MAHENGE DFS ENHANCED WITH ADDITION OF FOURTH MODULE SIGNFICANTLY IMPROVING PROJECT METRICS WITH FULL EXECUTIVE SUMMARY

HIGHLIGHTS

- **Black Rock's Mahenge Graphite Project Definitive Feasibility Study (DFS) enhanced to include fourth production module in response to customer demand for a more aggressive ramp up**
- **Financial metrics improved with:**
  - **Black Rock's unlevered NPV_{10} attributable value, after tax and after free carried interest increased by 30% from US\$895M to US\$1.16Bn (A\$1.65*Bn)**
  - **Long run C1 Opex US\$397/t (AISC US\$481/t)**
  - **IRR of 44.8%**
  - **Forecast initial capex US\$116**M for Stage 1** (inclusive of a 10% contingency, and is less than 1% increase from DFS)
  - **Stable state EBITDA (after year 5) of US\$306M (A\$426*M)**
- **Development sequence compressed for modules to be commissioned annually after first production, subject to funding**
- **Targeted steady state annual production to increase from 250,000 tonnes to 340,000 tonnes**
- **Success of project funding improved by addition of redundant power option**

* \$AUD/USD 0.70
** Forecast capex has been classified as a Class 3 estimate with accuracy of ±10% as defined by AACE

Tanzanian graphite developer Black Rock Mining Limited (BKT: ASX) ("Black Rock" or "the Company") is pleased to announce it has enhanced the 100% owned Mahenge Graphite Project DFS released on 24 October 2018 to include a fourth production module, and a compressed development schedule, which is now subject to financing and confirmation of the 16% Tanzanian Government free carried interest. The enhanced DFS (eDFS) was completed in response to product demand and feedback from customers and financial markets for a more aggressive production schedule and de-risked commissioning plan.

Commenting on the enhanced DFS, Black Rock's CEO, John de Vries, said

"The enhanced Definitive Feasibility Study brings together a number of competitive advantages associated with Mahenge. Ultimately this is a customer and financial markets driven outcome. Product placement from both the Canadian pilot plant and our recent Chinese pilot plant has demonstrated that Mahenge Graphite concentrate has significant "value is use" advantages, now recognised by our customers. This is evident in Black Rock having established pricing and volume frameworks based on the October DFS, three module business plan, and our customers being prepared to be named against a pricing framework. Something no other developer or producer has achieved. Ultimately, this is an outcome that supports our financing strategy.

A key strength of our business model is scalability. Being able to add capacity incrementally ensures we do not over capitalise the asset with excessive redundant capacity but can respond to changes in market demand. This approach ensures the asset is not developed unless market demand is present.

While not an intended outcome of the exercise, the addition of the fourth module brings our total planned annual capacity to 340,000 t – 350,000 t of concentrate. This will make Mahenge one of the world's largest potential graphite producers. Critically, given our concentrate purity and flake size, we have multiple market segments where demand for higher specification product exceeds available supply. Fundamentally, we are not directly competing with existing producers and trying to place product in highly contested lower specification markets.

What started off as an enhancement study in response to market demand from our customers, ultimately ended up as a conversation with our financiers about a de-risked start-up and commissioning plan. Ongoing engagement with financial markets indicated a strong desire to decouple the project development schedule from the schedule for development of the 220 kV high voltage lateral from Ifakara to Mahenge. The high voltage line development is scheduled to be available for Module 2, which occurs in year two of the compressed schedule. Our base case is that access to hydro power from the national grid gives us the greenest produced graphite possible, and at the lowest cost possible. A decoupled power supply schedule via short-term on-site generation ensures Black Rock controls and manages all elements of the project start-up.

Finally, we have nominated Module 4 as "sprint". Our development strategy is now "crawl, walk, run, sprint"

Mahenge Graphite Project Enhanced DFS

Black Rock completed a DFS on the Mahenge Graphite Project in October 2018 (refer ASX release dated 24 October 2018) and is moving towards securing project financing and progressing into construction and operations with first production targeted in 2020 to 2021. Exact timing of first production will be an outcome of progress on securing finance.

The eDFS was undertaken due to strong customer demand and includes a fourth production module which will produce an additional 85,000 tonnes of graphite concentrate per year, increasing total steady state production by 340,000 tonnes to 350,000 tonnes per year. The development schedule, subject to financing and confirmation of the Tanzanian Government's 16% free carried interest, will now consider four production modules each coming online annually after the first module, rather than every two years in the original DFS.

The milling schedule in the eDFS was developed using existing pit shells for Ulanzi and Cascades, with no changes in pit inventory or Ore Reserves as an outcome of the eDFS.

The additional mill feed in the eDFS will be sourced by developing a third pit at the Epanko deposit. Epanko ore is exclusively scheduled into Module 4 with production commencing at year seven in the compressed schedule. Epanko contributes 9.9 million tonnes (Mt) at 6.7% TGC (Total Graphitic Carbon by Loss on Ignition) for an additional 660,000 t of concentrate. Epanko feed included 3.4 Mt at 8.0% TGC as Indicated Resource, with the remaining material being Inferred. The potential inclusion of Epanko in the Ore Reserve was considered to be not material, and no changes to the Ore Reserve have been considered as a consequence of the inclusion of Epanko in the enhanced DFS.

The addition of a fourth production module has no material change to the forecast capex for the first three phases, however will lift the overall revenues with a revised project NPV_{10} of US$1.16Bn (A$1.65Bn) (an increase of 30% over the original three module DFS). Total capex for all four modules rises from US$269M to US$337M. The US$222M required to fund modules two, three and four is funded from internal cash flow. The next steps include continued progression of financing discussions and commencing detailed engineering for the commencement of construction and confirmation of the 16% Tanzanian government free carried interest.

Product from Module 4 remains uncommitted, creating capacity for industry cornerstone participation in the project development. Black Rock Mining's immediate focus will be the continued progression on financing discussions for development of Module 1.

Provision has been made for a 10 MW duel fuel (HFO/diesel) power station for start-up of Module 1. Beyond Module 1, the station will be subject to a decision to be used as back-up/standby from year two when grid connection becomes available. Decoupling the overall project from any schedule delays associated with the grid connection reduces schedule risk.

Finance

Black Rock Mining has appointed Ironstone Capital as advisors to accelerate progress on financing the Mahenge Graphite Project. Ironstone have consolidated existing and established new financing pathways with relevant banks and other potential sources of debt and industry finance.

The Ironstone appointment is in direct response to the number of inbound financing proposals and structures presented to Black Rock, in addition to options instigated by the Black Rock management team. A number of options are being pursued including project level equity, conventional African-domiciled debt financing, convertible/hybrid structures and offtake-related financing proposals. Our focus remains on identifying the least dilutive option for our shareholders.

Ironstone bring extensive experience in structured mining finance internationally and have significant experience in the China market which is highly relevant to Black Rock's Mahenge Graphite Project. Assessment of opportunities is ongoing.

Table 1 | Summary of the Enhanced DFS Financial Metrics Compared to Initial DFS

MAHENGE DEFINITIVE FEASIBILITY STUDY FINANCIAL METRICS		
Metric	**Oct 2018 DFS**	**Jul 2019 Enhanced DFS**
Post-tax, unlevered NPV_{10}	US$895m	US$1.16bn
Post-tax, unlevered IRR	42.80%	44.80%
Forecast Capex for Module 1*** (85,000 tonnes per year; includes 10% contingency)	US$115M (excludes HV Power Connection Provision)	US$116M (excludes HV Power Connection Provision)
Forecast Capex for Module 2 ***# (85,000 tonnes per year; includes 10% contingency)	US$69.5M	US$69.5M
Forecast Capex for Module 3***# (85,000 tonnes per year; includes 10% contingency)	US$84.2M	US$85.3M
Forecast Capex for Module 4 ***# (85,000 tonnes per year; includes 10% contingency)	n/a	US$67.1M
Forecast Total Project Capex	US$268.7	US$337.4
Life of Mine C1 Costs, FOB Dar	US$401/t	US$397/t
Life of Mine All in Sustaining Costs, FOB Dar*	US$473/t	US$494/t
Concentrate basket FOB Dar es Salaam**	US$1,301/t	US$1,301/t
Life of Mine	32 years	26 years
Average steady state production rate	250,000 tonnes per year	340,000 tonnes per year
Total Life of Mine Concentrate production	6.6 Mt	7.4 Mt
Ore reserves	70 Mt @ 8.5% TGC****	70 Mt @ 8.5% TGC****
Reserve life	23 years	16 years
Resources	212 Mt @ 7.8% TGC****	212 Mt @ 7.8% TGC****

* AISC includes all post start up capex including module 2&3 expansion
** Basket is LOM average price for 97.5% LOI sized concentrate packed in 1 tonne bulka bags
*** Forecast capex has been classified as a Class 3 estimate with accuracy of ±10% as defined by AACE
**** Total Graphitic Carbon by Loss on Ignition
# Forecast to be funded from internal cash flow

Table 2 | Offtake Pricing Framework *

	Regular	**Premium**	**Ultra**
Nominal Graphite Grade (TGC)	94.5% - 95.5%	97.5% - 98.25%	>99%
CIF China (ex-duty) (US$/tonne)	**US$1,117**	**US$1,490**	**US$2,161**

Reference exchange rate	RMB/USD 6.71
Rise & fall pricing reference USD$/tonne	95% TGC - #100 mesh Benchmark Minerals US$950/t as at Nov 2018

* pricing as released in ASX announcement 08 May 2019

Table 3 | Committed Offtake Volumes by Customer *

	Year 1	Year 2	Year 3
Heilongjiang Bohao	20,000	50,000	90,000
Qingdao Fujin[(1)]	10,000	15,000	15,000
Taihe Soar	20,000	55,000	100,000
Qingdao Yujinxi	20,000	20,000	20,000
Yantai Jinyuan	15,000	30,000	30,000
TOTAL	**85,000**	**170,000**	**255,000**

(1) pricing to be finalised   ** as per ASX announcement 08 May 2019*

Ends

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About Black Rock Mining

Black Rock Mining Limited is an Australian based company listed on the Australian Securities Exchange (ASX:BKT). The Company has a 100% interest in the Mahenge Graphite Project (the Project or MGP) located in Tanzania. The Project has a JORC compliant Mineral Resource Estimate of 212 Mt at 7.8% TGC (refer to ASX Announcement released on 24 October 2018). It also has Ore Reserves of 70 Mt at 8.5% TGC. The Ore Reserve supports a mine life of up to 350,000 tonnes of graphite per year for a reserve life of 16 years. Since the release of the Mineral Resource Estimate, the Company confirms that it is not aware of any new information or data that materially affects the mineral resources estimate.

On 24 October 2018, the Company released a Definitive Feasibility Study (DFS) for the Project, which was based on strong customer demand This was enhanced in July 2019, and demonstrates exceptional financial metrics including:

- *Low Capex*: Lowest peak capital expenditure of US$116M for phase one*;
- *High Margin*: AISC margin of 63.1%;
- *Low Technical Risk*: Substantial pilot plant operations run of 110 tonnes
- *Superior Economics*: IRR of 44.8%% with NPV_{10} of US$1.16Bn (A$1.65Bn**).

In February 2019, the Company announced receipt of its mining licence for the Project.

In May 2019, the Company announced it had substantially allocated planned production with up to 255,000 tonnes per year of graphite committed to sale by year three of production, through Pricing Framework Agreements. The company is progressing these agreements into binding offtake commitments.

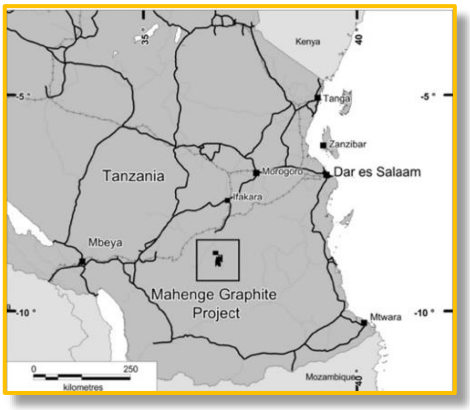
Following release of the DFS on 24 October 2018, the Company confirms that it is not aware of any new data or information that materially affects the information included in the eDFS and in the case of estimates of mineral resources or ore reserves, that all material assumptions and technical parameters underpinning the estimates in the relevant market announcement continue to apply and have not materially changed.

The estimated ore reserves and mineral resources underpinning the production target has been prepared by competent persons in accordance with the requirements of Appendix 5A (JORC Code).

The Company is currently progressing financing discussions and detailed engineering with a view to commencing construction of the mine.

JORC Compliant Mineral Resource and Ore Reserve Estimate***

Ore Reserves	Tonnes (Mt)	Grade (% TGC)	Contained Graphite (Mt)
- Proven	0	0.0	0.0
- Probable	69.6	8.5	6.0
Total Ore Reserves	**69.6**	**8.5**	**6.0**
Mineral Resources			
- Measured	25.5	8.6	2.2
- Indicated	88.1	7.9	6.9
Total M&I	**113.6**	**8.1**	**9.1**
- Inferred	98.3	7.6	7.4
Total M, I&I	**211.9**	**7.8**	**16.6**



For further information on Black Rock Mining Ltd, please visit www.blackrockmining.com.au

* Forecast capex has been classified as a Class 3 estimate with accuracy of ±10% as defined by AACE
** $AUD/USD 0.70
***Resource and Ore Reserve Estimates as released to ASX on 8 August 2017 *Optimised PFS*

BLACK ROCK MINING LIMITED

MAHENGE GRAPHITE PROJECT

ENHANCED FEASIBILITY STUDY

Addition of Stage 4

Document Number: 7075-RP-G-100
Revision 4
July 2019

Disclaimer

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1 EXECUTIVE SUMMARY

1.1 Introduction

Black Rock Mining Limited (Black Rock) is an ASX-listed graphite exploration and development company (ASX:BKT). Black Rock is focused on developing the 100%-owned Mahenge Graphite Project (MGP), situated in the East African country of Tanzania.

The project site is located 450 kilometres (km) by road from Tanzania's largest port, Dar es Salaam and is contained within 520 square kilometres (km^2) of exploration tenements in the Ulanga district. The Mahenge deposit is the fourth largest (JORC compliant) contained graphite resource in the world.

The project development area will be around the Ulanzi, Cascade and Epanko deposits, which provide a nominal mine life of more than 26 years. Black Rock has recently reduced the project footprint by adopting processes to dewater mill residue, thereby avoiding the need for large areas of tailings facilities.

Black Rock completed a definitive feasibility study (DFS) on the Mahenge Project in October 2018 and is moving towards securing project financing and progressing into construction and operations with first production targeted in 2020.

This feasibility study report includes the addition of a fourth processing facility (Stage 4), mining of the Epanko North (Epanko) ore body in the mine plan and an accelerated implementation schedule with each of the four stages coming online in successive years over the first four years of operation. Sections of the report that are unchanged from the DFS are noted as such. Refer to the DFS report for these sections.

The financial analysis indicates a net present value (NPV) @10% (post tax, ungeared after 16% free carry) of US$1,161M for the base case production profile and price assumptions, which provide for an internal rate of return (IRR) of 44.8% (post tax, ungeared after 16% free carry). A maximum cash draw of US$199.1M is incurred 3.5 years after the commencement of construction.

The financial performance of the project is summarised in Figure 1-24.

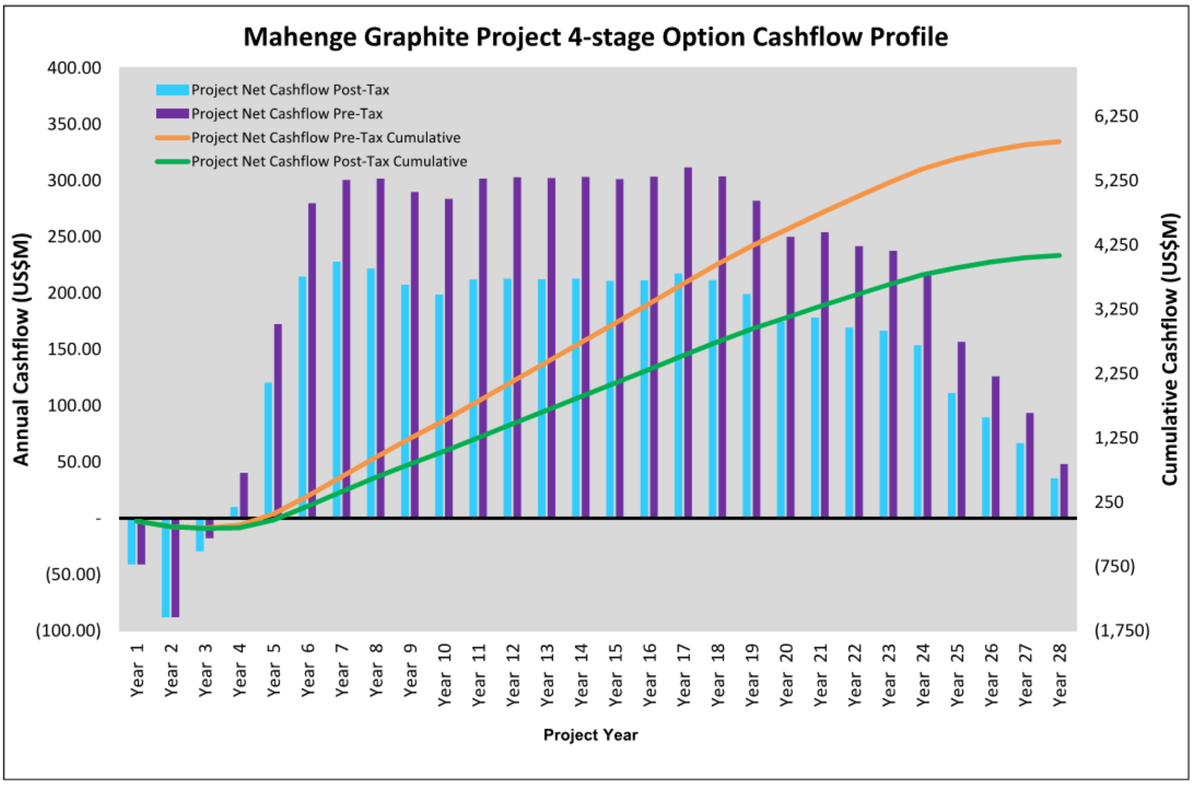

Figure 1-1 LOM Cash Flow Profile (US$ real)

The financial analysis indicates the project is financially viable and results in strong financial returns. With a short payback period of 3.6 years from first ore processed, the project has relatively low exposure to the key risk factor of long term commodity prices, mitigating exposure to the financial risk associated with the project's capital funding requirements. The strong financial returns under the base case assumptions provide a positive risk versus reward assessment.

1.2 Project Background

1.2.1 Project Location

The Mahenge Project is located in south-eastern Tanzania, approximately 250 km north of the border with Mozambique, 250 km west of the coastal port city of Mtwara on the Indian Ocean and 300 km southwest of Tanzania's largest city, Dar es Salaam as shown in Figure 1-2.

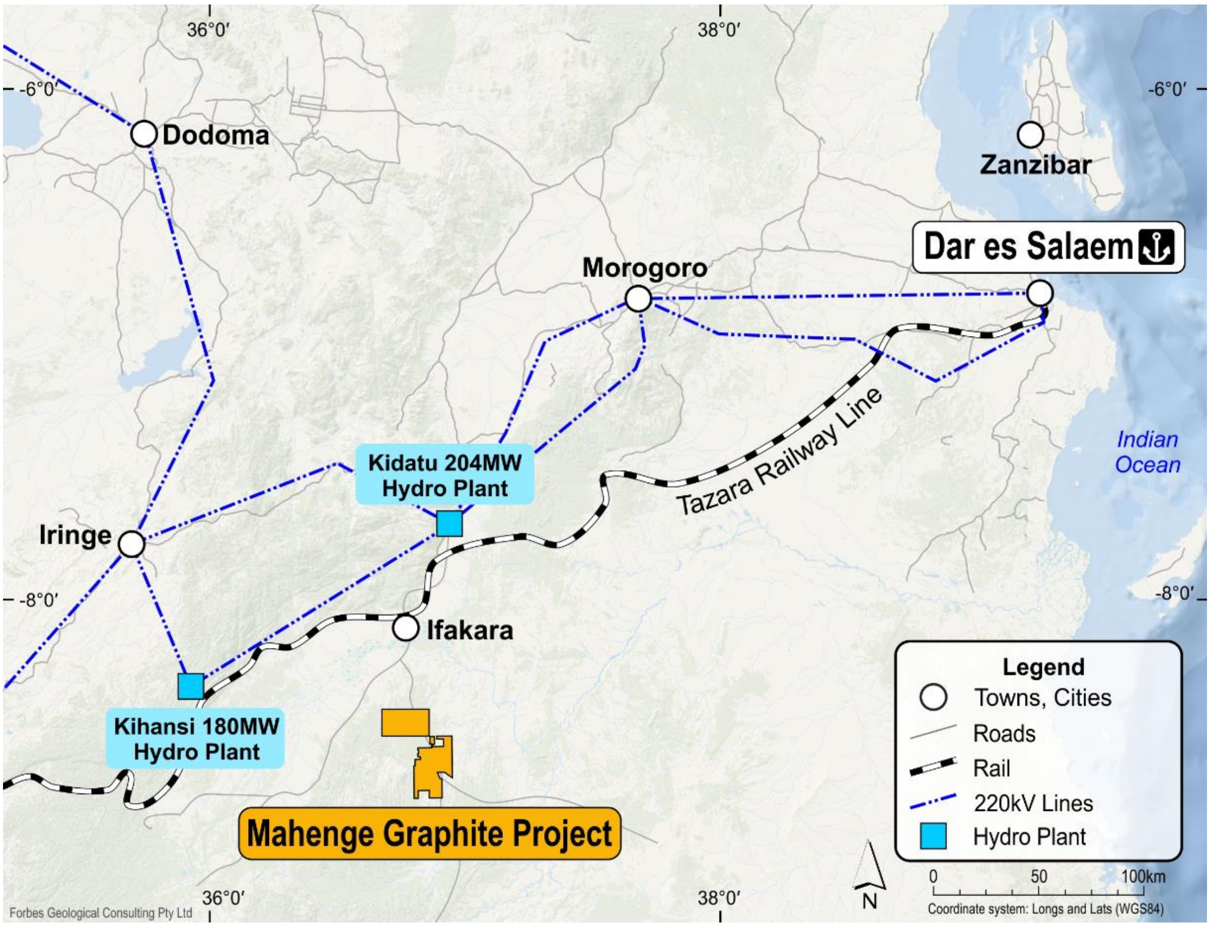

Figure 1-2 Location of the Mahenge Project

The natural ground level in the project area generally slopes to the north with some localised steeper valley areas, up to 75 metres (m) deep. Watercourses cross the site towards the north. The ore bodies are located toward the top of the valley sides.

The project site is an open area between hilly terrain. The process plant is located approximately 600 m north of the Ulanzi open pit at an elevation of 487 metres above sea level (masl).

1.2.2 Site Access

The MGP is accessed from driving west from Dar es Salaam to Morogoro and then southwest and south passing through the regional township of Ifakara and then onto Mahenge (Figure 1-2). Access to the property is predominantly by sealed and local gravel roads.

From Dar es Salaam, the bitumen section on the A7 to Mikumi (via Morogoro) is well maintained. The roads from Mikumi to Ifakara consist of tarmac for the first third of the sector followed by gravel road for the remainder. The gravel road from Ifakara to site features many bridges and rough road sections including a hilly section in the last 7 km to site.

The road passes through several villages and is used by pedestrians, bicycles, cars and trucks for commuting and commercial purposes.

The project site is approximately 70 km by road from the nearest train line, the Tanzania Zambia Railway Authority (TAZARA) line, located at Ifakara, that runs to Dar es Salaam, Tanzania's principal port.

There is no air strip near the project site and one is currently not planned to be constructed for the project. Charter flights can be arranged between Dar es Salaam and the Mbunga or Ifakara air strips.

All travel to/from the project site will be by a combined goods and passenger train service between Dar es Salaam and Ifakara. A bus will transport personnel between Ifakara and the project site.

1.2.3 Political Overlay

Since the election of President Magufuli in 2015 Tanzania's investment landscape has been altered across all key industries with a sharp focus on mining. Although Tanzania retains many of the hallmarks of stability that mining companies look for when considering long-term, capital-intensive investments, regulatory tightness in the short to mid-term has increased, as has the onus on mining companies to constructively engage with critical stakeholders. At a high level:

- Tanzania's transition to independence continues to shape the psyche of politics and the role of the private sector in contributing to the broader Tanzanian economy. The influence of socialism continues to impact government decision making and engagement between the public and private sectors.
- Tanzania's democratic dominant party state that has seen Chama Cha Mapinduzi (CCM) hold power since 1977, coupled with the lack of violent overthrow or large-scale election-related violence, has allowed investors to avoid some of the cyclical risks associated with elections in many sub-Saharan African countries.
- Tanzania's internal stability, strategic location and a degree of sustained domestic security experienced by few of its neighbours, have seen it long-considered an ideal place for investment in sub-Saharan Africa.
- Tanzania's economic development and aim of attaining middle-income status as directed by the country's Second Five Year Development Plan 2016/17 – 2020/21, outlines the county's aim to increase the contribution of the mining sector from its current level of 4% to 10% of GDP by 2025. Overall the country's current growth rates are estimated between 6% to 7%.
- Since the election of President Magufuli, Tanzania's ranking on key anti-corruption metrics has improved. The ease of doing business indicators however have fallen slightly – confirming the success of President Magufuli's anti-corruption campaign, but also reinforcing concerns voiced by the private sector around significant changes in personnel, restructuring of multiple ministries and agencies and a less friendly approach to private sector engagement.
- President Magufuli's time in office has had a significant impact on the country. He has been criticised for his crackdown on opposition groups and media freedoms, aggressive

tax policies and insufficient levels of engagement with the private sector, including the country's largest investors. However, the country's anti-corruption drive has been well received by both the private sector and the broader public and the last 6 to 12 months appears to have seen an increased engagement between the highest levels of government and the private sector.

- President Magufuli has led a significant overhaul of the country's mining sector – changing the sector's legislative framework and governance structures. The changes made, some of them retroactively, led to a loss of confidence across the sector with many companies choosing to divest or delay projects while they tried to understand and navigate the new situation. For those that stayed it has become evident that although Tanzania remains open for business, companies need to ensure that their engagement is positive, inclusive, involves meaningful local content and seeks to empower Tanzanians and assist in the country's growth and industrialisation agenda thereby aligning with the country's development plans while paying respect to the country's political and ideological roots.

1.2.4 Environmental Data

The MGP is located on the hilly terrains of the Mahenge District, forming part of isolated mountain blocks of the Eastern Arc Mountains. The climate is warm and temperate with monthly temperatures ranging from a minimum of 13°C to a maximum of 28°C. The average annual relative humidity is 70%.

The Mahenge District generally experiences a bi-modal rainfall pattern with long rains between March and April and short rains between November and January. The typical dry season extends from May to October. In winter (June to September) there is less rainfall than in the summer (December to April).

The annual rainfall is approximately 1,870 millimetres (mm) and evaporation is 1,170 mm so the overall water balance is positive and therefore a shortage of water is not expected. Figure 1-3 shows the monthly average rainfall and evaporation for the project.

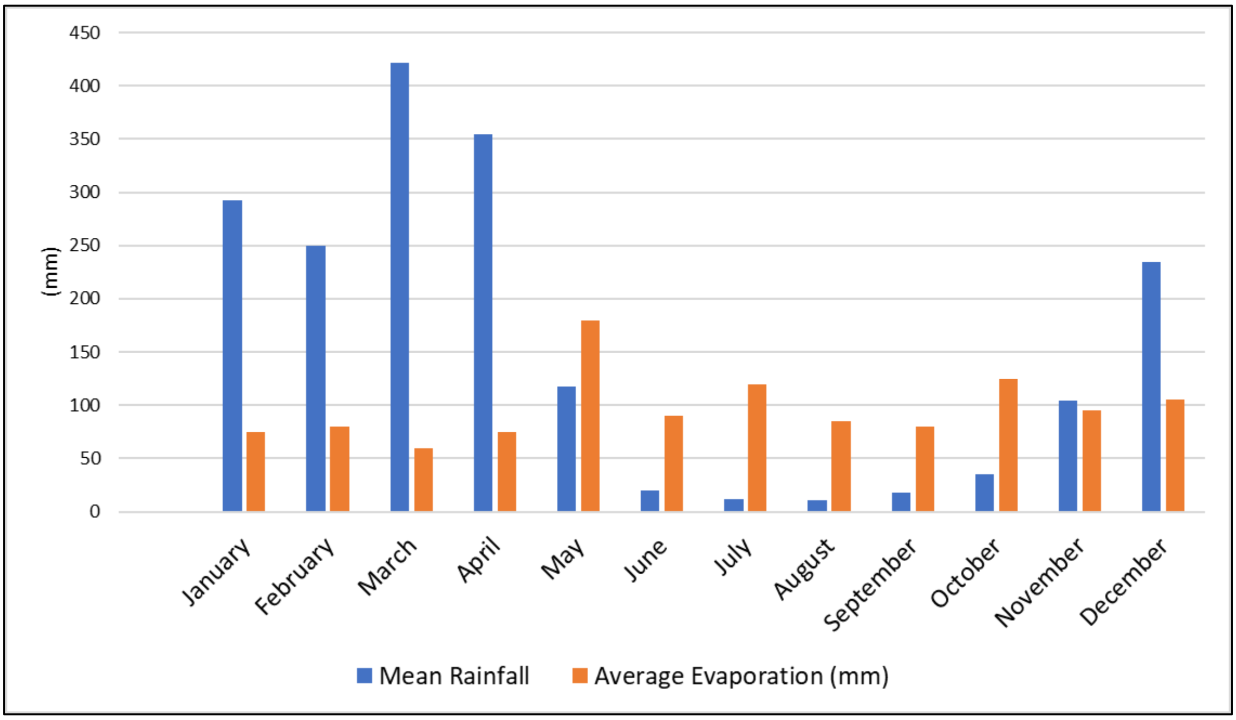

Figure 1-3 Average Monthly Rainfall and Evaporation

The site has an overall average net positive water positive balance of 700 millimetres per year (mm/y). The highly seasonal nature of the wet season results in generation of decant water and a requirement during the dry season to access stored water.

The topography of the Mahenge area is mountainous, with steeply-dipping hills and scarps. Vegetation in the region is diverse and includes sub-montane and montane forest types, although the project area has been heavily degraded by the local people and is now predominantly clear of any forest.

The project is in a low earthquake hazard area.

1.2.5 Site Topography and Drainage

The MGP is located on the edge the Mahenge Mountains, which rise to 1500 m above sea level. The project area is characterised by north-south orientated steep hills and valleys. It is well drained with rapid to moderate water infiltration rates and rapid run-off on mountain slopes. The mountains have linear slope gradients ranging between 70% to 85% while the U-shaped valleys are nearly flat with average slope gradient of about 18%.

The Mbaha River is a local watercourse that crosses the proposed Ulanzi mining pit and potential mill residue dry stack area. It joins the Luri River, which is one of the only permanent rivers in the region. Other local rivers include the Shilangazi (Epanko), Iroko and Mdindo Rivers.

The locations of the principal local rivers within the proposed mining area are shown in Figure 1-4.

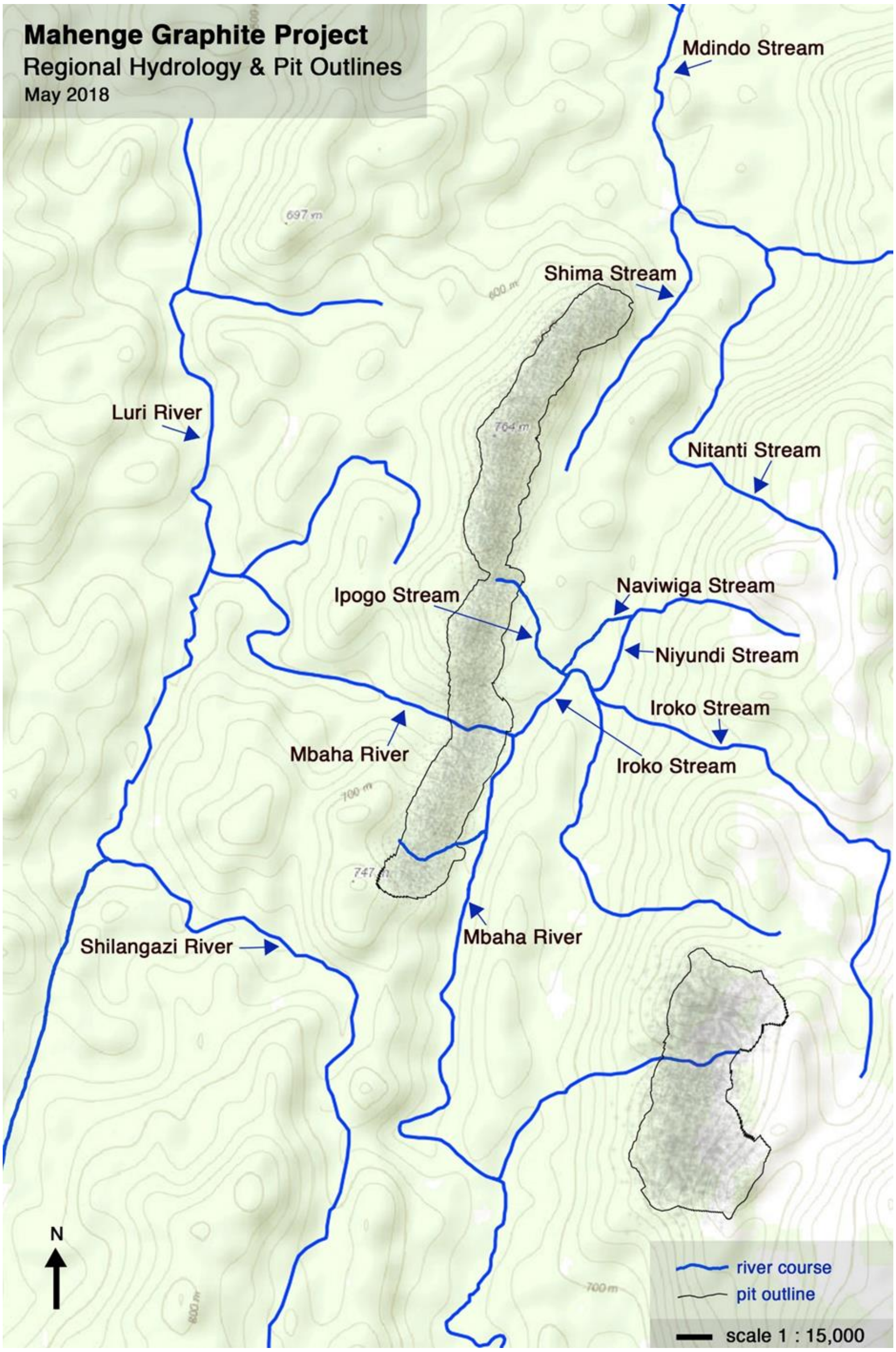

Figure 1-4 Regional Hydrology and Pit Outlines

1.2.6 Existing Infrastructure

The closest port is Dar es Salaam. The project area is situated in the Morogoro district and is approximately 60 km to the south of the town of Ifakara which is close to the railway line running to Dar es Salaam. There is also an airstrip at Ifakara. Grid power is currently available from Ifakara from the Kidatu Hydroelectric Scheme. Basic lodge accommodation is readily available, and for the duration of the work programs described here the site staff stayed at the 'Mbega Hilltop Lodge'.

Communication with GSM cellular network is generally good with the Vodacom and Tigo networks providing good coverage in the Mahenge area.

1.3 Ownership and Leases

The MGP comprises four prospecting licences PL13752/2019 (under application, formerly 7802/2012), PL10111/2014, PL10426/2014 and PL10427/2014 and two mining licences ML611/2019 and ML612/2019, which surround the town of Mahenge. The Mineral Resource estimate lies entirely within PL13752/2019 (Figure 1-5, Figure 1-6 and Table 1-1).

The licences are 100% owned by Black Rock through its Tanzanian subsidiary Mahenge Resources Limited. Black Rock acquired the licences in 2014 and all four prospecting licences were granted for Graphite Industrial Minerals under section 32 of the Tanzanian Mining Act 2010 by the United Republic of Tanzania Ministry of Energy and Minerals.

A prospecting license allows the company to explore for graphite and other nominated minerals for an initial period of 4 years and then 2 successive renewal periods for an additional 5 years. In total the license can be held for 9 years. A 35 km^2 Special Mining Lease (greater than US$100M capex project) or 10 km^2 Mining Lease can be applied for a period of 10 years upon presentation of an accepted suitable feasibility study, environmental impact study and employment plan. PL10111 has been successfully renewed.

During the first half of 2019, Black Rock was granted with mining licences ML611/2019 and ML612/2019 covering immediate areas targeted for near term development. The former PL7802/2012 will be replaced with PL13752/2019, the latter is currently in process.

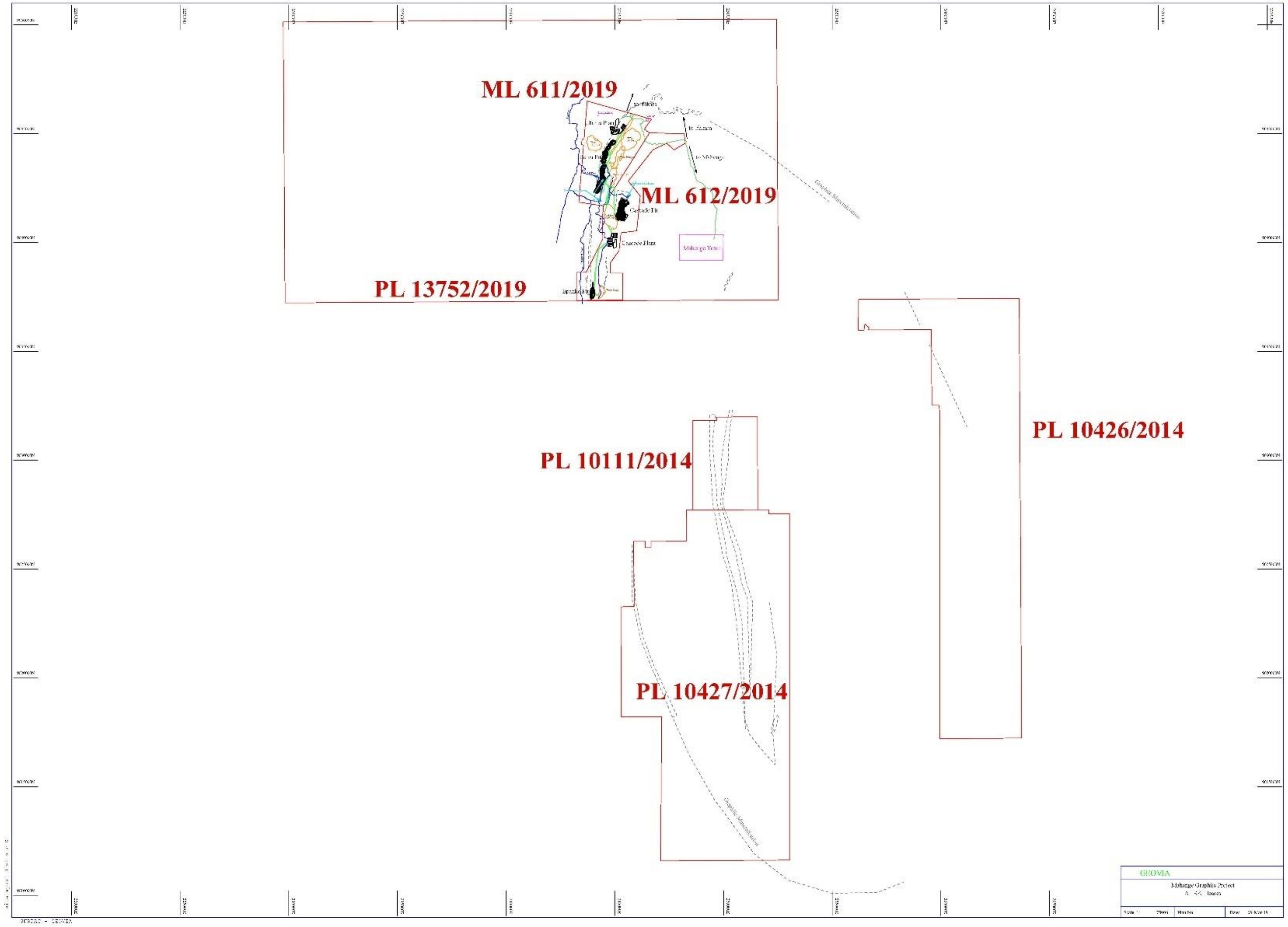

Figure 1-5 Tenements for Key Exploration Targets on the Mahenge Property

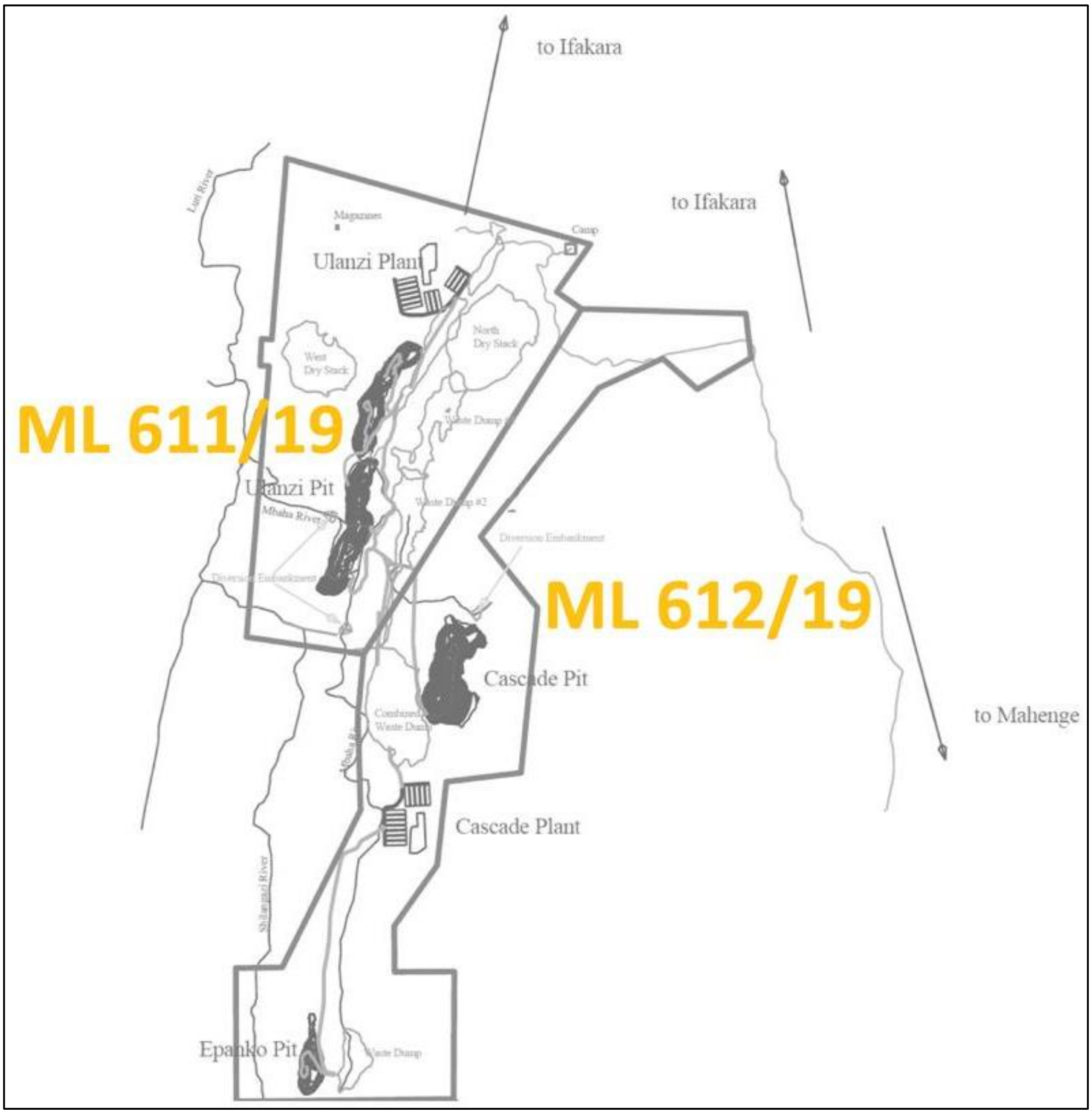

Figure 1-6 Mining Licenses Granted to Black Rock

Table 1-1 Summary of Licence Tenure

Licence Type	Licence Number	Area (km^2)	Date Granted	Expiry Date	Black Rock Ownership (%)	Comments
PL	13752/2019	118.37	Awaiting	Awaiting	100%	Under Application
PL	10111/2014	12.55	13/08/2014	12/08/2021	100%	First Renewal
PL	10426/2014	77.46	02/12/2014	01/12/2021	100%	First Renewal
PL	10427/2014	111.6	02/12/2014	01/12/2021	100%	First Renewal
ML	611/2019	9.94	25/02/2019	24/02/2029	100%	Initial Period
ML	612/2019	9.79	25/02/2019	24/02/2029	100%	Initial Period
Total		**339.71**				

1.4 Geology and Resources

In June 2017, Black Rock requested that Trepanier Pty Ltd update the Mineral Resources estimate for the Cascade Graphite Deposit, which together with the Ulanzi Graphite Deposit and the Epanko North Graphite Deposit form the MGP.

The MGP is located within the rocks of the Proterozoic Mozambique Orogenic Belt that extends throughout eastern Africa. It consists of high-grade mid-crustal rocks with a Neoproterozoic metamorphic overprint. The Mozambique Belt is divided into the Western Granulite and the Eastern Granulite, the latter of which hosts the MGP as shown in Figure 1-7. The two granulites are separated by flat-lying thrust zones and younger sedimentary basins of the Karoo.

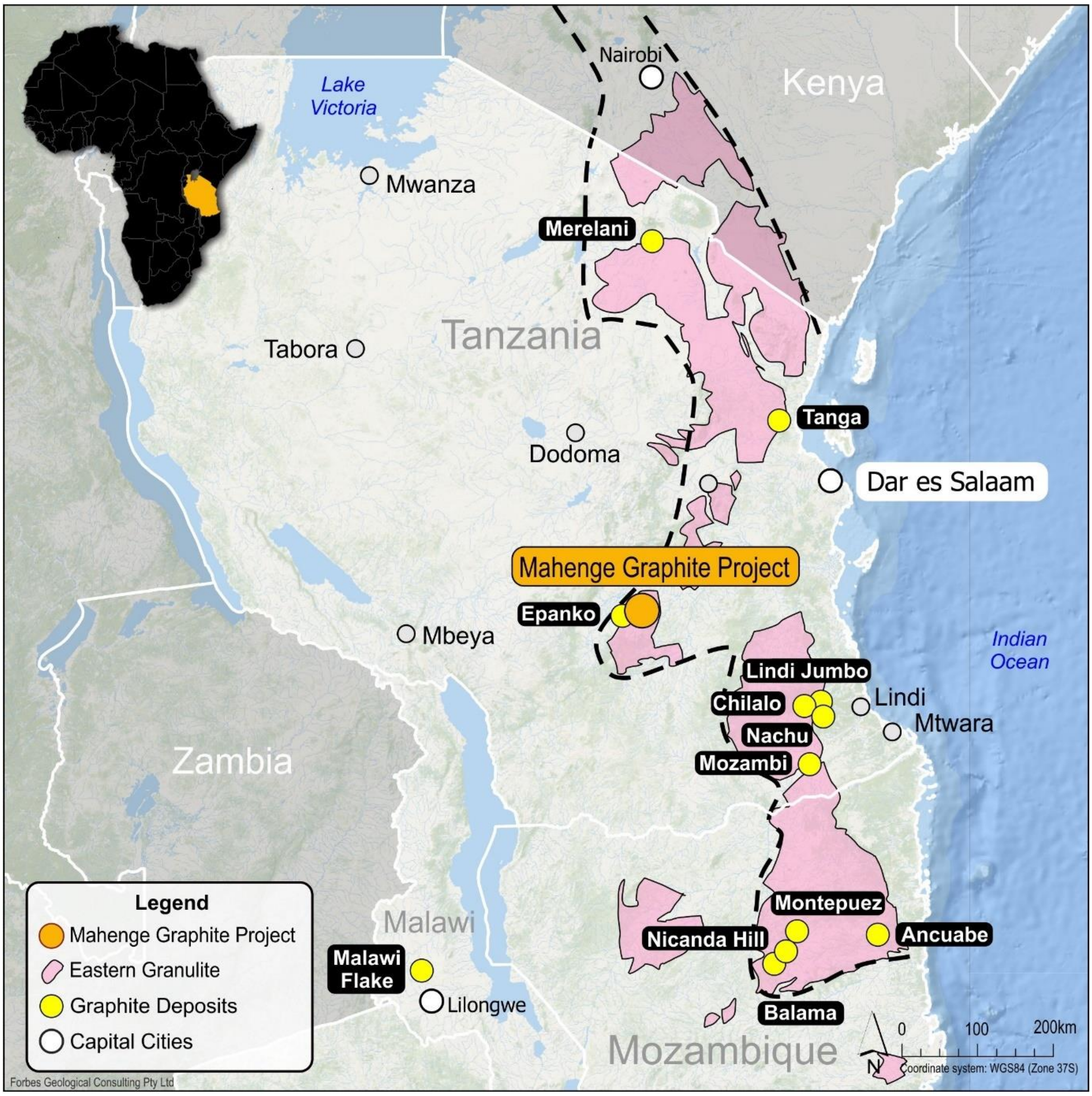

Figure 1-7 Geological Location of the Mahenge Graphite Project

The belt has undergone granulite phase metamorphism that has been subsequently retrograded to upper amphibolite facies. Structurally, the Mahenge region has undergone intense deformation forming a tight poly-phase sequence of marble, mafic and felsic gneisses and graphitic schists as part of the kilometre-scale Mahenge Synform. The Mineral Resources are located on the western flank of the synform where the bedding and foliation dip between 60° and 80° towards the east. The units typically strike to the north and rotate to the northeast as they wrap around the fold nose.

The geological interpretation used in the Mineral Resource estimate was based on mapping of surface outcrop, multiple pits and trenches in conjunction with two phases of reverse circulation (RC) and diamond (DD) drilling. The 3D geological wireframes were created using well-defined foot-wall and hanging-wall boundaries based primarily on changes from graphite-dominated gneiss to mica or garnet gneissic units, which as expected also reflected a decrease in the graphite grade. The wireframes were extrapolated along strike to half-section spacing.

The latest resource model is based on information from 175 RC drill-holes for 15,166.7 m and 34 diamond drill-holes for 3,911.0 m (includes diamond drilled “tails” on existing RC drill-holes), all drilled by Black Rock. Black Rock has used 100 m by 100 m, 100 m by 50 m and 50 m by 50 m grid drill spacing, which has been sufficient to confirm geological and grade continuity. The drilling has been oriented perpendicular to the mineralisation or as close to perpendicular as possible subject to drill access.

Grade envelopes have been wireframed to an approximate 4% to 5% total graphitic carbon (TGC) cut-off, allowing for continuity of the zone. Based on visual and statistical analysis of the drilling results and geological logging of the graphite rich zones, this cut-off tends to follow a natural geological change and coincides with the contact between the graphite rich schists and the other host rocks (i.e. biotite schists and gneisses, garnet gneisses and occasional dolomites).

Black Rock completed specific gravity test work on 1,078 drill core samples across the Epanko, Ulanzi and Cascade deposits using hydrostatic weighing (uncoated). Of these, 587 are from within the modelled mineralised domains. Statistical analysis of the samples and comparison against depth and TGC grade identified a subjective relationship between bulk density (BD) and TGC grade. As such, the BD used for fresh material was the average for the deposits (90% confidence interval) at 2.73 t/m^3 and 2.74 t/m^3 at Cascade (with a standard deviation of 0.05).

Directional variograms were modelled by domain using traditional variograms. Nugget values for TGC are low to moderate (around 15% to 30%) and structure ranges up to 270 m. The four Ulanzi domains were top-cut between 16.0% and 17.6% TGC prior to variogram generation, however, no top-cuts were required at Cascade. Grade estimation was completed using ordinary kriging (OK). The OK estimates were constrained within the discrete wireframe domains for each deposit and generated with multiple estimation passes completed with expanded sample searches.

The Mineral Resource has been classified based on confidence in the geological model, continuity of mineralised zones, drilling density, confidence in the underlying database and the available bulk density information. The Mahenge Mineral Resources have been classified as Measured, Indicated and Inferred according to JORC (2012) and are shown in Table 1-2.

Table 1-2 Global Mineral Resource Estimate for the Mahenge Graphite Project

Prospect	Category	Tonnes (Mt)	Grade (% TGC)	Contained Graphite (Mt)
Ulanzi	Measured	13.3	8.9	1.2
	Indicated	49.7	8.2	4.1
	Inferred	50.2	8.1	4.1
	Sub-total	**113.3**	**8.2**	**9.3**
Cascade	Measured	12.1	8.3	1.0
	Indicated	20.8	8.3	1.7
	Inferred	27.3	7.9	2.2
	Sub-total	**60.2**	**8.1**	**4.9**
Epanko	Measured	-	-	-
	Indicated	17.6	6.4	1.1
	Inferred	20.8	5.9	1.2
	Sub-total	**38.4**	**6.1**	**2.3**
Combined	Measured	25.5	8.6	2.2
	Indicated	88.1	7.9	6.9
	Inferred	98.3	7.6	7.4
	Total	**211.9**	**7.8**	**16.6**

Note: Appropriate rounding applied

Since reporting of the above Mineral Resource in 2017, the following geology and resource associated work programs have been completed:

- Diamond core drilling at Ulanzi (31 holes for 1,890 m) to collect material for metallurgical testwork and pilot plant testing.
- Geostatistical study to simulate grade control drill spacings.
- Planning of sterilisation drillholes targeting proposed infrastructure sites at Mahenge.

1.5 Mining

During the DFS, key mining items were addressed, and design was advanced from the PFS which included:

- optimisation of the mining fleet
- resolution of the mining operating approach (owner mining vs contracting)
- simplification of the haul road network
- mining below natural streams
- ore category simplification

- ore handling controls
- ore stockpile management
- dry mill residue and waste rock management
- responding to overall site layout changes and revised mining schedule
- material sequencing to meet key requirements.

The Mineral Resource, pit inventory, pit design and staging, staged milling development and throughputs used in the DFS have remain unchanged since the updated PFS. For the DFS, the mining schedule was updated to reflect the improved haulage networks, changes in the site layout and revised mining equipment adopted for the study. The inclusion of the Epanko North (Epanko) deposit was included in this enhanced feasibility study.

The 95.0 million tonnes (Mt) of Mineral Resource in the mining schedule consists of 69.6 Mt of Ore Reserves and 25.4 Mt of Inferred Resource representing 73% and 27% of mill feed respectively. The material distribution by resource classification of ore fed to the mill at the process plant over the life of mine (LOM) is presented in Figure 1-8. The inclusion of the Inferred Resource and its distribution over the second half of the mine life, currently projected to exceed 25 years, is not a determining factor in the project's viability.

Pit shells include some Inferred material of which there is a low level of geological confidence and there is currently no certainty that further exploration work will result in the determination of Indicated Mineral Resources or that the production target itself will be realised.

This enhanced DFS has not changed the JORC compliant Reserves and Resource estimates. The underlying JORC Resource and Reserve assumptions remain consistent with that announced to the ASX on 24 October 208 reported in the DFS.

The Resource and Reserves are outlined in Table 1-3.

Table 1-3 JORC Compliant Mineral Resource Estimate and Ore Reserve

Category	Tonnes (Mt)	Grade (%TGC)	Contained Graphite (Mt)
Ore Reserves			
Proven	0	0	0
Probable	69.6	8.5	6.0
Total Ore Reserves	**69.6**	**8.5**	**6.0**
Mineral Resources			
Measured	25.5	8.6	2.2
Indicated	88.1	7.9	6.9
Total Measured and Indicated (M&I)	**113.6**	**16.5**	**9.1**
Inferred	98.3	7.6	7.4
Total Measured, Indicated and Inferred (M, I&I)	**211.9**	**7.8**	**16.6**

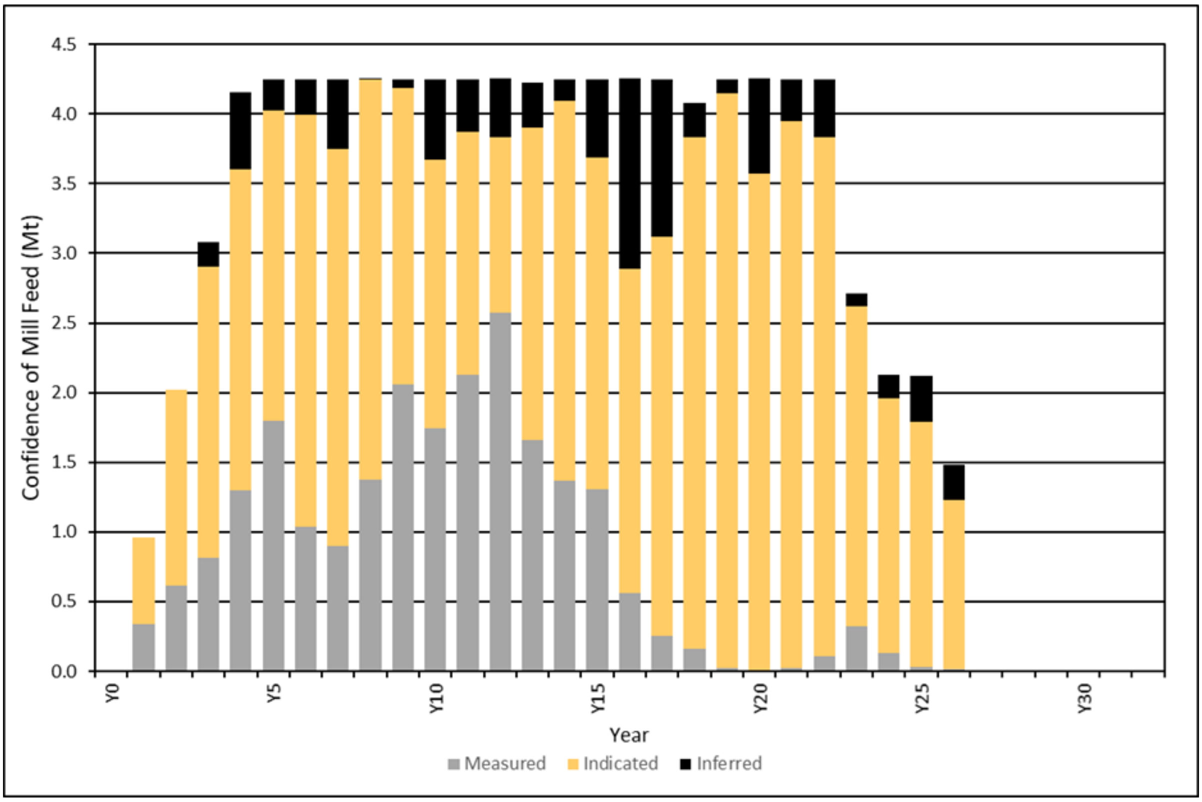

Figure 1-8 Material Presentation to the Plant by Resource Classification

The MGP will be an open pit mining operation based on mining the Ulanzi, Cascade and Epanko deposits using a conventional truck and shovel operation. Mining commences at Ulanzi in Year 0 followed by Cascade in Year 2. In the early periods, widely available 20-tonne (t) rear tipper trucks will be matched to 45 t class excavators for site establishment and pioneering works. After Year 1, once sufficient workspace is established, and pit development has matured, the mining fleet will be upgraded to a larger 50 t class articulated dump trucks and 90 t class excavators to increase mine productivity and attain economies of scale. In additional to mining, the mining fleet will be required to undertake mill residue handling and ore stockpile rehandling activities on a campaign and as required basis. The mining fleet build-up from pre-production through the first five years is shown in Table 1-4.

An owner operator mining approach including drill and blast and pit dewatering, is adopted for the LOM. Blast consumables will be sourced from a reliable and reputable supplier. Mine assay samples will be sent to the onsite laboratory for analysis and enable a quick turnaround for results. This follows the outcome of a vendor capability and capacity study conducted for a range of equipment suppliers and service providers during the DFS.

The open pit mining activities have been sequenced and scheduled by pit staging to optimise cashflow, provide a continuous ore feed to the processing plant, minimise stockpile inventory and provide a managed waste rock schedule for constructing key infrastructure.

Initial waste rock generated from mining is to be used for constructing key infrastructure such as upgrading the haul road to the Ulanzi processing plant, run of mine (ROM) pad construction, causeway construction, reshaping drainage terrain and surface water embankments. The remaining LOM waste will be diverted to a central waste dump to be located east of the Ulanzi deposit and west of the Cascade deposit.

Initial dewatered mill residue generated from the process plant will be deposited next to the dewatering facility. Dewatered mill residue will then be trucked to the final deposition site, levelled and stacked in layers with each layer roll compacted using impact rollers. Further details of the mill residue stacking can be found in Section 1.8.5.

The total material movement over the LOM is shown in Figure 1-9.

Table 1-4 Mining Fleet Build-up First Five Years

Data	Pre-production	Year 1	Year 2	Year 3	Year 4	Year 5
Mining Shifts per Day	1	1	1	2	2	2
Mining – Ulanzi	Prestrip	Operating	Operating	Operating	Operating	Operating
Mining – Cascade	-	-	Prestrip-	Operating	Operating	Operating
Mining – Epanko North	-	-	-	-	-	-
Processing	-	Stage 1	Stage 1 and 2	Stage 1, 2 & 3	Stage 1,2, 3 & 4	Stage 1,2, 3 & 4
Equipment – Make/Model						
Small Truck – Sinotruk 20 t	3	8	-	-	-	-
Big Truck – Bell B60E	-	-	11	15	17	17
Large Excavator – Caterpillar 390F	-	-	3	3	3	3
Small Excavator – Caterpillar 349D2L	1	1	-	-	-	-
Front End Loader – Caterpillar 980M	1	2	2	3	4	4
Drill – Epiroc FlexiRoc D50	1	1	3	3	3	3
Dozer – Caterpillar D7R	1	2	2	3	3	3
Grader – Caterpillar 140K	1	2	3	4	5	5
Water Truck – SinotrukWC	1	2	2	3	4	4
Maintenance Truck – Sinotruk with Crane	1	1	1	1	1	1
Service Truck – Sinotruk	1	1	1	1	1	1
Tractor – CaselH Optum 270	1	1	2	2	3	3
Compactor Towed – Broons HD1300	1	1	2	2	3	3
Compactor Self Propelled – Caterpillar CS-563E	1	1	1	1	1	1

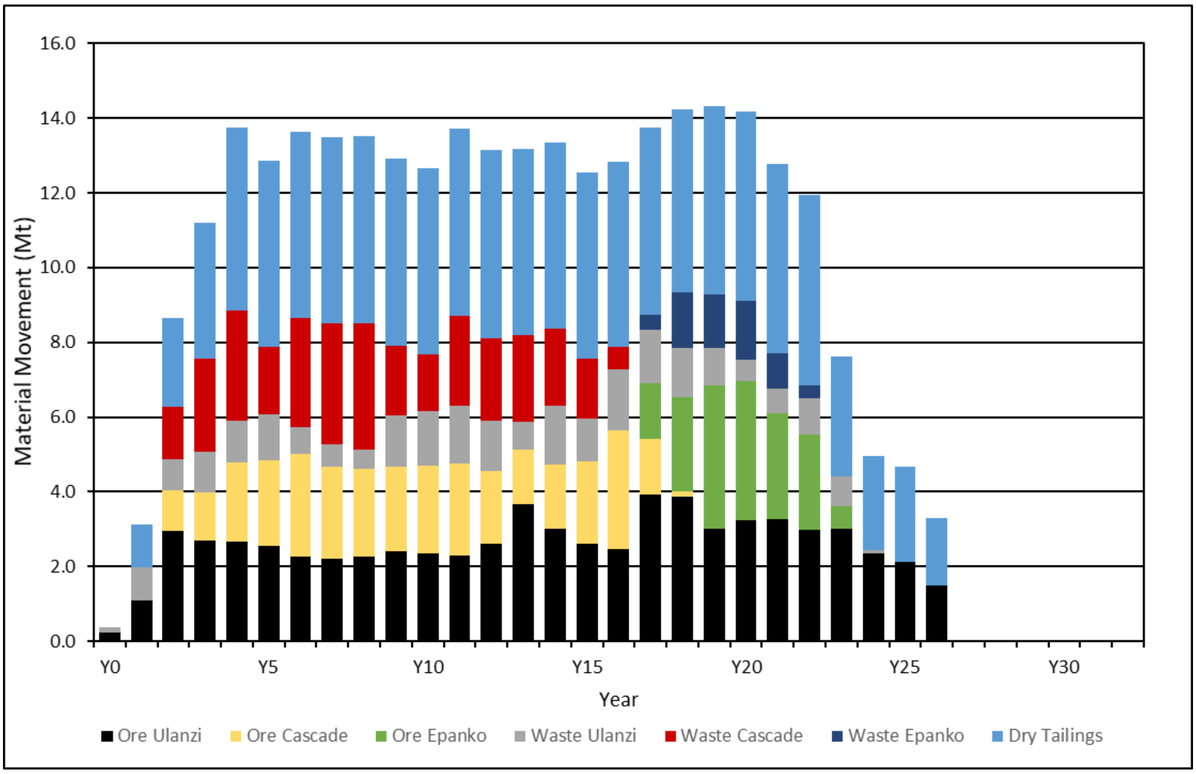

Figure 1-9 Total Material Movement

Production ramps up to full production over the first three quarters of operation for each Stage as outlined in Table 1-5.

Table 1-5 Production Ramp-up

Period	Plant Throughput (%)	Plant Recovery (%)
Production Quarter 1	80	85
Production Quarter 2	87.5	87.5
Production Quarter 3	95	90
Production Quarter 4	100	93

Scheduled mill feed sourced from the Ulanzi and Cascade deposits is reported in Table 1-6. There has been no change to the Ore Reserve since the DFS was completed. Additional material has been scheduled from Epanko for the enhanced mine schedule however this material resides at the latter half of the life of mine. The Epanko material is currently not considered in the Ore Reserve.

Table 1-6 Sources of Mill Feed

Category	Ulanzi		Cascade		Epanko		Total	
	Mt	%TGC	Mt	%TGC	Mt	%TGC	Mt	%TGC
Proved	0	-	0	-	0	-	0	-
Probable	46.5	8.4	23.1	8.6	0	-	69.6	8.5
Sub-total	**46.5**	**8.4**	**23.1**	**8.6**	**0**	**-**	**69.6**	**8.5**
Inferred	9.9	6.7	5.7	8.7	9.9	6.7	25.4	7.1
Total	**56.4**	**8.1**	**28.7**	**8.6**	**9.9**	**6.7**	**95.0**	**8.1**

Consideration for inclusion of Epanko in the Ore Reserve will occur as part of the normal ore reserve cycle associated with statutory ore reserve reporting.

1.6 Metallurgy

The focus of testwork for this DFS was to determine the optimum flowsheet for processing ore from the Ulanzi deposit. Ore from the Cascade deposit underwent some testing however this was put on hold at an early stage in the process to focus solely on Ulanzi to align with the mining production schedule.

Historical testwork as well as the proposed Pilot Plant 1 (PP1) flowsheet was reviewed based on CPC experience and it was initially determined that the proposed split flowsheet, whereby larger and finer flakes are classified mid-flotation and processed in separate trains, would result in the highest overall product value. Subsequent optimisation testwork and piloting in PP1 demonstrated that this was not warranted when considering the financial and operability benefits of employing a single flotation-filtration-drying train, and therefore a single train flowsheet was adopted.

The product specification targets are based on marketing feedback and testwork indicated that product graphite grades can be tailored to 95, 97.5 or 99% TGC, by varying the number of stages of polishing and flotation. The flowsheet to produce 95 and 97.5% TGC concentrates was determined in lab scale optimisation testwork and confirmed in a 40 t pilot plant. Samples of the final product exceeding 99% TGC was generated in both sighter lab scale tests and using un-optimised pilot plant scale equipment.

Testwork showed that the graphite particle size distribution (PSD) is generally weighted towards the market-defined coarse product fractions, as opposed to the medium flake product fractions. Good alignment was seen between lab scale PSDs and PP1 PSDs, with P_{80} values regularly above 300 µm.

Comminution testwork showed that the ore was relatively soft, however competent with a medium abrasiveness, lending itself to a relatively low energy comminution circuit. No clay issues were identified.

Variability testwork showed that target concentrate grades can be achieved when feeding different parts of the Ulanzi deposit through the flowsheet. The variability testwork however also indicated varying hardness across the deposit which should be addressed in further testwork.

Equipment suppliers were approached to determine technology suitability and design data for a variety of unit operations including, thickeners (Outotec), filters (Outotec), dryers (Drytech) and dry screens (Rotex and Great Western Manufacturing). Results of the equipment supplier findings include:

- The mill residue thickens well in a high rate thickener and filters well under vacuum in both belt and disc style vacuum filters.
- The concentrate thickens relatively well in a high rate thickener and filters effectively under pressure in a Larox style pressure filter.
- The concentrate can be dried using either a flash or rotary dryer though further investigation is required to determine if conventional flash dryers result in particle burring.
- The dry concentrate was reported to be difficult to screen by Rotex (linear vibrating screen) however an efficient split can be achieved in both instances. Great Western Manufacturing (plansifter) had better results requiring fewer screening units.

Materials handling testwork was undertaken by Jenike & Johanson (J&J) to define mechanical design criteria for solids handling components within the process plant flowsheet. Results showed that the crushed ore exhibits a higher than normal propensity to hold-up and rathole. Chutes and bins have been sized in accordance with the recommendations from the J&J report.

The following additional testwork is recommended:

- mill residue geochemical and geotechnical characterisation testwork on fresh ore (testwork on oxide ore completed)
- variability comminution testwork
- additional variability flotation testwork
- Ultra circuit optimisation
- SMM (equipment supplier) testwork, including investigation on effects on particle shape
- flash dryer degradation investigation testwork
- dry solids transportation (vendor) testwork
- mill residue slurry rheology testwork
- dust explosivity testwork
- froth factor determination testwork
- additional materials handling testwork on crushed ore at lower moisture
- raw water quality survey (following final selection of raw water source)

A 500 t sample of drill core is available at SGS Canada for additional pilot plant testwork for potential strategic partners.

From November 2015 to February 2017, sighter testwork on fresh and oxide composites from the Epanko deposit was undertaken at Bureau Veritas' (BV) Laboratory in Perth, Australia. This testwork is described in the PFS study report 'Mahenge Graphite Project PFS (Rev 0)', completed by Battery Limits. Given the limited testwork available for the Epanko deposit, the Stage 4 process plant design is the same as Stage 1 which is based on the available testwork for Ulanzi.

1.7 Process Plant

The Mahenge ore will be processed over the LOM using a four-staged approach which will initially process 1 million tonnes per year (Mt/y) in Stage 1, increase to 2 Mt/y in Stage 2, 3 Mt/y in Stage 3 and finally process 4 Mt/y with the completion of Stage 4.

The four stages will be developed over the initial years of the mine with the current mine schedule indicating a LOM of 26 years, after which time the current defined deposits will be depleted. Stage 1 and Stage 2 will process ore predominantly from the Ulanzi and Cascade deposits while Stage 3 and Stage 4 will process ore predominantly from the Cascade and Epanko deposits.

Table 1-7 Key Process Parameters for the LOM

Parameter	Units	Stage 1	Stage 2	Stage 3	Stage 4	Total
Commence Operation	year	1	2	3	4	-
Nominal Mine Life	years	-	-	-	-	26
Process Throughput	t/y	1,061,341	1,061,341	1,061,341	1,061,341	-
LOM Ore Treated	Mt	27.1	26.1	21.7	20.0	95.0
Average Feed Grade	TGC %	8.21	8.19	7.96	8.06	8.12
Recovery	%	92.9	92.8	92.8	92.8	92.8
Average Concentrate Grade	TGC %	97.3	97.3	96.12	96.1	96.8
Graphite Concentrate Production	Mt	2.12	2.04	1.7	1.6	7.4

The focus of the feasibility study was to develop the Stage 1 process plant design.

The Stage 1 process plant will be fed ROM ore at an average grade of 8.21% TGC and will recover approximately 93% of this graphite to produce approximately 85,000 t of graphite products per year.

The Stage 1 process plant has been designed to produce various graphite products targeted at specific graphite end users. Each grade is classified into size fractions relevant to specific graphite end users. The three broad classifications of products have been defined as follows:

- Mahenge Standard Flake – 95% LOI
- Mahenge Premium Flake – 97.5% LOI

- Mahenge ULTRA PURITY-FP™ Flake – 99%+ LOI.

The proposed process plant as shown in Figure 1-10 can be summarised into the following processing stages:

- three stage crushing of ROM
- primary milling in a rod mill and rougher flotation, including a ball mill regrind-scavenger flotation circuit
- primary polishing in a ball mill and three stage cleaner flotation (Ulanzi Standard production)
- secondary polishing in a stirred mill and one stage cleaner flotation
- tertiary polishing in a stirred mill and two stage cleaner flotation (Ulanzi Premium production)
- two stages of ultra-polishing in stirred mills, each followed by one stage cleaner flotation (Ulanzi Ultra production)
- concentrate dewatering using a thickener and pressure filter, followed by a dryer
- product classification using screens
- product bagging
- process plant mill residue is thickened, vacuum filtered and dry stacked.

The process plant is located approximately 600 m north of the Ulanzi open pit at an elevation of 487 masl. The location for the process plant has been selected in a clearing that is large enough to accommodate the layout for both Stage 1 and Stage 2 while minimising earthworks. The terrain surrounding the mine is hilly which restricts the suitability of several areas.

The Stage 3 and Stage 4 process plants will be duplicates of the Stage 1/Stage 2 process plants and will require the same footprint. The Stage 1 layout and equipment selection is duplicated for Stage 2.

Stage 2 includes some shared equipment with Stage 1 including the bagging plant and building infrastructure. However, this is relatively minimal. A feeder circuit breaker in the 33 kV switchboard for Stage 1 will feed a new 33 kV switchroom. The process area switchrooms and motor control centres (MCCs) will be duplicated for Stage 2.

A process plant control philosophy was developed to support the feasibility study. Required control system infrastructure has been outlined and process and instrumentation diagrams (P&IDs) have been developed to estimate instrumentation and input/output (I/O) requirements. The process plant is to be semi-automated where practical and will have remote capabilities to allow for off-site analysis and troubleshooting.

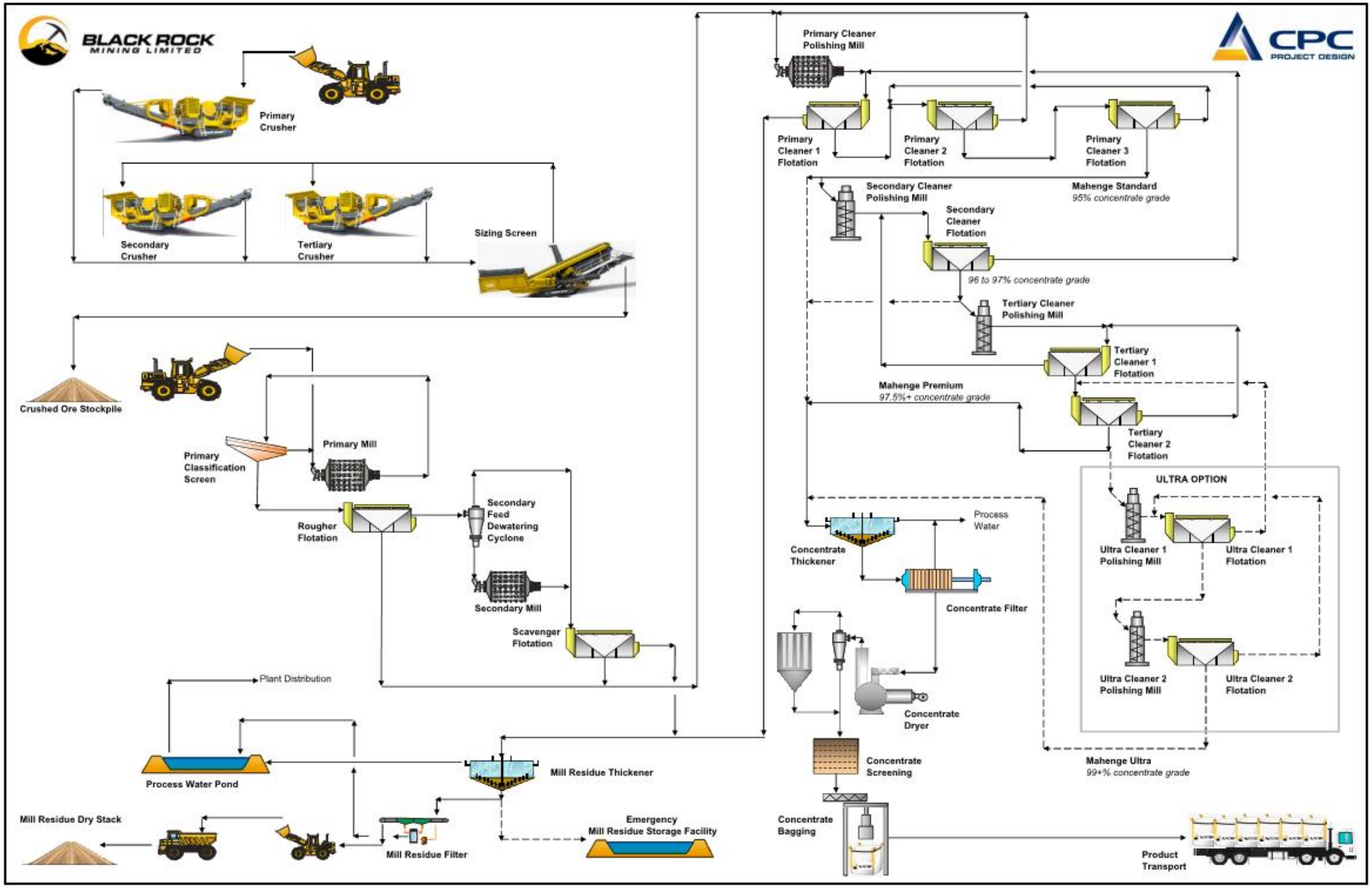

Figure 1-10 Simplified Process Diagram

1.8 Infrastructure

1.8.1 Site Layout

The plant and infrastructure located on site will consist of:

- Processing facilities for processing Ulanzi/Cascade ore (Stage 1 and Stage 2) and for Cascade/Epanko ore (Stage 3 and Stage 4) including product warehouses, reagents storage and truck loading area.
- Onsite power generation utilising rental units initially for Stage 1 followed by a permanent grid power connection in future years.
- Stockpiles for mined ore and ROM pads (one shared ROM pad for Stage 1 and Stage 2 and one for Stage 3 and Stage 4).
- Water ponds.
- Mine waste dumps.
- Mining workshop and staging area.
- Explosives magazine.
- Site buildings (administration offices, medical clinic, canteen, metallurgical laboratory, workshops, etc.)
- Security/gatehouse.
- Mill residue filtering plant.
- Dry stack areas.
- Camp facilities complete with kitchen and mess, recreation area and gymnasium.

The Stage 1 and Stage 2 (future) process plants have been located in close proximity to the Ulanzi deposit which is the first ore feed source. The majority of infrastructure is also located within this area as it is close to the site gatehouse and camp facilities.

The processing plants for Stage 3 (future) and Stage 4 (future) will be located remotely near the Cascade open pit (approximately 5 km from Ulanzi) and will utilise most of the existing infrastructure from the Stage 1 plant.

The site layout for the project can be found in Figure 1-11.

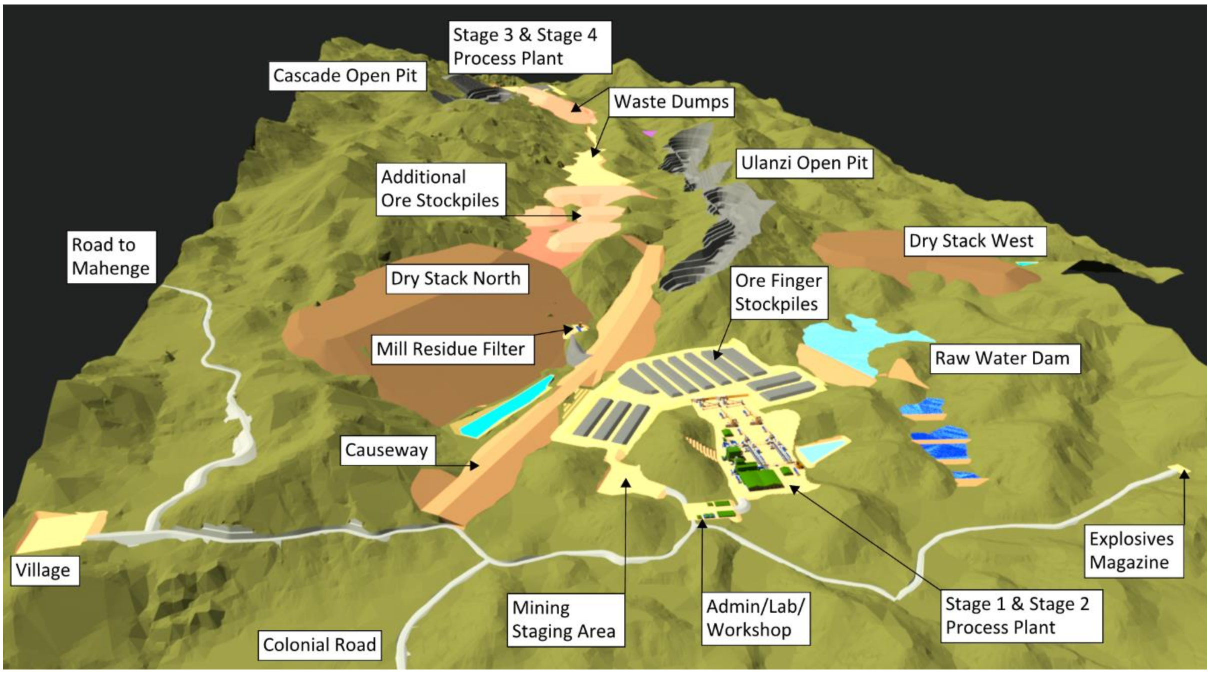

Figure 1-11 Site Layout

1.8.2 Roads

The current road into Mahenge is a narrow road that has steep winding inclines in places. Access to the mine site is currently via a single lane track from the main Ifakara to Mahenge road which will be upgraded to a two-lane unsealed road. The Black Rock accommodation village is also accessed from this road.

An alternative road route has been identified that follows the currently unused colonial access track. This approximately 7 km long road is relatively flat and avoids the steep inclines of the existing road. Discussions have been held with the Tanzania Rural and Urban Road Agency (TARURA) regarding the new road route. TARURA have reviewed the road route and indicated they will document and gazette it. The road will be for public use and used as the main public access road to Mahenge town. The colonial access road will also open new areas suitable for resettlement and farming.

Other roads that will be created include:

- plant site and mine services area access road
- magazine access road.

1.8.3 Mine Services Area

A mine services area will be established with facilities that include:

- Mine workshop and mine production office consisting of containers with dome shelter roof between each container.
- Vehicle wash bay.
- Ablution facilities.

- A common mine services area will service all stages.

1.8.4 Explosives Magazine

The explosives magazine has been located northwest of the Ulanzi deposit and to the east of the Stage 1 and (future) Stage 2 processing areas. They are located to achieve the require safety distances to other facilities with a blast radius of 500 m. The magazine is accessed by a single lane track from the plant site access road. Explosives can be transported to the mine without going through the process plant and associated facilities.

The mine magazine consists of sea containers with security fencing and will be constructed in accordance with Australian and Tanzanian standards. Explosives materials are stored in approved explosives containers. Initiation products (electric and non-electric detonators, surface delays) must be stored in separate magazines to HE (Packaged explosives, detonating cord and blasting agents).

1.8.5 Accommodation Village

The accommodation village has been designed to house 120 residents in single accommodation rooms with en-suite bathrooms for Stage 1, with 20 additional rooms added for each of Stage 2, Stage 3 and Stage 4.

The accommodation village has been sized solely for the expatriate and national labour that will be required during operations. The size of the accommodation village has been minimised given that most of the workforce is sourced from the local communities.

Common facilities in the accommodation village will be sized for the full 180-person village from start of operations and will include a kitchen, dining area, recreation room, gymnasium and laundry.

The village will be a self-contained facility independent from the main plant and managed by an independent camp management company. During the construction phase the intent will be to use a combination of the camp village and local available accommodation for the construction crews working on site.

1.8.6 Site Buildings

Site buildings will be constructed from a variety of methods to suit the application.

To promote local content while having robust buildings suitable for the LOM, buildings constructed utilising blockwork construction will include:

- Security/gatehouse
- administration office
- canteen
- gatehouse
- clinic
- ablutions

- substation buildings.

Structural steel framed clad buildings will include:

- plant warehouse
- product storage warehouse
- reagents storage
- compressor shed.

Containers with dome shelter roofs between them are used for:

- light vehicle workshop and maintenance
- plant workshop.

The plant and crusher control room swill be prefabricated modular buildings constructed on a steel frame suitable for installation on a steel structure.

Both the clinic and metallurgical laboratory will be contractor operated and fitted out.

1.8.7 Fuel Storage and Distribution

A fuel farm will be installed with a capacity of approximately 200 cubic metres (m^3) of diesel fuel, which will provide approximately two weeks storage of fuel for the operation. The bulk storage facility will be designed to be expanded progressively to 800 m^3 for Stage 2, Stage 3 and Stage 4. Fuel will be delivered by a Tanzanian bulk fuel supplier utilising their existing fleet.

Diesel fuel is stored on site for the following purposes:

- mine fleet
- light vehicles
- dryer
- reagents (collector)
- raw water bore pumps

A separate temporary bulk fuel facility will be provided for the onsite power generators during the initial project operation.

The fuel storage facility will include separate off-loading and fuel bowser stations which are designed to minimise the interaction between light mobile vehicles and heavy mining equipment. An automatic vehicle identification (AVI) system will be installed to only allow authorised users to dispense fuel. The AVI system will also compile data from each refueling transaction and record which operator withdrew the fuel, into which vehicle, how much was used and when.

Fuel used for processing (dryer operation and reagents) will be trucked from the fuel storage facility into a tank located near the process plant. Fuel will then be pumped into the process as needed.

1.8.8 Water Supply and Distribution

1.8.8.1 Raw Water

Raw water is supplied via the raw water source pumps and the raw water pond pump. For most of the year, raw water will be sourced from the nearby waterways which will be dammed to form the raw water pond. In times of low rainfall, the raw water source pumps (borefield pumps) will be used to supply raw water to site via an overland pipeline.

The raw water source pumps and the raw water pond pumps supply water to the raw water tank which has 12 hours (h) of process surge capacity plus additional capacity for fire water.

1.8.8.2 Potable Water

Bore water from the raw water source pumps is sent to the camp potable water treatment feed tank. The tank has 48 h residence time and feeds the potable water treatment plant. Treated potable water is stored in the camp potable water storage tank which has an additional 48 h of residence time.

Allowance has been made for sediment removal, UV treatment and chlorine dosing and monitoring.

From the camp potable water storage tank, the treated potable water can be sent to:

- the camp potable water pump for distribution to the camp site
- the site potable water storage tank for distribution around the Ulanzi facilities for Stage 1 and Stage 2
- a second site potable water storage tank for distribution around the Cascade facilities for Stage 3 and Stage 4.

At site, potable water is distributed to the safety shower ring main, as well as to the various general users such as the plant ablutions, laboratory, and the administration building.

1.8.9 Waste Disposal

Provision has been included for a waste water treatment plant (WWTP) located at the accommodation village. The activated sludge bed bioreactor plant has been sized based on peak flows estimated for up to 180 persons using the ablutions at the village, or up to 300 persons using the toilets at the plant site.

Sewage generated at the village will flow via gravity into two sewerage macerator pump pits, which will pump to the 50 m^3 central collection pit, acting as a balance tank to feed the WWTP.

Sewage generated at the plant site will flow via gravity into several smaller pits that will be emptied as required by a vacuum truck and transported to the central collection pit at the village.

Treated water from the sewage treatment plant will be directed to a spray field. In the future, this water may be used for irrigation of vegetated areas or for dust control, subject to approval by the authorities.

1.8.10 Power Supply

Stage 1 of the project will initially be powered by an onsite diesel driven power plant that will be rented prior to a future permanent connection to the local grid. This will ensure power is available for plant startup and will allow for the required construction period to connect the project site to the Tanzania Electric Supply Company Limited (TANESCO) power network.

The power plant rental proposal includes:

- eight continuous power containerised gensets
- all required step-up transformers
- substation
- bulk fuel storage and diesel day tank
- containerised workshop/store
- containerised control room
- all cabling and diesel distribution systems.

TANESCO have performed a prefeasibility study (PFS) to upgrade the power network to supply the proposed MGP load and service other expected growth in consumption in the region.

The proposed future power network upgrade includes running a 220 kV powerline from Ifakara to Ndororo (Mahenge). A 220/33 kV step down substation is proposed at Ndororo (Mahenge). The proposed substation includes two 60 MVA transformers.

The TANESCO proposal also includes running a 33 kV powerline for 6 km from Ndororo (Mahenge) to the project site.

The installed site load, maximum demand (peak power for 30 minutes) and average load are shown in Table 1-8 for the four stages of the project.

Table 1-8 Power Loads under Varying Conditions

Throughput	Installed Load (kW)	Maximum Demand (kW)	Average Load (kW)
Stage 1 (1 Mt/y)	11,797	8,558	8,130
Stage 2 (2 Mt/y)	22,656	16,682	15,848
Stage 3 (3 Mt/y)	34,363	25,075	23,821
Stage 4 (4 Mt/y)	45,222	33,185	31,525

1.8.11 Communication System Infrastructure

The mine site area currently has limited mobile telephone coverage. A new mobile telephone tower will be established at the plant site by one of the major Tanzanian telecommunications providers.

Communications to the site is via a 24 core fibre optical cable from mobile telephone tower. This connects to the 33 kV switchroom communications panel which forms part of the site fibre-optic ring.

Each building requiring communications is equipped with a communication panel containing fibre-optic cable termination equipment and at least one Ethernet switch with Gigabit backbone capability. These are housed in a clean air-conditioned room.

Communications between the process plant and the remote areas (mining, mill residue and accommodation village) is via the 33 kV powerline optical ground wire (OPGW).

Wireless internet has been provided in the administration building, mine production office and the Ifakara office.

A UHF radio system has been provided at the plant site and the Ifakara facility. The system includes base stations, hand held radios and vehicle radios for a limited number of vehicles.

A PABX (private automatic branch exchange) communications server has been provided in the administration building for the site Voice Over Internet Protocol (VOIP) telephone system.

Telephones have been provided in the administration building, plant warehouse office, mine production office, Ifakara office, process plant control rooms and process plant switchrooms.

A facial recognition access system has been provided in addition to a standard card access system at the plant gate.

1.9 Mill Residue Dry Stacking and Site Water Management

A mine surface water and groundwater management study was completed in 2017 to investigate methods of mill residue disposal. The study concluded that up to eight mill residue storage dams would be required over the LOM which raised several economic, environmental and social risks for the project. Subsequently, a further review in late 2017/early 2018 examined alternative approaches to mill residue management and resulted in wet mill residue dams being replaced in the design with dewatering and dry stacking of the mill residue. The dry stack option resulted in:

- a significantly reduced water management risk as the site has an average net positive water balance and the use of dry stacking to store mill residue significantly reduces complexity associated conventional wet tailings management systems
- less infrastructure requirements
- A development footprint that contains the mill residue storage within two areas in the vicinity of the Ulanzi.

A risk assessment conducted in April 2018 confirmed the mill residue dewatering and dry stacking was the preferred design approach.

Mill residue dry stacking facilities and water dams were designed for the MGP as part of the DFS. The designs presented in this report were prepared using the following documents:

- Tanzanian Regulations - Water Resources Management (Dam Safety) Regulations, GN 237, dated 2 August 2013

- ANCOLD (Australian National Committee on Large Dams) Guidelines (2012) 'Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure'

The design objectives of the dry stack mill residue storage facilities (DSMRSFs) are:

- To maximise the storage of mine residue within a restricted footprint area. Studies were carried out to examine storage capacity at selected sites, stack geometry and the optimisation of the project layout which had to incorporate various infrastructure.
- To provide adequate stack stability. Studies were conducted to examine stack geometry, various slope reinforcement methods and stack drainage.
- To reduce environmental impact due to seepage and dusting of the mill residue.
- To provide a solution to excessive decant water management due to the overall average net positive water balance.
- To reduce the risk of catastrophic dam failure.
- To minimize long term capital and operating costs associated with significant dam inventory.

In accordance with the criteria for categorisation of dams based on the Water Resources Management Regulations of Tanzania, the proposed dry stacking of the mill residue can be categorized as Low 'C' for:

- loss of life
- economic and social loss
- environmental and cultural loss.

The water storage dams are also considered to be Low 'C' for the same elements.

Based on the ANCOLD (2012), as far as this document relates to dry stacks, the level of severity rating is considered to be medium, and the consequence rating for the proposed DSMRSFs has been assessed as 'Significant'. A similar level of severity and consequence rating would be applicable for the water storage dams.

The proposed method of mill residue storage is by stacking after filtering/screening to form a side-hill free standing structure. The mill residue will be thickened in the process plant and pumped to the filtering/screening plant adjacent to the storage area. After processing to reduce the moisture content of the residue, it will be delivered to the active face of the storage area by trucks. The filtered/screened mill residue is expected to have a maximum moisture content not exceeding 20%.

There are two areas proposed for dry stacking. The northern DSMRSF (NDSMRSF), which will be commissioned first, with the tailings initially being placed in the southern section of the NDSMRSF. This area provides approximately 2.3 years of storage capacity and will then be covered by low grade ore stockpiles. Stacking will continue to the north and the NDSMRSF have a total life of approximately 15.8 years. The western DSMRSF (WDSMRSF) will be commissioned later in the project life and store the final 13.2 years of mill residue production. The LOM dry stacks are shown in Figure 1-12.

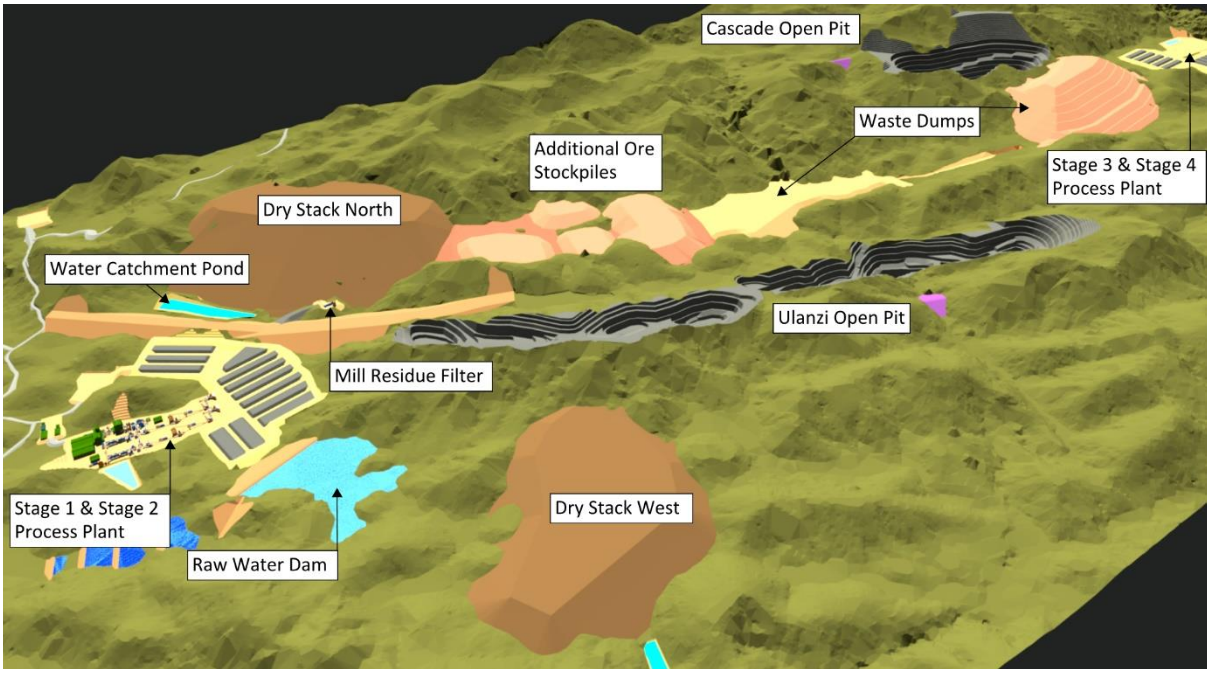

Figure 1-12 LOM Dry Stacks

The two DSMRSFs will accommodate approximately 92 Mt of mill residue at an in-situ dry density of 1.7 t/m^3. The NDSMRSF will have a maximum height of 140 m and the WDSTSF will have a maximum height of 87 m. Stacking rates will vary according to the operational requirements. Assuming continuous operation at plant design capacity the average stacking rate would be approximately 396.5 t/h (with all four stages operating).

The filtered/screened mill residue will initially be placed at the southern end of the NDSTSF, on an area lined with a bituminous geomembrane (BGM). The base of the lined portion of the facility will incorporate an under-drainage layer of quarried gravel and rock above the liner. The base of the stack will slope towards downstream water ponds such that leachate will flow under-gravity to the ponds. Rainfall runoff falling on the top of the stack will flow via finger drains down the side of the stack to the base drain. Rainfall falling on the stack batters will also be diverted to the downstream pond. Diversion drains will be cut into the sides of the valley as the DSMRSF rises to direct runoff away from the stack. As the stack is raised the vegetation and soils will be stripped from the sides of the valley, with the vegetation mulched and redeployed with the soil on the out perimeter of the stack to promote rehabilitation.

The stacked mill residue will be built as a series of terraces using the equipment deployed to move the mill residue away from a static deposition point following filtering/screening. The proposed terrace or bench height is 5 m. A compacted outer perimeter of oxide mill residue is to be placed in advance and is raised with each lift. As each layer is placed, the mill residue will be compacted by a compactor or roller to achieve the design density. An impact roller will be used, which will allow the height of each compacted lift to be increased compared to the height of each compacted lift using conventional compaction equipment. It is preferred that when oxide mill residue is being processed that this material be placed in the outer compacted perimeter of the stack with the primary mill residue placed and compacted within the central zone of the stack. The exposed final batters of the stack will be covered with geotextile, mine waste, soil and mulch, which is recovered from the sides of the valley forming the confinement as each section of the stack has reached a lift height of 5 m. This is important as capping of the stack batters after the final height is reached will not be possible.

The mill residue stack has been designed with a slope of 1:2.5 (vertical:horizontal). Stability analyses have been performed to confirm overall stack stability and define the operating criteria which will constrain the stacking.

It is expected that during the dry season, evaporation will have a significant impact by readily removing moisture during transportation and stacking of the mill residue. The risks of instability will therefore be lower during the dry season.

Instability of the mill residue stack may occur if the material is too wet, particularly during the wet season when rain storm events may result in ponding of the water on the surface of the mill residue stack. In order to manage the phreatic (water) surface within the stack, the following processes will be incorporated into the construction of the DSMRSF:

- Sloping of the top surface stack to internal drains (rather that to external batters).
- Internal or finger drains down the sides of the valley and interface with the stack linked into the underdrain at the base of the facility.
- During the wet season, the mill residue will be placed and compacted with temporary covers such as low-density polyethylene (LDPE) deployed as part of operations to shed water from the surface and limit vertical infiltration. Some internal drainage such as a drain-coil or similar can be place in the stack for every 5 m lift at 20 m intervals to intersect water ingress into the stack as required as part of operations.

During the wet season stacking operations will need to be confined to smaller working fronts and may need to cease for short periods during storm events. An emergency stacking location is to be provided for these events. Where stacking ceases during storm events, the stack area must be assessed by qualified geotechnical personnel before stacking can resume. Emergency storage of mill residue will also be provided in the raw water dam (RWD).

1.9.1 DSMRSFs Water Management

Surface water will be removed from the DSMRSFs by internal finger drains which run down the side of the stack and link with the main underdrain in the base of the stack. This underdrainage system will deliver water under gravity to an external water pond downstream of each DSMRSF. Water collected in the downstream pond will be monitored and pumped either to the process plant or RWD near the plant for reuse in processing.

Water that falls on the stack batters will be diverted to the downstream water ponds. Runoff from the perimeter drains cut into sides of the valley up-slope of the stack will, where practical be diverted through silt traps around the downstream ponds and discharge downstream.

1.9.2 Raw Water Dam (RWD) and Polishing Water Dam (PWD)

The RWD has been designed in lifts. Lift 1 will have a capacity of 300,000 m^3 (crest reduced level (RL) 515 m with 2 m freeboard). The Lift 1 embankment will be raised by 5 m using downstream methods to provide a total final capacity of 600,00 m3 (Lift 2, crest RL 520 m with 2 m freeboard). The RWD can also be used as for emergency mill residue storage when the mill residue filter/screening plant is not operational.

The PWD will comprise a series of embankments with water flowing through the facility to attenuate the flow and promote settling of contaminates. There will four embankments in total with flow between the cells within the PWD via spillways. The total capacity of the PWD cells below the spillways will be 40,500 m^3.

The RWD and PWD have been designed as cross-valley facilities with homogeneous embankments with a cut-off trench under the upstream zone to reduce seepage. A geomembrane will be installed on the upstream side to reduce wave action and erosion. Finger drains on the downstream side of the embankment will counteract the uplift pressures and enhance stability.

The design of the RWD and PWD includes spillways to remove excess water from these facilities.

1.10 Product Logistics

1.10.1 Logistics Operation

Product logistics will be managed directly by Black Rock. Bagged graphite product will be transported on flatbed trucks from site to Ifakara approximately 70 km away. Trucks will haul 15 t of bagged product seven days a week for a period of 12 hours each day, making two return trips per day. This requires a fleet of eight trucks for Stage 1 product transport. The trip time is expected to reduce as the road is upgraded progressively throughout the mine life.

In Ifakara, allowance has been made for Black Rock to purchase land for intermediate product handling. Bags are temporarily stored in a warehouse with one day plant production storage capacity and consolidated into shipments based on customer orders and loaded into 20-foot shipping containers. Each container will contain 20 bags of graphite product.

Containers will be consolidated into shipments and dispatched as a total order. Shipments are loaded onto rail cars at Ifakara and transported on the TAZARA rail line to Dar es Salaam which is located approximately 470 km northeast of the project site. Figure 1-13 shows the location of the port in Dar es Salaam relative to the project site along with other smaller ports in the region.

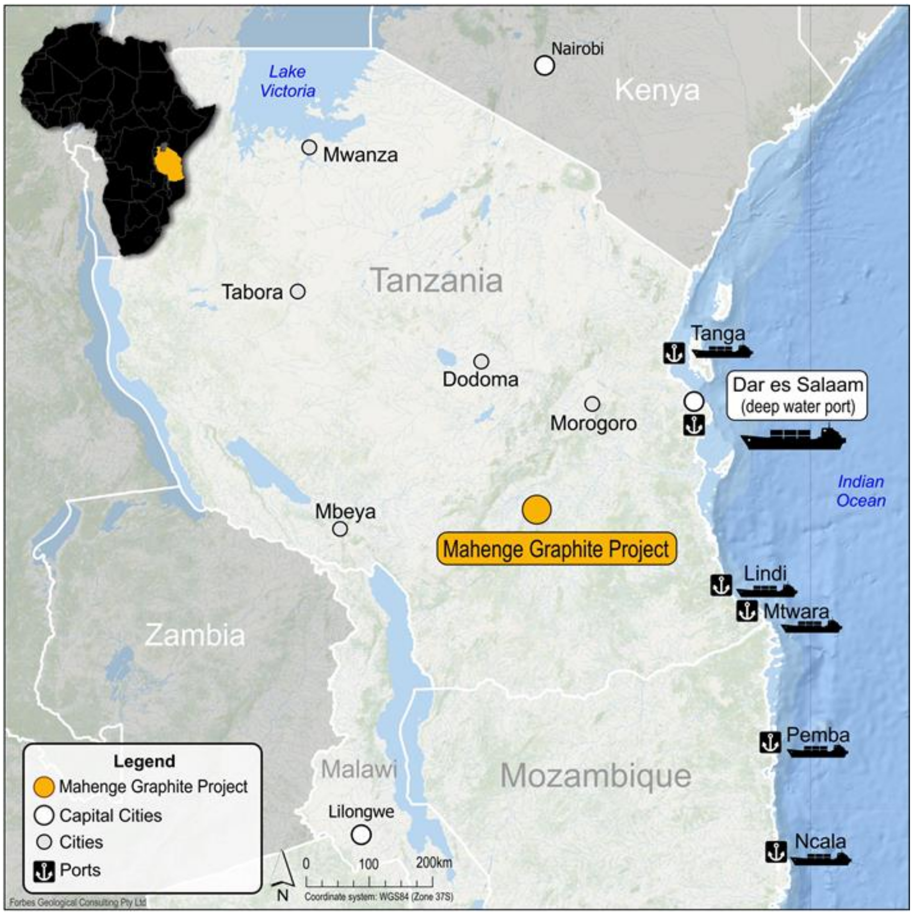

Figure 1-13 Port of Dar es Salaam and Smaller Ports Relative to the Project site

Unloading of the product containers from the rail line, delivery to the ship, stevedoring and all other associated port management will be contracted to a local logistics management and freight company. The logistics contractor will also be responsible for returning empty containers back to the rail line for shipping to Ifakara.

All costs associated with transport of the product from site to FOB (free on board) the ship are included in the operating cost estimate discussed in Section 1.14.

1.10.2 Port Selection

The port of Dar es Salaam was selected as the preferred port for export of graphite product. Dar es Salaam port is the principal deep-water port for Tanzania and handles approximately 95% of the Tanzanian international trade.

The port also serves the landlocked countries of Malawi, Zambia, Democratic Republic of Congo, Burundi, Rwanda and Uganda. The port is not seasonal with consistent annual operations.

Dar es Salaam port is strategically placed to serve as a convenient freight linkage not only to and from East and Central Africa countries but also to Asia, Europe, Australia and America. The port has high frequency direct shipping to Asia with a sizeable number of empty containers currently returning to Asia.

Other ports that were considered include Mtwara Port (Tanzania), Pemba Port (Mozambique) and Nacala Port (Mozambique). These ports were not selected for various reasons including distance from the Mahenge mine site, logistics route costs, availability of empty containers and shipping frequency.

Table 1-9 below summarises for each port key characteristics and the container import/export volumes/imbalances.

Table 1-9 Container Import/Export Volumes/Imbalances

Container exports TEU	Dar		Mtwara		Pemba		Nacala	
	Full	Empty	Full	Empty	Full	Empty	Full	Empty
2015	109,554	201,227	N/A	N/A	N/A	N/A	N/A	N/A
2016	99,640	139,447	N/A	N/A	N/A	N/A	N/A	N/A
2017	97,088	191,487	14, 960	4,000	N/A	N/A	23,276	5,356
Nominal annual tonnage (mt dwt)	4.1		N/A		N/A		N/A	
Vessel arrivals (2017)	1,366		N/A		24		200	
Berth Length (m)	2,600		385		199		1,050	
Draft (m)	12		9.5		9		10 to 14	
Service Area	Tanzania, Malawi, Zambia, DRC, Burundi, Rwanda, Uganda		Regional port for oil & gas exploration and cashew export		Mozambique		Mozambique, Malawi, Zambia, Zimbabwe	
Seasonal	No		Yes		Yes		No	

1.11 Environment and Community

1.11.1 Environment

1.11.1.1 Vegetation and Flora

The surveys of the MGP conducted for the Environment and Social Impact Assessment (ESIA) report that the vegetation categories classified within the project footprint are well represented regionally.

An estimated 80% of the project site has been cleared for farmland, although this figure includes abandoned and fallow fields. About 15% of the landscape in total is currently being actively farmed.

The most important vegetation type growing within the project area is 'Riverine Forest', which grows along the rivers and watercourses and is characterised by tall trees, climbers and high species diversity. The vegetation is considered important for maintaining water quality by stabilising the river banks.

1.11.1.2 Flora and Fauna

The baseline vegetation and flora survey recorded 102 different plant species, of which eight species were considered as being conservation significant. The survey was conducted during the dry season at a time when many annual herbaceous species are not present, and a wet-season survey has been recommended.

The project area hosts a moderate number of native species, including migratory and vagrant birds. Hunting has resulted in larger ungulates (elephants, buffalos, etc.) becoming locally extinct; however, smaller, more tolerant species remain in some areas, including wild pigs and Velvet monkey. The African Clawless Otter (IUCN Red List) was recorded in the area, which is widely distributed in permanent waterbodies across the region, but whose habitat is under threat.

1.11.1.3 Groundwater

The geology of the project area is complex, and few bores have been sunk. A shallow well (4.6 m) exists at Mdindo village and gives fresh water (63 mg/L TDS) but at a low rate (0.4 L/s). The area also supports several small springs, although few had sufficient yield to measure (dry season). Groundwater levels in two deep exploration bores were 56 m below ground level (elevation 743 m) and 13 m below ground level (elevation 675 m).

Groundwater supports the baseflows of the local rivers during the dry season (up to 0.4 m^3/sec), including the Mdindo River.

1.11.2 Social factors

1.11.2.1 Population Centres

The nearest regional population centre is Mahenge, located approximately 10 km southeast from the centre of the MGP. The population of the Mahenge district is around 10,000.

Within the project envelope (Ulanzi area), the Mdindo village is located and has an estimated population of around 1,500 people. To the south, the village of Kisewe (est. population 990 people) is located about 1.3 km from the edge of the Cascade pit. The villages of Kwiro and Nawenge are located approximately 1.5 km to the southeast of the Cascade pit. These two villages are contiguous with the Mahenge township.

1.11.2.2 Land Ownership and Use

Land in the project area is largely under customary ownership. There are no government reserves within the footprint, including nature reserves. Within the customary land tenure system, agricultural land (including fallow land) is held by individual households or families; other rural lands are communal community land. Some areas may also be owned by the Catholic Church and are typically associated with church and school buildings.

1.11.2.3 Socio-economic Context

The population of the area is predominantly Tanzanian of the Pogoro ethnic group, though there are a small number of households spread throughout the hamlets from other tribes (and regions) of Tanzania, including the Sukuma tribe from the Mwanza Region brought to the area for small scale mining opportunities.

Kiswahili and Kipogoro are the main spoken languages used in the villages, with limited amounts of English spoken by some households. Kiswahili and English are taught in the local (Kisewe) Primary school, with Kiswahili being used as the main written language in the villages. A secondary school is located at Nowenge, and also at Mahenge. The nearest health care centres are also in Mahenge.

Agriculture is the main source of income, with the majority of households undertaking subsistence agricultural activity. The crops grown include maize, rice, cassava, banana trees and vegetables. Involvement in waged labour is relatively low and centres around employment in the mining industry with a number of artisanal and small-scale mining companies in the region. Some individuals supplement income by harvesting building materials, specifically bamboo from community land and forested slopes and gather plants with cultural significance at certain times of the year, as well as foraging for medicinal plants, forest fruits and fungi. Some households within each hamlet undertake small scale business activities, including restaurants, maize milling, and the sale of local beer. There is no industrial activity in the project area.

Over the past decade, the area has seen some out-migration of younger people seeking employment opportunities in Mahenge, Morogoro and Dar es Salaam.

1.12 Project Implementation

1.12.1 Staged Construction Approach

The project will be executed in four stages to accommodate a staged development around the three currently identified deposits, Ulanzi, Cascade and Epanko.

Stage 1 will be the first Ulanzi process plant module capable of a nominal throughput of 1 Mtpa to produce an average of 85,000 t/y of graphite concentrate. Stage 1 will include infrastructure to support Stage 1 and Stage 2 and will be the initial production plant.

Stage 2 consisting of the second Ulanzi process plant module is based on using the same design as the first module and will double the plant throughput, increasing graphite concentrate production to an average of 170,000 t/y. The Stage 2 process plant will be commissioned approximately one year after Stage 1.

The Stage 3 process plant module will be located near the Cascade deposit and will use the same design as the first module, tripling the Stage 1 throughput and increasing graphite concentrate production to a total average of 255,000 t/y. Stage 3 will include infrastructure to support Stage 3 and Stage 4. The Stage 3 process plant will be commissioned approximately two years after Stage 1.

Stage 4 consisting of the second Cascade process plant module is based on using the same design as the first module and will quadruple the plant throughput, increasing graphite concentrate production to an average of 340,000 t/y. The Stage 4 process plant will treat Cascade and Epanko ore and will be commissioned approximately three years after Stage 1.

Figure 1-14 shows the implementation schedule for the four stages.

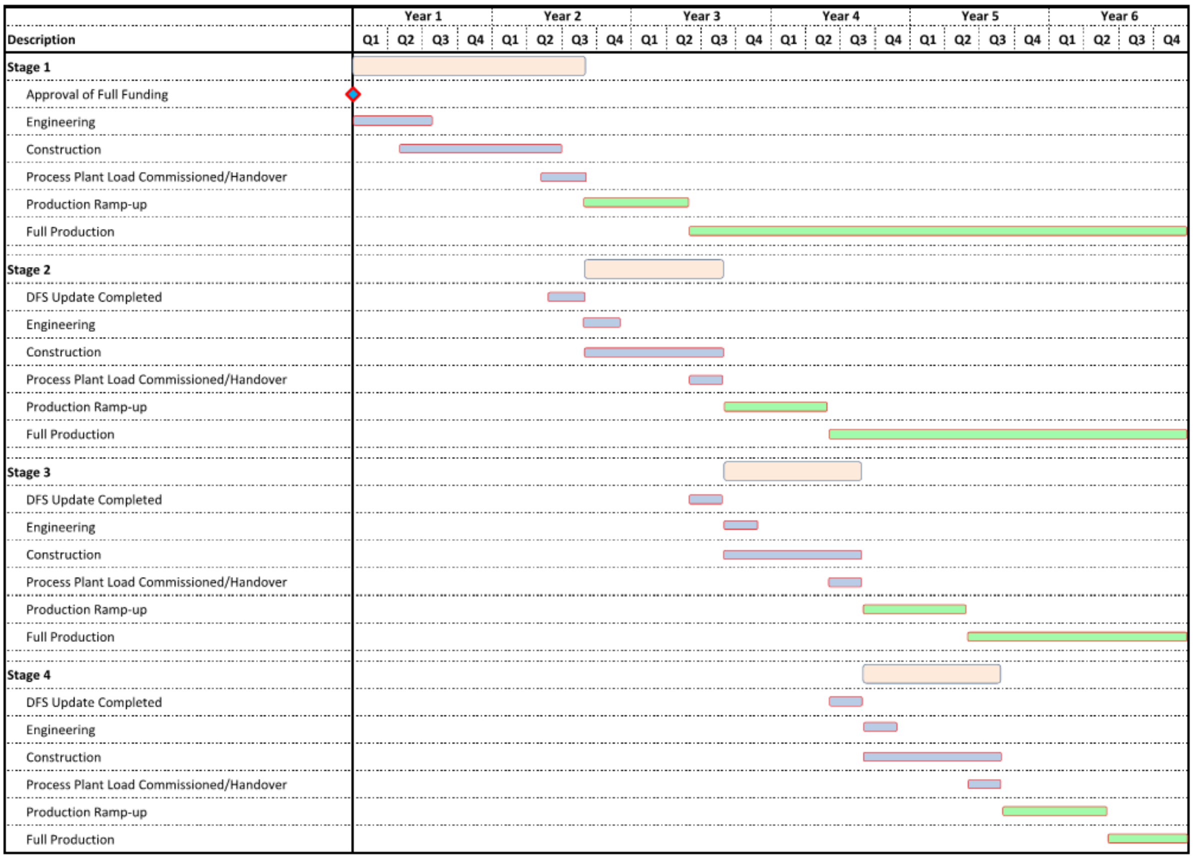

Figure 1-14 Staged Project Implementation Schedule

1.12.2 Implementation Plan

Black Rock will establish a project delivery team to execute the MGP which will consist of experienced management and technical personnel necessary to administer all aspects of the project. An engineering consultant with proven systems and procedures in the execution of mining resource projects will be appointed by Black Rock to form a combined project delivery team with Black Rock to deliver the project.

The project delivery team prime responsibilities will include:

- safety management
- contract management
- technical review
- establishment of appropriate controls and reporting
- construction and commissioning management
- liaising with statutory bodies and owners.

The services of various specialised consultants and engineers, such as for the mill residue dry stack and water embankments design will be appointed as required throughout the course of the project to support and assist in the project execution.

An operations team will be mobilised early in the project development to develop and implement a business readiness plan and ensure a smooth transition from construction to operations. The business readiness plan will include implementation of systems, recruitment and training of all operations personnel for the project. The operations team will also support the project delivery team.

1.12.3 Contracting Strategy

The process plant and associated plant infrastructure will be executed as a lump sum turn key (LSTK) engineering, procurement and construction (EPC) package using a Chinese contracting partner. The process plant EPC contract will include:

- detailed engineering
- modular off-site fabrication
- shipment to site
- assembly on site
- commissioning
- ramp up and performance testing.

Process plant handover to the operations team will be subject to acceptance testing to ensure plant operations are consistent with design parameters.

The project delivery team will review the EPC contractors design to ensure it is in accordance with Australian and Tanzanian standards and operating practices, in accordance with the required quality requirements and monitor the overall progress.

Process plant earthworks and concrete construction will be managed by the project delivery team with the design prepared by the process plant EPC contractor. A civil contractor will be appointed to perform the works.

The design and construction of the site infrastructure including access roads, accommodation village, site services, non-process plant buildings and Ifakara rail terminal will be managed by the project delivery team. Any detailed design not completed by the process plant EPC contractor will be completed by either the project delivery team or external specialised consultants.

This contracting strategy will ensure Black Rock involvement through all phases of the project while minimising the construction interface issues and risks.

1.12.4 Implementation Schedule

A project master schedule has been developed for the project covering all major activities from project approval through to commissioning and hand-over to the operations team. It also includes key milestones for the project, some of which are imposing constraints. The schedule will be extended to the next level of detail with inputs from contractors and suppliers once the project is approved and contractors are appointed.

The schedule consists of a logic-networked critical path schedule based on project requirements and acknowledges current manufacturing periods for major equipment which may change due to global demand.

The schedule is summarised in Figure 1-15.

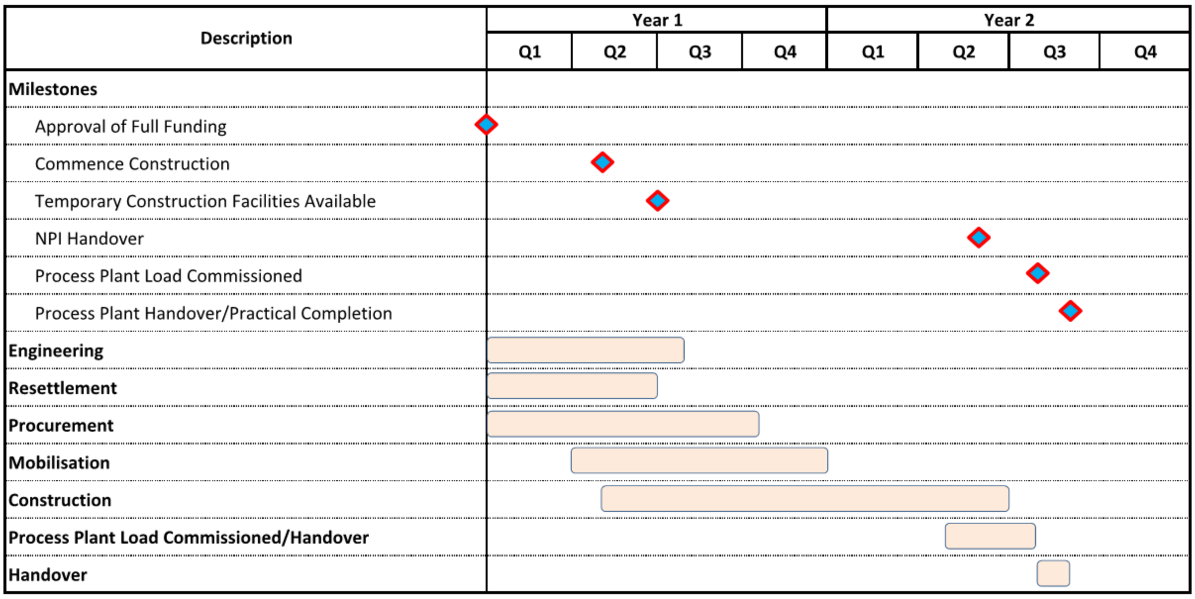

Figure 1-15 Schedule Summary

Following the necessary approvals, critical or near critical activities include:

- execution of free carry agreement with the Tanzanian Government
- obtain project funding
- appointment of the process plant EPC contractor
- detailed engineering
- procurement of long lead equipment items
- construction of access roads
- plant site bulk earthworks
- plant site civil works including receipt of concrete drawings from process plant EPC contractor
- construction of the process plant
- liquid fuel power station
- process plant commissioning, ramp up and handover.

Key equipment packages that have long lead durations are outlined in Table 1-10.

Table 1-10 Key Equipment Packages with Long Lead Durations

Equipment Package	Ex-works Lead Time (weeks)
Mobile Crushing and Screening	16-20
Dry Screens	18-20
Polishing (Attrition) Mills	18-20
Rod Mill	22-26
Ball Mills	16-18
Flotation Cells	24-26
Concentrate (Press) Filter	30-32
Mill Residue (Belt) Filter	25
Thickeners	20-22
Flotation Air Blowers	16-18
On Stream Analyser	34
Concentrate Dryer	28-30
Concentrate Bagging Plant	26-30
Screw Feeder	28

1.13 Operational Readiness

A comprehensive risk-based program has been developed to ensure Black Rock has the requisite capability and systems to operate the Mahenge Project successfully from day one.

This approach commenced with a thorough enterprise-wide risk assessment and identification of the standards, controls and systems which will be required to mitigate these risks through the life of the operation. The outcome is an intellectual architecture comprising of well thought through and effective operating systems, which is designed to ensure operational readiness and logical prioritisation of the project’s many moving parts.

The process is deliberately more detailed and involves a higher level of operational systems design than is typically undertaken by single asset sponsors for new projects of this scale. This is done primarily due to the high bar of performance that Black Rock has set for the project and the strong business imperative to have the asset predominantly run and operated by Tanzanians. In addition, Black Rock recognizes that the graphite mining industry is an emerging industry and thus has less established practices and a lesser depth of expertise than is typical in other sectors of the mining industry.

The key aims of this approach are:

- To rigorously and effectively manage the project execution and the project start up and ramp-up to full capacity, thereby avoiding operational start-up dip.
- To align the company with ISO 9000 quality compliance through effective controls and management of those controls governing product quality.

- To control the scope of roles within the company and to manage the amount of discretion that people have in their roles so that they are positioned to focus on the right 'stuff'.
- To facilitate role clarity and enabling effective decision making, successful team work, and accountability.
- To the achieve the company's vision of being "a globally significant graphite producer, who is recognised for our great people, and great products produced safely and ethically".
- To achieve the company's planned localisation targets and strategy, which will provide sustainable business opportunities and jobs for Tanzanians, and a sense of ownership of the asset within the country.
- To minimise the dependence on expensive expatriate resources.
- To drive safety, productivity and product quality through an in-built and inherent business improvement mindset.
- To enable the most efficient management of the asset in a global market, with all the inherent challenges involved in managing multiple time zones, markets and cultures.

KPMG's Mining Consulting Group (KPMG) were engaged for their proven, risk-based operational readiness methodology, and worked closely with Black Rock's expert team to develop the program. The process commenced with a series of risk workshops to identify all the risks and opportunities facing the project from feasibility through financing, permitting, project construction and into operations.

1.13.1 Company Values

A simple but powerful set of company values, known as the Reaching for the STARS Values, has been firmly established within Black Rock and will underpin the operational strategy of the company.

> ***Safety***: *All of us have an equal right to go home safely.*
>
> ***Team Work***: *We achieve superior results by working together.*
>
> ***Accountability***: *We are accountable to our family, our community and our colleagues – do them proud, give it your best.*
>
> ***Respect***: *We are a diverse organisation who respect each other.*
>
> ***Stakeholders***: *Our stakeholders measure our success – our customers, our investors and our community - all have expectations of us.*

1.13.2 Operational Strategy

Black Rock is a new company staffed by global mining and graphite industry experts. Lean, experienced and nimble, the team have a clear opportunity to provide a fresh approach to operations of a Tanzanian graphite mine and processing facility, and a global marketing function, with best operating and management practice guaranteed through effective Australian (Perth) head office governance.

The Mahenge mine and processing facility will be operated by a predominantly Tanzanian workforce and a Tanzanian leadership team (TLT), with minimal long-tern reliance on permanent expatriate personnel. This strategy will create a high level of government and community acceptance and pride in the project.

To ensure the project is run safely and will reliably produce an on-specification product at nameplate capacity and cost from day one, a robust suite of management systems and operating standards will be developed jointly by an early recruited leadership team and the Perth head office and will be implemented during commissioning. Figure 1-16 shows the top two levels of a three-level management systems hierarchy which contains 86 management systems in total.

Capable Tanzanian operational staff will be recruited with sufficient lead time to be fully trained in the operation of mine and plant with emphasis on the key controls and expectations by which their performance will be measured.

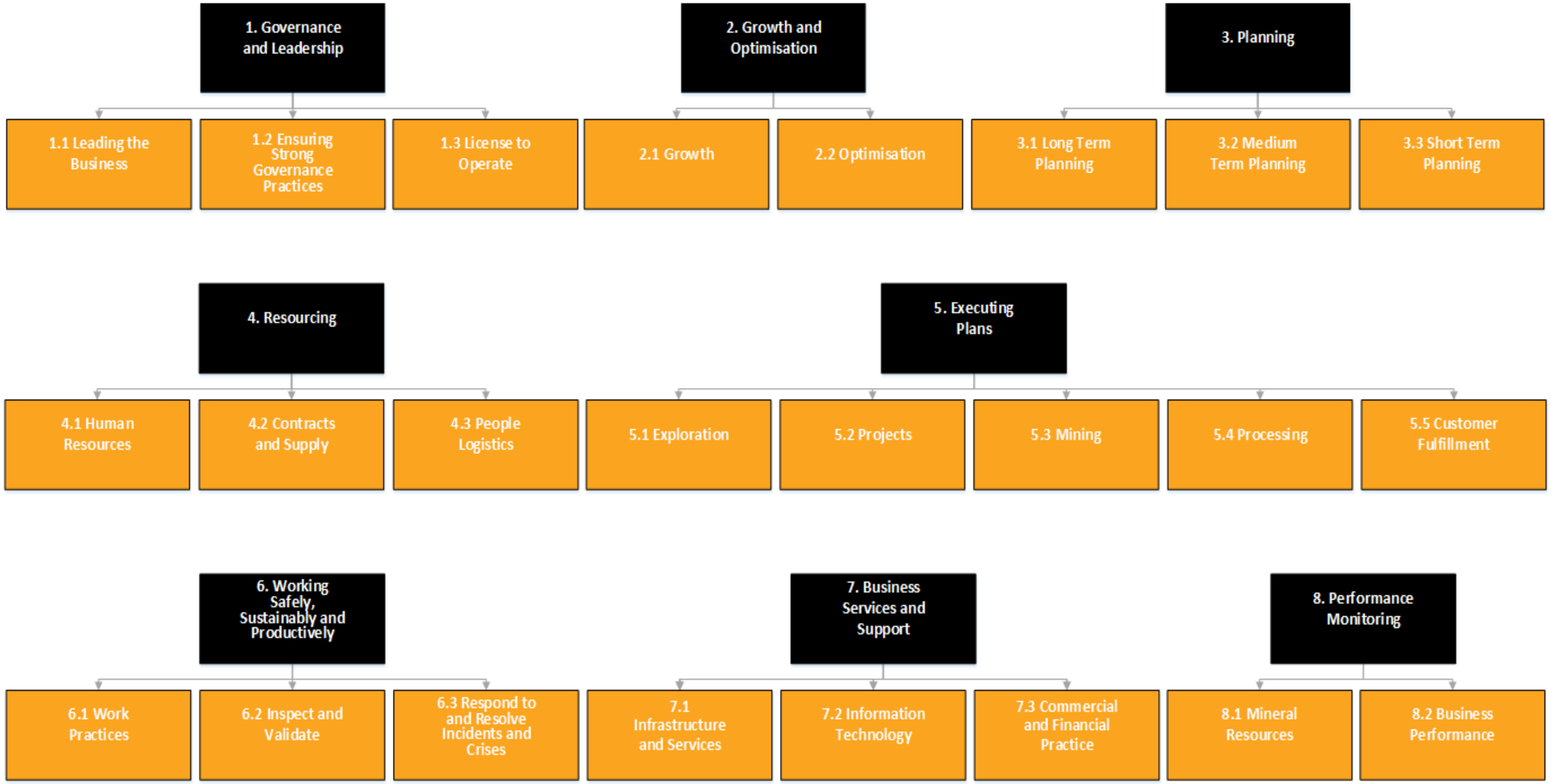

Figure 1-16 First Two Levels of the Management Systems Hierarchy

There will be early recruitment of key management and technical roles for the express purpose of developing and implementing the management systems, and then training the operating staff in the lead up to operations.

The design of the organisation structure and operational systems will be fit for purpose striking the right balance between the required level of governance and operating efficiency which will ensure sustained performance of safe, efficient, on specification operational delivery through the life of the project.

1.13.3 Risk Based Approach

An operational readiness plan has been developed using a strong risk-based approach. The lesson from other projects is that where there is a failure to fully understand and prepare for operational risks early, projects are exposed to significant value loss arising from production shortfall, out of specification product, and cost increases, collectively referred to as “start-up dip”. In addition, there is often a high level of safety and environment incidents.

Project risk workshops identified the following key project risks:

- failure to finalise the 16% free carry agreement with the Tanzanian Government
- failure to achieve project financing
- failure to achieve project permitting and land compensation arrangements
- project cost overrun or delay resulting in significant dilution of value for existing shareholders
- excessive working capital requirements for the project and possible loss of market niche for Mahenge’s high value graphite products, due to:
    - inadequate orebody knowledge or unexpected complexity
    - inadequate operational preparedness and capability resulting in out of specification product
    - product logistics delays
    - sales and marketing issues
    - production issues
- loss of government or community support for the project
- health, safety and environmental (HSE) risks.

These risks have been captured in a comprehensive and detailed risk register containing over 400 detailed risks. The approach has been to “leave no stone unturned”, and to prepare mitigation strategies accordingly.

Risk controls have been identified for all risks, comprising:

- mitigation actions to be completed prior to commencement of operations
- operational standards and management systems which will govern operations and mitigate risks through the life of the project.

Risk mitigation actions include:

- Clarification on the structure of, and resolution of the government 16% holding. This is being progressed using a similar strategy in which the mining licences were secured. This involves the use of local counsel advice on issues of law, and wide ranging engagement with relevant arms of the government. Critically, this approach is not solely focused on the Mining Commission but includes the Treasury, Attorney General and others.
- Specific studies to ensure full anticipation of technical, quality, reliability and environmental issues.
- Engagement of specialist consultants to advise on critical technical, marketing and government and community aspects of the project.
- Design reviews to ensure engineering controls are included in plant design.
- Specific obligations to include in third-party contracts that will be critical to safety, environment, production and product quality.
- Identification of key points of difference between Mahenge and its competitors in financial, labour and product markets and in the eyes of government and community.
- Definition of infrastructure upgrades and government co-commitments.
- Establishment of a project controls for construction management.
- Planned and targeted early recruitment and training.

On-going control of risk through the life of the operation will be through effective implementation of 44 standards and 86 management systems.

In particular, the controls for HSE risks are documented in a set of HSE standards and systems which collectively define the Health, Safety and Environment Management System (HSEMS) for the project. The HSEMS, consists of a set of 24 Health and Safety standards, 7 Environment standards, and 23 systems which are critical to effective HSE management. This provides a comprehensive risk management framework for the project.

1.13.4 Development of Operational Readiness Plan

These risk mitigation actions have been prioritised and sequenced into a comprehensive work plan for operational readiness. The work plan also includes completing the design of standards and systems in a prioritised way and implementing these as required for the project construction phase and for the operations phase of the project.

The operational readiness project plan has clear links to the financing, permitting, and construction project plans.

The process to build the operational readiness plan is summarised in Figure 1-17.

Risk Register – 400 risks

Risk Description	Standard(s)	Development and Project Phase Considerations and Actions
	Risk Controls	
Product quality not to specification due to inadequate orebody knowledge	Product Quality Standard	1. Complete comprehensive geo-metallurgical studies for all geological ore domains 2. Pilot plant trials
Damage to product packaging in containers due to transit	Product Quality Standard	3. Design packaging and handling equipment to minimise risk of container and packaging damage
Process plant doesn't achieve product quality due to asset unreliability	Product Quality Standard	5. Undertake FMECA/RCM design of asset management strategy for process plant
Process plant doesn't achieve product quality due to inadequate operator capability	Product Quality Standard	6. Ensure operations control is intuitive and visual as far as possible 7. Develop a process plant simulator for operator training

Standards – (44)

Defines what is required to manage each risk during operations :

Product Quality Standard
- Requirement for grade control models for detailed delineation of orebody
- Requirement for product freight contracts to include product stewardship provisions
- Requirement to optimise maintenance strategy for process plant
- Requirement for process plant operations manual and decision support tool
- Requirement to train process plant operators to strict operations protocols

Management Systems – (86)

Defines the Processes, Responsibilities, Software, Management Controls to ensure requirements are consistently met over time

Grade Control Modelling System

General Contract Management System

Reliability and Maintenance Tactics Planning

Employee Work Practices Management System

Competency Management and Development

Operational Readiness Plan

A comprehensive plan :
- *to complete all of the Development and Project phase actions*
  and
- *to design and implement the Management Systems for the operation*

Figure 1-17 Process Used to Build the Operational Readiness Plan

1.13.5 Implementation of the Operational Readiness Plan

The operational readiness plan will be implemented by an early recruited operations team, supported by expert consultants where required, and with a Project Management Office (PMO) function to track and report on status throughout. The recruitment schedule is aligned with the operational readiness plan to ensure just-in-time on-boarding of key roles to complete work plan tasks. The clear remit of early recruited roles will be to build the organisational systems and to have their teams fully operationally-ready at start of operation.

KPMG's operational readiness methodology will be used to support key aspects of the implementation including coaching and training on standards and systems design, access to a comprehensive library of checklists and requirements from equivalent operations design, and executive leadership advice where required.

There is a close relationship between the operational readiness plan and the human resources strategy for the project. In particular, the design of the standards and systems will provide clear role clarity for all operations positions. The training and development of personnel recruited into leadership roles will include training in standards and systems design methodology and in the style of leadership required of Black Rock managers at all levels to ensure that the management systems are effectively utilised.

1.14 Human Resources

There are many human resources (HR, also referred to as personnel) considerations required to establish the MGP and move from construction to commissioning through to steady state production. The requirements and inputs to establish the department as well as the capabilities and ongoing requirements and inputs to manage the function longer-term and the implications of this for the company and Tanzania (host country) have all been given due consideration.

The total permanent workforce for Stage 1 is estimated at 413 people consisting of 346 Black Rock employees and 67 contractors. The organisational structure is shown in Figure 1-18. The labour ramp up through pre-production into the first seven years of production is shown in Figure 1-19 and outlines expatriates, nationals and locals. The workforce peaks at 966 people in year 8 with all three stages are in operation.

	#	Level
Vice President of Operations	1	EL1a
Vice President of Operations Assistant	1	EL10a

PROCESS

	#	Level
Plant Manager	1	EL2
Production Superintendent	1	EL3
Operations Leader	3	EL5
Shift Supervisor	4	EL7
Operator - Crushing	4	EL9
Operator - Milling	4	EL9
Operator - Flotation	4	EL9
Operator - Concentrate Handling	8	EL9
Operator - Tailings Filtration	4	EL9
Operator - Control room	8	EL9
Day Crew/Reagents	8	EL9
Senior Plant Metallurgist	1	EL4
Plant Metallurgist	2	EL5
Bureau Veritas Staff:		
Expat Manager	1	C3a
Second-in-Command	1	C3a
Lab Technicians	8	C3b
Sample Preparers	14	C3b
Maintenance Manager	1	EL2
Maintenance Foreman	1	EL6
Maintenance Shift Supervisor	4	EL7
Boilermaker	4	EL8
Fitter/Mechanic Day Shift	6	EL8
Fitter/Mechanic Night Shift	2	EL8
Electrical & Instrumentation Supervisor	2	EL7
Electrician Day Shift	4	EL9
Electrician Night Shift	2	EL9
Instrumentation/Process Control Technician	4	EL9
Maintenance Planner Supervisor	2	EL7
Maintenance Planner	2	EL4
Mechanical Engineer	1	EL5
Mechanical Engineer (National)	1	EL5a
Electrical Engineer	1	EL5
Electrical Engineer (National)	1	EL5a
Process plant total employees:	**114**	

ADMINISTRATION

	#	Level
Administration Manager	1	EL2a
Administration Manager Assistant	1	EL10a
Camp Manager	1	C2a
Deputy Camp Manager	1	C2a
Camp Staff	12	C2b
Camp Staff (Local)	26	C2c
Finance Superintendent	1	EL3a
Accounts Secretary	1	EL10a
Accounts Officer	1	EL10a
Pay Roll Controller	1	EL10a
Accountant	3	EL5a
Public Relations Officer	1	EL10a
Receptionist	1	EL10a
HS&E Manager	1	EL2
Safety Superintendent	2	EL3a
Safety Officer	2	EL5a
Paramedic	0	C1a
Doctor	1	C1b
Clinical Officer	2	C1c
Training Officer	1	EL5
Training Officer (National)	1	EL5a
IT Superintendent	1	EL5a
IT Technician	2	EL8a
HR Superintendent	1	EL3a
HR Officer	2	EL10a
Recruiter	1	EL10a
Travel Department	2	EL10a
Environmental Superintendent	1	EL3a
Environmental Officer	4	EL5a
Supply Superintendent	1	EL3a
Procurement Supervisor	1	EL7
Procurement Officer	2	EL10
Store Supervisor	2	EL7
Store Personnel	4	EL11
Security Superintendent	1	EL3a
Security Supervisor	4	EL7
Security Guard	64	EL11
Administration total employees:	**154**	

LOGISTICS

	#	Level
Logistics Manager	1	EL2a
Logistics Manager Assistant	1	EL10a
Logistics Superintendent	2	EL3a
Plant Logistics Shift Supervisor	4	EL7
Plant Logistics Shift Operators	16	EL9
Logistics Road Transport Drivers	16	EL9
Ifakara Inland Port Logistics Supervisor	4	EL7a
Ifakara Inland Port Logistics Operators	16	EL9a
Ifakara Inland Port Maintenance Supervisor	2	EL7a
Ifakara Inland Port Maintenance Operators	4	EL9a
Logistics employees:	**66**	

MINING AND GEOLOGY

	#	Level
Mine Manager	1	EL2
Mine Clerk	2	EL10
Mine Superintendent	1	EL3a
Senior Mining Engineer	1	EL4a
Mining Engineer	2	EL5a
Senior Geologist	1	EL4a
Mine Geologist	2	EL5a
Senior Surveyor	1	EL4a
Surveyor	1	EL5a
Pit Samplers	4	EL10
Technical Services Superintendent	1	EL3a
Mine Shift Supervisors	2	EL7
Operations Clerk	2	EL10
Operators	32	EL9
Drill & Blast Supervisor/Shotfirer	1	EL7
Blast Crew	4	EL9
Maintenance Superintendent	1	EL3a
Maintenance Planner	2	EL4a
Maintenance Clerk	2	EL10
Mine Training Officer	2	EL8
Maintenance Supervisors	2	EL7
Maintenance (Technical)	10	EL8b
Maintenance	2	EL11
Mine employees:	**79**	
Total employees:	**413**	

Figure 1-18 Stage 1 Organisational Chart

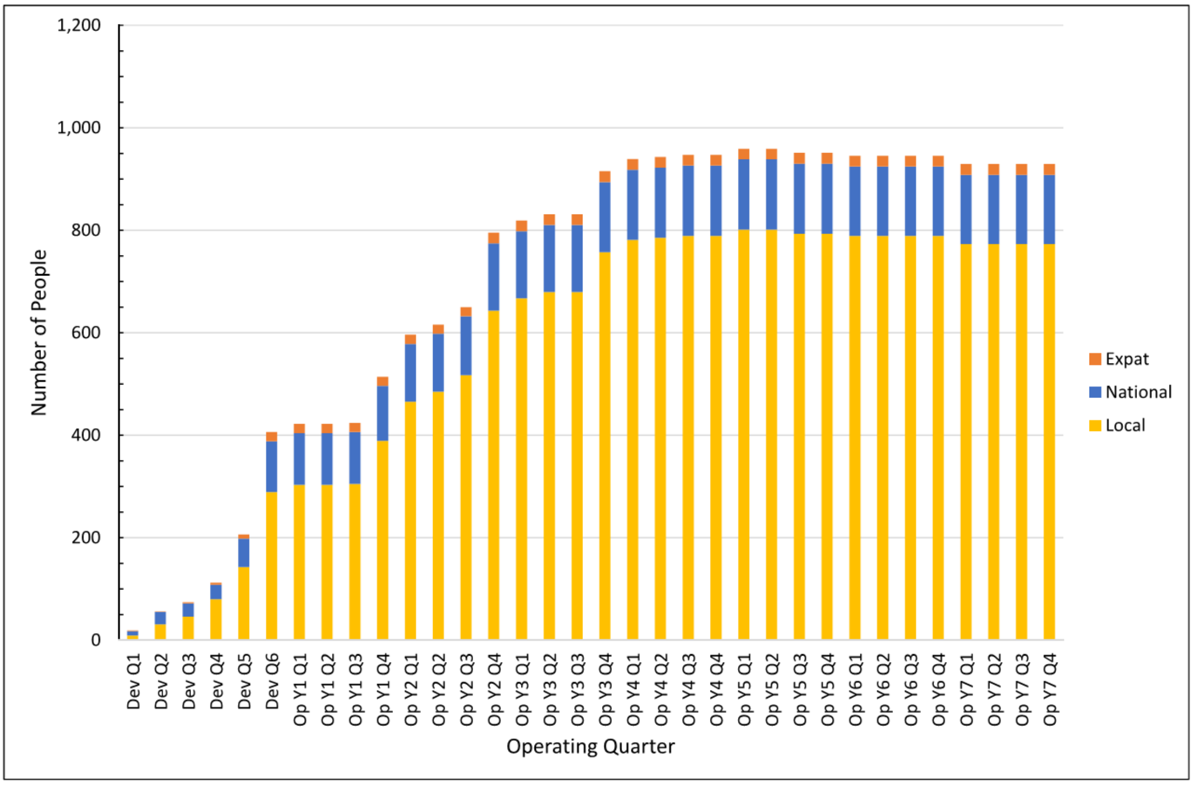

Figure 1-19 Labour Ramp Up from Pre-production through 7 Years of Production

Black Rock's people strategy and approach is driven by their business strategy. Continued alignment between the two strategies is crucial to the ongoing success of the project. Black Rock's vision is "to be a globally significant graphite producer, who is recognised for our great people, and great products produced safely and ethically."

The company's values articulate what Black Rock stands for and define the required behaviors expected from everyone who joins the team from this point forward. The values form the acronym STARS which is easy to remember and incorporates all the important elements for an effective team and workforce.

Safety is the number one company value and priority for its people. Black Rock is committed to all its people having an equal right and expectation to go home safely. A safety management system focused on People, Process and Place will be developed to ensure that all aspects are combined and directed at managing safety so that the company and its people can uphold the company values. Australian and Tanzanian safety standards will be applied (processes, behaviours and standards) and embedded as the number one, non-negotiable priority, using a Safety by Design approach.

To establish a functioning and flourishing personnel function and team, seven key aspects are required and planned to be addressed by Black Rock. These seven essential elements of effective teamwork and leadership combine to address and get the right results, the right way and at the right time for the organisation and the host country. The seven Strategic HR pillars are:

- Self and team awareness to get the best out of people.

- Shared vision, values and communicate business strategy.
- Clarity of roles and processes, legal compliance and technology.
- Develop, build and maintain commitment and trust.
- Appreciating differences (diversity and inclusion).
- Accountability and clarity.
- Individual competence and organizational capability.

Each of these pillars underpins the development and maintenance of a thriving, engaged, committed and high performing team for the duration of the project. To deliver the right company culture, Black Rock will develop a common and shared ethos of success. The systems and processes to be developed will establish a common measure of success for the project through its people.

Black Rock is clear regarding the progressive and performing culture it wishes to establish and maintain, aligned with the company values. The Employer Value Proposition, employer brand and early start employees and leaders will start off the culture, but it’s only brought to life by the employees living it. This expectation will be communicated to candidates throughout the recruitment process and will be re-enforced during onboarding and throughout the employment relationship.

The workplace culture will be fundamentally underpinned by two key philosophies:

- Equal employment opportunity for all: meaning no religion or gender or other bias will form part of decision making processes around recruitment, progression or performance.
- Local, permanent workforce wherever possible: meaning Black Rock will recruit locally against skills and experience requirements and then look internationally if required. Where local talent is not available in the first instance and international talent is required, Black Rock’s commitment is to train local people up to the standard required to perform the roles in the longer term. The company will also implement an apprenticeship program in the longer term to deliver on this commitment.

The expectations of every single person employed or engaged by Black Rock is for them to be a valued team member, committed to safe behaviours and competency, fairness and respect. Black Rock is committed to having people in permanent roles wherever possible and developing talent in-country. Black Rock will implement a robust program to manage talent, career paths, internal mobility and localisation. This is a key component of the company’s commitment to localise positions wherever possible.

Black Rock will comply with (and seek local legal advice as appropriate) the Employment and Labour Relations Act 2004 as well as the Labour Institutions Act 2004 and the subsequent Government Notices for Employment and Labour Relations Regulations and the Fundamental Rights and Protections and Employment Standards. All employment conditions and leave provided to Tanzanian nationals will align and conform to the statutory requirements and all HR processes and systems will be compliant with the laws of Tanzania.

The work required to establish the necessary processes and level of readiness to complete the work required from a personnel perspective should be considered to increase exponentially as the mine progresses from DFS through the next stages. Prior to Black Rock recruiting positions for the construction, commissioning and production phases of the project, various processes will need to be established before moving onto the next phases from a people perspective. These processes are outlined in further detail in the report.

1.15 Operating Cost Estimate

An operating cost estimate (OPEX) was developed for the MGP and is presented in US dollars (US$) using prices obtained in, or escalated to, the third calendar quarter of 2018 (Q3 2018). The estimate has an accuracy of ±10% and were developed by CPC Project Design Pty. Ltd. (CPC), using inputs from other study sub-consultants and Black Rock where appropriate.

The estimate covers all costs associated with mining, processing and transporting the final concentrate to end users and includes general and administration (G&A) costs associated with the project.

The costs exclude all taxes, permitting costs, corporate administrative costs and other government-imposed costs unless otherwise noted with no allowance for escalation or inflation.

Mining costs have been based on the expected mining schedule tonnage movements and all in mining cost developed by Black Rock from first principles. This cost includes all labour and fuel costs based on owner operated mining with the direct purchase of the mining fleet.

The processing cost estimate is based on new processing facilities for graphite production built in four stages consisting of near identical processing trains staggered in development with each stage bringing on a plant feed throughput of 1 Mt/y beginning with Stage 1 in year 1, followed by Stage 2 starting in year 2, Stage 3 in year 3 and finally, Stage 4 in year 4.

Labour workforce requirements have been estimated for direct maintenance, operations, administration and logistics personnel. Labour salaries and on-costs were provided by Mercer.

Electrical power draw quantities were derived from the mechanical equipment list and are based on utilisation and expected demand. Costs for the initial rental of the power station including mobilisation/demobilisation, fixed monthly charges and variable supply charges have been provided by a reputable company currently active in Tanzania. Diesel will be free issued to the rental contractor by Black Rock. Cost for purchasing grid power and associated tariffs has been provided by TANESCO, the in-country provider of power and will be used once the grid upgrades have been completed. Table 1-11 shows the fixed and variable costs for both power supply options and includes fuel consumption costs for the rental option.

Table 1-11 Power Costs

Cost	Unit	On-site Power Generation (Rental)	Grid Power (TANESCO)
Charge to Provide Services (Fixed Cost)	US$/month	176,000	70,118
Power Supply (Variable Cost)	US$/kWh	0.263	0.067

Diesel fuel consumption is based on estimates from suppliers for equipment and mobile fleet. Diesel pricing was quoted by a local provider at US$0.972/L including freight.

Maintenance costs are taken as a percentage of initial equipment capital costs. This accounts for replacement of wear parts and other miscellaneous components for the equipment.

Administration costs includes general site costs, insurances, vehicles, Ifakara operating expenses and other ancillary costs associated with operating the project. Contracts for operation of the camp, medical and first aid facility and laboratory have been sourced and budget pricing was obtained for use in the opex.

Product logistics will be managed by Black Rock with the movement of containers from the rail terminal in Dar es Salaam to the port and back outsourced. Transport and shipping costs have been developed for trucking of bagged product from site to Ifakara, containerising the bags at Ifakara and transporting by rail to Dar es Salaam.

The LOM operating cost summary is show in Table 1-12.

Table 1-12 Summary of LOM Average Operating Costs

Area	LOM Average		
	US$M/y	US$/t ore feed	US$/t graphite product
Mining	30.3	8.28	106.38
Processing	48.1	13.16	169.08
Administration	4.9	1.34	17.26
Logistics (Black Rock)	6.8	1.87	24.04
Transport and Freight	21.6	5.92	75.99
Total	**111.7**	**30.58**	**392.76**

1.15.1 PFS Comparison

Figure 1-21 outlines the major items contributing to the LOM average opex change from the PFS to the enhanced DFS.

Mining costs have been refined since the PFS based on an optimised mine plan which includes the expected mining schedule tonnage movements and mining cost developed by Black Rock from first principles. The cost includes all labour and fuel costs based on owner operated mining with the direct purchase of the mining fleet. As a result of the optimisation, the costs have decreased.

Mill residue handling costs were not included in the PFS and have been added into the DFS hence the addition of this cost. The PFS was based on multiple wet tails dams which would be constructed throughout the mine life.

Reagents, consumables and water consumptions have been updated based on the most recent testwork data and pricing obtained in 2018. The PFS included fuel consumption in this category which has been calculated separately for the DFS.

Fuel consumption was included in the reagents, consumables and water consumption category for the PFS and assumed a consumption of 15 L/t concentrate for product drying. The fuel consumption for the DFS is based on vendor data sized specifically for the operation and is almost twice that assumed in the PFS hence the increase in cost. Fuel consumption has also increased from the PFS for the mobile equipment on site due to the inclusion of the haul truck fleet transporting product from site to Ifakara which was not included in the PFS also contributing to the increase in cost.

Power consumption for the process plant has increased from the PFS and excluded all non-process infrastructure which is included in the DFS. This is the basis of the large increase in operating cost. The power costs used were similar in both studies however the PFS allowed for onsite power generation for the first two years of operations however it did not include the monthly charges for the rental of the generators.

Logistics for the PFS was based on utilising a contractor to transport bagged concentrate from site directly to Dar es Salaam port via road. The DFS is based on Black Rock operated transport of the bagged concentrate from site to the inland port and rail terminal at Ifakara where the consolidated shipments will be loaded onto rail car and transported to Dar es Salaam port. The inclusion of owner operated trucking and utilisation of the TAZARA rail line have resulted in a decrease to the logistics operating costs however, this has led to an increase in fuel costs as noted above.

G&A costs have been updated for the DFS and have resulted in a slightly higher cost than the PFS due to the inclusion of the logistics G&A costs for hauling product, operating the Ifakara warehouse and vehicle insurances.

Maintenance costs for the DFS have been calculated for each stage of the project whereas in the PFS the cost was calculated for a single stage and not increased when the second stage was installed hence the increase in the LOM opex cost to the DFS.

Personnel numbers have increased slightly from the PFS due to the inclusion of owner operated logistics from site to Ifakara. The costs have decreased in the DFS however due to maximising the use of local and national labour over expatriates.

Travel, accommodation and meals costs have increased slightly based on actual budget quotations for provisions and changes to the number of personnel as noted above.

There was a decrease in cost from the DFS to the enhanced DFS due to the distribution of fixed overhead costs across four stages instead of three.

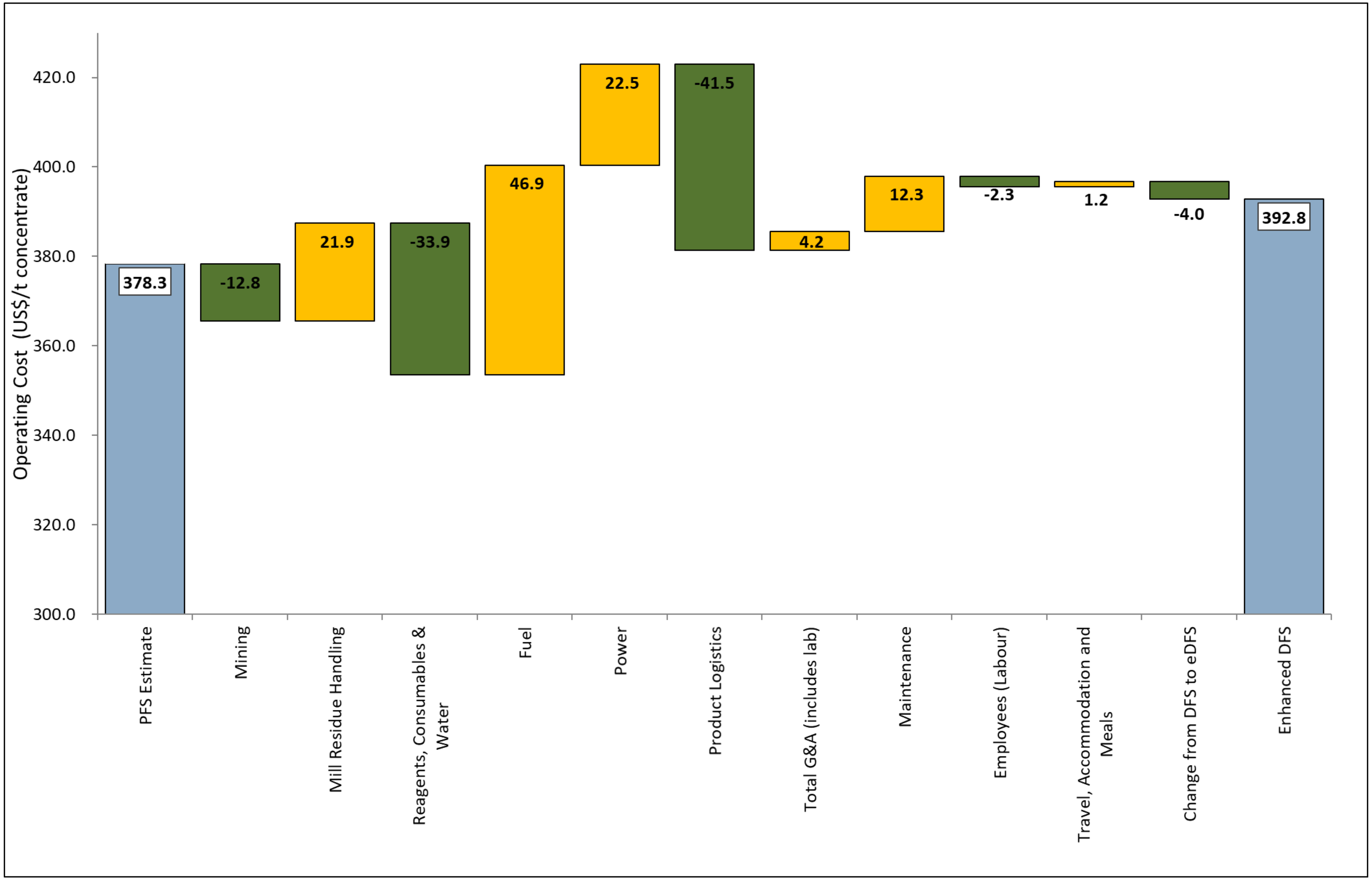

Figure 1-20 PFS to the Enhanced DFS LOM Average Opex Movement

The comparison of the LOM average operating costs from the PFS, DFS and enhanced DFS are shown in Table 1-13.

Table 1-13 LOM Average Operating Cost Comparison

Area	LOM Average (US$/t concentrate)		
	PFS	DFS	Enhanced DFS
Mining	89.5	76.7	76.7
Mill Residue Handling	-	21.9	29.7
Reagents, Consumables & Water	61.8	27.9	28.6
Fuel	1.5	48.4	46.7
Power	38.2	60.7	60.2
Product Logistics	117.0	75.5	76.0
Total G&A (includes lab)	17.7	21.9	19.3
Maintenance	11.2	23.5	21.7
Employees (Labour)	37.6	35.3	29.8
Travel, Accommodation and Meals	3.8	5.0	4.0
Total	**378.3**	**396.8**	**392.8**

1.16 Capital Cost Estimate

The capital cost estimate (capex) has been compiled by CPC and is based on the design, supply, fabrication, construction and commissioning of a new graphite process plant in Tanzania and includes supporting infrastructure and indirect costs. In addition, mine establishment and infrastructure costs are included.

The capex covers the design and construction of the MGP process plant and all associated infrastructure, equipment and ancillaries. The estimate has a base date of Q3 2018 and is reported in US$. No allowances were made for the costs of escalation, pre-implementation studies, financing, taxation, mining rights, rehabilitation and closure.

The capex has been classified as a Class 3 estimate with an accuracy of ±10% as defined by AACE International. The estimate relies predominantly on supplier and/or contractor quotations and/or tenders. Preliminary material take offs (MTOs) for earthworks, structural steel, platework, concrete, piping, valves, instrumentation and cables were developed to determine quantities for estimating.

The capital cost required to develop the project is estimated at US$115.6 million (M) for Stage 1.

Where appropriate, capital costs were deferred and included in the sustaining costs of the project. This applies to construction of Stage 2, Stage 3 and Stage 4 processing facilities, mill residue dry stacking lifts, final pond embankments, storm water embankments and mobile equipment addition/replacement.

The estimated capital costs for all four stages are reported in Table 1-14.

Table 1-14 Total Project Development Capital Costs

Area (WBS Level 1)	Stage 1 '000 US$	Stage 2 '000 US$	Stage 3 '000 US$	Stage 4 '000 US$	Total '000 US$
Mining	10,165	-	-	-	10,165
Ifakara	1,366	1,041	727	682	3,816
Infrastructure	14,315	3,325	53,705	40,976	112,321
Process Plant	50,877	45,300	4,737	4,293	105,207
Site Support (Temporary Services)	1,767	194	194	194	2,349
Indirects	9,904	6,955	8,468	6,955	32,282
Owners Costs	16,174	5,160	6,294	5,160	32,788
Contingency	11,000	7,500	11,200	8,800	38,500
Total	**115,569**	**69,474**	**85,324**	**67,060**	**337,428**

A summary of the major cost components included in Stage 1 of the capex is shown in Table 1-15.

Table 1-15 Major Capex Cost Driver Quantities (Stage 1)

Trade Description	Major Commodity	Unit	Total
Architectural	Brick and Block Building	m^2	971
Bulk Earthworks	Bituminous Liner	m^2	133,178
	Bulk Excavation	m^3	146,131
	Bulk Filling	m^3	188,380
	Clear and Grub	m^2	553,250
	Quarried Marble	m^3	273,710
Civil	Reinforced Concrete	m^3	6,906
Cladding	Cladding	m^2	22,596
Electrical	Cable	m	268,888
	Cable Terminations	no.	19,740
	Conduit	m	36,882
	Fibre Optic	m	7,820
Flooring	Grating	m^2	8,738
	Kick Plate	m	10,581
Hand Railing	Hand Railing	m	3,527
Platework	Platework	t	412
Steel	Structural Steel	t	1,178

1.16.1 PFS Comparison

Figure 1-21 outlines the major items contributing to the capex change from the PFS to the enhanced DFS.

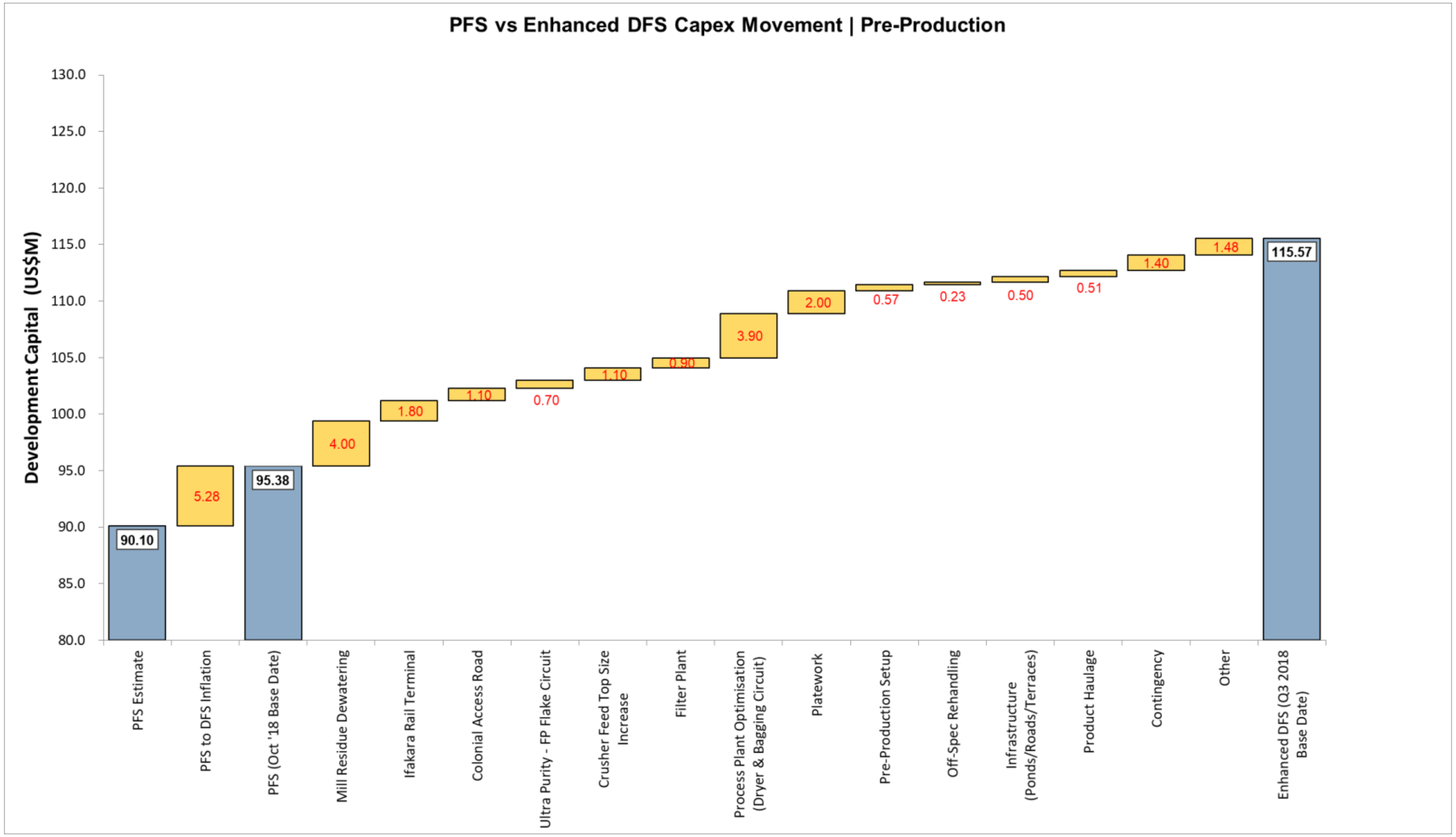

Figure 1-21 PFS to Enhanced DFS Capex Movement for Stage 1 Capex

1.16.2 Range Analysis (Stage 1 Only)

Contingency is a specific monetary provision in the estimate of a project with a defined scope of work that accounts for the uncertainties associated with the various estimate elements (e.g. quantities, unit prices, and schedule activity durations) and is fundamentally aimed at deriving an expected final cost outcome.

Given the inherent nature of contingency, namely that it is a specific monetary provision for known items with an unknown cost impact, rather than unknown items with an unknown cost impact, it does not cover scope changes, specification changes, or project exclusions. In accordance with best practice associated with capital cost estimating, Stage 1 contingency was determined by developing a probabilistic contingency risk model.

The model was developed using the Oracle “Crystal Ball” software package.

The expected accuracy ranges listed in the AACE estimating guideline were used as a guide for the three point estimate ranges. These three point estimates were summarised at WBS Level 2 and the probabilistic contingency risk model was developed and “run” at this level.

A BetaPERT distribution was selected for all models. The BetaPERT distribution is derived from the beta distribution and is commonly used in project risk analysis for assigning probabilities to task durations and costs and is a continuous probability distribution.

There are three conditions underlying the BetaPERT distribution:

- the minimum value is fixed
- the maximum value is fixed
- the most likely value falls at a peak between the minimum and maximum values, indicative of the fact that values near the minimum and maximum are much less likely to occur than those near the most likely value.

The calculated low and high values from the three point estimates were assigned to the respective minimum and maximum values in the distribution, with the neat estimate value being assigned to the most likely value in the distribution.

The probabilistic contingency risk model was based on 10,000 iterations of the model.

The output from this analysis was based on a distribution of likely outcomes for the total project cost (point estimate value), which can be summarised in a histogram and distribution curve. The histogram (also called a ‘Bell-curve’) displays the shape of the distribution with the maximum, minimum and mean values.

The results were graphed as a cumulative probability distribution curve (also called an S-curve), from which it is possible to directly determine the amount of contingency required to achieve the desired probability of under-running a certain target (see Figure 1-22).

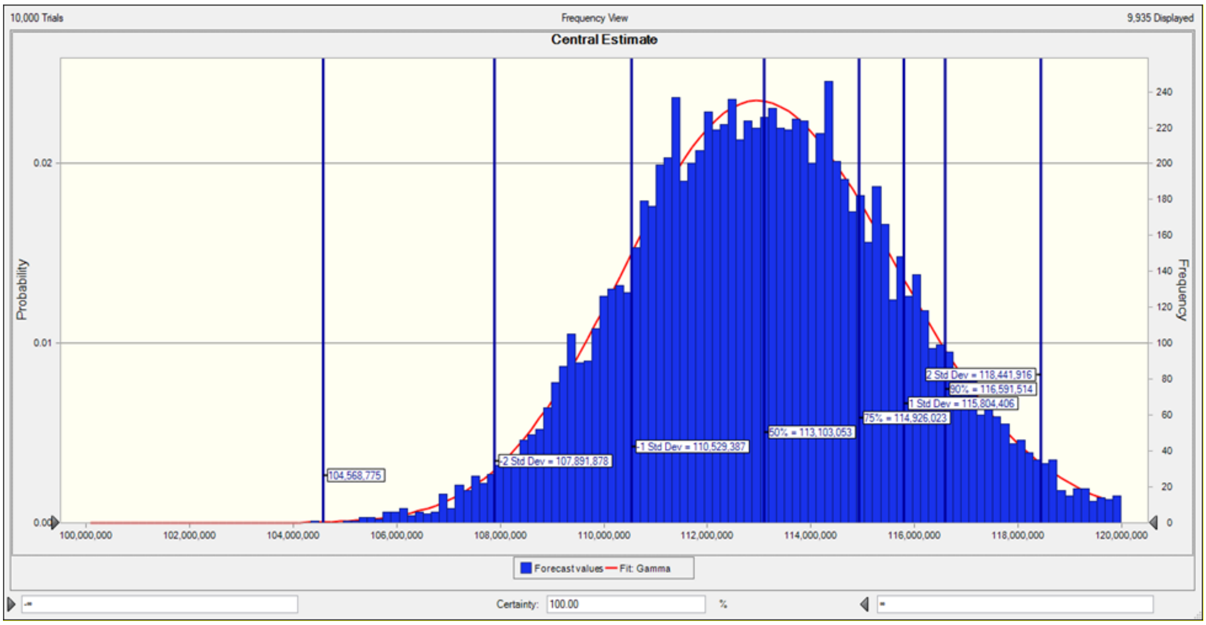

Figure 1-22 Cumulative Probability Distribution Curve

Based on the output, the range analysis advocated a contingency for Stage 1 capex of circa US$8.5M. Subsequent to the outcome of the range modelling the project team took the view of including US$11M of contingency into the estimate, theoretically increasing the project confidence to about P_{80}. Refer to Table 1-16 for reference.

Table 1-16 Probabilistic Outcomes for Stage 1 Capex

Percentile	Total (US$) (Inclusive of Contingency)	Contingency	
		Amount (US$)	% of Base Estimate
P0	104,432,450	-136,324	0.13
P5	108,980,388	4,411,613	4.22
P10	109,840,816	5,272,041	5.04
P20	110,930,695	6,361,920	6.08
P30	111,695,882	7,127,107	6.82
P40	112,408,477	7,839,702	7.50
P50	**113,103,053**	**8,534,279**	**8.16**
P60	113,796,612	9,227,837	8.82
P70	114,503,357	9,934,583	9.50
P75	114,926,023	10,357,249	9.90
P80	115,365,627	10,796,853	10.33
P90	116,591,514	12,022,740	11.50
P95	117,604,995	13,036,220	12.47
P100	124,277,802	19,709,027	18.85

1.17 Marketing

1.17.1 Graphite Pricing

Market volume and pricing has historically been led by steel markets, and consequently pricing has been determined by the rate of Chinese industrialisation. The advent of lithium ion batteries, increased demand for thermal management products particularly in electronics and expanded graphite for fire suppressant is reshaping markets, product types and quality premiums. Two vectors impacting pricing relative to historical trends are increased price premiums attached to higher specification concentrate grades and flake size.

Mine gate pricing is conventionally reported as a weighted average sales price by product and application to arrive at average sales prices. Public pricing information has been sourced from industrial research providers including, Benchmark Minerals, Roskill, Industrial Minerals, and RefWin China. Additionally, customer feedback and access to industry experts has been referenced in developing an appropriate price forecast. Pricing developed in this report is considered realistic and achievable.

Pricing for graphite products is not limited to a single price point for each grade. Multiple price points exist across many applications, and are dependent on several factors including:

- quantities
- documentation
- packaging
- inventory management/safety stock
- take or pay provisions
- length of supply contract or agreement
- credit terms
- Incoterms.

Convention is for pricing to be reported by deposit and is characterised as a deposit signature. Individual characteristics will determine the final price by deposit type. The two flake graphite signatures at Mahenge project are Cascade and Ulanzi.

For simplicity, commercial confidence, and in absence of reported public commercial sales, both signatures have been averaged and are assumed to be common for purposes of economic analysis of this project.

Company specific price estimates vary from external industry sourced data however for external public reporting of valuation, referenced public data has been selected. Pricing has been referenced to Roskill *Natural and Synthetic Graphite: Global Industry, Markets and Outlook, 2018© Roskill, 2018* (Figure 1-23). Roskill estimates have been modified by Black Rock to account for targeted grades not being reported and for flake sizing not considered by Roskill. Time periods have been averaged to generate a real price for project start date.

FOB realised pricing has been generated by evenly weighing for freight between Tanjin, Tokyo and Busan. Nominal frictional costs for agency, long term contract discounts of 2.5% each have been added to generate FOB pricing Dar es Salaam. Pricing used in the economic analysis for 97.5% LOI product, FOB Dar es Salaam is shown in Table 1-17.

Table 1-17 FOB Dar es Salaam Pricing Used in Economic Analysis for 97.5% LOI

Mesh #	Segment Pricing (US$/t)	Basket Weight (%)	Shipping (US$/t)	Channel & Agent (US$/t)	Contract Discounts (US$/t)	Basket (US$/t)
+32	1,579	5	1.65	1.97	1.97	73
+50	1,449	18	5.96	6.52	6.52	242
+80	1,444	36	11.89	12.98	12.98	481
+100	1,379	9	3.06	3.19	3.19	118
-100	1,314	32	10.52	10.44	10.44	386
	1,404	**100**	**33.08**	**35.10**	**35.10**	**1,301**

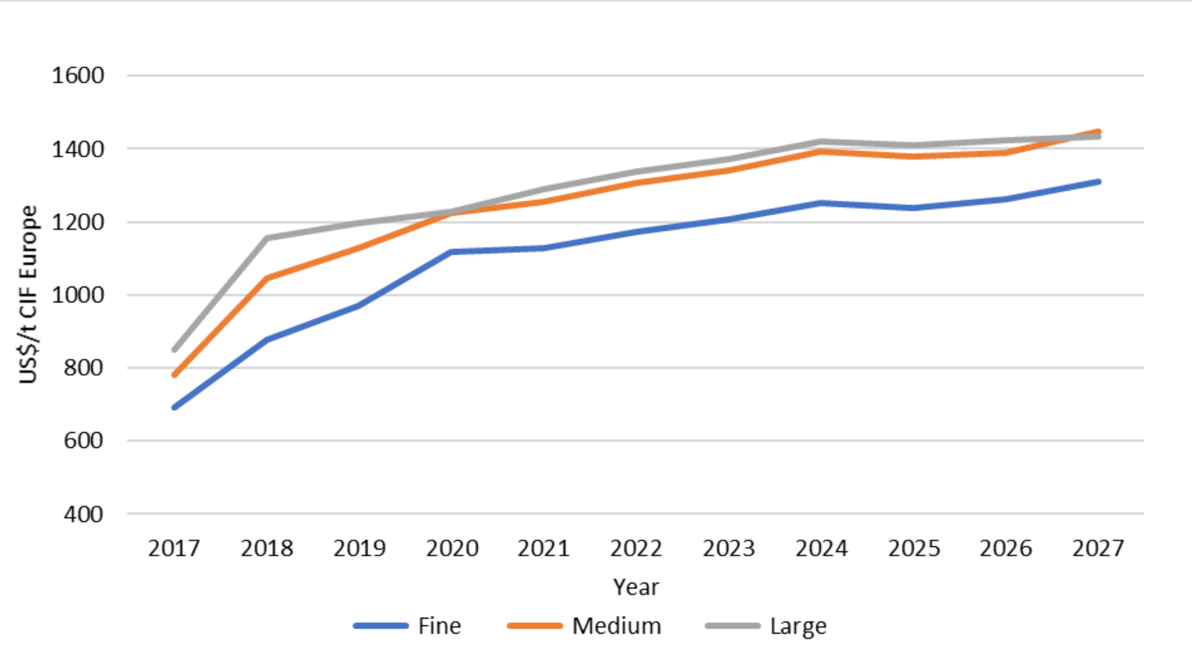

Figure 1-23 Forecast Price for Natural Flake Graphite

(Source Roskill. Published in: Natural and Synthetic Graphite: Global Industry, Markets and Outlook, 2018 © Roskill, 2018)

1.17.2 Product Differentiation

Black Rock has identified, qualified and presented flake graphite samples from its first pilot plant to potential customers. Sample sizes ranged from a few kilograms up to 1,000 kg and consisted of sized and graded product. Target purities and sizes supplied were in response to customer requirements and specifications. Concentrating on customer needs translates to qualifying customers, leading to memorandums of understanding (MOU's) and subsequent sales contracts and supply agreements.

Pilot plant production is fundamental to customer qualification as the production plant provides important commercial plant design parameters as well as indicators as to the mesh size fractions that can be effectively produced and the target purities that can be achieved.

Pilot plant output combined with customer feedback has been considered in plant design. Plant design based on customer feedback and potential commitments leads to more efficient production planning, sales forecasting, and providing detailed customer commitments by product for short, medium and long-term revenue and profit margin forecasting.

With the increasing emphasis on battery flake graphite supply, marketing has been directed on applications with lower barriers to entry that provide for higher than average price points. This creates immediate and medium-term cash flows, while also allowing participation in longer term qualifications including battery precursor flake graphite for lithium ion batteries. As the supplier landscape stabilises and the electric vehicle (EV) market demonstrates anticipated growth, Black Rock will be a prequalified supplier of battery grade precursor graphite but will also be an established supplier across a wide range of applications and will receive new and reoccurring sales from traditional and high-tech applications.

Black Rock utilised critical resources in graphite expertise and plant design knowledge to develop pilot plant production information from customer specifications, application requirements, and feedback from customer sample evaluations. Black Rock has embraced a quality over quantity methodology as it is imperative to meet customer needs and responding with those specific graphite products.

Due the variances in metallurgical and chemical signatures of natural flake graphite, all graphite must be qualified before any potential customer will move forward with commercial bulk sampling and subsequent commercial supply agreements. Producing high volumes of any graphite grade without prequalified customers to ship finished concentrate strains working capital while anxiously working to qualify unqualified inventory in the market; inevitably selling product at lower prices all in the effort to reduce inventories depressing market prices and upsetting the demand supply equilibrium. Black Rock's focus of understanding customers and their application specifications and needs leads to a commercial plant design that will manage production levels, protecting the graphite market from oversupply, while developing credibility in the graphite sector, increasing customer loyalty, and most importantly, company and brand recognition.

1.18 Financial

The financial analysis indicates a net present value (NPV) @10% (post tax, ungeared after 16% free carry) of US$1,161M for the base case production profile and price assumptions, which provide for an internal rate of return (IRR) of 44.8% (post tax, ungeared after 16% free carry). A maximum cash draw of US$199.1M is incurred 3.5 years after the commencement of construction.

The financial performance of the project is summarised in Table 1-18 and Figure 1-24.

Table 1-18 Financial Performance Summary

Financial Performance Summary	Unit	LOM
Project Life	Years	27.5
Operating Life	Years	26.0
Total LOM Net Revenue	US$M, real	9,619
Graphite Price (Real)	US$/t	1,301
Total Project Development Capital Costs	US$M	337.4
C1 Cost: Real (including withholding tax)	US$/t	397
C3 Cost: Real (including withholding tax)	US$/t	494
Stable State EBITDA (after year 5)	US$M, real	306
Project NPV @10.0% - Post Tax, Ungeared after 16% Free Carry	US$M, real	1,161
Project NPV @8.0% - Post Tax, Ungeared after 16% Free Carry	US$M, real	1,489
Project IRR – Post Tax, Ungeared after 16% Free Carry	%, Nominal	44.8
Maximum Project Drawdown	US$M, real	199.1
Maximum Cash Draw Period - from Construction Start	Years	3.5
Breakeven Graphite Price (Constant Real Price so NPV=0)	US$/t	576

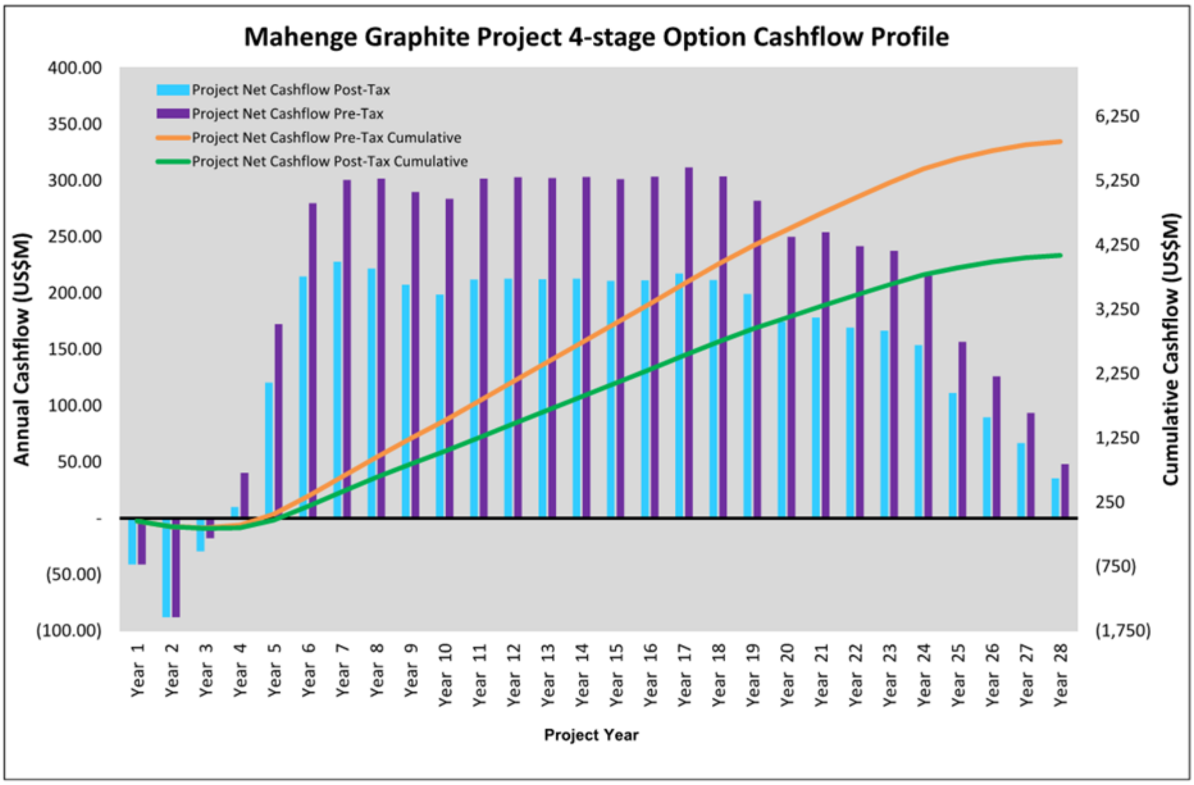

Figure 1-24 LOM Cash Flow Profile (US$ real)

The financial analysis indicates the project is financially viable and results in strong financial returns. With a short payback period of 3.6 years from first ore processed, the project has relatively low exposure to the key risk factor of long term commodity prices, mitigating exposure to the financial risk associated with the project's capital funding requirements. The strong financial returns under the base case assumptions provide a positive risk versus reward assessment.

1.18.1 Key Financial Assumptions

The key financial assumptions are:

- All amounts have been modelled in US$.
- The financial model is built using real inputs in 2018 dollars. Commodity prices, operating and capital costs are escalated within the cashflows to nominal values by using a general 2% US$ inflation rate to correctly calculate depreciation, corporate taxation and working capital. For valuation purposes resultant nominal cashflows are deflated to real cashflows using the same 2% general US$ inflation rate and the resultant real cashflow is discounted by a real discount rate, which is the equivalent of a 10% nominal discount rate, i.e.:

$$Real\ discount\ rate = \frac{(1 + nominal\ discount\ rate)}{(1 + inflation\ rate)} - 1 = \sim 7.84\%\ real$$

- The financial model is built in quarters and real and nominal cashflows are assumed to occur at period end. Resultant real cashflows are discounted using mid-point discounting to adjust the valuation to simulate the effect of running a monthly model.
- Pre- and post-production capital and capitalised operating costs are depreciated for tax purposes on a 20% per year straight line basis. The costs of mining pre-production are part of capitalised pre-production operating costs and ore is not carried separately as mining inventory. The resultant tax treatment is conservative.
- Pre- and post-production capital and capitalised operating costs are depreciated for accounting purposes over the LOM. There is no residual value. Accounting depreciation (deflated and expressed as real) is used as the basis for real C2 cash costs.
- No end of LOM rehabilitation costs, mine closure costs or project residual values have been assumed. Operating costs allow for progressive rehabilitation of land throughout the project life and for land to be returned to traditional uses as quickly as possible post mining. The mill residue dry stack operating costs include for progressive rehabilitation which is a requirement for operation of the dry stack.
- Financial analysis is provided at the level of ungeared project cashflows. Analysis is based both on 100% project equity and 84% Black Rock equity after government free carried interest of 16% is deducted. In the context of this financial analysis free carried interest means that Black Rock will pay for initial capital investment before the project generates positive revenues and will also make up the shortfall in its entirety for the construction and financing of future project stages if insufficient funds have been retained in the project company. Dividend payout ratios are adjusted to ensure that (to

the extent possible) the project company first meets the needs of financing future stages before paying a dividend. Dividends are then paid to government (16%) and Black Rock (84%) in line with the government's free carried interest proportion.

- Basket pricing of $US1,301/t finished product has been applied. Pricing is FOB Dar es Salaam.
- Taxation inputs for the financial model are based on professional advice from Ernst & Young (Tanzania) and judgements by Black Rock.
  - Corporate income tax of 30.0% is applied to earnings before tax, with the assumption that government royalties are tax deductible for corporate tax purposes.
  - Royalties of 3.0% are applied to gross FOB revenue.
  - Withholding tax is assumed to be paid at 5% of gross (5.26% of net) capital and operating costs.
  - No carried forward tax losses are assumed at the project level. Tax losses incurred during the project are carried forward indefinitely and can be applied to reduce profit before tax in future periods.
- Working capital assumptions are:
  - Finished goods inventory is assumed to be 30 days (production to sale at Dar es Salaam port on embarkation).
  - Creditors: 30 days except for royalties and salaries (which are assumed payable immediately). Capital costs are provided as cash S-curve and assumed payable as incurred.
  - Debtors: 30 days.
  - VAT is assumed to be incurred at 18% on 20% of capital and operating costs. VAT is recouped only in periods when there is tax payable.

1.18.2 Production Profile

Project revenue is derived from the sale of graphite product alone. Average graphite pricing of US$1,301/t finished product has been applied. Pricing is based on FOB Dar es Salaam and is net of marketing contributions.

The base case average sales pricing is based on marketing research which is discussed in Section 1.17.1.

1.18.3 Sensitivity Analysis

The sensitivity of the financial performance of the project is detailed in Figure 1-25 and Figure 1-26.

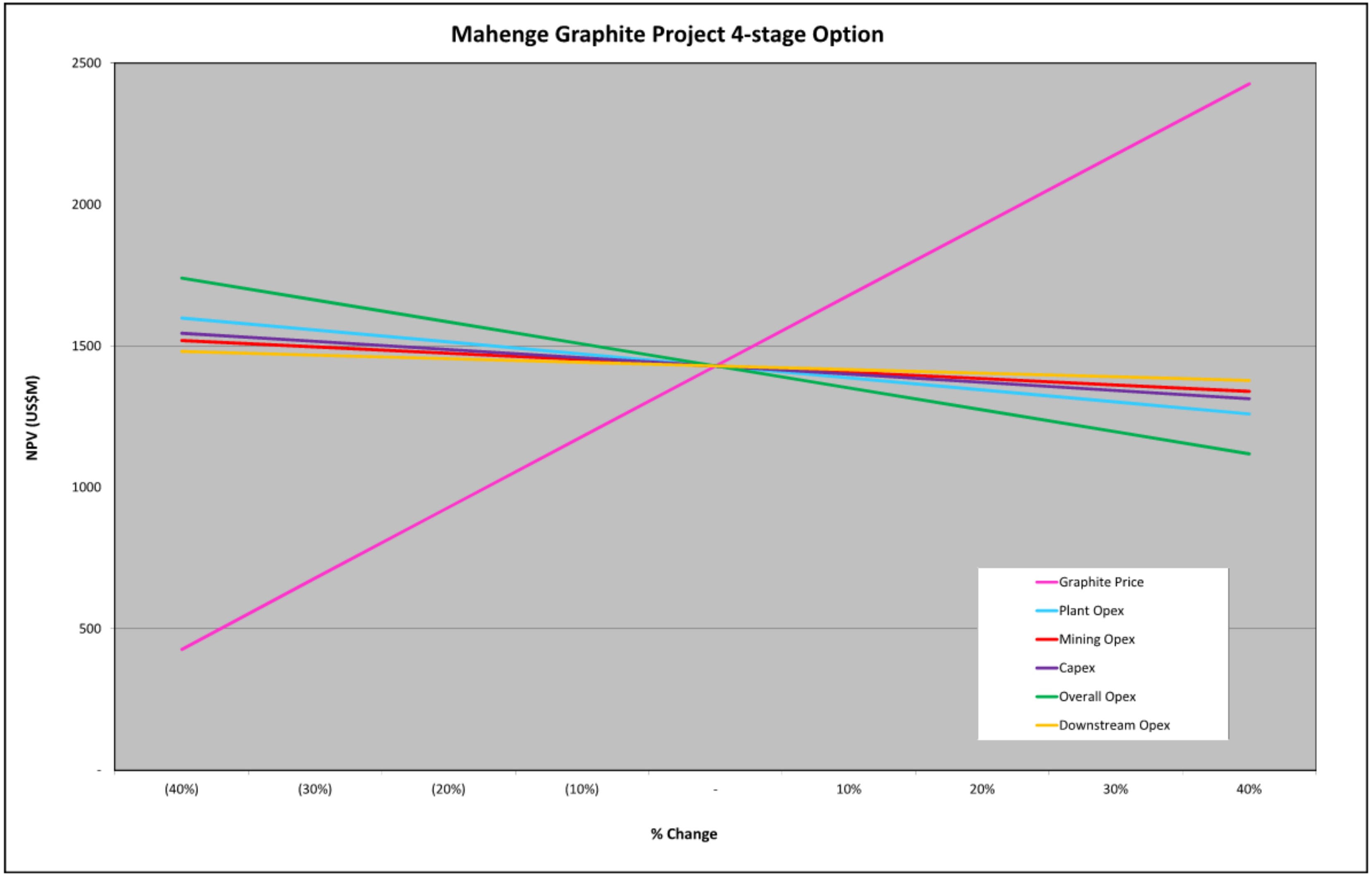

Figure 1-25 NPV Sensitivity to Changes in Opex and Total Capex

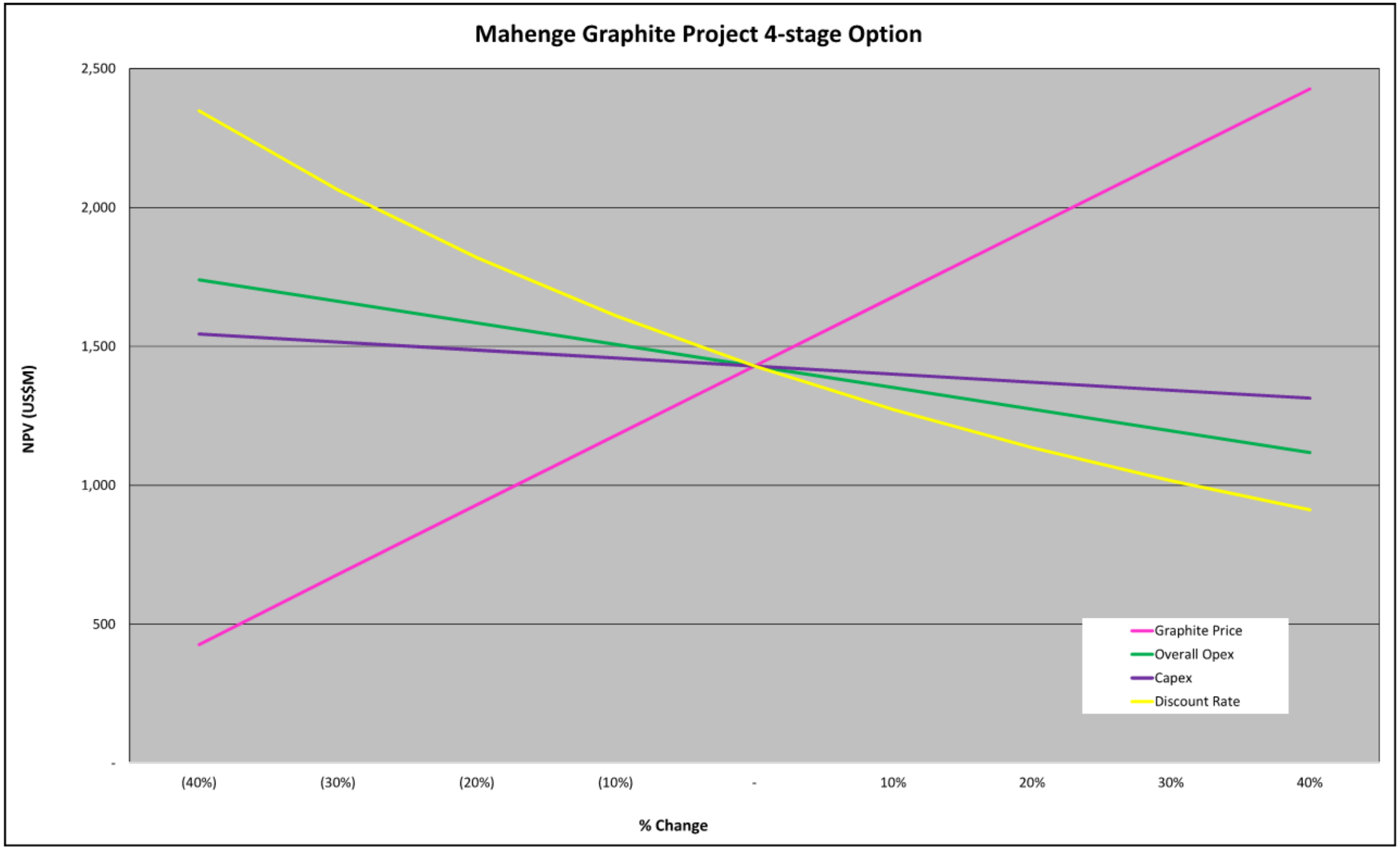

Figure 1-26 Project NPV Sensitivity