at the end of this long tunnel now seems to be here for shareholders.**

At the current market cap of just over £1.5 million, the shares are, incredibly, valued at the lowest point in the company's history and yet the company is now at the most opportune point since the licence was spirited away to finally conclude a deal. Indeed, at 0.525p the shares are valued as a de facto shell and a fraction of a realistic resolution level as illustrated here. It gets even more surreal however as based on our analysis as detailed extensively here, it effectively values the shares as receiving less than a 2% residual interest in the project, something that we as the largest shareholders would vote against.

With the seeming buy in of all parties to end this saga, the key now is to secure a funding partner at, we understand, the asset level thus avoiding any further equity dilution and for which there seems to be more than one capable potential entity in the frame from both an operating and financial perspective. We have a great deal of faith that under the direction of SA national and seasoned lawyer Dennis Edmonds that this will be brought to fruition much sooner than the market's lowly valuation presently ascribes.

We thus re-initiate our coverage of Pathfinder Minerals with a Conviction Buy stance and an initial target price of 7.23p.

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