COMPETENT PERSON’S REPORT
for
Base Resources Limited

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4 October 2012

The Directors
Base Resources Ltd
Level 1
50 Kings Park Road
WEST PERTH WA 6005

Dear Sirs

TZ Minerals International Pty Ltd (TZMI) has been commissioned by Base Resources Limited (Base or the Company) to provide a Competent Person’s Report (CPR) for the Kenyan mineral sands assets owned by Base.

This CPR is to be used for the purposes of Base’s intended listing on the AIM Market of the London Stock Exchange (AIM). A copy of the CPR will be made available on Base’s website.

Base is constructing the Kwale mineral sands project, about 50 kilometres south of the port city of Mombasa, which is planned to produce titanium and zirconium minerals commencing production in 2013. Base also holds options to acquire exploration projects north of Mombasa at Vipingo, Kilifi and Mambrui.

Our views on the projects have been assembled over a period of approximately 24 months, since Base first acquired the Kwale project. We have viewed accumulated reports and data from Tiomin, the former project owner; observed flowsheet testwork at Allied Mineral Laboratories (AML) in Perth; viewed the Kwale deposits, site laboratories, port site, dam site, road and power infrastructure, and met with Kenyan authorities during Base negotiations.

We have followed the progress of the enhanced definitive feasibility study (EDFS) undertaken by Base and the Australian listed global engineering company Ausenco Limited (Ausenco). This CPR draws significantly upon the detail in the EDFS, which is built on the same basic data and information TZMI reviewed from the Tiomin documents. Base undertook an infill drilling programme on the Kwale deposits during 2010, and TZMI has reviewed the detail of this programme. Ausenco was awarded the EPCM contract to build the Kwale project mining and processing facilities. TZMI has reviewed the overall detail of this engineering work, including plant layouts, detailed equipment specification and selection, and operating assumptions. At the time of writing procurement and contract work totalling 70% of the project value had been committed.

Resource assessment has been undertaken in several stages, by Tiomin in 1997; by SRK in 2004; and by Base in 2011, with each new assessment showing general agreement with the previous estimation of resources. The accumulation of geological and metallurgical data presents a resource assessment that has been prepared, along with the remainder of this CPR, in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Resources 2004 (the JORC Code).
Code), which is binding upon Members of the Australasian Institute of Mining and Metallurgy (AusIMM), and the rules and guidelines issued by such bodies as the London Stock Exchange, which pertain to Independent Expert Reports.

The mineral properties north of Mombasa for which Base holds options to acquire are considered to be ‘Exploration Projects’. These are speculative in nature, and no decision has been made by Base on whether they will exercise any of the options to acquire the projects. The North Dune at Kwale is not included in the current reserve for the project, and while it represents a potential mine life extension opportunity, there is no guarantee that it will in fact provide such an extension. The exploration programmes planned for these assets are nonetheless based on sound technical merit including some previous drilling programs.

The capital costs for the Kwale Project have been estimated most recently to amount to US$275 million plus additional contingencies of US$23 million. This total project forecast of US$298 million represents a 14% increase over the original budget. Base has announced that it is working towards finalising funding arrangements to accommodate the increased capital cost estimate, including undertaking an underwritten A$40 million share placement and entitlement offer.

The CPR has been prepared from information provided to TZMI by Base, and is understood to be up to date as at October 2012. Pursuant to section 23 of Annex 1 of the AIM Rules for Companies and the AIM Rules for Nominated Advisers (the AIM Rules), TZMI has provided and has not withdrawn its consent for the CPR to be used for the purposes of Base’s listing on AIM, including publication on Base’s company website and to the inclusion of statements made by TZMI and to the references of its name in other documents pertaining to Base’s listing on AIM, in the form and context in which the report and those statements appear. A final draft of the Competent Person’s report was also provided to Base, along with a written request to identify any material errors or omissions prior to Admission.

TZMI confirms that it has taken all reasonable care to ensure that the information contained in the CPR is, to the best of its knowledge and belief, factually accurate without omission that would otherwise materially affect the import of the document. TZMI is a publishing and consulting firm, which has been providing services and advice to the international titanium minerals industry since 1994. This CPR has been compiled by Mr Steven Gilman, who is a metallurgist with 37 years experience (predominantly in the mineral sands industry) in Australia, the US and Africa and is a Chartered Professional and Fellow of AusIMM. He is also a Professional Member of the Society for Mining, Metallurgy, and Exploration, Inc. (SME). Mr Gilman has the relevant qualifications, experience, competence and independence to be considered as a ‘Competent Person’ under the JORC Code. The geology section and resource assessment checks were undertaken by Mr Geoffrey Richards, a geologist with over 20 years experience in the minerals sands industry, and a member of the Australian Institute of Geoscientists (AIG). Mr Gilman and Mr Richards have sufficient relevant experience in the assessment and evaluation of the style of mineralisation and type of deposit as represented by Base’s Kenyan mineral assets, while Mr Richards also has sufficient relevant experience in the estimation of such types of mineral assets. As such, Mr Gilman and Mr Richards qualify as Competent Person’s for the purposes of the AIM Rules.

Neither TZMI, nor the authors of this report have, or have previously had, any material interest in Base or the mineral properties in which Base has an interest. TZMI, Steve Gilman and Geoffrey Richards are independent of the Company, its Directors, senior management of the Company, RFC
Ambrian and the Company’s other advisers. Our relationship with Base is solely one of professional association between client and independent consultant. This CPR is prepared in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent upon the results of this report. No member or employee of TZMI is, or is intended to be, a director, officer or other direct employee of Base. No member or employee of TZMI has, or has had, any material shareholding in Base. There is no formal agreement between TZMI and Base as to Base providing further work for TZMI on the basis of this CPR.

TZMI is not aware of any material change in any of the data used in this evaluation that would cause us to materially alter the estimates set forth herein.

Yours faithfully
TZ Minerals International Pty Ltd

Mr Steven Gilman FAusIMM(CP)  Mr Geoffrey Richards MAIG(CP)
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Executive summary

Purpose

TZ Minerals International Pty Ltd (TZMI) has prepared a Competent Person’s Report on the Kwale Mineral Sands Project of Base Resources Limited (Base), located in Kenya for public release which will be made available on Base’s website as part of Base’s application for a proposed listing on the AIM of the London Stock Exchange.

Overview of Kwale Project

The Kwale project comprises two sand dune hosted mineral sands deposits, process plants and tailings disposal infrastructure covering an area of 56 square kilometres, and is located about 50 kilometres south of the port city of Mombasa in Kenya. The project is about 10 kilometres inland from the Indian Ocean, and is connected by sealed roads to the export facilities at Mombasa.

Kwale Project location
The project is fully permitted, and all project elements are in physical construction. Sales contracts for over 70% of product value are in place for the first five years, and orders have been placed for long lead time items of production plant and equipment.

Access agreements and land acquisition for the access road; the power transmission line, and the port area have all been concluded.

The project is expected to be commissioned in the third quarter of 2013, with first product shipments in November 2013.

Geology and resources

The review of geology and resources has been undertaken as a collaboration between the authors of this Competent Person’s Report. TZMI believes that the results as presented are accurate.

Resource estimation of the deposits was conducted using Surpac modelling software. Based on Base’s exploration results in late 2010, the Central and South Dunes are reported to have a combined JORC compliant mineral resource of 86.2 million tonnes at 5.5% THM in the Measured category and 59.8 million tonnes at 4.0% THM in the Indicated category, based on a cut-off grade of 1%.

### Mineral Resources estimate

<table>
<thead>
<tr>
<th>Deposit</th>
<th>Classification</th>
<th>Resource (Mt)</th>
<th>HM (%)</th>
<th>Ilmenite (%)</th>
<th>Rutile (%)</th>
<th>Zircon (%)</th>
<th>HM (Mt)</th>
<th>Ilmenite (Mt)</th>
<th>Rutile (Mt)</th>
<th>Zircon (Mt)</th>
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<tr>
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<tr>
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<td>0.8</td>
<td>0.2</td>
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<td>1.36</td>
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<td>0.17</td>
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<td>North*</td>
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<td>2.0</td>
<td>1.00</td>
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<td>0.10</td>
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<td>1.2</td>
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<td>0.50</td>
<td>0.22</td>
<td>2.4</td>
<td>1.1</td>
<td>0.3</td>
<td>0.1</td>
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<tr>
<td></td>
<td>Inferred</td>
<td>116.0</td>
<td>2.0</td>
<td>1.00</td>
<td>0.10</td>
<td>0.10</td>
<td>2.3</td>
<td>1.2</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
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<td><strong>3.6</strong></td>
<td><strong>1.88</strong></td>
<td><strong>0.41</strong></td>
<td><strong>0.20</strong></td>
<td><strong>9.5</strong></td>
<td><strong>4.9</strong></td>
<td><strong>1.0</strong></td>
<td><strong>0.5</strong></td>
</tr>
</tbody>
</table>

* The Central, South and North deposits are 100% attributable to Base Titanium Limited, the Kenya subsidiary of Base Resources Limited. The North deposit does not form part of the EDFS but is included here for the sake of completeness as it may provide an extension to currently planned minelife.

TZMI is satisfied that the exploration processes adopted and results obtained are of good quality and properly support the JORC categories of Measured and Indicated for the Kwale resources.

In addition to the mineral sands assets listed above, as part of the Kwale acquisition Base also secured options to purchase three further exploration projects from Tiomin, namely Kilifi, Mambrui and Vipingo, located along the coast to the north of Mombasa. These options are exercisable at a price of US$1 million per project, with the options exercisable up to 31 May 2014, however no decision has been made on whether any of the options will be exercised or not.
Executive summary

Mining

Mining will be conducted by large bulldozers pushing ore to a screening and slurring unit. This ‘dozer trap’ mining method has been in use in the mineral sands industry for about 10 years, and is increasingly popular due to its flexibility and reliability. Process water from the plant reservoir is piped to the dozer trap, and used to slurry and transport the screened ore back to the plant. Ground conditions as determined by geotechnical testing in several excavations made by Base in 2010, and Tiomin testing in 2000, show the selected mining method to be ideally suited.

During the first four years, mining production is constrained by the output capacity of the wet concentrator plant (WCP). Higher grades restrict ore feed rate to 900–1,100 tph. Once the lower grades in the central dune are accessed, the mining rate increases to the maximum feed rate that can be accommodated at the WCP of about 1,700 tph.

Expected mining and production schedule

<table>
<thead>
<tr>
<th>Product (tonnes)</th>
<th>Ore mined (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2014</td>
<td>13.5</td>
</tr>
<tr>
<td>FY 2015</td>
<td>12.0</td>
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<tr>
<td>FY 2016</td>
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<td>FY 2017</td>
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<tr>
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<tr>
<td>FY 2021</td>
<td>3.0</td>
</tr>
<tr>
<td>FY 2022</td>
<td>1.5</td>
</tr>
<tr>
<td>FY 2023</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Source: Base Resources

Mineral processing

Processing of ore is conducted in two distinct stages. The WCP receives ore as slurry from the mine, and after removal of clay and silt, the sands are concentrated by spiral gravity separators to yield a concentrate of mixed heavy minerals (HMC). The HMC is cleaned, dried and fed into the mineral separation plant (MSP) where progressive removal of valuable minerals into final products is achieved.

Thickened slimes (over 30% solids) is pumped to the tailings storage facility (TSF) and spread in layers from the peripheral wall. The slimes slurry is left to drain and consolidate in the valley. Water is decanted by penstocks to a pump basin for transferring the reclaimed water back to the plant process water reservoir.
Sand tailings from the WCP are pumped in a dedicated network of pipelines to dewatering stackers, which are initially used to raise the empoundment walls of the TSF. Water recovered from the tailings stackers is also collected for return to the plant reservoir.

In the MSP, multiple stages of magnetic and electrostatic separation are employed in the dry section of the plant to isolate the ilmenite and rutile products. The remaining material is mainly zircon and lighter minerals that are removed in wet gravity separation processes including spirals, classifiers, wet tables and Kelsey jigs. A strategic stockpile of HMC is maintained between the two plants to improve the effect of grade swings in the mined ore, and ensure the MSP is fed by a constant tonnage of HMC.

The recovery factors for the three valuable minerals are summarised in the following table.

<table>
<thead>
<tr>
<th>Mineral recovery rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery</td>
</tr>
<tr>
<td>WCP %</td>
</tr>
<tr>
<td>MSP %</td>
</tr>
<tr>
<td>Overall %</td>
</tr>
</tbody>
</table>

The designed flowsheet follows testwork results, and in particular corresponds with the most recent tests from the Base drilling samples. Rutile product from the MSP includes a small proportion of non-rutile mineral (leucoxene) and reports as over 100% recovery.

Infrastructure

Make-up water volumes for the project in the first four years will be 5.2 gigalitres (GL) per annum, rising to 8 GL per annum as the mining rate increases. Most of the make-up water is intended to be drawn from the Mukurumudzi River dam, which is currently under construction, and is designed with a capacity of 8.5 GL. The project also is installing six groundwater bores in the Gongoni forest area to the east of the project, with a capacity of 2 GL per annum.

Average power demand for the project is around 6 MW, and as high as 13 MW towards the end of the south dune mining. While Base holds a permit to generate its own electricity supply, the national grid is deemed sufficiently robust to supply the power requirement of the project.

A bulk export facility is to be established by Base on the south bank of Mombasa harbour at Likoni. The land has been purchased and the construction contracts have all been executed. The shiploader contract has not yet been executed but a conditional award is in place. Some of the rutile and all the zircon is intended to be shipped bulk in containers, from the container terminal on Mombasa Island. Access to the terminal is via ferry from the south bank of the harbour. Numerous cargoes from southern Kenya and northern Tanzania use this mode of export, which is well established.

Products and marketing

TiO₂ pigment market

The global TiO₂ pigment market accounts for around 90% of all titanium feedstock demand, and is therefore the dominant driver of offtake. For zircon, ceramic applications are the dominant end-use application accounting for 60% of global zircon demand.
The coatings sector is the largest consumer of pigment averaging 58% of total pigment consumption, with architectural coatings (paint) representing the majority of this end-use segment. Demand for architectural coatings is driven by factors such as existing home sales, new construction (residential and commercial), home maintenance and government spending on urban development. On the other hand, demand for industrial coatings is influenced largely by industrial production, disposable income/purchasing power parity, consumer confidence, infrastructure spending and unemployment levels — all factors that relate to the health of the overall economy, particularly the durable goods sector.

TZMI estimates that global demand for TiO₂ pigment in 2011 reached 5.35 million tonnes, only marginally above the levels achieved in 2010. Over the period to 2020, TZMI is forecasting global TiO₂ demand to increase at a rate moderately above the 30-year growth rate of 3.5% per annum, mostly due to the influence of higher GDP growth in the developing economies on the overall global growth number.

TZMI is forecasting global TiO₂ pigment supply to reach around 8.0 million tonnes by 2020, a growth rate of slightly over 4% per annum. It is expected that Chinese pigment production will display the highest growth rates globally.

**Titanium feedstock market**

Feedstock demand in the long-term, for both the sulfate and chloride pigment production routes, is expected to show strong growth. In particular, demand for sulfate feedstocks, led by China’s requirement to meet fast growing domestic pigment production, is forecast to grow at a 4% CAGR over the period between 2011 and 2020. The total feedstock demand is forecast to increase by almost 3 million TiO₂ units during this period and will approach 9.8 million TiO₂ units by 2020, with sulfate feedstock demand expected to account for more than half of the total growth.

The continuing strong growth experienced by the Chinese domestic TiO₂ pigment industry, together with a buoyant titanium metal sector and increased focus on ilmenite beneficiation to titanium slag, is further impacting on the country’s titanium feedstock demand. China remains reliant on imported feedstocks, predominantly ilmenite but also increasing volumes of titanium slag, for almost one third of its total feedstock requirements.
On the supply side, based on TZMI’s current outlook of supply from existing producers and approved new projects, global feedstock production will grow to around 7.8 million TiO₂ units in 2015. Beyond 2016, supply of feedstocks is expected to decline to approximately 7 million TiO₂ units, without the development of further new supply projects.

**Total titanium feedstock supply/demand balance: 1999–2020**

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### Zircon market

Zircon is recovered as a co-product from most titanium mineral operations, although the ratio of zircon to titanium minerals produced varies widely depending on the mineral assemblages of specific deposits. The rock ilmenite producers, for example, produce no zircon while for some mineral sands producers it provides a very important contribution to total revenue. The production of zircon is often fundamental to the economic success of many titanium mineral operations.

TZMI is forecasting that global demand for zircon will grow at around 4.0% per annum between 2012 and 2020. The largest end-use market for zircon is as an opacifier in ceramic glazes. This application accounted for approximately 58% of estimated global zircon consumption of 1.39 million tonnes in 2011.

Supply remains the greatest cause of uncertainty in the global zircon market, as it is not obvious where future sustainable supply will be sourced to meet the ongoing demand requirements of the sector. Given the current rate of demand growth in the sector driven predominantly by the industrialisation in China and, to a lesser extent in India, substantial additional supply from new projects will be required to avoid a significant future supply gap.

TZMI’s forecasts suggest that without considering additional supply from potential new projects that have yet to receive formal approval to proceed, the global supply/demand balance is likely to show progressively larger deficits beyond 2016 as underlying demand for zircon continues to grow while the supply base declines.
Titanium feedstock and zircon prices

The market is currently witnessing a wide range of feedstock prices among individual product types, in some cases a three-tier pricing environment: lower prices associated with existing ‘legacy’ contracts; significantly higher prices for new contracts (both annual and six-monthly price negotiation); and ‘peak’ pricing in spot sales, some of which will reflect purchases by some customers unable to secure sufficient offtake. This reflects the ongoing transition of the sector away from an extended period of ‘cap and collar’ long-term contract (annual) pricing, towards contracts of significantly shorter duration, and more frequent price negotiation (six monthly and perhaps even quarterly). There is also an increasing volume of material being sold on a spot basis. The influence of legacy contract pricing will continue to diminish during the next two years, such that by 2014, global weighted average prices will more closely reflect new contract or market prices.

Notwithstanding the recent economic headwinds in several regions and the current slowdown in China, the medium term fundamentals for titanium feedstocks are still strong in TZMI’s opinion. The general trend of feedstock prices is expected to remain upwards in the medium term with varying short-term trends for individual feedstock types dependent on contract terms and other market factors. This view is based on continued tight supply for most products during the next three years and competition among consumers to secure sufficient feedstock offtake.

Operating costs

Base has updated its operating cost model to reflect mid-2012 conditions, and estimates an average life-of-mine cash cost of US$5.16 per tonne of ore mined. During the first six years, operating costs average US$53 million per annum, while in the later years this is estimated to rise to US$60 million per annum as production throughput increases from around 8 million tpa to approximately 12 million tpa.

TZMI has independently estimated costs using its proprietary cash costs modelling, which seeks to track and compare operating costs for most mineral sands producers. Base’s operating costs are within 10% of TZMI’s estimates.

The key drivers of operating costs are fuel, electricity, personnel and maintenance. Mining activity, including tailings disposal and rehabilitation, takes up 30% of annual operating costs. Most of this relates to mobile equipment usage, which has been scrutinised by an Australian contract miner with direct experience in supplying dozer trap mining services to the mineral sands industry.

From a cost competitiveness standpoint, Base’s unit costs are at the lower end of industry ranges.

Unit operating costs

<table>
<thead>
<tr>
<th>Measure</th>
<th>Units</th>
<th>Base Resources</th>
<th>Industry ranges (2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMC cash costs of production</td>
<td>US$/t HMC</td>
<td>60</td>
<td>65*</td>
</tr>
<tr>
<td>Mineral separation costs</td>
<td>US$/t product</td>
<td>33</td>
<td>10 – 120</td>
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<tr>
<td>Total cash costs of production</td>
<td>US$/t product</td>
<td>173</td>
<td>40 – 580</td>
</tr>
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</table>

* Weighted average cash cost of HMC production for 2011, expressed in terms of per tonne of HMC
Ore Reserves

Reserves are calculated after applying relevant modifying factors to Resources. In the case of the Central dune deposit, the reserves and resource tonnages are very close, Reserves being less than 1% lower. The South dunal deposit has an increased lower grade zone, which is more or less included in the Reserves depending on product pricing.

Kwale Project ore reserves estimates

<table>
<thead>
<tr>
<th>Dune</th>
<th>Classification</th>
<th>Tonnes (Mt)</th>
<th>THM (%)</th>
<th>Ilmenite (%)</th>
<th>Rutile (%)</th>
<th>Zircon (%)</th>
<th>THM (Mt)</th>
<th>Ilmenite (Mt)</th>
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<td>2.59</td>
<td>0.65</td>
<td>0.29</td>
<td>6.88</td>
<td>3.64</td>
<td>0.91</td>
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Capital costs

The constructed capital cost for the Kwale project was estimated in April 2011 at US$256 million, including an allowance of 8.6% for estimating accuracy and a US$20 million project contingency. This total was reported in 2011 at the conclusion of the Enhanced Definitive Feasibility Study (EDFS) undertaken by Base, and incorporating results from its own resource sampling, latest process flowsheet design, and recent important changes in the product markets. An additional $32 million is allowed for unspecified sustaining capital at a rate of $3 per million per year, after commissioning. Mobile equipment normal replacement; increases in mining rate and the eventual mining move to the South Dune total a further $27 million in capital spread over the project life.

The revised capital cost estimate in September 2012 was increased to US$275 million, plus an additional US$23 million project contingency. The increase in capital cost estimate was reported to be attributed to design improvements and scope changes during the design phase, of which a significant portion is attributable to labour costs in construction. Procurement and contracts totalling 70% of the expected cost have been committed, and TZMI believes the remaining 30% should be covered by the latest contingency. Base has announced that it is working towards finalising funding arrangements to accommodate the increased capital cost estimate, including undertaking an underwritten A$40 million share placement and entitlement offer.

Economic indicators

Using TZMI’s proprietary cost modelling, the project after-tax NPV (exclusive of funding and corporate charges) is estimated at US$492 million at a discount rate of 10%, with an attractive after tax IRR of 46%.
Executive summary

Risk analysis

The Kwale mine will be the first mineral sands operation in Kenya. Its scale and visual impact may be a surprise to many, including regulators and local community, with the level of water consumption and land disturbance to be larger than any experienced in the locale. However the current local and national attitude towards the project is positive, and it will remain a key management function to ensure this is maintained.

The project is in a periodic drought affected area, however stochastic analysis shows that combination of dam and borefield would be insufficient for operations only in circumstances of multi-year consecutive droughts. It is statistically likely that in one season during the mine life somewhat restricted mining operations will arise due to low reservoir levels.

Base undertook a thorough assessment of project risk, and has sensible mitigation measures in place for all of the material risks. Overall, the risk profile for the Kwale project is seen as moderate. While it has some risks, it is well-served by existing infrastructure; is located in an attractive living area; employs robust technology; and supplies much of its product value into very strong markets. It will probably have to ride out at least one drought; and manage its public image in the face of likely concern over its visual impact.

Environmental considerations

The Kwale project will have a large footprint, and impact in many ways on the environment during construction and operations. As with most mineral sands operations, the mining and mineral separation processes are quite benign, and afford the possibility of returning the entire project area to productive land use after mining. With the legacy infrastructure of the Mukurumudzi Dam and Reservoir; power and roads, the project presents a significant long term development opportunity to uplift employment and economic activity well beyond the mine life of 13 years. Environmental studies, public consultation and impact mitigation measures incorporated into environmental management plans are in accordance with Kenya Government requirements and good industry practice. Base has adopted the IFC Performance Standards and compliance with the Equator Principles in addressing environmental and social issues.

Conclusions

The Kwale project is an outstanding development, both for its owner, and the Kenyan community. The high value ore in Central Dune affords a relatively easy start-up, and the suite of products are in high demand in the market. The project has very positive support from the local and national community in Kenya, and also from the markets addressed by its products.

Kwale is forecast to be a relatively low operating cost operation when compared to its global peers, with relatively high ore grade, virtually no overburden, and despite a significant proportion of non-ilmenite products, its MSP unit cost remains very competitive. As such during the first five years of production, cash margin proportions are expected to be in the highest quartile of the global mineral sands industry. The process plants are designed with robust operational margins, and afford ample opportunity to take early advantage of meeting ramp up expectations, or exceeding production targets. The production processes are all state-of-the-art and currently commercialised. The ilmenite and rutile circuits are relatively straight forward and are anticipated to come on stream without difficulty. The more complex zircon recovery circuit has a longer ramp-up period of two years, however early years reject streams are to be stockpiled for reprocessing in later years after ore grades decline.
More than 70% of the product value has been contracted for sale for the first five years. Potential exists for the balance to be sold at a variance to the long-term prices used, however these accord to TZMI’s price forecasts. There is a potential for some underestimation of operating costs, however the project margins are very strong, and it is anticipated the debt facility should be cleared within the first two years of operations.

Latest project management reports from August 2012 continue to predict commissioning in the September quarter of 2013.

In the normal course of sensibly managed construction and operational stages, the Kwale project is expected to be a very significant success.
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1.0 Introduction

1.1 Context

Base is a public company listed on the Australian Securities Exchange (ASX) which is developing Kwale mineral sands project in Kenya, East Africa. Base’s principal exploration and development activity is in Kenya through its 100% owned subsidiary Base Titanium Limited (BTL), with its main development focus being the Kwale project situated on Special Mining Lease (SML) 23.

Mineral Resources totalling 146 million tonnes at a grade of 4.9% Heavy Minerals (HM) including 2.59% ilmenite, 0.65% rutile and 0.29% zircon for 3.8 million tonnes of contained ilmenite, 0.95 million tonnes of contained rutile and 0.42 million tonnes of contained zircon have been estimated in accordance with JORC guidelines at Base’s Kwale project (including the South Dune and Central Dune).

Mineral Resources totalling 116 million tonnes at a grade of 2.01% HM including 1.0% ilmenite, 0.1% rutile and 0.1% zircon for 1.16 million tonnes of contained ilmenite, 0.12 million tonnes of contained rutile and 0.12 million tonnes of contained zircon in the ‘inferred’ category have been estimated in accordance with JORC guidelines at the North Dune, however these Resources do not form part of the Kwale Project currently under construction and there can be no guarantee that they will provide any mine life extension opportunity.

Base has completed an enhanced definitive feasibility study (EDFS) at Kwale and is now advancing Kwale’s progress through the construction stage, targeting first production during the 3rd Quarter of 2013.

Base has appointed RFC Ambrian Limited (RFC Ambrian) as the Company’s Nominated Adviser, and has commissioned TZMI to prepare a CPR for the purposes of the Company seeking an AIM listing.

Neither TZMI, nor the authors of this report have, or have previously had, any material interest in Base or the mineral properties in which Base has an interest. Our relationship with Base is solely one of professional association between client and independent consultant. This report is prepared in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent upon the results of this report. Base has also confirmed to TZMI that no director of Base has any interest in any of the assets that are the subject of this report other than through their directorship and shareholding (if any) in Base.

1.2 Principal sources of information

This Report has been based upon information available up to and including 4 October 2012 (Valuation Date). The information was provided to TZMI by Base or has been sourced from the public domain, and includes both published and unpublished technical reports prepared by consultants and previous explorers, and other data relevant to the individual project areas.

TZMI’s views on the projects have been assembled over a period of over 24 months, since Base first acquired the Kwale project. We have viewed accumulated reports and data from Tomin, the former project owner; observed flowsheet testwork at Allied Mineral Laboratories (AML) in Perth; undertaken site visits and viewed the Kwale deposits, site
laboratories, port site, dam site, road and power infrastructure, and met with Kenyan authorities during the project acquisition negotiations.

We have followed the progress of the EDFS undertaken by Base and the Australian listed global engineering company Ausenco Limited (Ausenco). This report draws significantly upon the detail in the EDFS, which is built on the same basic data and information TZMI reviewed from the Tiomin documents. Base undertook an infill drilling programme on the Kwale deposits during 2010, and TZMI has reviewed the detail of this programme. Ausenco was awarded the EPCM contract to build the Kwale project mining and processing facilities, and at the time of writing detailed design work was approaching completion. All seven project packages were in construction, and approximately 70% of the project value was committed or contracted. TZMI has reviewed the overall detail of the mining, processing and tailings disposal engineering work, including plant layouts, detailed equipment specification and selection, and operating assumptions.

The authors have endeavoured, by making all reasonable enquiries, to confirm the authenticity and completeness of the technical data upon which this report is based. Base and RFC Ambrian were provided a final draft of this report and requested to identify any material errors or omissions prior to its lodgement.

TZMI confirms that it has taken all reasonable care to ensure that the information contained in the CPR is, to the best of its knowledge and belief, factually accurate without omission that would otherwise materially affect the import of the document.

1.3 Review of Base Resources interests

Base Resources Limited, through its Kenyan subsidiary Base Titanium Limited, is developing the Kwale Mineral Sands Project on the eastern coast of Kenya. The Kwale Project was acquired in 2010 from Tiomin Kenya. The Kwale Project is comprised of two areas of significant heavy mineral grade deposits – Central and South Dunes, which formed the basis for the Enhanced Definitive Feasibility Study (EDFS) completed in May 2011. The North Dune is not currently included in the Resources comprising the Kwale Project.

A summary of the company’s mineral sands assets is presented in Table 1.1 below:

<table>
<thead>
<tr>
<th>Asset</th>
<th>Operator</th>
<th>Interest</th>
<th>Status</th>
<th>Licence expiry date</th>
<th>Licence area (ha)</th>
<th>Comments</th>
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<tr>
<td>SML 23 (Kwale)</td>
<td>Base Titanium</td>
<td>100%</td>
<td>Development</td>
<td>6 July 2025 - renewable to cover continued mining operations</td>
<td>1,354.78</td>
<td>First production planned for 2H 2013</td>
</tr>
<tr>
<td>EL 173 (Kwale)</td>
<td>Base Titanium</td>
<td>100%</td>
<td>Exploration</td>
<td>31 March 2013</td>
<td>5,840</td>
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</tr>
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</table>

In addition to the mineral sands assets listed in Table 1.1, as part of the Kwale acquisition Base also secured options to purchase three further exploration projects from Tiomin, namely Kilifi, Mambrui and Vipingo, located along the coast to the north of Mombasa. These options are exercisable at a price of US$1 million per project, with the options exercisable up to 31 May 2014, however no decision has been made on whether any of the options will be exercised or not.
2.0 Property overview

2.1 Background on property location

The Kwale District in Kenya is set in coastal and erosional plains, and coastal uplands. The coastal plain ranges from 10 to 50 metres above sea level, while the coastal uplands rise to a maximum of 225 metres towards the northwest. The major geographic feature in the district is the Shimba Hills, further inland, which rise to a maximum 475 metres above sea level. The deposit sits in the coastal uplands, and is divided into central and southern parts by the Mukurumudzi River. There are five major perennial rivers rising from springs in the Shimba Hills, and many minor seasonal streams in the area. The minor streams generally disappear into the coastal sands before reaching the sea, and dry up outside the rainy seasons. There is a reliable ground water source in the coastal sands.

Kwale's climate is semi-humid, exhibiting two rainy seasons. The long rains are in March to May, and the short rains from October to December. Coastal rainfall averages 1,500 mm per year, reducing to 400 mm inland. The project area averages about 1,300 mm per year. About every 20 years a significant drought period of up to two years is experienced, while a dry year occurs about every five years. Temperatures are fairly consistent, with mean monthly maxima and minima of 30°C and 22°C respectively. Winds are generally westerly from November to January, and southerly in the mid-year months.

In the project area, land use is approximately 50/50 natural vegetation and agriculture. The nearest major population centres are at Shimba Hills and along the coastal strip at Ukunda. Small holding land users were living on the mining area, but have been relocated under a resettlement agreement made by Tiomin, and completed during 2011. The flood zone of the new Mukurumudzi dam is now owned by the Kenyan government, and until recently was being used by squatter occupiers. The project has permission to flood the area, and all relocations were completed in February 2012 pursuant to resettlement agreements executed under an officially mandated authority chaired by the District Commissioner.

**Figure 2.1: Current land use**
2.2 Regulatory and fiscal setting

Exploration and mining activities in Kenya are regulated by the Mining Act of 1940. The special mining lease (SML) under section 55 of this act provides the governing authorisation to mine. The central and southern deposits at Kwale are included in SML No. 23 which was granted to Tiomin in 2004. The SML principally provides exclusive right to mine for the production of ilmenite, zircon and rutile. The term is 21 years and renewable to cover continued mining operations that extend beyond the nominal expiry date of the initial term; and a gross sales royalty, less transport and product handling costs FOB Mombasa, of 2.5% is payable in the first five years of commercial production. The lease also stipulated the resettlement plan, and that the lessee would purchase land from affected landowners, then vest these lands with the Kenyan government. The lease also cites other legislation that must be complied with, covering wildlife, forestry and environmental Acts.

In July 2010, the SML was assigned to Base Titanium.

An agreement in relation to the SML was made by the Kenya government in 2005, providing for rights of the lessee, various taxation and fiscal incentives, and lists obligations of the government to facilitate licences, permits and access for infrastructure. This ‘fiscal agreement’ is for 21 years, and may be renewed, and provided for the following key items:

- Corporate income tax halved for the first 10 years of commercial production (i.e. initially 15%, increasing to 30%);
- Imported equipment exemptions from VAT and customs duties;
- Unhindered rights to mine, market and sell exported minerals;
- Freely convert all currency and transfer funds;
- Capital expenditure may be deducted as incurred, and carried forward, against revenue (i.e. instead of more customary depreciation treatments).

The Fiscal Agreement was assigned to Base Titanium in July 2010.

A suite of licences and permits pertaining to the project is maintained. Key permits relate to water supply; environmental impact, emissions, and bond deposit; and access permits. Base has confirmed that the necessary licences and permits are all up to date.

2.3 Kwale Project

The Kwale project comprises two sand dune hosted mineral sands deposits, process plants and tailings disposal infrastructure covering an area of 56 square kilometres, and is located about 50 kilometres south of the port city of Mombasa in Kenya. The project is about 10 kilometres inland from the Indian Ocean, and is connected by sealed roads to the export facilities at Mombasa.

*Figure 2.2* shows the location of the project in relation to the port of Mombasa.
The project is fully permitted, and all project elements are in physical construction. Sales contracts for over 70% of product value are in place for the first five years, and orders have been placed for long lead time items of production plant and equipment.

The project was acquired from Vaaldiam (formerly Tiomin Resources Inc) in July 2010, for cash consideration of US$3 million, and a 2% royalty of the FOB Mombasa gross revenue less product handling and transport costs FOB Mombasa for products from the Kwale Central and South Dunes.

A dedicated sealed access road being constructed from the project site to the main coastal highway, which connects to the export facility at the port of Mombasa. Product will be hauled by road trains to the dedicated bulk storage and export facility at Likoni, on the south shore of the Mombasa deep water harbour. Bulk shipments of ilmenite and rutile will be loaded from this facility, while zircon will be exported in containers from the Mombasa container terminal on Mombasa Island.

Kenya operates an integrated electricity generating and transmission service, which is also connected to neighbouring countries. A high voltage transmission line runs nearby the coastal road, and a substation at Galu will connect a dedicated 132 kV line to the project. The
line will be 14 kilometres in length, and is being contracted under a contract with CG Global and will be transferred to the Kenya Government’s power distribution company on completion.

**Figure 2.3: Likoni land for future bulk storage and export facility**

Access agreements and land acquisition for the access road; the power transmission line, and the port area have all been concluded.

The project is expected to be commissioned in the third quarter of 2013, with first product shipments in November 2013.

### 2.4 Country review

Kenya is one of the leading economies in East Africa, with a well developed business infrastructure attracting a diverse range of international firms that have made the country their regional base. Economic expansion is fairly broad-based and is built on the stable macro-environment fostered by the Government of Kenya. By African standards, Kenya has a substantial and robust private sector. The domestic private sector has been concentrated in food-related manufacturing (for both the domestic and regional markets) and a significant tourism industry, for which it is well known.

#### 2.4.1 Main cities and infrastructure

Nairobi continues to be the primary communication and financial centre of East Africa. It enjoys the region’s best transportation links, communications infrastructure, and trained personnel. Nairobi’s Jomo Kenyatta International Airport is the hub of East African air transport, and it has connections to many European and US cities.

Mombasa, the principal seaport of Kenya, serves as a major distribution point for the East African market, providing connections to landlocked neighbouring nations. The port of Mombasa is linked to the world’s major ports, with over 1,700 sailings per year between Europe, North and South America, Asia, the Middle East, Australia and the rest of Africa.
The Trans-Africa Highway connects all the East African countries. The road transport network is extensive and fully developed, with roads connecting to the major commercial cities of Nairobi, Mombasa and Dar-es-salam.

2.4.2 People

Kenya is well recognised for its large pool of well-educated professionals, fluent in English and highly trained in various fields. Kenya holds the distinction of having the highest number of university and college educated English speaking professionals in East Africa.

2.4.3 Mining sector

At present the mining sector accounts for less than 1% of Kenya’s annual GDP and lags significantly behind its neighbours, Tanzania and Uganda, with whom it shares a number of key mineral belts. As a consequence, Kenya is considered to have significant exploration potential. The Government of Kenya regards the development of a robust mining industry as a priority.

To date there are no listed companies with a producing operation in Kenya - Base will be the first. However, there is an exploration sector, with companies such as Aviva Corporation Ltd (ASX:AVA) and Red Rock Resources plc (AIM:RRR) exploring for gold and base metals in the west of Kenya. The recent sale of Aviva’s projects to African Barrick plc is considered a significant step forward for, and a vote of confidence in, the Kenyan resources sector.
3.0 Geology and resources

The review of geology and resources has been undertaken as a collaboration between the authors of this Competent Person’s Report. On the one part, a desk based review of the Base EDFS resources and reserves detail, including the SRK report of 2005 and appendices to the EDFS were studied in detail to comment on the JORC classification and techniques applied. Additionally, one of the authors has visited the project site; observed sampling and sample locations; reviewed laboratory techniques and procedures in detail; and also reviewed the geological and resource reports from the exploration programmes dating back to the original Tiomin investigations. Two other related reports, subsets of the geology appendices in the EDFS, were reviewed - namely Appendix 2 (Kilifi Resource Estimates) and Appendix 3 (Mambrui Resource Estimates). Both were prepared by Snowden in 2005 for Tiomin Resources Inc (Tiomin).

The Resource/Reserve Report provides detailed geostatistical analyses of much of the geological database, with particular focus on the integrity of sampling and analytical processes. Variogram studies by external consultants Quantative Group provided key inputs for modelling and Ore Reserve estimates were prepared by Creative Mined Pty Ltd using Surpac software.

These related complimentary studies form an essential and critical sequence of activities where accurate resource estimates are required. TZMI believes that the results as presented are accurate.

3.1 Geological setting

The Kwale Project is comprised of three mineralised zones, Central, South and North Dunes, of which only the Central and South deposits are permitted for mining and have been included in the EDFS.

The heavy mineral bearing Magarini Sands, which host the Kwale deposit, comprise an elongated series of Aeolian deposits inland and sub-parallel with the modern coastline. The Magarini Sands were believed to be deposited during the Pliocene and consist of unconsolidated sediments derived from the regional basement sandstone. These sands present reasonably simple targets for the type of exploration employed by Tiomin and later Base, and are typical of similar mineral sands deposits mined elsewhere in the world.

The Kwale deposit is generally poorly stratified and contains a fraction of clay and silt of about 24%. A typical cross-section of the Kwale Central deposit is shown in Figure 3.1.

The various reports describe the local geology and clearly indicate a good understanding of the nature and extent of the minerals sands mineralisation within the Central and South deposits of the Kwale Project area.
3.2 Drilling

Previous exploration by Tiomin (1997) and the infill drilling program initiated by Base (2010) have created an effective grid over the two Kwale deposits of approximately 100 metres x 100 metres.

A total of 249 holes were drilled by Tiomin in 1997 over three phases. The drilling results of these programs are reported in Tiomin 2000 (Summary Report of Infill Drilling). SRK audited the resources in 2005, and quoted a JORC compliant resource base of 139 million tonnes of mineralised sands, with a total heavy mineral (THM) grade of 4.6%.

Following the acquisition by Base, an infill drilling program was undertaken in late 2010, covering 275 holes for a total of 5,974 metres. Wallis Drilling was contracted to conduct the drilling program using a Mantis 75 aircore rig, fitted with 3 metre NQ drill rods and a rotary sample splitter at the cyclone. The drilling rig and associated equipment used is considered to be of industry standard. Additionally, these Western Australian developed ‘aircore’ systems provide a continuous and accurate stream of material from the soft sandy sediments and are critical for the generation of accurate samples.

Duplicate samples were collected at the splitter for every twentieth sample. Sample intervals of 3 metres were applied and are considered appropriate when characterising this style of mineralisation. A total of 2,253 samples were collected, averaging 2.5 kg per sample.

*Figure 3.2* and *Figure 3.3* show the location of the drillholes at the South and Central dunes.
Figure 3.2: South Dune mineralisation outline, mining lease and drillholes
The drillhole distribution achieved provides a robust areal spread of observation points and is considered adequate in supporting the Resource classifications.

The application of splitters for sub-sampling at the drilling stage is noted and this is considered normal industry practice. During the Tiomin drilling campaign, rudimentary logging of colour and lithology was adopted. Base, on the other hand, adopted a more detailed logging and sample duplication procedure to those previously used by Tiomin, which involved closer logging of geological characteristics using a mix of quantitative and qualitative fields.

### 3.3 Assaying

Sample flowsheets used for determination of silt and clay (slimes) oversize and percentage of heavy minerals (HM) via float/sink determination are widely accepted and largely standardised within the mineral sands industry. Base slightly modified the laboratory flowsheet, to avoid process alteration of recovered mineral, otherwise the results from Tiomin and Base programmes are directly comparable and therefore complimentary. The assaying regime included the application of reference standards and repeat sampling (every twentieth sample) and meets the JORC requirements for quality assurance and sample process checks.
Heavy mineral fractions from identified geological domains were composited before more detailed mineralogical and product quality and quantity factors were determined.

The use of a standard bulk density of 1.7 tonnes/m³ is acknowledged as both appropriate and conservative.

### 3.4 Resource estimation

Resource estimation of the deposits was conducted using Surpac modelling software. Surfaces corresponding to the geological domains were created and reviewed.

The Base drilling determined some resource outlines that were in doubt from the previous work, including suspected down-hole contamination and dune edge grades.

Geological and drill sample results were interpolated into a resource model with cell sizes of 50 metres x 50 metres x 3 metres, in accordance with variography results. Elliptical weighting of inverse square values as suggested by the variography was employed to create the resource model. Interpolation parameters are summarised in Table 3.1.

<table>
<thead>
<tr>
<th>Run #</th>
<th>Deposit</th>
<th>Field</th>
<th>Min # samples</th>
<th>Max # samples</th>
<th>Ellipse dimensions</th>
<th>Constraining</th>
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</thead>
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<tr>
<td>1</td>
<td>Central</td>
<td>HM, SL &amp; OS</td>
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<td>36</td>
<td>400 200 5</td>
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</tr>
<tr>
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<td>HM, SI &amp; OS</td>
<td>12</td>
<td>36</td>
<td>800 400 5</td>
<td>Domain constrained</td>
</tr>
<tr>
<td>3</td>
<td>Central</td>
<td>HM &amp; slime</td>
<td>4</td>
<td>36</td>
<td>800 400 30</td>
<td>Domain constrained</td>
</tr>
<tr>
<td>3</td>
<td>Central</td>
<td>OS</td>
<td>4</td>
<td>36</td>
<td>1,000 500 50</td>
<td>Ore constrained</td>
</tr>
<tr>
<td>1</td>
<td>South</td>
<td>HM, SL &amp; OS</td>
<td>12</td>
<td>36</td>
<td>500 300 4</td>
<td>Domain constrained</td>
</tr>
<tr>
<td>2</td>
<td>South</td>
<td>HM, SI &amp; OS</td>
<td>12</td>
<td>36</td>
<td>1,000 600 4</td>
<td>Domain constrained</td>
</tr>
<tr>
<td>3</td>
<td>South</td>
<td>HM &amp; slime</td>
<td>4</td>
<td>36</td>
<td>1,000 600 24</td>
<td>Domain constrained</td>
</tr>
<tr>
<td>3</td>
<td>South</td>
<td>OS</td>
<td>4</td>
<td>36</td>
<td>2,000 1,000 50</td>
<td>Ore constrained</td>
</tr>
</tbody>
</table>

The Central and South Dunes are reported to have a combined JORC compliant mineral resource of 86.2 million tonnes at 5.5% THM in the Measured category and 59.8 million tonnes at 4.0% THM in the Indicated category, based on a cut-off grade of 1%. Table 3.2 shows the resource estimates for the Central and South Dunes.

<table>
<thead>
<tr>
<th>Project</th>
<th>Classification</th>
<th>Resource (Mt)</th>
<th>HM (%)</th>
<th>Ilmenite (%)</th>
<th>Rutile (%)</th>
<th>Zircon (%)</th>
<th>HM (Mt)</th>
<th>Ilmenite (Mt)</th>
<th>Rutile (Mt)</th>
<th>Zircon (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Measured</td>
<td>46.2</td>
<td>7.1</td>
<td>4.01</td>
<td>0.93</td>
<td>0.43</td>
<td>3.3</td>
<td>1.85</td>
<td>0.43</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td>Indicated</td>
<td>29.9</td>
<td>4.6</td>
<td>2.47</td>
<td>0.61</td>
<td>0.26</td>
<td>1.4</td>
<td>0.74</td>
<td>0.18</td>
<td>0.08</td>
</tr>
<tr>
<td>South</td>
<td>Measured</td>
<td>40.0</td>
<td>3.8</td>
<td>1.95</td>
<td>0.54</td>
<td>0.22</td>
<td>1.5</td>
<td>0.78</td>
<td>0.22</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>Indicated</td>
<td>29.8</td>
<td>3.4</td>
<td>1.36</td>
<td>0.39</td>
<td>0.17</td>
<td>1.0</td>
<td>0.40</td>
<td>0.12</td>
<td>0.05</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>146.0</td>
<td>4.9</td>
<td>2.59</td>
<td>0.65</td>
<td>0.29</td>
<td>7.1</td>
<td>3.78</td>
<td>0.95</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Note: The Central and South deposits are 100% attributable to Base Titanium Limited, a Kenyan subsidiary of Base Resources Limited.
The statement of Mineral Resources at the Kwale Project has been produced in accordance with the Australasian Code for Reporting of Mineral Resources and Ore Reserves, December 2004 (the JORC Code). The information in this report relating to Mineral Resources is based on information compiled by Base, and reviewed by TZMI. The detail provided by Base has been reviewed by Mr Geoffrey Richards, a member of Australian Institute of Geoscientists (AIG). AIG requires its members to adhere to the JORC Code. Mr Richards has sufficient experience relevant to the style of mineralisation and type of deposit under consideration to qualify as a Competent Person as defined by the JORC Code. The Mineral Resources statement reported represent estimates at 30 June 2012. Mr Richards consents to the inclusion in this report of the information based on his work in the form and context in which it appears.

*Table 3.3* compares the resources determined by Tiomin, with the latest estimates produced following the Base drilling program in 2010.

**Table 3.3: Comparison of resource estimates (Tiomin vs Base)**

<table>
<thead>
<tr>
<th>Dune</th>
<th>Classification</th>
<th>2006 Tiomin Resource estimate (Mt)</th>
<th>2010 Base Resource estimate (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Measured</td>
<td>38.5</td>
<td>46.2</td>
</tr>
<tr>
<td></td>
<td>Indicated</td>
<td>30.2</td>
<td>29.9</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>68.8</td>
<td>76.2</td>
</tr>
<tr>
<td>South</td>
<td>Measured</td>
<td>-</td>
<td>40.0</td>
</tr>
<tr>
<td></td>
<td>Indicated</td>
<td>70.1</td>
<td>29.8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>70.1</td>
<td>69.9</td>
</tr>
<tr>
<td>Combined</td>
<td>Measured</td>
<td>38.5</td>
<td>86.2</td>
</tr>
<tr>
<td></td>
<td>Indicated</td>
<td>100.34</td>
<td>59.8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>138.9</td>
<td>146.0</td>
</tr>
</tbody>
</table>

The main differences between the Base 2010 resource estimate and the Tiomin reported estimate in 2006 are:

- Increase of around 8 million tonnes of material in the Measured category at Central Dune due to closer drill spacing and additional drilling at the dune edges.
- Upgrade of 40 million tonnes from Indicated to Measured as a result of closer drill spacing.
- Higher grades of ilmenite and rutile at South Dune due to better geological domaining combined with domain controlled mineralogy.

### 3.4.1 North Dune

The North Dune, which has been excluded from the EDFS, was reported to have a resource of 116 million tonnes in the Inferred category at 2% HM, as estimated by SRK in 2000.
Table 3.4: North Dune Mineral Resource estimate

<table>
<thead>
<tr>
<th>Project</th>
<th>Classification</th>
<th>Resource (Mt)</th>
<th>HM (%)</th>
<th>Ilmenite (%)</th>
<th>Rutile (%)</th>
<th>Zircon (%)</th>
<th>HM (Mt)</th>
<th>Ilmenite (Mt)</th>
<th>Rutile (Mt)</th>
<th>Zircon (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>North*</td>
<td>Inferred</td>
<td>116</td>
<td>2.01</td>
<td>1.00</td>
<td>0.10</td>
<td>0.10</td>
<td>2.3</td>
<td>1.2</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Note: North Dune is 100% attributable to Base Titanium Limited, a Kenyan subsidiary of Base Resources Limited.

3.4.2 Optioned projects

As part of the Kwale acquisition, Base also acquired an option to purchase three exploration projects, Mambrui, Kilifi, and Vipingo, which are located along the coast to the north of Mombasa. As these deposits are only under option and not owned by Base, a detailed review of their history and Resources has not been presented. However, these deposits were reported to have a combined JORC compliant Mineral Resource of 1,111 million tonnes at 3.7% THM in the Indicated category and 393.7 million tonnes at 3.4% THM in the Inferred category (as prepared by Snowden in 2005 for Tiomin).

Table 3.5 shows the resource estimates.

Table 3.5: Additional resource estimates summary

<table>
<thead>
<tr>
<th>Project</th>
<th>Classification</th>
<th>Resource (Mt)</th>
<th>HM (%)</th>
<th>Ilmenite (%)</th>
<th>Rutile (%)</th>
<th>Zircon (%)</th>
<th>HM (Mt)</th>
<th>Ilmenite (Mt)</th>
<th>Rutile (Mt)</th>
<th>Zircon (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mambrui</td>
<td>Indicated</td>
<td>301.4</td>
<td>5.08</td>
<td>2.27</td>
<td>0.11</td>
<td>0.11</td>
<td>15.3</td>
<td>6.8</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Mambrui</td>
<td>Inferred</td>
<td>129.3</td>
<td>4.77</td>
<td>2.13</td>
<td>0.12</td>
<td>0.12</td>
<td>6.2</td>
<td>2.8</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Kilifi</td>
<td>Indicated</td>
<td>809.7</td>
<td>3.22</td>
<td>1.42</td>
<td>0.14</td>
<td>0.12</td>
<td>26.1</td>
<td>11.5</td>
<td>1.1</td>
<td>0.9</td>
</tr>
<tr>
<td>Kilifi</td>
<td>Inferred</td>
<td>148.4</td>
<td>3.38</td>
<td>1.55</td>
<td>0.15</td>
<td>0.14</td>
<td>5.0</td>
<td>2.30</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1,388.8</td>
<td>3.79</td>
<td>1.68</td>
<td>0.13</td>
<td>0.12</td>
<td>52.6</td>
<td>23.4</td>
<td>1.8</td>
<td>1.7</td>
</tr>
</tbody>
</table>

Kilifi and Mambrui are currently 100% owned by Tiomin Kenya, with acquisition options held by Base Titanium.
4.0 Mining

Mining will be conducted by large bulldozers pushing ore to a screening and slurrying unit. This ‘dozer trap’ mining method has been in use in the mineral sands industry for about 10 years, and is increasingly popular due to its flexibility and reliability. The mining technique replaces the more capital intensive bucketwheel excavator and overland conveyor system selected by the previous project owner Tiomin.

Process water from the plant reservoir is piped to the dozer trap, and used to slurry and transport the screened ore back to the plant. Caterpillar D11 dozers are specified for the production task, with a D10 dozer selected for auxiliary duties. Ground conditions as determined by geotechnical testing in three excavations made by Base in 2010, and Tiomin testing in 2000, show the selected mining method to be ideally suited.

The scheduling of mine extraction has been conducted using computerised mine optimisation and planning software, applying variable cost and revenue values into cells derived from the resource model. During the first four years, mining production is constrained by the output capacity of the wet concentrator plant (WCP). Higher grades restrict ore feed rate to 900–1,100 tph. Once the lower grades in the central dune are accessed, the mining rate increases to the maximum feed rate that can be accommodated at the WCP of about 1,700 tph. Figures 4.1 and 4.2 depict a typical dozer trap mining; and the mining schedule for Kwale respectively.

Figure 4.1: Typical dozer trap mining
Following completion of the off-path Tailings Storage Facility (TSF) walls, sand tailings from the WCP will be placed in the mining void as backfill. The Central Dune deposit will be almost mined out before the first sand tailings will need to be placed in this pit, in Year 6. Much of the sand tailings from the South Dune mining will also fit into the Central Dune void. The TSF is designed to have sufficient capacity to contain slimes for the entire mining project, however some slimes will be used in soil reconstruction on the backfilled areas of the Central Dune and South Dunes. During the last three years of production, it is planned to cover all tailings areas with a mixture of sand and slimes to a depth of 2 metres, to establish a fertile growing zone for post-mining rehabilitation.

All mined areas, including those backfilled with sand and the TSF will be covered with stored topsoil and planted. The rehabilitated land use will be a mixture of forest and agriculture.
5.0 Metallurgical testwork and processing

Numerous test work programmes dating back to 1996 have been conducted on Kwale ore. Pilot plant concentration trials were conducted at site in 1997 and 2003, processing bulk samples from the central and south dunes. From 2005 to 2010, selected parts of the processing flowsheets have been changed with the advent of new technology. In 2010, the emergence of better market conditions for ilmenite enabled a significant change to the mineral separation plant (MSP) approach, resulting in a simpler plant and higher recoveries of rutile and ilmenite.

Figure 5.1: Pilot plant

The relatively high slimes content in Kwale ore requires a robust slimes management system, and slimes has been the focus of several test programmes, including a pilot plant campaign in 2003.

Based on freshly drilled samples from both central and south deposits, Base undertook several validation programmes in 2010 and 2011. A portable thickener was located to site, to directly demonstrate the ability to adequately thicken slimes for safe disposal in the proposed evaporation dam. The use of water from the Mukurumudzi River, and freshly exposed ore from across the deposits gave very good results, and closely resembles the conditions that will be encountered during production.

Three ore samples representing the range of geometallurgical domains identified in the resource were tested through to production of rutile and ilmenite. This confirmed the selected flowsheets, and validated the design for detailed engineering.

The accepted recovery factors for the three valuable minerals, based on the testwork, are shown in Table 5.1.
Table 5.1: Summary of recovery rates

<table>
<thead>
<tr>
<th>Recovery</th>
<th>Ilmenite</th>
<th>Rutile</th>
<th>Zircon</th>
</tr>
</thead>
<tbody>
<tr>
<td>WCP %</td>
<td>96.7</td>
<td>94.3</td>
<td>97.4</td>
</tr>
<tr>
<td>MSP %</td>
<td>99.0</td>
<td>103.0</td>
<td>77.8</td>
</tr>
<tr>
<td>Overall %</td>
<td>95.7</td>
<td>97.1</td>
<td>75.8</td>
</tr>
</tbody>
</table>

5.1 Mineral processing

Processing of ore is conducted in two distinct stages. The wet concentrator plant (WCP) receives ore as a slurry from the mine, and after removal of clay and silt, the sands are concentrated by spiral gravity separators to yield a concentrate of mixed heavy minerals (HMC). The HMC is cleaned, dried and fed into the MSP where progressive removal of valuable minerals into final products is achieved. The MSP relies entirely on the various different physical properties of the minerals to separate them from each other and residual gangue minerals contained in the HMC. Multiple stages of magnetic and electrostatic separation are employed in the dry section of the plant to isolate the ilmenite and rutile products. The remaining material is mainly zircon and lighter minerals which are removed in wet gravity separation processes including spirals, classifiers and Kelsey jigs. A strategic stockpile of HMC is maintained between the two plants to improve the effect of grade swings in the mined ore, and ensure the MSP is fed by a constant tonnage of HMC.

The mining sequence commences in the higher grade parts of the central dune, at about 8% HM, and during Year 5 grade starts to reduce, reaching about 4% HM by Year 6 and the remaining life of the central and south dunes. The WCP is designed to accommodate the larger tonnages required to be mined (approximately 1,700 tonnes per hour) after the ore grade reduces. However, as the ore grade is significantly higher in the early years, only about 1,100 tonnes per hour will be mined in order to avoid overloading the HMC stockpile. The WCP is designed to efficiently deal with this range of feed tonnage.

Figure 5.2 outlines the general process scheme for the WCP. This is a typical modern mineral sands concentrator, and would be expected to perform well in excess of requirements during the important start up years. The designed flowsheet follows testwork results, and in particular corresponds with the most recent tests from the Base drilling samples.

Gravity concentration employs a water medium, and uses very high flows of water. Most of the water is recirculated through thickeners, or returned from the tailings disposal area, so that only a small fraction of the plant requirements are from fresh water. This is supplied from the Mukurumudzi dam, with a back-up groundwater supply from six bores. The thickeners are a key element in water conservation, and also prepare the clay and silt (slimes) for disposal in the off-path evaporation dam.

Thickened slimes (over 30% solids) is pumped to the TSF and spread in layers from the peripheral wall. The slimes slurry is left to drain and consolidate in the valley. Water is decanted by penstocks to a pump basin for transferring the reclaimed water back to the plant process water reservoir.
Sand tailings from the WCP are pumped in a dedicated network of pipelines to dewatering stackers, which are initially used to raise the empoundment walls of the TSF. Water recovered from the tailings stackers is also collected for return to the plant reservoir. There is sufficient volume of sand in the planned TSF walls to dispose of all the WCP tailings during the first four years of operation. Thereafter the sand tailings will be pumped into the mining void as backfill. The use of deslimed sand tailings to construct dam walls is commonly practised in the mineral sands industry. Evaporation of layered thickened slimes is also commonly employed in the industry. Its success is significantly enhanced when the slimes is thickened to the point where it readily forms sloped beaches in the empoundment. The testwork undertaken by Base using local water and fresh samples of ore successfully demonstrated the required thickening effect.

Heavy mineral concentrate is taken either directly from the WCP or from the HMC stockpile, and fed at a controlled rate into the mineral separation plant. High density water attritioning is used to thoroughly clean the mineral surfaces, before the HMC is filtered and dried.
Ilmenite is removed using state-of-the-art magnetic separators, and stored in silos for transport to the port, while there is also a large storage shed at the plant site for additional ilmenite stockpiling. As ilmenite comprises about 60% of the HMC, subsequent stages of the plant are only required to treat much smaller tonnages than the designed HMC feed rate of 83 tonnes per hour.

Rutile is recovered using a combination of electrostatic and magnetic separators, which are placed to maximise recovery of leucoxene and other high TiO₂ minerals to augment rutile product volume, while maintaining market quality requirements.

*Figure 5.3* depicts the major stream flows and separation processes employed in the MSP.

*Figure 5.3: MSP process flowsheet*

The non-conductor stream remaining after rutile recovery holds the zircon, and impurity minerals predominated by kyanite and quartz. These are removed in a multiple stage wet gravity circuit, incorporating all the latest metallurgical techniques to effect a somewhat difficult separation. Recovery of zircon is affected by the requirement to produce a low alumina product, with the process complicated to some degree by some overlapping physical properties of kyanite and zircon. The design allows for stockpiling of some zircon-containing rejects (zircon tails) during the early years, with the zircon tails to be reprocessed to market quality zircon once the plant has spare capacity.

The final zircon circuit employs dry separation processes including magnetic and electrostatic separation. Zircon is stored in a product silo, and loaded bulk into sea containers for export via the container terminal at Mombasa. Rutile product will be exported in containers, or alternatively in bulk cargoes, as per individual customer requirements.
6.0 Infrastructure

Mineral sands projects consume large quantities of water and energy; require a skilled workforce; and good connections to their export markets.

A water consumption model constructed for the project predicts that make-up water volumes in the first four years will be 5.2 GL per annum, rising to 8 GL per annum as the mining rate increases. This amounts to a make-up rate of 600 litres per tonne of ore mined. Given the relatively high slimes content of 25%, this water consumption rate can be expected with good water recovery and recycling results. Most of the make-up water is intended to be drawn from the Mukurumudzi River dam, which is currently under construction, and is designed with a capacity of 8.5 GL. The project also intends to install six groundwater bores in the Gongoni forest area to the east of the project, with a capacity of 2 GL per annum. In reference to the climatic patterns of five yearly dry spells and one in 20 year droughts, the project may experience some reduced production period due to water shortage during the planned mine life. Construction has commenced on the dam wall and spillway, and the borefield.

The peak power demand for the project is 13 MW toward the end of South Dune mining. In the early years power demand is calculated to be about 6 MW. While Base holds a permit to generate its own electricity supply, the national grid has been deemed sufficiently robust to supply the project. Fault frequency and voltage problems on the main supply lines from the north were reviewed, leading the project to opt for a connection via a dedicated 132 kV line to the Galu substation located 14 km from the processing plant. Internal power reticulation from the plant substation will service the outlying facilities such as the water supply and mining plant. The easement for the new power line has been obtained, and the line and transformer are in construction. Ownership of the line will be transferred to the Kenyan national power utility upon completion.

A paved road is being constructed from the plant site to the main highway to Mombasa. The easement for this 8 km private road has been obtained, and construction has been underway since late 2011 under a contract with a Kenyan company.

A bulk export facility is to be established by Base on the south bank of Mombasa harbour at Likoni. The land has been purchased and the all contracts have been let and construction is underway. The shiploader contract has not yet been executed but a conditional award is in place. The port facility will accommodate ships up to 45,000 tonnes DWT, which would be among the largest ships used for mineral sands bulk transport. Some bulk storage capacity, reclaim and shiploading equipment will be located at the port, while additional ilmenite storage will be maintained at the mine. Storage will be sufficient for six weeks production at the port, with an additional six weeks capacity at the mine. Some of the rutile and all the zircon is intended to be shipped bulk in containers, from the container terminal on Mombasa Island. Access to the terminal is via ferry from the south bank of the harbour. Numerous cargoes from southern Kenya and northern Tanzania use this mode of export, which is well established and has several back-up barges. Some delays can occur at the ferry entrance, however the container port is operated to high standards.
Diesel fuel for the mining equipment and the MSP dryer will be road hauled from Mombasa to site. Diesel is the standard fuel for supplementary power generation throughout Kenya, and is supplied by multiple international oil companies.

Much of the workforce will be drawn from the local population, which has its own established housing. Some housing will be required for specialist personnel from outside the region, including expatriates. The company has already purchased six houses in the nearby resort strip along Diani beach, and in the regional town of Ukunda. Expatriate workers have already found suitable houses in the area and established leases. Ukunda is serviced by a regional airport with connections to Nairobi.
7.0 Products and marketing

7.1 Mineral sands market review

The mineral sands industry is orientated primarily towards the supply of titanium raw materials for the production of titanium dioxide ($\text{TiO}_2$) pigment and titanium metal. The term ‘mineral sands’ refers to concentrations of minerals commonly found in sand deposits, which include the titanium minerals ilmenite and rutile. The other mineral of significance usually found in these deposits is zircon, which most producers consider a co-product of their titanium mineral products.

The global $\text{TiO}_2$ pigment market accounts for around 90% of all titanium feedstock demand, and is therefore the dominant driver of offtake. For zircon, ceramic applications are the dominant end-use application accounting for 60% of global zircon demand.

7.2 $\text{TiO}_2$ pigment market

$\text{TiO}_2$ pigment is used predominantly in the production of high quality surface finishes, and is essentially a lifestyle product. Historically, its use has developed strongly in the most economically developed countries of the world where it is an essential component of basic consumer products, such as housing, motor vehicles and plastic products.

$\text{TiO}_2$ consumption generally increases as disposable income increases, and as a result there is a close link between GDP growth and $\text{TiO}_2$ pigment consumption. On a global scale, both growth rates historically have been similar; approximately 3.5% per annum, depending on the starting and ending dates and relative position in the business cycle. This historical pattern provides an indication that the long-term trend in future consumption of $\text{TiO}_2$ pigment will continue to show growth at rates that will be underpinned by world GDP growth.

Traditionally the main consuming regions for $\text{TiO}_2$ pigment are the major industrialised economies of North America, Europe and more recently the significantly increasing role played by China.

The segmentation of the $\text{TiO}_2$ pigment market by consuming industry in 2011 is shown in Figure 7.1. The coatings sector is the largest consumer of pigment averaging 58% of total pigment consumption, with architectural coatings (paint) representing the majority of this end-use segment. Demand for architectural coatings is driven by factors such as existing home sales, new construction (residential and commercial), home maintenance and government spending on urban development. On the other hand, demand for industrial coatings is influenced largely by industrial production, disposable income/purchasing power parity, consumer confidence, infrastructure spending and unemployment levels – all factors that relate to the health of the overall economy, particularly the durable goods sector.
The plastics sector accounts for around 22%, while the remaining 20% is predominantly consumed in the production of paper inks, fibres and other specialty materials.

TZMI estimates that global demand for TiO₂ pigment in 2011 reached 5.35 million tonnes, only marginally above the levels achieved in 2010. Over the period to 2020, TZMI is forecasting global TiO₂ demand to increase at a rate moderately above the 30-year growth rate of 3.5% per annum, mostly due to the influence of higher GDP growth in the developing economies on the overall global growth number.

In terms of pigment supply, global pigment production capacity grew from 6.0 to 6.3 million tonnes in 2011. The industry is dominated by seven producers of which five operate in multiple regions. These seven producers account for 62% of global capacity.

TZMI is forecasting global TiO₂ pigment supply to reach around 8.0 million tonnes by 2020, a growth rate of slightly over 4% per annum. It is expected that Chinese pigment production will display the highest growth rates globally.
Figure 7.2 shows the share of total TiO₂ production by the major global producers in 2011 and 2020 respectively, as estimated by TZMI. The relative increase in share of global production by Chinese and other producers is driven mainly by the fact that forecast production growth in China outstrips that in other parts of the world.

China will therefore have a marked influence on titanium feedstock demand, in particular sulfate ilmenite (either as a direct feed or for titanium slag production), to meet its future TiO₂ pigment requirements.

7.3  Titanium feedstock markets

7.3.1  Overall market

Feedstock demand in the long-term, for both the sulfate and chloride pigment production routes, is expected to show strong growth. In particular, demand for sulfate feedstocks, led by China’s requirement to meet fast growing domestic pigment production, is forecast to grow at a 4% CAGR over the period between 2011 and 2020. The total feedstock demand is forecast to increase by almost 3 million TiO₂ units during this period and will approach 9.8 million TiO₂ units by 2020, with sulfate feedstock demand expected to account for more than half of the total growth.

The continuing strong growth experienced by the Chinese domestic TiO₂ pigment industry, together with a buoyant titanium metal sector and increased focus on ilmenite beneficiation to titanium slag, is further impacting on the country’s titanium feedstock demand. China remains reliant on imported feedstocks, predominantly ilmenite but also increasing volumes of titanium slag, for almost one third of its total feedstock requirements.

On the supply side, based on TZMI’s current outlook of supply from existing producers and approved new projects, global feedstock production will grow to around 7.8 million TiO₂ units in 2015. Beyond 2016, supply of feedstocks is expected to decline to approximately 7 million TiO₂ units, without the development of further new supply projects. Figure 7.3 shows the supply/demand balances for the global titanium feedstock market from 2005 to 2020. TZMI forecasts indicate that based on supply from existing producers (including known expansions) and approved new projects, the overall market is expected to remain tight through to 2014. It is only with the onset of likely new projects that will move the market into a moderate surplus position during the period 2014 to 2016, and any delay in bringing such new supply on stream would obviously reduce the potential market surplus. The global market for all titanium feedstocks is expected to be in supply deficit beyond 2016 unless a significant volume of supply from new projects can be commissioned.
7.3.2 Sulfate ilmenite

TZMI’s estimates indicate that global ‘net’ sulfate ilmenite production in 2011 is approximately 2.3 million TiO₂ units, an increase of 14% from 2010 levels. A significant portion of the growth can be attributed to increased ilmenite output in China. The ‘net’ supply reflects ilmenite available as a feed for sulfate TiO₂ pigment manufacture, having allowed for ilmenite use in the production of titanium slag. Although South Africa and Canada are the two largest sulfate ilmenite producing countries globally, virtually all the ilmenite produced is consumed internally for slag manufacture.

China and India are the two largest ‘net’ sulfate ilmenite producing countries, accounting for more than 45% of total net sulfate ilmenite output in 2011.

Based on TZMI’s analysis, global net supply of sulfate ilmenite from existing producers and approved projects, will increase year-on-year through to 2015, reaching 2.7 million TiO₂ units before declining gradually to 2.0 million TiO₂ units by 2020.

TZMI forecasts that global net sulfate ilmenite demand will grow at approximately 4% per annum from 2.4 million TiO₂ units in 2011 to 3.4 million TiO₂ units in 2020, with China expected to account for most of the forecast growth. This total excludes ilmenite used in the manufacture of titanium slag, which is largely captive ilmenite outside of China. Most of this global offtake is for the manufacture of sulfate route TiO₂ pigment, with some small tonnages consumed for other uses.

Demand for sulfate ilmenite in western pigment plants is expected to remain relatively stable through to 2020 as no major sulfate route pigment capacity is anticipated in the medium term.

Based on TZMI’s forecast, the global sulfate ilmenite supply/demand is expected to be close to balance between 2012 and 2013, before moving into moderate surplus in 2014 and 2015 as new supply from a number of approved projects comes online. The market is then
expected to move into progressively larger deficit beyond 2016 if no new supply is brought online to meet the demand for the product.

7.3.3 Rutile market

As with other TiO₂ feedstocks, rutile is consumed largely for pigment manufacture. Figure 7.4 shows the breakdown of rutile demand by end-use segments in 2011, with pigment accounting for 60% of global rutile consumption. In the other uses segment, rutile is predominantly consumed for the manufacture of welding electrodes fluxes.

Figure 7.4: Rutile demand by end-use in 2011

TZMI’s analysis indicates that total rutile consumption for 2011 was around 770,000 TiO₂ units, up by 14% compared to the 2010 levels. TZMI forecasts indicate that the underlying demand for rutile is expected to grow at 2.5% CAGR through to 2020.

Global rutile production for 2011 is estimated at around 800,000 TiO₂ units, an increase of just 12% year-on-year. Australia remains the largest producer at some 480,000 TiO₂ units in 2011, or 60% of the global output. Overall, the global rutile supply profile is expected to remain essentially flat through to 2015, but beyond that date depletion of resources for existing producers could see a progressive decline in the production profile such that by 2020 total output from existing producers may be at a similar level to that witnessed in 2010. Therefore, unless new sources of supply are commissioned in the period beyond 2014, rutile supply deficits seem likely to occur during the period to 2020.

For most of the projects known to TZMI, rutile is a minor component of the overall product suite, and it is not obvious with respect to known discoveries what would fill the potential supply deficit.

7.4 Zircon market

Zircon is recovered as a co-product from most titanium mineral operations, although the ratio of zircon to titanium minerals produced varies widely depending on the mineral assemblages of specific deposits. The rock ilmenite producers, for example, produce no zircon while for some mineral sands producers it provides a very important contribution to.
total revenue. The production of zircon is often fundamental to the economic success of many titanium mineral operations.

While zircon production is highly concentrated, with the top seven producers accounting for 77% of world output, consumption is quite fragmented, as zircon is used in a wide range of consuming industries. The largest end use market for zircon is as an opacifier in ceramic glazes. This application accounted for 58% of estimated global zircon consumption of 1.38 million tonnes in 2011. China and Europe dominate consumption at 41% and 23% of the global total.

Supply remains the greatest cause of uncertainty in the global zircon market, as it is not obvious where future sustainable supply will be sourced to meet the ongoing demand requirements of the sector. Given the current rate of demand growth in the sector driven predominantly by the industrialisation in China and, to a lesser extent in India, substantial additional supply from new projects will be required to avoid a significant future supply gap. The global supply profile is expected to remain fairly flat after 2014 even with new supply from several new potential projects to be commissioned over the next few years.

Hence, new discoveries will certainly be required if supply levels are to sustain anywhere near anticipated levels of global demand. A typical project usually requires a minimum of seven years from the exploration stage to commissioning. As such, it would take several new discoveries over the next three to four years to avoid a supply hiatus by the end of the current decade, even if higher prices provided the economic imperative to mine some lower grade ore associated with a number of current operations and thereby extending their mine lives.

TZMI’s forecasts suggest that without considering additional supply from potential new projects that have yet to receive formal approval to proceed, the global supply/demand balance is likely to show progressively larger deficits beyond 2016 as underlying demand for zircon continues to grow while the supply base declines.

The projected growth in zircon demand from 2012 to 2020 is estimated at just over 4% per annum and is attributed to developments in industrialising nations in Asia-Pacific, and specifically China. Demand growth in China should account for around 65% of the projected global demand growth in the sector over the forecast period.

It is likely that a number of other projects will soon be added to the global projects pipeline, induced by high zircon prices in the short to medium term. However, in TZMI’s opinion, most of these projects are unlikely to add to the global supply prior to 2014/15 due to the long lead time required to get new projects off the ground.

7.5 Titanium feedstocks and zircon prices

The market is currently witnessing a wide range of feedstock prices among individual product types, in some cases a three-tier pricing environment: lower prices associated with existing ‘legacy’ contracts; significantly higher prices for new contracts (both annual and six-monthly price negotiation); and ‘peak’ pricing in spot sales, some of which will reflect purchases by some customers unable to secure sufficient offtake. This reflects the ongoing transition of the sector away from an extended period of ‘cap and collar’ long-term contract (annual) pricing, towards contracts of significantly shorter duration, and more frequent price negotiation (six monthly and perhaps even quarterly). There is also an increasing volume of material being sold on a spot basis. The influence of legacy contract pricing will continue to
diminish during the next two years, such that by 2014, global weighted average prices will more closely reflect new contract or market prices.

For the major western sulfate ilmenite contracts, prices for 1H 2012 are in the range US$315-370 per tonne FOB. For 1H 2012, bulk rutile prices in the range US$2,200–2,500 per tonne FOB appear to represent the majority of sales, with bagged product in the range of US$2,700–3,300 per tonne FOB. For zircon, developments in China have had the most significant market influence, as the output of ceramic tiles in the country has slowed considerably in response to a weaker domestic housing market. Prices for Q3 2012 are in the region of US$2,500 per tonne FOB, with some variability depending on product quality and size of shipments.

Some shorter-term price weakness is anticipated over the next six to nine months in line with the current demand softness in most regional markets.

Notwithstanding the recent economic headwinds in several regions and the current slowdown in China, the medium term fundamentals for titanium feedstocks are still strong in TZMI’s opinion. The general trend of feedstock prices is expected to remain upwards in the medium term with varying short-term trends for individual feedstock types dependent on contract terms and other market factors. This view is based on continued tight supply for most products during the next three years and competition among consumers to secure sufficient feedstock offtake.

Given the fact that contract durations are now typically only for a single year for a number of products, and for several suppliers, the future security of supply is the key risk that should sustain prices close to current levels, with further moderate price increases possible during the period 2013 to 2015. Beyond 2015, a scenario of sufficient new supply being commissioned from new projects should see prices decline towards more sustainable long term levels around 40–50% of current price levels.

7.6 Planned Kwale product quality and target markets

TZMI has assessed the specifications of the planned Kwale titanium feedstock and zircon products and can confirm that they meet the generally accepted quality considerations for most end-use market applications. As such, from a quality perspective, there should be no impediment from marketing the planned volume of Kwale products in the global market place.

For sulfate ilmenite, the product is suitable as a feedstock for sulfate route TiO₂ pigment production and as a feed for the manufacture of chloride grade titanium slag. These end-uses are the key target markets for the product.

For rutile, the Kwale product can be classified as a premium product, suitable for use in the production of chloride route TiO₂ pigment, as well as a feedstock for the manufacture of titanium sponge. The product is also suitable for use in welding electrode applications.

The Kwale zircon can be classified as a premium product and is therefore suitable for use in ceramic applications, the most significant end-use market for the product.

TZMI has sighted the current offtake agreements in place with customers for the Kwale products and can confirm that 43% of the product volumes and 70% of the projected revenue from the project are subject to long term contract at market linked prices that are therefore consistent with the current forecasts for the general market.
8.0 Operating costs

Base has updated its operating cost model to reflect mid-2012 conditions, and estimates an average life of mine cash cost of US$5.16 per tonne of ore mined. During the first six years, operating costs average US$53 million per annum, while in the later years this is estimated to rise to US$60 million per annum as production throughput expands from around 8 million tpa to approximately 12 million tpa.

Operating costs are estimated from supplier quotes; first principals; vendor information, and benchmarking against other operations, with mining costs being scrutinised by an Australian contract miner with direct experience in supplying dozer trap mining services to the mineral sands industry.

TZMI has independently estimated costs using its proprietary cash costs modelling, which seeks to track and compare operating costs for most mineral sands producers. A summary of the estimated operating cash costs of production, as assessed by TZMI, is shown in Table 8.1.

### TZMI estimated summary cash costs of production over life-of-mine

<table>
<thead>
<tr>
<th>Area</th>
<th>US$ million</th>
<th>US$/t ore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clearing &amp; stripping</td>
<td>6.7</td>
<td>0.05</td>
</tr>
<tr>
<td>Mining</td>
<td>160.3</td>
<td>1.14</td>
</tr>
<tr>
<td>Environmental/Rehabilitation</td>
<td>13.5</td>
<td>0.10</td>
</tr>
<tr>
<td>WCP &amp; tailings disposal</td>
<td>160.2</td>
<td>1.14</td>
</tr>
<tr>
<td>Centralised mining administration</td>
<td>41.7</td>
<td>0.30</td>
</tr>
<tr>
<td>Mineral separation plant</td>
<td>149.0</td>
<td>1.06</td>
</tr>
<tr>
<td>Product handling</td>
<td>54.6</td>
<td>0.39</td>
</tr>
<tr>
<td>Administration &amp; Marketing</td>
<td>85.4</td>
<td>0.61</td>
</tr>
<tr>
<td>Royalties</td>
<td>121.4</td>
<td>0.86</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>792.9</strong></td>
<td><strong>5.64</strong></td>
</tr>
</tbody>
</table>

TZMI estimates that the average operating cost for the project is around US$54 million per year for the first six years, increasing up to US$65 million per year as the operation expands its production throughput capacity from around 8 million tpa to approximately 12 million tpa and progresses toward the South Dune for the remaining life of mine. Base’s operating cost estimates are within 10% of TZMI’s estimates presented in Table 8.1 and as such are considered to be reasonable.

Royalty payments are based on the assumed FOB revenue after deduction of all costs of transport and insurance incurred in delivering the product to the point of FOB Mombasa sale. The applicable rates are 2.0% under the Kwale Project Royalty Deed and 2.5% to the Government of Kenya. Base have taken a conservative approach and estimated that an additional 2.5% royalty will be payable to the Government of Kenya after Year 6 of operation.

Kwale is forecast to be a relatively low operating cost operation when compared to its global peers, with relatively high ore grade, virtually no overburden, and despite a significant proportion of non-ilmenite products, its MSP unit cost remains very competitive.
9.0 Reserves

Reserves are calculated after applying relevant modifying factors to resources. In the case of the central dune deposit, the reserves and resource tonnages are very close, reserve tonnage being less than 1% lower. This is due to the high grade of ore, and mineralisation extending to the surface and dune flanks. The south dunal deposit has an increased lower grade zone, which is more or less included in reserves depending on product pricing. There is a higher grade core of resource in the south deposit which is included in reserves even at much lower product prices.

The resource model has been divided into discrete cells 50 x 50 metres and 3 metres depth. Each cell value is determined from its individual grade and mineral assemblage, and relevant recovery factors through the process to final products. Costs are assigned to each cell as a proportion of annual costs determined by the time taken to mine the cell; and by variable costs determined by the specific attributes of the ore in that cell. Inferred resources have their modelled grades set to zero, to avoid contributing to the optimisation process. Areas with less than five metres of ore are accorded additional mining costs and tagged as auxiliary mined ore. The cells are also assigned with a radial distance to the fixed plant, to assign ore pumping costs.

The assumed recovery factors for rutile and ilmenite applied to the optimisation process are considered conservative, resulting in recoveries that average 5% lower than what was achieved in the test work. Assumed zircon recovery factors applied to the optimisation process are 2% higher than demonstrated by the testwork, because the initial 5 years of tailings from the zircon section in the MSP are retreated from stockpiles in later years.

Table 9.1: Mineral recovery factors

<table>
<thead>
<tr>
<th>Product</th>
<th>Testwork recovery (pit to product) (%)</th>
<th>Recovery used by Base model (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ilmenite</td>
<td>96</td>
<td>94</td>
</tr>
<tr>
<td>Rutile</td>
<td>97</td>
<td>89</td>
</tr>
<tr>
<td>Zircon</td>
<td>76</td>
<td>78</td>
</tr>
</tbody>
</table>

The variable costs assigned to each resource cell include slimes handling, which is determined by the slimes content; mineral processing and product transport, dependant on the grade and mineral assemblage; and mining factors such as ore hardness or auxiliary mining surcharge. Fixed costs are assigned on a time-to-mine basis, from annualised labour, maintenance, sustaining capital and local overheads. In the early years, each cell takes more time to mine as the high grade bottlenecks the mining rate. Mining blocks related to the dozer trap sequence are individually checked against a number of process bottlenecks, and their contributing cells constrained by the controlling limitation of its average mining rate.

The cell residual values are treated to a Lerches Grossman optimisation routine, and pit shells modelled for a range of factors from 50% to 150% of the base case revenue. The central pit optimisation shells plateau close to the lower revenue value, reflecting the robustness of this mine. The south pit optimisation is also constrained by the resource at revenues above 70% of the 2011 base case.

Reserves are shown in Table 9.2.
## Table 9.2: Ore Reserves estimates

<table>
<thead>
<tr>
<th>Project</th>
<th>Classification</th>
<th>Resource (Mt)</th>
<th>HM (%)</th>
<th>Ilmenite (%)</th>
<th>Rutile (%)</th>
<th>Zircon (%)</th>
<th>HM (Mt)</th>
<th>Ilmenite (Mt)</th>
<th>Rutile (Mt)</th>
<th>Zircon (Mt)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>Proven</td>
<td>46.3</td>
<td>6.9</td>
<td>3.93</td>
<td>0.91</td>
<td>0.42</td>
<td>3.19</td>
<td>1.82</td>
<td>0.42</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Probable</td>
<td>29.2</td>
<td>4.5</td>
<td>2.45</td>
<td>0.61</td>
<td>0.26</td>
<td>1.31</td>
<td>0.72</td>
<td>0.18</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>Proven and Probable</td>
<td>75.5</td>
<td>6.0</td>
<td>3.36</td>
<td>0.80</td>
<td>0.36</td>
<td>4.53</td>
<td>2.54</td>
<td>0.60</td>
<td>0.27</td>
</tr>
<tr>
<td>South</td>
<td>Proven</td>
<td>39.9</td>
<td>3.7</td>
<td>1.89</td>
<td>0.52</td>
<td>0.22</td>
<td>1.48</td>
<td>0.75</td>
<td>0.21</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>Probable</td>
<td>25.2</td>
<td>3.4</td>
<td>1.42</td>
<td>0.40</td>
<td>0.17</td>
<td>0.86</td>
<td>0.36</td>
<td>0.10</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>Proven and Probable</td>
<td>65.1</td>
<td>3.6</td>
<td>1.71</td>
<td>0.48</td>
<td>0.20</td>
<td>2.34</td>
<td>1.11</td>
<td>0.31</td>
<td>0.13</td>
</tr>
<tr>
<td>Total</td>
<td>Proven</td>
<td>86.2</td>
<td>5.4</td>
<td>2.99</td>
<td>0.73</td>
<td>0.33</td>
<td>4.65</td>
<td>2.58</td>
<td>0.63</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>Probable</td>
<td>54.4</td>
<td>4.0</td>
<td>1.97</td>
<td>0.51</td>
<td>0.22</td>
<td>2.18</td>
<td>1.07</td>
<td>0.28</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Proven and Probable</td>
<td>140.6</td>
<td>4.9</td>
<td>2.59</td>
<td>0.65</td>
<td>0.29</td>
<td>6.88</td>
<td>3.64</td>
<td>0.91</td>
<td>0.41</td>
</tr>
</tbody>
</table>

*Source: Base Resources*

The statement of Ore Reserves at the Kwale Project has been produced in accordance with the Australasian Code for Reporting of Mineral Resources and Ore Reserves, December 2004 (the JORC Code). The information in this report relating to Ore Reserves is based on information provided by Base, and has been checked in detail by Mr Steven Gilman, who is a Fellow and Chartered Professional of the Australasian Institute of Mining and Metallurgy (AusIMM); and by Mr Geoffrey Richards, a member of the Australian Institute of Geosciences (AIG). Both Mr Gilman and Mr Richards have over twenty years experience which is relevant to the style of mineralisation, type of deposit, and extractive operations under consideration. As such they are individually qualified Competent Person’s as defined by the JORC Code. The Ore Reserves statement reported represent estimates at 30 June 2012. Both Mr Gilman and Mr Richards consent to the inclusion in this report of the ore reserve estimate in the form and context in which it appears.
10.0 Capital costs

The capital cost estimate for the Kwale project was estimated in July 2011 at US$256 million, including an allowance of 8.6% for estimating accuracy and an additional US$20 million contingency. This total was reported in May 2011 at the conclusion of the EDFS undertaken by Base, which incorporated an updated resource as a result of further drilling, a revised process flowsheet design, and the recent strengthening of the mineral sands product markets. Sustaining capital expenditure totalling US$32.5 million (equivalent to US$250,000 per month) as well as future capital expenditure of approximately US$27 million, spread over the project life, associated with normal mobile equipment replacement, increases in throughput and the move of the DMU to the South pit have also been factored into the Kwale capital costs.

The latest project expenditure report available at the time of writing stated that $52 million had been expended, and that the forecast to initial commissioning of the project would bring the total to $275 million, plus additional project contingencies of US$23 million.

The project establishment has been divided into seven capital projects, and three owner’s projects. The largest external project is the detailed design, procurement and construction of the fixed plant and plant infrastructure, representing approximately half of the initial capital cost. This project has been awarded to Ausenco, an Australian listed global engineering company. Ausenco has completed most of the detailed engineering for the fixed plants.

Temporary facilities including a construction camp, and the access road construction have been let to Kenyan contracting firms, and both road and camp are currently being prepared. The Mukurumudzi dam project is in construction. Figures 10.1 and 10.2 show the progress on the dam spillway and main wall; and the construction camp.

Figure 10.1: Mukurumudzi dam project
The project to construct marine facilities at Likoni is under way. Other contracts have been let for the power line construction, and also for the start-up infrastructure for the TSF. The TSF starter walls groundwork commenced in the last week of June 2012. About 20% of the project capital is being directly managed by Base, including typical ‘owners costs’.

While the capital cost estimate is expressed in US dollars, the service and equipment suppliers being utilised during the development of Kwale are located in a number of countries/regions, such as Australia, the US, Europe and South Africa, while labour costs are predominantly Kenyan. Favourable moves in the relevant exchange rates compared to those used in the EDFS have resulted in a small forecast reduction in capital costs. With over 70% of the project costs already committed, Base undertook a capital cost review. Due in part to changes in scope for improved project outcomes, and also based on appreciation of labour costs in construction to date, the forecast project capital expenditure is estimated as of mid-September 2012 to be US$275 million plus additional total contingencies of US$23 million for a total of US$298 million. Working capital is essentially the capital needed to fund the normal, day-to-day operations of a business and is particularly important during the start-up period as it allows the company to continue operating and generate revenue while waiting for cash flow receipts from earlier product sales to arrive.

In the mineral sands business, there is typically a delay between shipping of product and the receipt of revenue which is associated with offtake terms of payment, and in Base’s instance, this is conservatively assumed to be two months on the basis of offtake agreements and negotiations.
11.0 Economic analysis

Using TZMI’s cost modelling, the project after-tax NPV (exclusive of funding and corporate charges) is estimated at US$492 million at a discount rate of 10%, with an attractive after-tax IRR of 46%.

A sensitivity analysis has been performed on the DCF financial analysis to understand the impact of variations to estimates on the project economics. The purpose of this assessment is to indicate the areas of greatest sensitivity, thus providing appropriate focus for future work, rather than to indicate a possible range of project outcomes. Table 11.1 shows the impact on the project IRR for variations to the following parameters:

- Capital costs
- Revenue
- Operating costs
- Delay to project start-up
- Unforeseen drought in 2016 (resulting in 30% loss of sales)

<table>
<thead>
<tr>
<th>Table 11.1: Project variables sensitivity analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Case</td>
</tr>
<tr>
<td>NPV (US$m)</td>
</tr>
<tr>
<td>492</td>
</tr>
<tr>
<td>After tax IRR (%)</td>
</tr>
</tbody>
</table>

It can be seen from the table above that the project IRR is most sensitive to project start-up delay. A 1-year delay could result in the project IRR decreasing from 46% to 37%, as product prices are expected to decline progressively towards TZMI’s long term average after 2015. A 10% variation in product prices will result in a 7-percentage points variation in project IRR.

11.1 Project revenue-to-cash cost ratio

The analysis of the mineral sands operations’ production costs can be somewhat complicated, considering the varying nature of the orebodies, different mining methods, mineral separation and beneficiation techniques employed, geographical location and product values.

When comparing competitiveness of mineral sands operations, it is important to ensure that the comparison is done on the same basis. Due to the multi-product nature of the individual producers, the comparison of the cash cost of production alone is not adequate as ilmenite dominant producers usually have a lower cost base compared to dominant rutile and zircon producers. Revenue generated by the varying product suite should also be taken into consideration when comparing the relative competitiveness of mineral sands operations. As such, TZMI has traditionally used a project’s revenue-to-cash cost (R/C) ratio as the primary metric of competitiveness for individual operations in the industry.

The R/C curve across the mineral sands industry for 2015, as estimated by TZMI, is shown in Figure 11.2. The curve has been constructed in the conventional cumulative manner, with the size of each operation (in total TiO₂ units produced) being represented on the X-axis by the width of the column bar. The average industry R/C ratio for 2015 was estimated to be 2.1
(based on real 2011 industry cash costs of production and TZMI’s long term price forecasts). For comparison purposes, TZMI has estimated the Kwale project R/C ratio based on projected production and sales in 2015 and assuming long term TZMI prices. Kwale’s R/C ratio is estimated at 3.4, placing the project in the first (top) quartile of the cost curve.

Once the ore grade reduces during the second half of the project life, the predicted R/C reduces to around 2.0.

**Figure 11.1: Revenue-to-cash cost ratio forecast for the industry in 2015**

![Graph showing revenue-to-cash cost ratio forecast for the industry in 2015.](image)

Historically an average R/C ratio of between 1.5 and 1.7 has been viewed as reasonably competitive in this industry, with the average weighted R/C ratio across the titanium feedstock industry for the past five years ranging between 1.4 and 1.5. While the average R/C ratio of existing producers is expected to be significantly higher given the increase in product prices, these increased prices are expected to induce new projects with deposits which may have been deemed uneconomical in the past. These new operations are likely to come online at lower R/C ratios bringing the overall industry average in line with historical levels.
12.0 Risk analysis

The Kwale mine will be the first mineral sands operation in Kenya. Its scale and visual impact may be a surprise to many, including regulators and local community, with the level of water consumption and land disturbance to be larger than any experienced in the locale. Because the area of the mine is significant it may attract attention from natural opponents of any type of mining activity, with the natural delay in the commencement of land rehabilitation often a targeted issue. However the current local and national attitude towards the project is positive, and it will remain a key management function to ensure this is maintained.

The project is in a periodic drought affected area, however stochastic analysis shows that combination of dam and borefield would be insufficient for operations only in circumstances of multi-year consecutive droughts. The deep bores in the coastal sands will be a new source of water that will to some extent mitigate a drought, and the large reservoir and dam on the river will reduce the quantity of water ‘lost’ to the sea. Statistically there is expected to be one season during the intended project life when mining and primary concentrator activity is reduced due to low reservoir levels.

It is unlikely that earthquake, flood or tropical cyclones will impact the project. Seismic records put the area in a low risk category. The project area is elevated and the TSF has gravity drainage through penstocks, so flooding should not affect the operation. Tropical cyclones in the area are rare, and hardly rate a mention alongside natural disasters caused by floods in low-lying areas or droughts.

Base undertook a thorough assessment of project risk, and has sensible mitigation measures in place for the more serious ones. Political risk is assessed as being moderate, and the key undertakings of the Kenyan government have to date been delivered. Market risk for the project has been mitigated to a large extent by the offtake agreements that are in place.

Security in the area is affected in a typically emerging economy manner. Petty theft and personal security require additional care and also entails project fencing and security staff. The coastal residential area is a favoured tourist destination for Europeans, and strives to maintain acceptable security standards. A comprehensive Security Management Plan is in place.

The technology employed in the Kwale project is applied throughout the mineral sands industry, and should be quite manageable. In the event that insufficient technical expertise can be trained in the predicted timeline, Base could extend the period during which experienced expatriates are employed in greater numbers.

Exports of product, and imports of spare parts and fuel are completely dependent on good access through the port at Mombasa. Any disruption to the free flow of material through the port would have a severe impact on the project. However, Mombasa is the key sea port for much of east Africa, and is a very high priority to maintain cargo flows.

Overall, the risk profile for the Kwale project is seen as moderate. While it has some risks, it is well-served by existing infrastructure; is located in an attractive living area; employs robust technology; and supplies much of its product value into very strong markets. It will probably have to ride out at least one drought; and manage its public image in the face of likely concern over its visual impact.
13.0 Environmental considerations

The Kwale project will have a large footprint, and impact in many ways on the environment during construction and operations. As with most mineral sands operations, the mining and mineral separation processes are quite benign, and afford the possibility of returning the entire project area to productive land use after mining. With the legacy infrastructure of the Mukurumudzi dam and reservoir; power and roads, the project presents a significant long term development opportunity to uplift employment and economic activity well beyond the mine life of 13 years. Environmental studies, public consultation and impact mitigation measures incorporated into environmental management plans are in accordance with Kenya Government requirements. Base has adopted World Bank Standards and Equator Principles for addressing environmental issues.

Legislative requirements direct the project through a network of regulations; permits; studies and management plans which are generally given oversight by the National Environmental Management Authority (NEMA). The rules in Kenya are effectively aligned to World Bank standards, and adhere to the Equator Principles.

The previous owner, Tiomin, had advanced many of the requisite studies and action plans, and these have been absorbed into the project development under Base, with few changes. Where mining and infrastructure techniques and provisions have been changed by Base, the various permits and management plans have been changed accordingly, with approval from the relevant authorities.

Communities directly affected by the mine and water reservoir footprint have already been relocated to a host location, under the auspices of the district resettlement and compensation committee (DRCC) which was set up by the government in 2004.

The key processes that have been undertaken are outlined below:

- Environmental Impact Assessment (EIA). Environmental studies commenced in 1998, and by 2002, NEMA had approved the project EIA. Baseline studies were conducted on the physical, biological and human environments, for the mine project area and the port site.
- Environmental management programmes. In accordance with the EIA outcomes, and Equator Principles, management plans have been developed by the project owners and approved by NEMA. For the design and construction phases, there are eight management plans, canvassing the resettlement action plan; framework design plans; and social management plans. The operating phase is covered by eleven management plans, and to date one generic decommissioning management plan.
- Public consultation and disclosure. Discussions with affected farmers in the mine area commenced in 1997, leading to the formation of the broad spectrum stakeholder DRCC. This group comprised representatives of all levels of government and civil society, including Members of Parliament, religious leaders and councillors from the area, and farmers. The DRCC participated fully in formulating and approving the resettlement action plan (RAP). This group was replaced in 2010 by a smaller mining project liaison committee (MPLC) chaired by the Kwale District Commissioner, to formally liaise between Base and district government authorities, local leaders and other stakeholders.
- Legacy undertakings. The RAP included provision by the project, of community, schooling, and religious infrastructure in the host area. Schools and other community infrastructure has also been provided to the broader community. Once the mining operation is complete, it is intended that the reclaimed areas be developed for
agriculture, taking advantage of the drought-proofing afforded by the Mukurumudzi dam; power distribution, and established roads.

The port site at Likoni includes several acres on shore and extends into the port area shipping channel. It was assessed as being in poor environmental condition. No adverse impacts are expected by the approved infrastructure development. Roads into the facility pass through densely populated areas at the approaches to the port. Realignment of the access road, and removal of enterprises encroaching into the road easement to behind a barrier was effected by the government prior to Base acquiring the project.

Many of the environmental permits are issued with regular renewal intervals, subject to regulatory inspections. Such permits at the time of writing were up-to-date. An emissions licence awaits formal publication of relevant regulations, as does the posting of the rehabilitation bond.
14.0 Concluding statements

The Kwale project is an outstanding development, both for its owner, and the Kenyan community. The high value ore in central dune affords a relatively easy start-up, and the suite of products are in high demand in the market. The project has very positive support from the local and national community in Kenya, and also from the markets addressed by its products.

During the first five years of production, cash margin proportions are expected to be in the highest quartile of the global mineral sands industry. The process plants are designed with robust operational margins, and afford ample opportunity to take early advantage of meeting ramp-up expectations, or exceeding production targets.

Kwale is forecast to be a relatively low operating cost operation when compared to its global peers, with relatively high ore grade, virtually no overburden, and despite a significant proportion of non-ilmenite products, its MSP unit cost remains very competitive. As such during the first five years of production, cash margin proportions are expected to be in the highest quartile of the global mineral sands industry. The process plants are designed with robust operational margins, and afford ample opportunity to take early advantage of meeting ramp up expectations, or exceeding production targets. The production processes are all state-of-the-art and currently commercialised. The ilmenite and rutile circuits are relatively straightforward and are anticipated to come on stream without difficulty. The more complex zircon recovery circuit has a longer ramp-up period of two years, however early years reject streams are to be stockpiled for reprocessing in later years after ore grades decline.

Reliable supplies of water and electricity are essential for the project, and each has been catered for as much as practicable by Base. The installation of the Mukurumudzi dam, supplemented by groundwater bores should mitigate all but the worst of drought conditions, while power reliability has been studied at length, and appears to be systematically improving from what is considered to be an already acceptable quality from the state grid.

More than 70% of the product value has been contracted for sale for the first five years. Potential exists for the balance to be sold at a variance to the long term prices used, however these accord to TZMI’s price forecasts. Kwale is predicted to be reasonably low cost operation, with Base’s forecast operating costs being within 10% of TZMI’s independent estimate and considered reasonable. Coupled with a high-value product assemblage forecast, the project margins are expected to be very strong, providing capacity for the potential accelerated repayment of the debt facility.

The latest capital cost estimate, after 70% of the project procurement and contracts have been let, has been reviewed. The anticipated cost to commissioning is 14% higher than the 2011 estimate, including a contingency amount of US$23 million. A total of US$52 million has been expended to date, and construction is under way in all seven project areas. Forward estimates maintain the project completion date in the September quarter of 2013.

Previous residents, farmers and informal users of the mine area have all been relocated to a host community, and afforded compensation in accordance with a government approved process. The easements for roads, pipelines, power lines and all off-path infrastructure have all been granted, and are either cleared or about to be cleared. The legal status and regulatory requirements for the project are all in order, with a couple of minor exceptions that are in train.

In the normal course of sensibly managed construction and operational stages, the Kwale project is expected to be a very significant success.
15.0 Declarations by TZ Minerals International Pty Ltd

15.1 Independence

TZMI is an independent firm of consultants providing a diverse range of consulting and publication services to the global mineral sands industry. TZMI has offices in Australia, the US, Europe, Africa and China. The strength of TZMI’s consulting services stems from extensive practical experience in the mineral sands, titanium dioxide and coatings industries and from a comprehensive database, which has been built over many years.

This report has been prepared independently and in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code). The authors do not hold any interest in Base Resources Limited, its associated parties, or in any of the mineral properties which are the subject of this report. Fees for the preparation of this report are being charged at TZMI’s standard consulting rates, while any expenses incurred during the course of this assignment are being reimbursed at cost. Payment of fees and expenses is in no way contingent upon the conclusions drawn in this report.

15.2 Qualifications

The principal personnel responsible for the preparation and review of this report are Mr Steve Gilman and Mr Geoffrey Richards.

Mr Steve Gilman is a Senior Partner and Director of TZMI and is a metallurgist with 37 years experience (predominantly in the mineral sands industry) in Australia, the US and Africa. Steve is a Chartered Professional and Fellow of the Australasian Institute of Mining and Metallurgy (AusIMM). He is also a Professional Member of the Society for Mining, Metallurgy, and Exploration, Inc. (SME). Mr Gilman has the relevant qualifications, experience, competence and independence to be considered as a ‘Competent Person’ under the JORC Code.

Mr Geoffrey Richards is a geologist and world expert in mineral sands deposits covering exploration, development and mining. Geoffrey has over 25 years global experience with major Australian/International producers and has been responsible for reviewing the geology and resource assessment of the Kwale Project. Mr Richards is a member of the Australian Institute of Geoscientists (AIG).
Glossary

aeolian: pertaining to, or caused by, wind

alumina: aluminium oxide (Al₂O₃)

backfill: replacement material, typically sand tailings, to re-fill the mining void

beneficiation: refers to the transformation of a mineral to a higher value product

chloride pigment: one of the two principal commercial chemical processes converting TiO₂ feedstock (ilmenite, rutile, slag etc) into TiO₂ pigment

sulfate feedstock: acid-soluble Ti mineral or slag

classifier: process equipment making particle size separation, usually employing water as the separation medium

dozer trap: bulk mining technique using large bulldozers and a buried feeder arrangement

electrostatic separator: process equipment employing high DC voltage electrical fields to separate mineral particles having differing surface electrical conductivity (ie conducting versus insulating minerals)

elliptical weighting: geostatistical method used in assigning values to resource model cells.

evaporation pond: silt or clay slurry embankment employing solar drying

fault frequency: electrical supply quality parameter

feedstocks: raw material required for an industrial process. In the mineral sands context, feedstock refers to titanium minerals such as ilmenite, rutile, synthetic rutile and titanium slag which are used as raw material for pigment manufacture

flowsheet: graphical depiction of metallurgical process scheme

geometallurgical: geological artifact impacting on process performance

geostatistical analysis: use of statistics in determining resource attributes, as opposed to geological observation

geotechnical: earth material physical properties

gravity concentrator: equipment or process plant, usually employing water as a carrying medium, that separates mineral particles based on differing densities

heavy minerals (HM): a term given to minerals that have a specific gravity above 2.9 gm per cc

ilmenite: black or dark brown iron titanium oxide mineral, which is the major source of titanium

Indicated: resource classification having a lower level of certainty than a Measured resource

Inferred: resource classification having a lower level of certainty than an Indicated resource
JORC Code: Joint Ore Reserves Committee (JORC) Code is a Code of practice which sets minimum standards for public reporting in Australia and New Zealand of Exploration Results, Mineral Resources and Ore Reserves. It provides a mandatory system for classification of tonnage/grade estimates according to geological confidence and technical/economic considerations in reports prepared for the purposes of informing investors, potential investors and their advisors

Kelsey jigs: centrifugally enhanced gravity concentrator using jigging action

kyanite: alumino-silicate mineral (Al₂SiO₅)

leucoxene: ilmenite alteration product, having iron content reduced by natural weathering processes, and resulting in higher TiO₂ content (typically 70–90%)

magnetic separator: process equipment using strong magnetic field to separate mineral particles having differing magnetic susceptibilities (how attracted to a magnet they are)

Measured Resource: formal resource classification having the highest level of certainty

metallurgical: pertaining to mineral or metal processing

mineral sands industry: also known as beach sand or heavy minerals industry. High density resistate minerals tend to accumulate at the ocean shore due to wave action, and form the bulk of global titanium and zirconium mineral resources

mineral assemblage: a term to describe the percentage by weight of individual heavy minerals

mineralogy: listing and proportion of discrete mineral species found in geology or metallurgical process streams

nonconductor: in electrostatic separation, the insulating type particles

opacifier: fine particles (eg milled zircon, TiO₂ pigment) with ‘hiding power’ that result in the substrate taking on the appearance of the opacifier material

ore reserve: economically extractable part of a mineral resource

overburden: barren or low grade material which must be removed to uncover an ore body

pigment: strongly coloured (or bright white) substance used in paints, dyes and coatings to impart selected colour appearance when applied

pilot plant: small scale (typically sub-economic) process plant used to demonstrate a process or product prior to investment in a commercial scale operation

penstock: a sluice or gate or intake structure that controls water flow

Pleistocene: time division in geological history from about 1.8 million to 10,000 years

Pliocene: time division in geological history from about 10 to 2 million years

quartz: common sand component silicon dioxide (SiO₂) mineral

rutile: a yellow, red, brown or black mineral, which is a major source of titanium
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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</thead>
<tbody>
<tr>
<td>screening</td>
<td>simple classification technique using a sieve</td>
</tr>
<tr>
<td>slag</td>
<td>in smelting processes, the lighter liquid floating on (usually) denser metallic material</td>
</tr>
<tr>
<td>slimes</td>
<td>industry term for very fine particles, silt or clay</td>
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<tr>
<td>slimes slurry</td>
<td>water and slimes particles mixture. Slimes tends to follow the water flow</td>
</tr>
<tr>
<td>slurry</td>
<td>mixture of liquid (usually water) and solid (sand or slimes) particles</td>
</tr>
<tr>
<td>spiral gravity separators</td>
<td>Usually in banks of many, process equipment for separating heavy minerals from light minerals of sand-sized particles in water slurry medium</td>
</tr>
<tr>
<td>stratified</td>
<td>refers to the layering that occurs in most sedimentary rocks and in those igneous rocks formed at the earth’s surface</td>
</tr>
<tr>
<td>sulfate pigment</td>
<td>one of the two principal commercial chemical processes converting TiO\textsubscript{2} feedstock (ilmenite, rutile, slag etc) into TiO\textsubscript{2} pigment</td>
</tr>
<tr>
<td>sulfate feedstock</td>
<td>acid-soluble Ti mineral or slag</td>
</tr>
<tr>
<td>tailings</td>
<td>waste material (typically barren sand) expelled during concentration processes to recover valuable mineral</td>
</tr>
<tr>
<td>thickener</td>
<td>physical process equipment to concentrate fine particles while simultaneously recovering water for re-use</td>
</tr>
<tr>
<td>TiO\textsubscript{2} units</td>
<td>tonnage of a particular TiO\textsubscript{2} product multiplied by its percentage TiO\textsubscript{2} content</td>
</tr>
<tr>
<td>titanium</td>
<td>high strength to weight ratio, corrosion resistant metallic element, atomic number 22</td>
</tr>
<tr>
<td>titanium slag</td>
<td>manufactured high TiO\textsubscript{2} feedstock, a product of smelting ilmenite</td>
</tr>
<tr>
<td>variogram</td>
<td>geostatistical method to determine directional axis(es) of a resource, and sampling interval to achieve measured status</td>
</tr>
<tr>
<td>water attritioning</td>
<td>sand scrubbing technique using high density slurry to achieve surface cleaning via particle-to-particle rubbing</td>
</tr>
<tr>
<td>welding electrode fluxes</td>
<td>in electric arc welding, protective liquid coating while the weld solidifies is provided by fluxes, either as a coating on stick electrodes, or as a core in wire electrodes. Usually contains some TiO\textsubscript{2} mineral such as leucoxene or rutile</td>
</tr>
<tr>
<td>wet concentrator plant</td>
<td>in mineral sands industry, the process plant rejecting waste (tailings) sand while recovering valuable heavy minerals into a concentrate for further processing</td>
</tr>
<tr>
<td>wet tables</td>
<td>water based gravity concentration process equipment</td>
</tr>
<tr>
<td>zirconium</td>
<td>specialist use corrosion and neutron resistant metallic element, atomic number 40</td>
</tr>
<tr>
<td>zircon, zirconium silicate</td>
<td>a refractory mineral, which is the major source of zirconium</td>
</tr>
</tbody>
</table>
**Bibliography**

Snowden, 1999: *Kwale Variography, December 1999*

Snowden, 1999: *South Dune Study for Tiomin Kenya Limited, December 1999*

Snowden, 2000: *Kwale Variography Update – Central Dune, December 2000*


Tiomin Kenya Limited, 2005: *Kwale Project, Process Design Criteria*


Tiomin Kenya Limited, 2010: *Kwale Mineral Sands Project Overview*


Roche Mining, 2006: *Wet Zircon Circuit Flowsheet Development Testwork, Report no. 06/81374/1, July 2006*

Roche Mining, 2005: *Metallurgical Testwork for Performance Assessment of a Revised WCP Circuit Incorporating High Capacity Spiral Separators, Report no. 05/81280/1, October 2005*

Roche Mining, 2005: *Performance Assessment of a Revised Primary MSP Circuit, Report no. MS.05/81279/1, September 2005*

Roche Mining, 2004: *MPP Flowsheet Validation with the Latest Technology, Report no. MS.04/80933/1, May 2004*

SRK (UK) Ltd, 1999: *Fatal Flaw Analysis Kwale Project, September 1999*

Allied Mineral Laboratory Ltd, 2010: *Lab Analytical Methods, July 2010*