Energy
Mineral Resources

MINTEK
A global leader in mineral and metallurgical innovation

SHAREHOLDER PERFORMANCE AGREEMENT ("SHAREHOLDER'S COMPACT")

(2020/21)

Entered into by and between the

MINTEK BOARD,
(herein represented by the Chairperson of the Board)

and

THE GOVERNMENT
of the

REPUBLIC OF SOUTH AFRICA,
(herein represented by the
Minister of Mineral Resources and Energy)

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LIST OF ACRONYMS

Acronym	Full name
AENE	Adjusted Estimates of National Expenditure
CSFR	Client Satisfaction Frequency Rate
D&O	Derelict and Ownerless
DC	Direct Current
DMRE	Department of Mineral Resources and Energy
DSI	Department of Science and Innovation
EV	Electric Vehicle
GDP	Gross Domestic Product
HVAC	Heating, Ventilation and Air Conditioning
HySA	Hydrogen South Africa
ICT	Information and Communication Technology
IP	Intellectual Property
IPAP	Industrial Policy Action Plan
KPI	Key Performance Indicator
MPRDA	Mineral and Petroleum Resources Development Act
MTEF	Medium Term Expenditure Framework
MTSF	Medium Term Strategic Framework
NDP	National Development Plan
NEMA	National Environment Management Act
NIPMO	National Intellectual Property Management Office
OTT	Office of Technology Transfer
PFMA	Public Finance Management Act
PGM	Platinum Group of Metals
PPPFA	Preferential Procurement Policy Framework Act
R&D	Research and Development
RDI	Research, Development and Innovation
SET	Science, Engineering and Technology
SHEQ	Safety, Health, Environment & Quality
SMME	Small, Medium and Micro Enterprises
TRL	Technology Readiness Level
UG2	Upper Group 2 Reef

1. SHAREHOLDER PERFORMANCE AGREEMENT - AGREED PRINCIPLES

1.1 Introduction

1.1.1 The Mintek Board, as the Accounting Authority of a Schedule 3 Public Entity, is required to enter into an annual performance agreement with the Executive Authority – the Minister of Mineral Resources and Energy - as per Regulation 29 of the Treasury Regulations of the Public Finance Management Act No. 1 of 1999.

1.1.2 This Shareholder's Compact is the performance agreement for the financial year 2020/21, and it derives its goals and objectives from Mintek's founding legislation, the Mineral Technology Act No. 30 of 1989. The Shareholder's Compact is also inclusive of the Corporate Plan, which is submitted in terms of Section 52 of the PFMA, and consists of the budget, strategic intent and financial plans for the next three years.

1.1.3 The Shareholder's Compact also comprises the overarching principles from the Mineral Technology Act No. 30 of 1989; the programmes and key performance objectives that have to be attained over the medium to long term; as well as targets and performance indicators that will be used to measure progress over the Medium Term Expenditure Framework (MTEF) period 2020-2023. It is aligned to the Strategic Plan of the Department of Mineral Resources and Energy and compliments its programmes that are in support of the National Development Plan.

1.2 Interpretation

In this Shareholder's Compact, unless otherwise indicated or contrary to the context, the words and phrases set out below shall have the meanings ascribed to them as follows:

1.2.1 An **Accounting Authority** of a national public entity is the Board of Directors appointed by the Executive Authority of that entity.

1.2.2 **Board** refers to the Mintek Board of Directors.

1.2.3 **Executive Authority** refers to the Minister.

1.2.4 **Mindev** refers to Mindev (Pty) Ltd, a company with limited liability in terms of the Companies Act No. 71 of 2008, which is a wholly-owned subsidiary of Mintek, and has its registered head office at the same address as Mintek.

1.2.5 **Minister** refers to the Honourable Minister of Mineral Resources and Energy in his capacity as such.

1.2.6 **Mintek** is a Science Council established in terms of the Mineral Technology Act No. 30 of 1989, with its principal place of business situated at 200 Malibongwe Drive, Randburg, South Africa.

1.2.7 **Party** refers to either the shareholder or Mintek and **parties** mean both the shareholder and Mintek.

1.2.8 **PFMA** refers to the Public Finance Management Act No. 1 of 1999 as amended by Act No. 29 of 1999.

1.2.9 **R&D** refers to research and development as set out in the Mineral Technology Act No. 30 of 1989.

1.2.10 **Shareholder** refers to the Government of the Republic of South Africa, represented by the Minister.

1.2.11 **Shareholder's Compact** refers to the performance agreement between the Board and the Shareholder together with all appendices attached hereto, as defined in the PFMA.

1.3 Nature of the Shareholder's Compact

1.3.1 The Shareholder's Compact is designed solely to regulate the relationship between the Shareholder and the Board, specifically in relation to the expected outputs and outcomes that are products of Mintek's work in fulfilling its mandate as articulated by the Mineral Technology Act No. 30 of 1989.

It is a reflection of the expectations of each of the Parties, expressed in terms of outcomes and outputs that need to be achieved during the financial year starting on 1 April 2020.

1.3.2 The Shareholder's Compact is not intended to:

(i) Interfere in any way with the normal company law principles and the normal relationship between the Shareholder, on the one hand, and the Board, on the other. In giving effect to those principles, the Shareholder would have communicated its expectations to the Board and management;

(ii) Create rights and expectations that third parties may rely upon. It is hereby specifically recorded that this Shareholder's Compact does not create, confer and/or afford any third party rights or expectations in terms hereof.

1.4 Period

1.4.1 This Shareholder's Compact will be effective for the period 1 April 2020 to 31 March 2021.

1.4.2 It is hereby recorded that the agreed principles, although subject to review annually, set out matters that are applicable beyond a period of a year. In the event that they are amended, the parties shall take into account initiatives already commenced on the basis of such principles.

1.5 Mandate, Vision and Mission of Mintek

1.5.1 Mintek derives its mandate from the Mineral Technology Act No. 30 of 1989. According to the Act, Mintek was established to meet a national imperative "to promote mineral technology; and to foster the establishment and expansion of industries in the field of minerals and products derived therefrom" through research, development and technology transfer.

1.5.2 In executing its mandate, Mintek bases its industry focused interventions on an understanding of level of development of each customer and the industry segments. The approach enables Mintek to design and implement fit-for-purpose programmes that can meet the needs of new, emerging, mature and declining industries.

1.5.3 Mintek forms strategic partnerships with industry players, academic institutions, research institutions, government, state owned entities and communities. These partnerships also shape the products and services offered by Mintek.

1.5.4 The Shareholder acknowledges that, included in its mandate, Mintek has a developmental role that may require decisions that are not always optimal from a commercial perspective, but contribute to growth and development in South Africa and the rest of the continent.

1.5.5 The **vision** of Mintek is to be a leading partner in innovative mineral solutions.

1.5.4 The **mission** of Mintek is to lead research, development and innovation utilising minerals to drive sustainable industry development and inclusive economic growth.

1.6 Strategic Intent and Objectives

1.6.1 The strategic intent of Mintek is closely aligned with national imperatives and priorities with specific reference to:

a) Contributing to economic development, and addressing the triple challenges of poverty, unemployment and inequality, which Mintek does through fostering industrial growth and development.

b) Maximising the utilisation of finite ore resources by also considering opportunities such as the reprocessing of old discards and tailings facilities. These discards may contain significant amounts of the original commodity, as well as a potential source of secondary commodities that have since become of interest.

c) Promoting the use of minerals to make the final product, i.e. beneficiation activities and adding value to mineral and metal products. Mintek also intends to contribute by stimulating, as far as possible, transformation within the mining and minerals sectors.

d) Promoting the transition from a resource-dominated economy to a knowledge-based economy.

e) Supporting the development of a capable state through the development of institutional capacity to assist the minerals industry to leverage minerals for economic development, the development of the human capital required to capacitate the minerals industry, and the support of marginalised communities surrounding mining areas.

1.6.2 Mintek's approach to addressing its strategic intent is to focus on its core functions of research, development and innovation. These are combined with technical solutions that can be transferred to the minerals sector in support of the development and expansion of South African minerals based industries. Over the short to medium term period, Mintek's activities will drive towards the attainment of the five strategic outcome oriented goals that are listed below.

a) **Conduct relevant, applied research and technological innovation** by pursuing a focussed approach to research and technology development that emphasises high-impact scientific outputs and outcomes;

b) **Fostering the establishment of new industries** and **expansion** of existing ones, as well as addressing the challenges facing nascent, emerging, mature and declining industries;

c) **Develop a capable workforce** that has the requisite skills, expertise and capabilities to drive and support rigorous scientific research and technological development in pursuit of Mintek's mandate of conducting research and fostering industry development and expansion.

The workforce profile will reflect the demographic profile of South Africa;

d) **Ensure financial sustainability** and securing Mintek's future by achieving a solid research portfolio that is funded through both private and public sources and commercialising Mintek's technologies; and

e) **Develop and maintain world-class Research, Development and Innovation (RDI) infrastructure** that supports Mintek's research, technology innovation and the development of products and services that encourage industry growth and expansion.

1.6.3 Mintek's Products and Services

In achieving its strategic impact of fostering the establishment and expansion of the minerals industry, Mintek produces a number of outputs. These outputs are consolidated as the suite of Products and Services that Mintek offers. The suite covers the full spectrum of the Research, Development and Innovation value chain from basic and fundamental research through to intellectual property commercialisation and technology transfer.

In brief, the products and services consist of the following key components;

a) Metallurgical technology and processes

A significant proportion of Mintek's RDI outputs are consolidated into technology packages, and bespoke / optimised processes. This Intellectual Property is usually protected in the form of patents and is exploited via licence agreements. Examples of these are the SAVMIN™ Acid Mine Drainage treatment technology and the ConRoast PGM smelting technology.

b) Products

Some of Mintek's RDI outputs are encapsulated into tangible products. These include end user consumer products such as nano-technology enabled medical point of care diagnostic kits. It also includes physical equipment such as cyanide measuring equipment or turn-key furnaces, as well as virtual solutions such as process control software.

c) Services

Some of Mintek's outputs are delivered in the form of services. These range from routine services like chemical or mineralogical analysis, to non-routine services like process optimisation and evaluation.

Mintek also offers comprehensive metallurgical feasibility study services to companies evaluating the opportunity to develop new mineral deposits. These services leverage Mintek's RDI capability and infrastructure to foster the development of the industry.

Mintek also offers contract research services. These often take the form of consortium based research activities where Mintek's expertise and facilities are identified as key enablers of the research outcomes.

d) Consulting, training and advisory services

As a result of Mintek's knowledge-base and expertise, Mintek is often approached to provide consultancy services to assist in addressing industry challenges. In addition Mintek leverages its expertise to provide training and advisory services to develop human capital and address broader technical challenges.

1.6.4 Client Base

Mintek's client base consists of three spheres of government, state enterprises, communities, large multi-national mining companies, emerging resource companies, engineering contractors and SMMEs both locally and internationally.

Mintek's clients span a wide cross section of mine operators and mineworkers, project developers, engineering contractors, metal end-users and equipment vendors, and the governmental agencies that support and regulate the industry – both locally and internationally. In short, all the players in the minerals industry.

1.6.5 Competitors

Mintek, which operates in the global arena, servicing a multi-national industry, means that Clients have the option to source similar services from comparable facilities in Australia, Europe, Canada, Brazil, Chile, USA, China and Russia. The Client's selection of their preferred institution is often based on the reputation of the technical experts along with the quality of the facilities. In this regard, Mintek has very strong competitive advantages with respect to its excellent, large-scale facilities, an excellent reputation as a "one-stop shop" and, more especially an enormous information database developed since 1934, the year Mintek was established.

1.6.6 Business Environment

The global mining industry has experienced an almost-unprecedented period of difficulty for more than a decade, where mineral and metal demand tumbled, metal prices reached exceptional lows, grades are declining in the remaining reserves/ore bodies which, coupled with rapidly rising costs, mean that stakeholder expectations are at odds with the industry reality. China, the global mineral commodity growth engine and major producer of some 29 minerals/metals, has also reduced its demand in line with its shift from infrastructural investment to consumer-led growth. In the long term, the growing demand for Electric Vehicles (EVs) globally, coupled with the growing recycling sector, will have major implications for future demand of minerals, mainly on Platinum Group Metals (PGMs) and

technology metals, which will consequently impact on the South African economy.

The mining industry's project development pipeline, a key indicator of the demand for Mintek's commercial services, has been slow in recent years but the geological exploration programmes and project investments appear to be beginning to enter a growth phase. Industry spend on capital development decreased to almost half in the four years to 2017. Although there are signs of an upward trend observable from 2018, it is too early to tell if the trend will be sustained going forward.

Industry consensus was that 2017 was expected to be the start of the recovery of the industry from its current depressed state. This was seen to be the case with most commodity prices improving significantly from 2015, though some volatility within the markets exists. One notable event was the palladium price exceeding that of platinum. However, it should be borne in mind that demand for Mintek services may not be seen immediately since potential clients will need to focus on debt reduction, resume deferred construction and/or expansion and brownfields projects. Thereafter, consideration may be given to new greenfield projects and exploration programmes that will require the services of Mintek. It is therefore expected that this will create lag of between one to two years from recovery to the Client using Mintek's services.

In short, the weakened demand for Mintek commercial services evident over the past few years is expected to continue late into 2020. The continued changing global and local economic landscape require Mintek to reposition itself such that the business remains sustainable beyond the next decade. However, the State funded research programmes are showing promise as future opportunities whereby the remediation of acid mine drainage and tailings/dump reprocessing will allow for the removal of contaminants and recovery of valuable material in these tailings. Mintek is looking into feasibility of recovering precious metals from electronic waste as well as re-using valuable components such as plastics in the manufacturing of new products.

1.6.7 Organizational Environment

The organizational environment is largely affected by the external business environment. After a decade of economic weakness, there are positive signs that the economy has begun to gain lost ground, which bodes very well for Mintek. The policy inertia and uncertainty that have constrained investment and confidence especially for the mining sector have begun to lift. Government finalised the new Mining Charter last year and the Minister of Mineral Resources and Energy has signalled that the amendments to the Mineral and Petroleum Resources Development Act (2002) are in keeping with the policy intent. These policy pronouncements have brought some confidence in the mining sector and as such there are hopes of better mining growth in the coming MTEF period.

Mintek revenue is generated mainly from three revenue streams, i.e. state grant, sale of products and services (P&S) and contract research. The work undertaken under the P&S and contract research streams is also collectively referred to as commercial revenue and mainly comes from the sector through the deployment of our technology and providing consulting services based on the technical expertise of Mintek. Mintek aims for a balance ratio of 50:50 when comparing state funding and commercial research and this ratio is currently 70:30 in favour of state funding. Even though state funding in the form of MTEF has increased over the years, commercial revenue has sharply decreased. The Mintek revenue in real terms has not been growing in the previous five years. In fact, our baseline has been decreasing while additional funding on specific projects has been increasing making it difficult for the organisation to plan in the long term. This negative growth even further exacerbated by the ever increasing operational expenditure of which employee compensation is the main contributor.

The positive outlook of the mining sector is expected to end the over a decade decline in Mintek commercial revenue but this is also expected to be met with a decline in state funding arising from the fiscal constraint and changing priorities of government. It is therefore important that our research priorities are aligned to government priorities in order to maintain or attract other government related funding. The Mintek of the future therefore requires the right balance of skills to attract state funding and support efficiency and new investments in the minerals sector.

With respect to organisational capacity, Mintek's is currently engaging in a process of rebuilding research expertise and excellence in science and innovation. Over the last ten years, Mintek's quest to attract commercial work and funding had gradually shifted focus away from research excellence, to transactional and consulting services. The shift in focus also resulted in an untenable position where the ratio of researchers to support staff was heavily skewed in favour of support. There was a steady decline of researchers and scientists, in both headcount and proportional terms, which contributed to the current dearth of mid- to high-level skills in critical areas of Mintek's core.

The state of the organization in relation to organizational capacity became stark during the comprehensive diagnostic assessment of current resource profile, mapped against the ideal profile that will catapult research outputs into the next level. The assessment, which was conducted during the course of 2019, identified areas that required an overhaul, having noted that the organization appeared to have veered off course in terms of research excellence.

In recognition of the importance of human capital as the greatest asset for an organization whose main mandate is research and technology development, an urgent need to develop and retain the right skills in the right numbers was identified. The intention is to build a mid- to senior-level research capacity. With the resignations and retirement of senior and experienced staff members over the years, a phenomenon loosely defined as "juniorisation of research" has unfortunately been the result at Mintek, albeit to varying degrees across Mintek's core disciplines. Consequently, there is recognisable dearth of highly skilled and experienced staff that are well-placed to formulate, lead and disseminate research for maximum impact. The impact of this trend has filtered through to dwindling number of peer-

reviewed journal publications, less focus on cutting edge research and increasing trend of competing with small consulting firms and laboratories that do not even boast the wealth of infrastructure that Mintek has.

To address these challenges, a SET Human capital development programme has already been rolled out, targeting Masters and Doctoral programme candidates in science and engineering. This programme is complemented by an active recruitment strategy focusing primarily on recruiting experienced researchers with Masters and Doctoral degrees, as minimum entry requirements. The success of these interventions will be measured in the next three years, and will change the profile of Mintek's staff profile. The greatest challenge facing Mintek is the recruitment and retention of world-class expertise to maintain the historical high reputational standards.

1.7 Long-Term Priority Research, Development and Innovation Programmes

Following a six year period of sub 2% annual GDP growth and uncertainty in the local economy (and particularly the mining sector), it is important that Mintek aligns its activities to delivering direct economic impact. In serving the national interests through research, development and innovation, and fostering the establishment and expansion of the minerals industry, Mintek has identified a number of high impact programmes that can deliver socio-economic benefits in the short to medium term. These priority programmes will constitute the strategic focus for the financial year 2020/21 and are described below.

1.7.1 Establishing a local Rare Earth Element mining and manufacturing industry. The primary objective of the programme is stimulate the creation of local rare earth manufacturing industry by establishing a centralised rare earth element (REE) processing facility in South Africa to produce separated REE at globally competitive cost. The availability of these separated REE would then be able to promote the development of a downstream high technology industry in South Africa. This programme aims to leverage Mintek's REE processing capability and know-how to establish cost competitive production of REE to extract maximum value for the country from its rare earth resources. It will have the added benefit to contribute to the development of a more sophisticated economy in South Africa. REE facility is a boon for the mining industry and will provide support in the establishment and expansion of the mining industry.

1.7.2 Development and manufacturing of nano-technology based diagnostic products One of Mintek research priorities is to develop a suite of high value diagnostic products, most of which are ready for commercialization. The most advanced of these is a HIV point of care diagnostic test kit. Diagnostics test kits for malaria, tuberculosis, cancer and the Rift Valley fever are also at advanced stages of development.

The products have been developed at Mintek to use gold nano-particles as the active ingredient, and they outperform commercially available products in terms of shelf life and accuracy. Mintek has also developed the manufacturing infrastructure and facilities to produce these point of care kits on a commercial scale. The South African health care system currently imports all point of care diagnostic kits as the technology and facilities to manufacture the kits locally has not existed. Mintek is currently in the final stages of the accreditation of the manufacturing facility and thereafter will be able to manufacture South Africa's total requirements of HIV test kits, and will do so using locally developed technology that outperforms the international competition and also utilises South African mined gold as the active ingredient.

1.7.3 Transforming the energy mix in the energy intensive ferroalloys industry. The main objectives of this programme are two-fold. Firstly, the objective is to prevent further decline of the country's smelting capacity for manganese, reduce the incidents of exporting unprocessed ores, and ensure that manganese ores are upgraded locally through the use of efficient smelting technologies. Secondly, with respect to chrome, the objective is to enhance the value of the abundant UG2 chromite stock to stimulate metal production in South Africa. This will re-establish South Africa as the leading producer of ferrochromium alloy through the beneficiation of UG2 chromite concentrate via energy-efficient technologies. It will also support the creation of a new chromite smelting complex using Mintek's low-grade chromite smelting technology, and thus integrate the PGM and chromite smelting industry. As part of this research programme, Mintek will also continue seeking alternative energy sources, such as solar thermal heat and gas-fired energy, to apply them to existing processes to facilitate improved energy and environmental efficiency for the benefit of industry.

1.7.4 Developing a hydrogen and platinum based fuel-cell economy in South Africa. The global shift in the energy mix, in favour of renewables based energy has created the opportunity to leverage South Africa's platinum resources in meeting the demand for fuel-cells in a hydrogen based economy. The Hydrogen South Africa (HySA) programme, funded by government is aimed at developing hydrogen fuel-cells based on South African developed technology that utilises PGMs and other locally abundant mineral resources. Fuel-cell catalysts and membranes are currently being commercialised with the aim of supplying the global market.

1.7.5 **Energy Storage as an enabler of a just energy transition.** Energy storage is a key element in a worldwide move towards sustainable energy usage and huge strides are currently being made in the development of energy storage systems such as grid scale batteries. The sheer scale of these initiatives has led to a huge demand for technology metals. South Africa is well placed to become an important player in the development of these technologies, but competitive access to these metals or materials will be crucial if the development of these industries in South Africa were to be stimulated. The objective of the energy storage programme is to drive development of new industries in South Africa by developing technology for the supply of high specification precursors to be used in the manufacture of new battery systems. These precursors will be based on a number of base metals such as cobalt, nickel vanadium and manganese as well as on rare earths such as cerium or alkali metals such as lithium. A specific feature of these metals is exceptional purity.

1.7.6 **Development of clean coal technologies.** One of Mintek's priority research programmes focuses on the comprehensive utilisation of South Africa's coal resources using clean technologies. The programme aims to develop a direct current (DC) gasification technology to comprehensively use South Africa's coal resources, focusing on fine metallurgical grade coal and waste coal dumps to upgrade coal to synthetic natural gas for use as energy storage in support of the hydrogen economy. DC gasification of wet fine coal has already been patented by Mintek and the concepts have been modelled and a prototype is being tested. The potential impacts include supplementation of diesel in Eskom's open-cycle turbines and replacement of plasma torches for incineration.

1.7.7 **Revitalisation of the Iron ore industry in South Africa**. Mintek aims to grow and sustain the iron (Fe) ore industry in South Africa by unlocking sterile resources of low grade fine stockpiles and Banded Iron Formations (BIF) via unconventional process solutions. Ferrous Minerals (e.g. iron ore, manganese, chrome etc.) are one of the four most important commodity sectors for South Africa's economy with iron ore alone accounting for about 12% of the total mineral sales. The South African iron ore industry is facing multiple challenges, namely, volatility in commodity prices, high production cost curves in relation to major producers, depletion of high-grade reserves, and competitiveness amongst others. Mintek's strategic programme aims to reinvigorate this sector by exploiting novel solutions to unlock the sterile resources and improve the competitiveness of the sector.

1.7.8 **Unlocking the Bushveld Complex's titaniferous magnetite.** The primary objective of unlocking the Bushveld complex is to create an integrated, one-of-a-kind, state-of-the-art commercial smelting complex to comprehensively extract Iron, Vanadium and Titanium from titanomagnetite from the Bushveld Complex via fluxless open-arc smelting technology that is energy-efficient, economical and environmentally sustainable to contribute towards the industrialisation of the South African economy. The programme aims to leverage Mintek's DC technology know-how, and integrating process engineering concepts to minimise the cost of smelting and extract maximum value for the country.

The Bushveld Complex hosts the largest known vanadiferous titanomagnetite deposit in the world. The unfortunate demise of Highveld Steel in 2014/2015, has resulted in economic hardship for many due to the job losses. The Bushveld Complex's vanadium, combined with iron and titanium, offers a unique opportunity for the country to establish a world-class smelting facility that can play a pivotal role in invigorating the economy. Mintek's suite of technology interventions to unlock the Bushveld Complex will extract iron, vanadium and titanium efficiently. The benefit, both to country and industry, are immeasurable.

Mintek will continue to identify suitable opportunities detailed above and develop the most appropriate, innovative technological solutions for transfer to industry. In addition, the provision of commercial based test work, consultancy, analytical and mineralogical services will be made available to industry as required.

1.8 Key Performance Indicators

The Key Performance Indicators (KPIs) outlined hereunder will be used to measure Mintek's performance over the next financial year. The KPIs are linked to Mintek's core mandate and reflect outputs and outcomes of the work that will be done in the areas of research and development, innovation and technology development. Collectively, the key performance indicators provide a holistic view of the health of the organization and the extent to which it is on the correct path towards fulfilling its mandate.

1.8.1 **Publications** include a set of metrics that are used to measure the quality of Mintek's research outputs and its contribution to knowledge generation in science and engineering, as well as the capabilities of Mintek's researchers. The metrics include the number of **journal papers, conference papers, book chapters** and **books** published in a given period.

1.8.2 **Intellectual Property** measures are an indication of the novelty and innovativeness of Mintek's research, technologies and products. The portfolio includes **invention disclosures, patents** and **trademarks**.

1.8.3 **Science, Engineering and Technology (SET) Staff Profile** is a basket of measures that reflect Mintek's research capacity to deliver on its core mandate. The measures include the total **number of SET** employees, as well as the number of **SET staff with doctoral** and **masters' degrees** in the fields of science and engineering.

1.8.4 **Transformation** measures are an indication of the extent to which Mintek's SET staff reflects the demographics of South Africa's population. The measures include the percentage of **female SET employees** and the percentage of **black SET employees** as defined in the Employment Equity Act.

1.8.5 **Revenue Generation** measures indicates Mintek's financial position and the extent to which the organization can sustain itself through income generated from a wide range of sources. The measures include **total income** generated from the private sector, the voted funds from Parliament, sale of products and services, and contract research. It also includes the **net results** in rand value, which measures profitability.

1.8.6 **Commercialisation** measures are an indication of the quality of Mintek's outputs at the advanced stages on the technology readiness level (TRL) scale. They include the number of **prototypes, processes** and **models** that have been demonstrated or validated in a relevant environment. They also measure the readiness of a model for technology transfer and ultimately manufacturing. In addition, the measures include income that is generated from the **sale of products, services** as well as **royalties** and **license fees**, which are an indication of Mintek's ability to transfer technologies and products to market.

1.8.7 **Audit Opinion:** An unqualified audit opinion from the Auditor-General South Africa (AGSA) is a measure that Mintek fairly represented its financial statement and financial position to AGSA. It is confirmation that there were no material misstatements in the annual financial statements.

1.9 Roles and Responsibilities

1.9.1 Mintek has a developmental role that may require decisions that are not always optimal from a commercial perspective, but contribute to growth and development in South Africa.

1.9.2 The Shareholder is empowered and hereby reserves the right to determine developmental initiatives, projects or activities that Mintek shall undertake or become involved in, in the national interest, subject to the requirement that such activities shall:

a) be funded from the parliamentary grant, and

b) not prejudice Mintek's operations, financial health and ongoing viability as a going concern.

1.9.3 The key performance measures for Mintek, if necessary, shall be adjusted by the Shareholder to take into account Mintek's developmental role.

1.9.4 Any Developmental Project determined in terms of clause 1.9.2 shall be deemed to have been approved in terms of Section 54 of the PFMA, and no further approval shall be required in respect of such projects.

1.9.5 A definition of what constitutes major Developmental Projects and the applicable criteria shall be developed by the Board and agreed to with the Shareholder prior to commencement of the project.

1.9.6 The Board and the Shareholder shall agree on an amount to be set aside for developmental projects.

1.9.7 The Board hereby:

a) Undertakes to oversee and to contribute to the development of the strategic intent and the management of the business in accordance with such strategic intent, corporate plan, the Mineral Technology Act and any applicable legislation. The directors shall exercise their skill and fiduciary duties to ensure that management pursue the objectives and targets as set out in the corporate plan;

b) Commits itself to the achievement of the vision, mission, goals and objectives, and strategic intent of Mintek, and always acts within its powers and in the best interest of Mintek;

c) Accepts its responsibility to direct and guide the business in a proper manner in keeping with good governance practices, the PFMA, the Mineral Technology Act, the Shareholder's Compact, and in particular, in compliance with the materiality framework agreed to with the Shareholder, which is annexed hereto as Appendix II; and

d) Recognises the importance of speedy decision-making and will use its best endeavours to prevent undue delays with regard to critical decisions.

1.9.8 Subsidiaries:

a) The performance of Mindev will be regulated by Mintek in its capacity as shareholder in line with the broad policy and direction from the Shareholder. Mintek shall enter into a Shareholder's Compact with each of the main subsidiaries formed or to be formed, which

Compacts shall be regarded by the Shareholder as compliant to the PFMA.

b) In addition, Mintek will ensure that Mindev and all its subsidiaries shall comply with the policies of the Shareholder, and that they adhere to acceptable governance practices in terms of reporting and accountability, as well as the materiality framework annexed as Appendix II.

1.10 Undertakings by the Shareholder

The Shareholder undertakes for the duration of this agreement to:

1.10.1 Give reasonable notice before the introduction of any new or additional requirements during the validity period of this Compact. In addition, the parties shall, in such an event, amend the key performance indicators and targets, failing which, no new requirements or targets may be introduced;

1.10.2 Allow the Board the space to exercise its own discretion regarding matters falling within its authority, as provided for in this agreement, the PFMA and Mineral Technology Act No. 30 of 1989;

1.10.3 Respond speedily to critical decisions or the proper constitution of the Board, and to fill vacancies that arise in the Board within a reasonable time; and

1.10.4 Ensure that the Mintek Board or any of its directors are not in breach of any legal duty.

1.11 Mineral Technology Act

1.11.1 The Shareholder, in consultation with the Board, shall ensure that the Shareholder's Compact and the Compact between Mintek and its subsidiary shall be consistent with the Mineral Technology Act No. 30 of 1989 and the Memorandum and Articles of Association of any of the main subsidiaries.

1.11.2 In the event that there is any conflict between the provisions of this agreement and the Mineral Technology Act the provisions of the Act shall prevail.

2. SUBSIDIARIES – MINDEV

Mindev is a wholly owned subsidiary of Mintek that was registered in 2001 with the aim of having an agile entity or vehicle that would facilitate joint ventures and/ or participation with various partners in order to commercialise Mintek's technologies.

In line with the Companies Act, No. 71 of 2008, Mindev registered its Memorandum of Incorporation with the Companies and Intellectual Property Commission and was issued with a certificate of confirmation by the Commission in 2012. It is currently in full compliance with all legislative requirements.

Mindev has over the years entered into various joint ventures and commercial dealings that were mostly successful resulting in net reserves of R39.5 remaining on its last operating activities. Mindev continues to evaluate possible investment opportunities even though nothing has come to fruition over the years effectively making it dormant from both an investment and operational perspective.

Mintek is still of the view that Mindev should be retained in order to maximise the commercial value of Mintek's fully developed technologies in the future. Mintek will continue to invest all Mindev funds and provide for all resultant taxes due and the interest earned.

3. TECHNICAL OPERATIONS AND CORE CAPABILITIES

Mintek operates across the nexus of the RDI and mineral beneficiation value chains. This means that Mintek's operations and core capabilities have to cover all aspects of research, development and innovation, across the full beneficiation value chain from exploration, through extraction and processing, to refining and the production of metal based products and processes. In line with Mintek's core mandate to foster the establishment and expansion of the mining industry, it is also critical that Mintek is adequately capacitated to implement its research and development outcomes to drive economic growth.

Consequently Mintek is capacitated with the core capabilities, both in terms of human capital, and facilities and equipment, that cover the full spectrum of both of these value chains.

3.1. Analytical Testing Services

Mintek operates well-established inorganic analytical chemistry laboratories in geochemical and metallurgical analyses. The laboratories use ultra-modern instruments to provide specialised solutions to the metallurgical, mining and related industries. In the past, Mintek's analytical services were positioned as a commercial laboratory rather than a research laboratory, which has had numerous unintended consequences. A strategic decision has thus been taken to reposition analytical services to reduce the complete reliance on the volume of samples. This directional shift is needed to ensure that Mintek ventures into analytical research in a meaningful way for its clients. A reskilling of employees involved in analytical services will be

necessary to ensure that there is sufficient capacity to carry out high quality research.

3.2 Mineralogy

Mineralogy capabilities are primarily mineral characterization, which is conducted with an intention to understand processing behavior of minerals, thus empowering metallurgists and process engineers to obtain optimum recovery and grade in mineral beneficiation. Mintek provides mineralogical services across the life cycle of a mineral deposit, from exploration to mine closure. The organization is able to identify minerals and interpret the data with respect to evaluating a mineral deposit, beneficiating the ore, providing vital information for process design as well as on-going support with mineral industry troubleshooting, analyzing metallurgical projects and dealing with environmental issues.

Mintek's expert services with respect to mineralogy include process mineralogy using automated scanning electron microscopes, quantitative X-ray diffraction and cluster analysis; determination of mineral compositions, using electron probe microanalysis with light element detection capability; as well as optical microscopy, X-ray diffraction and scanning electron microscopy for exploration and descriptive mineralogical investigations. These services are important for scoping, pre-feasibility studies and metallurgical trouble shooting.

3.3 Mineral Processing

Minerals Processing capabilities are at the entry point of the metallurgical value chain, and focus on exploiting the physical properties of minerals for upgrade or concentration purposes. In this regard, Mintek plays a pivotal role within the mining value chain as its spectrum of service offerings is diverse and includes metallurgical optimisation solutions, assessing technology innovation, close interaction with mining sectors and technology suppliers as well as preparing and pre-concentrating material for downstream operations. Mintek is at the forefront off mining challenges thereby offering relevant solutions that support exploration, growth and sustainability.

The goal in mineral processing is to produce maximum value from a given raw material and to derive value from unexplored and sterile resources. In this space, Mintek provides metallurgical solutions for the recovery of minerals from a large variety of ores. This is achieved by means of desktop, laboratory and pilot plant studies to develop the most suitable plant configuration for existing operations, new projects or ore types.

With respect to mineral processing, Mintek's research goals are aimed at providing solutions on pre-concentration of commodities that are of greatest economic and strategic importance to the country, notably Precious, Ferrous, Energy, Industrial, Base metals and Rare earth elements. Although the particular research questions that Mintek works on varies across the different commodities, the over-arching and cross-cutting research themes has been: accessing and processing of low-grade and complex ore bodies; development of water-efficient and water-less processing technologies; development of energy-efficient technologies and advancing sensor-based rock sorting technologies. Mintek's services usually result in the commercialisation of new or improved technologies within the mining and metallurgical industry. It is thus a vital partner in ensuring the sustainability of the SA mining industry through leading technology innovation in mineral liberation and separation and enabling optimal solutions for the beneficiation of strategic and complex minerals.

3.4 Pyrometallurgy

Pyrometallurgy is a branch of extractive metallurgy which involves the practice of removing valuable metals from an ore and refining the extracted raw metals into a purer form. Pyrometallurgy involves high-temperature processes where chemical reactions take place to extract or concentrate metals. It is, therefore, the science and technology concerned with the use of high temperatures to extract and purify metals. It consists of the thermal treatment of minerals and metallurgical ores and concentrates on bringing about physical and chemical transformations in the materials to enable recovery of valuable metals which often requires a liquid or near-liquid state. The nature of the material determines whether a pyrometallurgical process step is required. Process temperature can range from 900 to 2000°C. The major types of operations are roasting, smelting, and refining. Pyrometallurgical processes are often complicated, high-risk and generally energy-intensive as the operating temperatures are frequently above 1500°C. Containment of liquid slags and metals at these elevated temperatures requires specialised know-how and equipment, as well as access to energy, often electrical energy.

The complex nature of pyrometallurgy processes means that demonstration at large pilot scale is frequently required and Mintek's pyrometallurgical pilot facilities are unique in the world. No other entity globally has both the scale and variety of facilities hosted by Mintek. Scale-up variations and operability challenges cannot yet be accurately predicted via modelling, simulation, or even via a rigorous laboratory experimental investigation, albeit an essential part of optimising and designing of high-temperature processes. Extrapolating the observations from a series of laboratory tests needs to be validated at a larger scale.

Mintek curates a number of pilot facilities, the majority of which are smelting equipment, enabling technology development from laboratory to pilot. Smelting processes frequently require process heat generated from electrical power and in the constrained energy environment, energy-intensive industries continuously strive to reduce electrical energy consumption and energy efficiency and energy optimisation is a primary area of research for Mintek. Alternative energy sources, such as solar thermal heat and gas-fired energy, are applied to existing processes to facilitate improved energy and environmental efficiency. Mintek excelled at developing high-impact smelting technologies, primarily via the direct current (DC) smelting technology with numerous commercial installations around the world, based on the technology developed internally. DC smelting technology has had a significant impact on the industry, with successful technology transfer for chromite,

ilmenite, battery recycling, cobalt slag cleaning, and recently in nickel laterite smelting processes.

3.5 Hydrometallurgy

Hydrometallurgy is a collection of techniques for obtaining metals from their ores. It falls within the field of extractive metallurgy involving the use of aqueous chemistry for the recovery of metals from ores, concentrates, and recycled or residual materials. In the simplest terms, Hydrometallurgy can be seen as a discipline that strives to dissolve metals from their ores and then purifies the dissolved metals. Since hydrometallurgy goes beyond manipulating minerals and works at atomic level, it is the only extractive metallurgy discipline that can purify metals to the maximum extent. Hydrometallurgy can do this by manipulating interrelated aqueous and multiphase chemical equilibria by controlling the chemical potential governing these equilibria. This means that hydrometallurgical processes are very complex, requiring a thorough understanding of the chemistry of each element in the process in order to achieve optimum solubilisation and purification.

Besides extensive chemistry expertise, Mintek has particular expertise in pressure leaching, precipitative purification, electrowinning, solvent extraction, ion exchange and process modelling. This forms an excellent base for the development of innovative solutions for complex hydrometallurgical and refining problems. Good science alone is unfortunately not always enough since in practice, hydrometallurgical processing is often complicated by other factors such as cost, market dynamics, process equipment and environmental impact. This means that the "best" process solutions are not necessarily determined by the chemistry of the process only. This is where Mintek has traditionally excelled in bringing the basic chemistry understanding of a system together with these external factors to develop the optimal solution for the processing of a specific ore or concentrate. Extensive process and industry knowledge is incorporated into state of the art process simulations to carry out techno-economic evaluations of the various process options so that the optimal process or product can be selected for potential application. This approach has led to the development of numerous innovative products and processes in support of the mining and minerals industry in South Africa.

3.6 Biotechnology

Biohydrometallurgy is a branch of extractive metallurgy which describes biotechnological processes that involve interactions between microorganisms and metal-bearing minerals. Bioleaching and bioremediation are two of the most studied branches in this field and are employed worldwide at commercial scale. Bioleaching involves the use of naturally occurring microorganisms to recover gold, base metals and uranium from mineral ores, concentrates and a range of waste materials. Mintek has established an internationally recognised position for the treatment of sulphide ores and concentrates bearing gold and base metals. The tank bioleaching technologies developed by Mintek typically find application in niche areas for treatment of refractory gold concentrates as well as complex polymetallic concentrates which contain impurities that attract smelting penalties. The organisation has the ability to take processes from amenability test work through to piloting, flowsheet design, techno-economic studies and commercial implementation.

With the depletion of higher grade resources, Mintek's biotechnology processes have shifted focus to include heap leach applications where metals are extracted into solution from minerals contained in dumps or stacked heaps of low-grade ores. The learnings from biological heap leaching have been expanded to also include acid, alkaline and chloride heap leaching in the division's portfolio. In addition, Mintek has the unique ability to combine percolation leach test work with geomechanical (hydraulic / hydrodynamic) testing of such ores and their leach residues. This allows Mintek to offer clients a combination of metallurgical performance results and geomechanical/hydrodynamic information from which engineering can be done based on quantified specifications provided. Mintek's activities in this area range from a suite of various bench-scale tests to integrated pilot and demonstration tests at Pre-Feasibility Study or Process Selection Phase level, enabling commercial clients to determine ideal flowsheet design and operating conditions for optimizing value.

There is a global trend to move the mining industry towards participating in a circular economy by promoting and investing in sustainable solutions and green technologies. Mintek is uniquely positioned to contribute to this drive through its multi-disciplinary capabilities, which include bioprocessing, chemical and environmental engineering and biological sciences expertise. The focus is on the economic, environmental and social benefits of waste treatment. Current flagship projects include passive biological treatment of mine water integrated with irrigated agriculture, production of value products from mine effluents and recycling of electronic waste and tailings.

3.7 Measurement and Control

Mintek's capabilities in measurement and control are for developing and supplying world-class process control solutions and measurement instruments that deliver tangible and significant improvements in recovery, and reductions in reagent and energy usage to minerals processing plants and smelters all over the world.

The differentiating factor of Mintek's measurement and control capabilities is that it is able to combine in-depth process understanding with sophisticated process control skill on a flexible control platform that has been purpose-built, to deliver solutions that are tailored to extract every last ounce of performance from each minerals processing control challenge to which it is applied.

The advanced process control builds in layers, beginning first by ensuring the base processes are stable, then optimising the performance further to ensure maximal recovery, with minimal input cost. Niche process measurement instruments are developed to enable further optimisation, in cases where the standard plant infrastructure is inadequate.

The approach to technology development is very much "technology-pull" – close contact is maintained with industry so that market need is clearly understood and fed into the technology development pipeline. This focus means that the products Mintek delivers appeal to a wide range of operations, which protects revenue generation prospects from the cyclical nature of the mining industry. Revenues generated through the sale of measurement and control products are spread well across regions, commodities, project stages and product types (service, software, and equipment). The primary focus is the African continent, with a growing network of sales agents and distributors providing support in other markets around the world.

Mintek has more than 400 active process control and instrument implementations spread across 40 countries.

3.8 Advanced Materials

At the heart of materials in general, is the chemistry that informs the structure of the material in order to eventually arrive at a useful application. However, in order to attain a desired structure with properties required for a particular useful application, there are processes required. Embedded in this process of materials design are the understanding of the theory, materials synthesis and characterization.

Advanced materials, therefore, entails advances over old and conventional materials that have hitherto been in application. The discovery and making of these advanced materials, therefore, require advanced theories towards their discovery which currently entail the use of computational approaches to understand and predict their performance in various applications. These new and novel approaches to materials allows for a deeper understanding of their structures, dynamics and functionality. The research and development of advanced materials normally exhibit novel properties that are superior to their conventional counterparts. This inherent novelty in most cases is associated with the generation of new knowledge and intellectual property (IP) that can be exploited in the form of new processes, products and technologies. The knowledge and IP hereby developed can now be exploited through the formation of new industries, its use in enhancing and revitalizing the currently existing industry for job creation and retention.

In this regard, Mintek follows the above-mentioned approaches towards specific research, development and innovation into the end-use of materials in the mining, fabrication and manufacturing industries. Through the use of advanced process technologies, Mintek aims to produce high value-added products by deploying cross-cutting skills from various disciplines that range from chemical sciences, physics, materials science and engineering, biochemistry and chemical engineering.

The focus areas through which these are attained are in physical metallurgy, catalysis, biomedical and nanotechnology. In physical metallurgy, the sectors of interest are the broader metals-related industry that require novel materials for application in conventional and extreme environments. Catalysis, on the other hand, finds special application in the hydrogen economy sector through the manufacture of fuel cells for various application. Nanotechnology has a special focus for application in health, where biomedical adds value, and in water and waste water technologies.

3.9 Small Scale Mining

Mintek also provides support to the small scale mining sector through research and development of new processes and processing technologies, environmental management and skills development and transfer. Success is often achieved through the deployment of Mintek's laboratories and expertise at various stages of the minerals processing value chain, for the benefit of community-based mineral beneficiation operations.

Part of the outputs towards the fulfilment of its mission, include feasibility reports, technologies developed or adapted and numbers of people trained. The latter has of late included the reskilling of retrenched mineworkers as a means of alleviating the economic impact of job losses on the moderately-skilled former mineworkers.

3.10 Mineral Economics

Mintek has in-house mineral economics capability to develop market insights and techno-economic analysis related to the extraction, processing, use, recycling, and disposal of mineral commodities. The capability enables Mintek to undertake market and sectoral analyses for external clients in the public and private sectors. Further, it enables Mintek to participate in policy and thought leadership engagements with government and research entities on issues pertaining to mineral beneficiation, resource management, renewable energy, and electronic waste recycling.

As Mintek's undertakes its organisational transformation journey, it will be strengthening capability in two competency areas, namely mineral economics and techno-economic analysis.

4. SUPPORT FUNCTIONS

In the last financial year, Mintek started a transformation journey that sought to return the main thrust of its business to its core of being a research institution. A critical aspect of that journey pertained to transformation of the support services functions that is moving away from transactional focus, to strategic support that creates an enabling environment for the research, development and innovation programmes to flourish. To that end, the business development function is going through a change that will prioritise the commercialisation of Mintek's expansive intellectual property portfolio that has been amassed over decades of cutting edge research. Similarly, the information and communication technology (ICT) and the engineering management services are all gearing towards creating a network of infrastructure, plant and equipment that will effectively enable Mintek's researchers to excel in their programmes. In this section of the shareholder compact, a

summary of the critical areas of focus is provided, for each support function.

4.1 Business Development and Commercialisation

Mintek's intended impact is primarily in fostering the establishment and expansion of the minerals industry. In achieving this it is critical that the outputs of Mintek's activities are transferred to industry and commercialised. This is driven by the business development and commercialisation functions and they are therefore the main drivers of Mintek achieving its strategic impact.

The business development function encompasses a number of activities that collectively are aimed at coordinating and driving technology transfer and commercialisation. The key activities are;

a) The development and coordination of the marketing plan for Mintek. This includes attendance at international events and exhibitions.

b) Management of the commercialisation and technology transfer functions, including the building of organisational capacity to maximise Mintek's impact.

c) Development and management of 'key account managers' for Mintek's key partners.

d) Development and management of RDI networks on behalf of Mintek.

e) Management of Mintek's industry focused brand, including reputation management.

4.1.1 Mintek Office of Technology Transfer

Mintek established the Mintek Office of Technology Transfer (MOTT) in 2011 following the promulgation of the IPR act. The office was established to ensure the efficient management and administration of Mintek's IP portfolio. The office was not capacitated to lead the commercialisation of Mintek's IP, this function was decentralised and delegated to the various business units.

In the period since the establishment of the MOTT, Mintek has been partially successful in commercialising its IP, with annual revenue in the R30-R40 million range. A recent review of Mintek's technology commercialisation and industrial impact as revealed that greater emphasis is needed on technology commercialisation and transfer so that the impact of Mintek's RDI can be maximized. As a result of this change in emphasis, more capacity is needed at Mintek in the area of technology transfer and commercialisation. Consequently Mintek successfully applied to NIPMO, under the Office of Technology Transfer Support Fund, to capacitate the MOTT with commercialisation and technology transfer skills.

The specific skills that are being targeted are specialists in;

a) Technology transfer and commercialisation at a Head / Director level

b) IP related legal skills at a Manager level.

c) Technology transfer and commercialisation skills and project management and co-ordination skills at a Co-ordinator level

This enhanced MOTT will be established and capacitated during the 2020 / 21 financial year and will formally drive the transfer of technology and commercialisation of Mintek's outputs.

4.2 Information and Communications Technology

ICT is one of the vital functions within Mintek that support operations by driving operational flows of research, technology development and innovation. The function is also currently on a business transformation path as it adapts, develops and implements effective solutions on business requirements and needs for internal and external clients. It is transforming from the transactional and operational focus to business enablement. The solutions deployed will require an understanding and interconnectedness of people, processes, information and technology capability. The connectedness, interoperability and integrated ecosystem become critical in enabling Mintek research environment.

This transformation journey will consist of multiple projects such as the implementation of technology, integration of systems, policy development, process changes, digital migration, innovation with purpose and other activities that are intended to support and enable Mintek. During this journey, the consideration of the ever-changing digital world will be kept in mind during the execution phase.

4.3 Communication and Knowledge Management

The primary objective of Corporate Communications is to represent Mintek's position as one of the world's leading mineral technology research and development organisations globally. It is the window through which external stakeholders get a view of the core capabilities of Mintek. For the internal stakeholder, Corporate Communications provides a wide range of strategic, corporate, marketing and media communications and supports. Employees are informed of latest developments in the organisation including news, forthcoming events, on-site services, policies and procedures.

Mintek hosts an onsite library with an expansive collection of reference materials and a robust network of online databases that is used to nurture research. Combined, the resources available provide researchers with critical scientific and technical information in support of research programmes.

4.4 Engineering and Maintenance Services

Engineering and Maintenance Services (EMS) is responsible for the management and maintenance of Mintek infrastructure and facilities, plant and equipment. The services offered include basic maintenance service, electrical and instrumentation, building maintenance (including the laboratories) and mechanical maintenance (heating,

ventilation and air conditioning (HVAC)), Drainage, Effluent, Bays, Mobile Equipment and Mechanical Equipment). EMS is also responsible for management of site support services; namely, Security, Garden Maintenance, Hygiene and Transport services.

Optimization of maintenance processes, energy management and SHEQ compliance, remain the main drivers of ensuring optimal infrastructure availability and utilization. Efforts to identify areas where services rendered can be optimised will inform the initiatives undertaken in the next financial year, such as upskilling of human resources to improve the value of service rendered whilst contributing towards a lean organization.

Mintek also intends to map and implement an integrated energy mix for the campus. The intention is to implement a load management strategy and reduce energy consumption and Mintek's carbon footprint by extension. Mintek has also recently acquired a gas pipeline, and will be constructing a gas-to-electric plant over time that will be able to carry the base load by end of the financial year.

Upgrade of existing infrastructure and development of new infrastructure (where required) will continue to form the greater part of the divisions function as Mintek continues to embark on the improvement of the facilities to return them to modern and world class status. The first quarter of this period (20/21) will see the implementation of Block 9000 renovations and Phase 2 of HVAC system upgrade.

4.5 Human Resources

People are Mintek's single biggest asset and to realise the value of this critical resource, the human resources (HR) function has had to step out of its traditional role of focusing on compliance, transactional and operational tasks, towards a function that is strategic, proactive, responsive, business-integrated, data-driven, and highly astute in attracting, deploying, developing, retaining and optimising talent. Stepping up to the new focus has meant that the operating model of the HR services is completely overhauled, and has internal capacity to help Mintek build outstanding research capacity to fulfil its mandate.

Although HR is still in the process of this major transformation, there are visible changes that are already showing positive benefits for users of the services internally. The client facing, transactional support that provides back office operations are continuing to operate, and will be gradually automated over the next few months until such time that employee self-services are within the direct control of all employees. This will release HR resources to focus on the strategic and advisory support services geared towards talent management and policy advice.

HR also continues to drive organizational transformation from an Employment Equity perspective. The overall employment equity target of 90% has been exceeded with the designated groups currently at 92%. The female representation is currently at 41% versus a stretch target of 46%. Efforts to improve Mintek's performance against target will continue.

4.6 Finance

Financial management is one of the most important aspects in any business that is important to ensuring that the entity deliver on its mandate. **Finance** is the lifeblood of business without it things would not run smoothly. It is the source to run any organization smoothly, healthy and financially sustainable. The financial management of Mintek includes amongst other things the provision of transactional, administrative financial support, management reporting and value added decision support to business. It provides a support service and creates an enabling environment for all divisions within Mintek.

The main activities of financial management include amongst others: budget control, internal control, and revenue and expenditure management, Supply chain Management and accounting system management.

During the planning cycle the function will amongst others focus on the following:

- Adoption of Standards of Generally Recognised Accounting Practice (GRAP);
- Utilisation of technology to improve efficiencies and drive innovation such as automated reporting; and
- Improved internal control and management reporting.
- Improving supplier relationship management through monitoring of supplier performance by implementing service level agreements with critical suppliers as well as supplier performance evaluation and the improvement of contract management. This will be achieved through the optimisation and utilisation of the contract management module on the ERP system.
- Review of processes in place for regulatory compliance monitoring to increase efficiencies in procurement processes and financial support processes.
- Continuation to emphasise the importance of asset management. More asset verifications will be conducted to improve control over the movements of assets.

4.7 Project Management Office

Mintek is project managing the implementation of abandoned mines rehabilitation programme or derelict and ownerless mines programme (D&O) on behalf of the Department of Mineral Resources and Energy (DMRE) and funded by the Department. The programme has been funded in a three year MTEF funding cycle since as early as 2009. Mintek has increased internal capacity to execute the D&O programme by opening a new project office that would solely focus on the programme. It will also keep the repository of institutional knowledge and data gained by Mintek over decades in this programme in order to improve its efficiency on number of rehabilitated projects sites delivered to the department of Mineral Resources and Energy.

4.8 Internal Audit

Internal Audit (IA) is an independent, objective assurance and consulting activity established in terms of section 51(1) (a) (ii) of the Public Finance Management Act No. 1 of 1999, as amended. The role of IA is to provide assurance to Management and the Board that Mintek's risk management, governance and internal control processes are operating effectively. The consulting services are performed on an ad hoc basis.

The Internal Audit Section prepares a Risk-based audit plan each year, which is approved by the Audit and Risk Committee. The Risk-based Audit plan details all the projects to be reviewed by the Internal Audit Section. Internal Audit adds value by enriching Mintek's operations through advice derived from its evaluation and assessment of Mintek's operations during the course of the year

5. SAFETY, HEALTH, ENVIRONMENT, QUALITY AND RADIATION PROTECTION (SHEQ-RP)

The Safety, Health, Environment and Quality (SHEQ) function ensures that Mintek complies with Safety, Health, Environment, Quality and Radiation Protection (SHEQ-RP) legal and other requirements.

Mintek's SHEQ policy provides the foundations for the organization's system. In terms of the policy, Mintek is commitment to zero harm to people and the environment. In line with this policy, an Integrated SHEQ management system to eliminate duplication of processes and procedures, as well as to ensure easy navigation through various electronic documents has been implemented and is continuously maintained. The standards in use include ISO 9001 (Quality Management System), ISO 14001 (Environmental Management System) and ISO 45001 (Occupational Health and Safety Management System).

SHEQ-RP objectives have been set to ensure that the commitments that are outlined by the organisation in the SHEQ-RP policy are achieved.

5.1 Safety and Health

People are considered the most valuable asset to the organisation, as such a reputable zero harm health and safety framework has been developed and implemented to provide guidance to our operations on delivering our health and safety commitment throughout the organisation. Zero Fatalities and ≤ 1 Lost Time Incident Frequency Rate (LTIFR) targets have been set and were achieved as at the end of 2018.

5.2 Environment

Mintek's environmental focus is centred on improving our environmental systems as well as proactively searching for environmentally sensitive methods of carrying out all aspects of our business. The conservation of natural resources is one of the key drivers in our decision making process while also providing opportunities for business growth. There were no major environmental incidents in 2018.

5.3 Quality

Quality is important to Mintek's business and we value our clients and stakeholders. We strive to provide our clients and the markets that we serve with products and services which meet and exceed their expectations. Our goal is to achieve operational excellence in all aspects of our operations. As such an objective of achieving ≥ 90% Client Satisfaction Frequency Rate (CSFR) has been set and achieved. In 2018 Mintek was re-certified on the new ISO9001:2015 and ISO14001:2015 standards. Continuous improvement remains part of Mintek's business processes as the new standards are entrenched in the new financial year 2019/20.

6. FINANCIAL PLANNING

6.1 Consolidated Budget – 2020/21 to 2022/23

The consolidated budget for the 2020/21 financial year is presented below in Table 1. Total expected income is R568 million with state grant contributing 71% of the total budget. This is mainly due to additional MTEF funding received for the rehabilitation of mine hollings. The consolidated budget shows positive net results which is dependent on the commercial activities of the organisation. The summarised budget is however projecting a positive financial outlook through-out the MTEF period if the current economic conditions improve. The tables in the ensuing pages, Table 2 and 3, should be read together with the State grant reconciliation in table which reconcile the figures as per the Adjusted Estimates of National Expenditure (AENE) document including all MTEF allocations and the spending in the same period, table 5.

Mintek undertakes a rigorous budget process in January of each year, on a strategic business unit level, considering current market conditions and inflation. A realistic budget is then compiled reflecting the business plan for the next financial year. The outer years of the MTEF period (2021/2022 and 2022/2023) are based on the following assumptions.

a) State grant – allocation as confirmed by Department of Mineral Resources and Energy;
b) Commercial income (contract research and sale of products and services) – average of 2% increase per year with an adjustment of R5 million and R40 million respectively to compensate for additional capacity available due to lower state grant in the 22/23 financial year;
c) Sundry and investment income - average of 2% increase per year;
d) Staff costs – increased by 2%;
e) Bursaries – increased by 2%;
f) Operating expenses – increase of 2% per year but adjustment of R15 million and R8 million respectively to account for fluctuations in State grant in those years; and
g) Depreciation – increased by 1% per year.

Table 1. Income and Expenditure Budget (R'000)

Income ['000 Rand]	2019/2020 Forecast	2020/2021	2021/2022	2022/2023
State grant	348,440	404,988	420,285	394,934
Contracted research	62,213	52,900	53,958	55,037
Sale of products and services	94,092	74,668	81,277	123,230
Investment income	31,678	31,625	32,257	32,903
Sundry Income	5,960	4,172	4,256	4,341
Total Income	**542,384**	**568,353**	**592,033**	**610,444**
Expenditure ['000 Rand]	**2019/2020 Forecast**	**2020/2021**	**2021/2022**	**2022/2023**
Staff Costs	295,616	294,320	300,207	306,211
Bursaries	11,860	13,828	14,105	14,387
Operating costs	203,122	209,435	228,263	240,384
Depreciation	49,853	44,868	45,317	45,770
Total Expenditure	**560,451**	**562,451**	**587,892**	**606,751**
Net result	**-18,067**	**5,902**	**4,141**	**3,693**

Table 2. Statement of Financial Position Budget (R'000)

	2019/2020 Forecast	2020/2021	2021/2022	2022/2023
Non-current assets	431,821	437,284	443,809	450,916
Property, plant and equipment	428,246	433,709	440,233	447,340
Intangible Assets	3,575	3,575	3,575	3,575
Current assets	471,434	493,532	497,748	497,999
Inventory	10,989	10,419	10,419	10,419
Trade receivables	51,587	25,487	25,487	25,487
Short term investments	388,712	439,036	443,252	443,503
Cash and cash equivalents	20,146	18,590	18,590	18,590
Total assets	903,255	930,816	941,557	948,914
Equity	604,501	610,403	614,544	618,237
Revaluation surplus	143,891	142,537	141,183	139,829
Retained Income	460,610	467,866	473,361	478,408
Long term liabilities	11,997	10,176	8,976	7,776
PRMA liability	11,997	10,176	8,976	7,776
Current liabilities	286,757	310,237	318,037	322,901
Trade and other payables	49,418	44,451	40,006	36,005
Loans and advances from subsidiary	39,515	39,515	39,515	39,515
Deferred Income	197,824	226,271	238,516	247,381
Total funds and liabilities	903,255	930,816	941,557	948,914

Table 3. Cash Flow Budget (R'000)

	2019/2020 Forecast	2020/2021	2021/2022	2022/2023
	R'000	**R'000**	**R'000**	**R'000**
Cash (utilised in)/generated from operations	-19,543	69,296	25,000	21,425
Interest received	31,678	31,625	32,257	32,903
Net cash from operating activities	12,135	100,920	57,257	54,327
Additions to property plant and equipment	-48,898	-50,331	-51,841	-52,877
Increase in investment deposits	-7,520	-50,324	-4,216	-250
Net cash from investing activities	-56,418	-100,655	-56,057	-53,127
PRMA obligations movements	-1,203	-1,821	-1,200	-1,200
Net cash from financing activities	-1,203	-1,821	-1,200	-1,200
Net decrease in cash	-45,486	-1,556	0	0
Cash at beginning of the year	65,632	20,146	18,590	18,590
Cash at end of the year	20,146	18,590	18,590	18,590
Cash generated from operations – calculation				
(Deficit)/surplus from operations	-18,067	5,902	4,141	3,693
Investment income	-31,678	-31,625	-32,257	-32,903
Depreciation	49,853	44,868	45,317	45,770
Working capital changes	-19,651	50,151	7,799	4,864
Increase in inventories	588	570	0	0
(Increase)/decrease in receivables	-19,638	26,100	0	0
Decrease in payables	-20,994	-4,967	-4,445	-4,001
Increase in deferred income	20,394	28,448	12,244	8,865
Cash (utilised in)/generated from operations	-19,543	69,296	25,000	21,425

6.2 Capital Investment Plan

The Capex budget for the MTEF period from the anticipated funding sources is presented below in Table 4. Mintek will continue the investment on capital expenditure averaging at R50 million annually and 42.3% of the total Capex will be from the state grant allocation while the balance comes from reserves and MTEF funding. Funding from reserves will increase as MTEF funding decreases over the coming three years.

Table 4. Capital Expenditure Budget (R'000)

Capital expenditure budget ['000 Rand]	2019/2020 Forecast	2020/2021	2021/2022	2022/2023
State grant - capital allocation	20,704	21,825	23,060	23,954
MTEF funding - capital allocation	5,000	10,423	3,717	3,855
Capex funded from reserves	23,161	18,083	25,064	25,068
Total Expenditure	**48,865**	**50,331**	**51,841**	**52,877**

6.3 Sources of Funding

6.3.1 State Grant Allocation

Mintek has two main sources of funding for its long-term research programme – Baseline State Grant (Science Vote) and MTEF allocations. Wherever possible, additional funding is leveraged from private companies and international agencies. Mintek funds its early stage research from baseline science vote and largely utilises the MTEF funding for specific later stage development.

Mintek's R&D programme is structured into various platforms or themes. These themes are determined according to (a) government priorities and (b) industry needs and opportunities. Over the past decade Mintek's RDI portfolio has been managed via the Science Vote Cluster system. The annual review of the science vote outputs and outcomes necessitated the change in approach regarding the distribution of resources. For the 2020 financial year, starting in April 2019, funding was awarded on the basis of an 'Open Call' for funding proposals. This 'Open Call' is a bottom up process and replaces the previous Science Vote cluster system. The new 'Open Call' process is aimed at tapping into innovative ideas throughout the organisation and any new ideas that are broadly aligned with Mintek's mandate, objectives and market segment. This change in funding approach did not exclude current and previous research projects, as these need to be completed. Mintek strives to invest in a robust and diverse portfolio of projects that create new knowledge and enables breakthroughs across all areas of science, engineering and technology research.

Mintek supports the mineral strategies and initiatives of the Department of Mineral Resources and Energy. The DMRE has identified ten commodities and five value chains priorities as a basis for deciding on technical programmes. Mintek's R&D plans and activities are thus fully aligned with DMRE priorities.

The starting cost-basis budget for State Grant allocation (Science Vote) distribution for the current financial year is R251m and a provision of R20m is made for support functions and R22m for capital expenditure. This results in R209 million being available for research in the 2020/2021 financial year. The gross MTEF funding allocation has decreased by R15 million (10%) from R161m in FY 2019/2020 to R146m for the current financial year, this include D&O but excludes roll-overs.

6.3.2 MTEF Investment

The MTEF investment are motivated to Treasury for specific project activities. These project proposals are based on successful early stage research funded from the State Grant and where there is close alignment with Government priorities. Once a project has been accepted by Treasury, operational management and oversight of the project is undertaken by the same team that manages the allocation and oversight of the State Grant research funds.

The following projects are expected to run over the Medium Term Expenditure Framework and they will be monitored and reported to the National Treasury on an ongoing bases.

Titaniferous Magnetite: This is a long term development project aimed at assessing and identifying technologies suitable to unlocking the value contained in the Bushveld Complex titaniferous magnetites which is starting during the current financial year. These represent the world's largest known reserves of titanium and vanadium, and along with the contained iron represent a significant opportunity for South Africa in the future. There is currently no technology that can economically process these deposits for the recovery of the titanium, vanadium and iron. The project aims to develop suitable technology so that in future (10 to 20 years) these deposits can be economically exploited.

6.4 Cost Containment Plan

The definition of cost containment is "The process of controlling the expenses required to operate an organisation or perform a project within pre-planned budgetary constraints." The cost containment process is an important management function that helps keep costs down to only necessary and intended expenses in order to satisfy financial targets. Budget monitoring is performed on a regular basis to ensure that there is no excessive spend. The focus for Mintek is to improve efficiencies through better utilisation of resources.

The cost containment plan as set in the National Treasury Instruction/circular No. 02 of 2016/2017 issued on the 30th September 2016 gives account of some of the measures that Mintek will continue to implement over the planning period.

The Mintek Cost Containment Plan is contained in Appendix III.

6.5 Allocation of other Government Grants

6.5.1 Rehabilitation Project

The programme of rehabilitation of asbestos mines has been managed by Mintek on behalf of the Department of Mineral Resources and Energy since 2013. The initial contract was for a duration of 3 years, with a value of R165 million, and concluded at the end of March 2016. The contract/project was extended into a second phase over a three year period from 2016 to 2019 to the value of R 155 million. In 2019 the contract was further extended over a three year period from 2019 to 2022, with a total value of R450 million. The current contract scope includes managing the rehabilitation of certain derelict and ownerless (abandoned) mine sites identified by the DMRE, with a specific focus on asbestos mines, as well as closing and sealing of derelict shafts (holings).

To date, 38 sites have been rehabilitated with great success. The very large Streatham project, in the Limpopo province, was divided into 4 separate smaller projects due to the size of the project. The project then saw activities on site commencing in early 2017. The total cost of the rehabilitation of the 4 sites has been R176m and the Streatham related activities have dominated the 2016 to 2019 contract period. The project is nearing completion after delays were encountered due to community issues.

Over and above the Streatham project, the Msauli and Steelpoort projects commenced in 2019 and are due for completion in the 2019/2020 financial year. Tenders were also awarded for Uitkyk, Penge Village and Lagerdraai. These projects have commenced and will be finalised in the 2020/2021 financial year.

In the 2019/2020 financial year, additional funding of R70 million was received from the Department of Mineral Resources and Energy to fund the closing of derelict shafts and holings. Currently, the projects are underway and sixteen clusters of shafts/holes will be closed by end of the 2019/2020 financial year.

This additional work has led to a change in the model of execution of rehabilitation projects. A dedicated project office was established in November 2018 and is being capacitated so that all of the previously outsourced services such as design and management of the projects can be performed internally.

The programme has faced some challenges. The major challenges on the rehabilitation projects being lengthy delays on projects due to protracted community strikes and collective action as well as an over-reliance on costly external consultants. Mintek, together with DMRE, has managed to resolve some community-related challenges which has seen the commencement of the longstanding Uitkyk and Lagerdraai projects. The dedicated project office has reduced reliance on external consultants. This change ensured that there is greater efficiency and flexibility in the execution of this programme.

The derelict shafts and holings are predominantly located in illegal mining hotspots which makes sealing/closing them risky and challenging. In 2019, a tactical security tender was issued and awarded to mitigate this risk.

5.6 Reconciliation of Allocations as per the AENE

Reconciliation of all allocations as per the Adjusted Estimates of National Expenditure (AENE) document and the Mintek Budget is presented below in Table 5.

Table 5. Reconciliation of allocations as per the AENE and Mintek Budget

State grant reconciliation	2019/2020 Forecast	2020/2021	2021/2022	2022/2023
Available allocation CASH	436,022	435,137	458,684	475,733
less VAT	56,872	56,757	59,828	62,052
Amount excluding VAT	382,475	381,699	402,354	417,310
less capex	25,704	32,248	26,777	27,809
State grant - capital allocation	20,704	21,825	23,060	23,954
MTEF funding - capital allocation	5,000	10,423	3,717	3,855
Available state grant revenue	356,771	349,451	375,578	389,501
MTEF				
Titaniferous Magnetite	21,120	22,282	23,508	24,382
D&O	140,208	124,064	130,887	135,753
Total	161,328	146,346	154,395	160,135
less VAT	21,043	19,089	20,138	20,887
Available MTEF	140,285	127,257	134,257	139,248
MTEF funding - current allocation	122,532	105,266	118,335	122,734
MTEF funding - capital allocation	5,000	10,423	3,717	3,855
Admin fee at 10%	12,753	11,569	12,205	12,659
Available MTEF	140,285	127,257	134,257	139,248

Available state grant revenue	356,771	349,451	375,578	389,501
Carry over MTEF from previous financial year	108,536	116,867	61,330	16,623
Carry over MTEF to next financial year	-116,867	-61,330	-16,623	-11,189
Total state grant revenue	348,440	404,988	420,285	394,934

6. PERFORMANCE ASSESSMENT WEIGHTING

The 12 National Outcomes contained in the "Guide to the Outcomes Approach" formed the starting platform for the Mintek planning process. The possible support and contribution that Mintek could make to each of the national outcomes was carefully considered, and these were formulated into Mintek's Strategic Objectives, and the weighting is presented below in Table 6.

Table 6. Performance Assessment Weighting

OBJECTIVES	WEIGHTING
Conduct relevant, applied research and technological innovation	35%
Foster industry establishment and expansion	30%
Developing a capable workforce	15%
Ensuring financial sustainability	15%
Developing and maintain world-class RDI infrastructure	5%

6.1 Planning Process for 2020/21 to 2022/23

The planning process has been conducted in line with the National Treasury Guidelines. The Shareholder Compact and Corporate Plan outline a set of annual corporate objectives, as well as priority research programmes that are at the core of Mintek's mandate. The set of KPIs that will be to measure organizational performance is provided later in Section 7 in an aggregated form. For internal management control of the business, a more comprehensive set of indicators and Executive Committee priorities will apply and be used for regular internal reporting.

The corporate objectives and performance indicators for 2020/21 were revised by Management and discussed during a series of engagement at all management levels of the organization, as well as engagements with all staff at divisional level. Various national documents key legislation and policy instruments were taken into account during the planning process, include thing the following:

a) Mineral and Petroleum Resources Development Act (MPRDA) – Department of Mineral Resources and Energy
b) Public Finance Management Act (PFMA) – National Treasury
c) National Environment Management Act (NEMA) – Department of Environmental, Forestry and Fisheries
d) Intellectual Property Rights from Publicly Financed Research and Development Act (IPR Act) – Department of Science and Innovation
e) Occupational Health and Safety Act – Department of Employment and Labour
f) Mine Health and Safety Act – Department of Mineral Resources and Energy
g) Construction Industry Development Act – Department of Public Works and Infrastructure
h) Ten Year Innovation Plan for South Africa – Department of Science and Innovation
i) Industrial Policy Action Plan (IPAP) 2016/17-18/19 – Department of Trade and Industry

Mintek has identified five Objectives supporting the 12 National Outcomes, and these were cascaded into a larger number of Activities with Performance Indicators that are based on the SMART criteria. The mapping of National Outcomes to Activities per Programme and Performance Indicators emerged as follows:

National MTSF Priority	Mintek Objectives	Policy Alignment
Priority 2 : Economic Transformation and Job Creation	**Strategic Objective 1: Conduct relevant, applied research and technological innovation**, and **Strategic Objective 2: Foster industry establishment and expansion** both entail mineral processing and beneficiation of South Africa's strategic minerals and metals such as the beneficiation of platinum for developing fuel cell technologies and the beneficiation of nano gold particles to develop high-value diagnostic products for use in the pharmaceuticals industry.	• MTSF • NDP • IPAP (2016/17-18/19) • PPPFA • B-BBEE Act • MPRDA • Beneficiation Strategy
Priority 2 : Economic Transformation and Job Creation	**Strategic Objective 2: Foster industry establishment and expansion** includes priority research programmes that are aimed at reviving sectors of the industries that have been struggling over the last few years, such as the ferro alloy industry. Further, there are numerous technologies and processes that Mintek will be commercialising to gold mining companies in particular, to assist extend the life of mining operations. All of these interventions will have a direct positive impact on employment.	• MTSF • NDP • IPAP (2016/17-18/19) • PPPFA • B-BBEE Act • MPRDA • Beneficiation Strategy
Priority 1: Capable, Ethical and Developmental State	**Strategic Objective 3:** Develop a capable workforce includes a robust human capital development programme, primarily targeting Science, Engineering and Technology (SET) skills.	• MTSF • NDP • IPAP (2016/17-18/19) • DST Innovation Plan • PPPFA • B-BBEE Act • MPRDA • Beneficiation Strategy
Priority 2 : Economic Transformation and Job Creation	**Strategic Objective 1: Conduct relevant, applied research and technological innovation**, and Strategic **Objective 2: Foster industry establishment and expansion** both include Mintek developing technologies and originating patents, trademarks and other discoveries, which are protected in terms of the IPR Act. These technologies are transferred to industry in line with Mintek's mandate.	• MTSF • NDP • IPAP (2016/17-18/19 • DST Innovation Plan • IPR Act

The above Mintek Objectives have been grouped using a Balanced Scorecard Approach as shown below. Details of the score card highlighting Mintek's Strategic Objectives, Programmes, Measures and Indicators follow in Section 7 and Appendix I.

Stakeholder Perspective
– Conduct relevant, applied research and technological innovation – Foster industry establishment and expansion – Developing and maintain world-class RDI infrastructure
Financial & Internal Business Perspective
– Ensuring financial sustainability
Learning and Growth Perspective
– Develop a capable workforce

7. CORPORATE SCORECARD

A comprehensive and balanced set of key performance indicators will be used to measure the health of the organization, focusing on its core business of research and development, its capacity and capabilities as a research organization, as well as its financial sustainability. The KPIs reflect outputs and outcomes of the work that will be done in the areas of research and development, innovation and technology development over a period of three years.

Table 1: Key Performance Indicators, 2020-2023

Strategic outcome oriented goal	Key Performance Indicators	Baseline 2019/2020*	Target 2020/2021	Target 2021/2022	Target 2022/2023
Conduct relevant, applied research & technological innovation	# of journal papers	24	30	38	46
	# of conference papers	61	70	81	93
	# of book chapters	5	4	5	7
	# of books	0	0	0	0
	# of invention disclosures	14	18	20	25
	# of patents	6	4	7	8
	# of trademarks	6	8	8	11
Foster industry establishment and expansion	# of prototypes, processes and/or models demonstrated/validated in a relevant environment	20	16	34	38
	Income from the sale of products & services, royalties and licences, (Rm)	94.09	74.7	81.3	123.2
	# of IP Licences	1	2	2	5
Develop a capable workforce	Total number of SET employees	203	215	216	230
	% of Black SET staff	78%	79%	78%	82%
	% of Female SET staff	48%	50%	50%	52%
	Total number of SET staff with doctoral degrees	23	33	43	50
	% of SET staff with doctoral degrees	11%	15%	20%	22%
	Total number of SET staff with masters degrees	41	54	64	74
	% of SET staff with masters degrees	20%	25%	30%	32%
	Total number of SET staff at middle and senior levels (SP, MP and SE)	99	111	112	126
	% of Black SET staff at middle and senior levels (SP, MP and SE)	64%	68%	72%	75%
Develop and maintain world-class RDI capacity	Total investment in plant, property and equipment, (Rm)	48.8	50.3	51.8	52.8
	Total investment in human capital, (Rm)	11.8	13.8	14.1	14.3
	Lost Time Injury Frequency Rate	<1	<1	<1	<1
	Disabling Injury Frequency Rate	<1	<1	<1	<1
	Client Satisfaction Rate	90%	90%	90%	90%
	Safety, Health, Environment and Quality	ISO Accredited	Maintain Accreditation	Maintain Accreditation	Maintain Accreditation
Ensure Financial Sustainability	Total income, (Rm)	542.3	568.3	592.0	610.0
	Net result, (Rm)	-18	5.9	4.1	3.6
	Contract R&D Income, (Rm)	62.2	52.9	53.9	55.0
	BEE Spend as % of Procurement Spend	80%	85%	90%	90%
	Audit opinion.	Unqualified	Unqualified	Unqualified	Unqualified

* The baseline for 2019/2020 is based on what we anticipate to achieve by the end of the financial year.

It is hereby recorded that the Corporate Scorecard, as presented in Section 7 above has been accepted by the Shareholder.

Dated at _____ on this the _____ day of _____ 2020.

AS WITNESSES:

1. _____ _____

(Minister of Mineral Resources and Energy for and on behalf of the Republic of South Africa)

2. _____

Dated at _____ on this the _____ day of _____ 2020.

AS WITNESSES:

1. _____ _____

(Chairperson of the Board of Mintek)

2. _____

APPENDIX I – PROGRAMME OBJECTIVES

PROGRAMME 1: ANALYTICAL SERVICES

Analytical services operate Mintek's well resources research laboratories that are certified to conduct quality research of international standards. The laboratories provide specialised solutions to the metallurgical, mining and related industry, and they boast a set of ultra-modern instruments and equipment. Although there was a heavy bias towards volume-based analytical services in the past, the next financial year will see a major shift towards a value-adding, research-based laboratory environment that guarantees quality results to clients. The commercial analytical work will continue parallel with the research function.

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION**
Objective	Redesign analytical services to focus on research activities
Objective statement	Five programmes are proposed going forward where research will be conducted by employees qualified with PhD and Masters degrees. The aim is to have 7 employees with a PhD and 7 employees with Masters degrees in the next 3 years who will contribute to divisional outputs e.g. publications (4 journal papers in the next 3 years) in high impact journals.
Baseline	There is currently no output i.e. journal papers, patents etc. from analytical services
GOAL 2	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective	Add value to the gold mining industry
Objective statement	Analysis of low gold tailings will allow for an extension of gold operations in the country. An accredited method for low gold tailings will be targeted under this programme in the next 3 years.
Baseline	There are 13 accredited methods currently in the mining industry (PGM and Au), ferrochrome and Fe- ore industries amongst others.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Grow the number of qualified SET employees in the division
Objective statement	Establish a team that has a majority of employees with a minimum honours degree for both the commercial unit and research unit within the next 3 years in order to ensure high quality output and sustainable financial position
Baseline	There are currently has 18 SET employees of which only 4 employees have PhD degrees and 2 employees have Masters degrees
GOAL 4	**ENSURE FINANCIAL SUSTAINABILITY**
Objective	Improve financial position of analytical services
Objective statement	Establish and implement a good mix between commercial and research activities in order to attract funding for research in addition to commercial revenue and break even.
Baseline	Analytical services incurred losses in the previous financial year.
GOAL 5	**DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRASTRUCTURE**
Objective	Establish a research and development unit with world class infrastructure and re-furbish current commercial unit infrastructure
Objective statement	Instigate partnership with suppliers for instruments (Analytical Innovation Laboratory for mining) within the next 2 years to establish a new laboratory with loaned instruments at no cost of instruments and maintenance, with continuous improvement of processes and opportunity to be the first laboratory to test their new technologies.
Baseline	Most key instruments and equipment are outdated, without recent efficient technologies - high repair frequency rate and downtimes - high maintenance cost and repair cost, causing delays and production losses.

PROGRAMME 2: MINERALOGY

Mineralogy (MNL) focuses on mineral characterisation to understand processing behaviour of minerals, ensures optimum recovery and grade in mineral beneficiation. The programme has identified a need for an effective process mineralogy that is expected to increase in the future as ores become more complex and of low grade. New, more complex operations, require integrated and sophisticated use of current and future knowledge that will need to be developed to overcome technical, environmental or societal considerations; for example when the excessive use of energy and water cannot be tolerated or permitted. Innovative and novel technologies, and the skills to utilise them to process lower grade deposits can be developed. The mineralogical knowledge will be essential to the provision of minerals and metals for a sustainable world. The objectives for the programme will be as follows:

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION**
Objective 1	Development and optimisation of emerging mineralogical characterisation techniques for Mintek applications
Objective statement	The objective of this programme is to develop and optimise mineralogical characterisation techniques to enhance Mintek's offering in mineralogy, ore and product characterisation capabilities. As part of a well-founded laboratory, not only routine services, but also the use and application of cutting edge techniques would enhance Mintek's offering to industry. Mineralogy is one of only 4 laboratories in the country running a 3D tomography scanner, and is the only laboratory in the country running a micro-XRF instrument. Development of these techniques to characterise various commodities of relevance to Mintek's business would give Mintek the edge in its commercial activities, whilst also allowing it to be at the forefront of new developments in these sectors
Baseline	There is no baseline currently.
Objective 2	Process optimisation prediction using Mineralogy
Objective statement	The objective of this programme is to use mineralogical datasets in a meaningful manner for predictive capabilities in ore processing and waste management (tailings, fines) Mineral properties may be well known, however there are gaps in understanding how these mineral properties influence mineral behaviour during beneficiation. For example, recent research conducted at Mintek has identified PGM speciation as a critical factor affecting recovery of PGM during flotation. This programme seeks to address similar gaps at various stages in beneficiation, so that optimal process strategies may be implemented.
Baseline	There is no baseline currently.
Objective 3	Data management and analysis performance
Objective statement	The objective is to organise mineralogical data from disparate sources into an integrated framework that allows efficient extraction of information on South African mineral resources.
Baseline	Mintek has amassed a wealth of data from different ores and ore types in any given commodity over many years. However, these are disparate datasets that emanate from samples of different origins, and come from different sources (e.g. bulk mineralogy, as opposed to EPMA spot analyses). Furthermore, large datasets are now being generated that require processing capabilities to enable storage and later extraction/interrogation in a meaningful way.
GOAL 2:	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective	Mineralogical characterisation of strategic commodities – vanadium and coal
Objective statement	The objective of this programme is to enhance the value that mineralogy brings to ore deposit evaluation at the early stages, for key commodities, in this case, vanadium and coal. Mineralogy is not only important to process efficiency studies (traditional process mineralogy) but also in the evaluation of ore deposits at the early stages of development.

	In this respect, two commodities have been identified as of strategic importance to South Africa's economy – the vanadium bearing titaniferous magnetites of the Bushveld Complex. The extraction of vanadium, titanium and iron, and from these deposits is in need of more in-depth understanding of mineralogical distribution in the ores. The magnetites are of strategic importance for the battery sector. For the coal, different coal seams and deposits will be evaluated to assess potential for coal use in different applications (e.g. thermal, steel, cement, metallurgical). The DMRE will also be appraised of commodities in terms of resource application and beneficiation options
Baseline	There is no baseline currently.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective 1	Ensure that the programme has transformed and diversified workforce
Objective statement	Increase the number of SET employees to 14
Baseline	Currently, there are 10 SET staff in mineralogy
Objective 2	Skilled workforce with higher qualifications, Doctoral degrees
Objective statement	Increase the total number SET staff with Doctorate degrees from 2 to 6
Baseline	There are 2 SET staff with Doctorate
Objective 3	Skilled workforce with higher qualifications, Masters degrees
Objective statement	Total number SET staff with Masters degrees from 4 to 8
Baseline	There are 4 staff with Masters degree
GOAL 4	**FINANCIAL SUSTAINABILITY**
Objective	Income from Products and Services
Objective statement	Ensure the division attracts and retain its clients to maintain the revenue of above R10 M per annum
Baseline	The current commercial revenue for FY 2019/2020 is R 9 M
GOAL 5	**DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRASTRUCTURE**
Objective	Ensure that mineralogy has the state of the art instruments
Objective statement	Instrument availability and less breakdowns. The sample preparation laboratory will have to be automated in order to keep up with the automated SEMs.
Baseline	Currently, Mintek has 4 Autosems, 1 SEMS, 1 XRD, 1 Micro-XRF, 1 LA-ICP-MS and Sample Preparation instruments

PROGRAMME 3: MINERAL PROCESSING

Minerals Processing contributes to the mining sector by conducting research, development and innovation in physical mineral upgrading processes and technology. It focuses on exploiting the physical properties of minerals for upgrade or concentration purposes. The overall aim in mineral processing is maximise the value that can be derived from any raw material and any unexplored or sterile resource. This is achieved by means of laboratory and pilot plant studies to develop the most suitable plant configuration for existing operations, new projects or ore types. MPD's research goals are aimed at providing solutions on pre-concentration of commodities that are of greatest economic and strategic importance to South Africa, notably Precious, Ferrous, Energy, Industrial, Base metals and Rare earth elements.

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION**
Objective	Equipment improvement and development
Objective statement	The objective of the programme will be to develop and provide locally manufactured products and equipment to the mining industry to enhance the operational performance of mineral separation process plants
Baseline	The programme did not exist in the past. This is a new programme that will be started in financial year 2021. Technology is at TRL 4 (Bottom driven cell prototype has been developed).
GOAL 2	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective 1	Revitalisation of the Fe ore industry in South Africa
Objective statement	The purpose is to grow and sustain the Fe industry in South Africa by evaluation of sterile resources (low grade fine stockpiles and Banded Iron Formation (BIF) via unconventional process solutions, and to create a South African based expertise network in the context of an existing fragmented value chain
Baseline	In October 2019, MPD had discussion with AMSA to discuss areas of collaboration. It has been decided that MPD should work with the primary ore producers and conduct research on their feed material. As a result of this arrangement Non-disclosure-agreement (NDA) is currently being signed by Assmang and Mintek. The ore needed by MPD for research is being mined by Assmang. Technology is still at TRL3, that is, laboratory tests have been completed.
Objective 2	Processing of Platreef ores and developing of new PGM and Cr resources
Objective statement	To develop a unique approach with regards to flotation and downstream processing so as to maximize value extraction from new and historical PGM ore reserves, thus ensure sustainability of the industry. The overall aim of the proposed research program is to enhance the quality of Platreef concentrates obtained from flotation circuits by improving the mass pull, grade and recovery relationship.
Baseline	Commercial test-work has been conducted on Platreef ores where recovery and mass pulls were low. At the time, MPD did not have required competency to process these type of ore. Fresh feed material has therefore been requested from Ivanhoe to be used as a feed in the research. Technology is at TRL3.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Increasing the level of qualification of the SET staff
Objective statement	Accelerate the development of SET staff to deliver applicable technologies and scientific outputs. Upskilling, training and skills transfer within the Division on SET staff must be initiated. MPD must increase the total number of PhDs to 6, and for MSc to 10.
Baseline	Currently, the total number of PhD is 3, and MSc is 6. Also, currently 2 Papers per year are produced, 1 Discovery pre year is being made.
GOAL 4	**ENSURE FINANCIAL SUSTAINABILITY**
Objective	To increase the contribution of commercial projects to overall revenue of MPD
Objective statement	To provide high quality research to the industry thus contribute in making MPD financially sustainable by offering process separation efficiency/optimisation services. [e.g.

	flotation reagent screening, locked cycle tests, spiral and shaking table tests
Baseline	Currently, MPD's commercial revenue is R30 million per annum.
GOAL 5	**DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRASTRUCTURE**
Objective	Modelling and simulation
Objective statement	To build and design solutions, including computational modelling, simulation, and data analytics in the development of virtual prototypes and pilot scale processes
Baseline	Modelling and simulation of spiral circuits has been performed. Comminution simulation tests currently underway. Technology still at TRL3.

PROGRAMME 4: PYROMETALLURGY

The value proposition of Pyrometallurgy is to use research knowledge responsibly to maximise the value from extracted metals by providing sustainable, superior and practical technical solutions to complex pyrometallurgical challenges at a high value-to-cost ratio and transfers its technological expertise to support and grow sustainable metal production and adjacent industries in South Africa. In order to do this, RDI activities in the Pyrometallurgy programme have been consolidated into a number of objectives designed to maximise impact.

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH AND TECHNOLOGICAL INNOVATION**
Objective 1	Unlocking complex and low-grade ores to support the growth of the mining and metallurgical industry in South Africa
Objective statement	Developing a sustainable, integrated process to extract iron, vanadium, and titanium from South Africa's Bushveld Complex and demonstrate the technology at pilot scale.
Baseline	Funding for pilot demonstration of fluxless DC smelting via a 5 year MTEF programme (R80M), including about R20M of Capital Investment. Integrated, modern operation with the ability to feed pre-reduced titanomagnetite. Project is in completing the second year of the five year programme.
Objective 2	Support and revival of energy intensive industries in South Africa
Objective statement	To revive the declining manganese smelting capacity in South Africa by optimising the electrical energy consumption through preheating of ores via alternative energy sources, including solar thermal heat.
Baseline	PreMa funded by Horizon2020 programme in EU including capital investment in pilot equipment, human capital development. PreMa completed year 1 of 3 year funding period with overall R37M of funding.
Objective 3	Support and revival of energy intensive industries in South Africa
Objective statement	Support and grow the chrome smelting capacity in South Africa through the development of competitive and energy efficient smelting technologies to address the declining smelting capacity in South Africa.
Baseline	Self-fluxing smelting technology for low-grade chrome patented and licensed.
Objective 4	Comprehensive utilisation of coal resources
Objective statement	Developing of the DC gasification technology to comprehensively use South Africa's coal resources, focusing on fine metallurgical grade coal and waste coal dumps to upgrade coal to synthetic natural gas for use as energy storage in support of the hydrogen economy.
Baseline	DC gasification patented
Objective 5	Solar thermal applications in minerals processing (STAMP)
Objective statement	Integration of solar thermal heat in minerals processing to reduce the reliance on electrical energy to dry, heat or process materials prior to smelting and to apply solar thermal heat to processing of low melting metals.
Baseline	PhD in progress Review of opportunities Work package leader in EU funded programme PreMa Organising committee of HiTemp2 – conference on applications of renewables

GOAL 2	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective 1	New Industries: Establishing of a titanium metal manufacturing industry in South Africa
Objective statement	To identify the potential opportunity in South Africa to establish a titanium metal production capacity with the view to support the metal manufacturing capacity, to create a local manufacturing industry leveraging titanium metal production capacity to produce titanium metal products from local resources.
Baseline	Review of industry and opportunities identified as first stage to develop a value-proposition and input in feasibility.
Objective 2	Establish new industries: Establishing a rare earth manufacturing industry in South Africa
Objective statement	To commercialise the PyEarth™ technology as a critical enabler to establish a rare earth metal production capacity in South Africa, including refining and metal production capacity.
Baseline	PyEarth™ patented (PCT) Pre-feasibility study, journal paper and conference paper published. 2 masters degrees linked to rare earth processing Funded State Grant proposal
Objective 3	Valorisation of waste streams
Objective statement	Establishing a commercially viable business to process local arising of electronic waste through the commercialisation of the eWasteSmelt technology via a business incubation model to enable co-processing of low-value cathode ray tubes (CRTs)
Baseline	Technology tested at TRL7
Objective 4	Foster the industry by extending the life of South African Gold Mining Industry
Objective Statement	Extending the life of gold producers through technologies, equipment supply, and technical support to improve efficiencies and maximise the value and life of mine of gold industries.
Baseline	Minfurn200 commercialised.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Developing and maintain a world-class research team that delivers applicable science and technology solutions to the mining and metal industry
Objective statement	Develop a team of researchers that are able to deliver applicable technologies and scientific output at a SET ratio of 3 researchers per output by increasing the number of world class researchers through development and recruitment over a three year period.
Baseline	4 PhDs 6 Masters 2 journal papers per annum (base of 20 researchers) 5 conference papers (from a baseline of 20 researchers) 3 discoveries 1 patent
GOAL 4	**FINANCIAL SUSTAINABILITY**
Objective 1	Offering high value-to-cost and diversified services to industry
Objective statement	Developing new and digital services to support and grow the commercial revenue stream. Modelling capacity to support and grow the business development for the division.
Baseline	1 PhD modeller
Objective 2	Increase revenue earning capacity
Objective statement	Appointment of experienced senior researchers to increase revenue earning capacity to build a SET capacity from 4 to 10 senior researchers able to lead research teams.
Baseline	2 x PhD appointments in 2019/2020

PROGRAMME 5: HYDROMETALLURGY

The Hydrometallurgy programme is a specialist set of techniques for obtaining metals from ores, using innovative solutions for complex hydrometallurgical and refining problems. The current focus areas of the Hydrometallurgy is to leverage key technologies that have been developed over years of extensive research for maximum impact in the South African minerals and related industries as well as to establish a relevant and sound technology and expertise base to be able to direct and drive developments in the industry going forward. In order to do this, RDI activities have been consolidated in a number of sub programmes designed to drive out maximum impact, as listed below.

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION**
Objective 1	Revolutionizing extractive metallurgy through cutting-edge design, process control and support services by means of digital process twinning.
Objective statement	Stimulating responsible project development in the mineral industry through the provision of better informed and more rapidly completed feasibility studies, process designs and commissioning as well as optimisation and support of the corresponding plants.
Baseline	The development of the technology framework and modelling philosophy that will form the basis for the Gemini Programme has been funded from State Grant (R1604k). This is the first year of the programme that is expected to run over a 10-year period.
Objective 2	Incubating a South African high technology industry
Objective statement	To unlock the potential of a high technology industry in South Africa by leveraging mineral wealth and metallurgical expertise to provide competitive access to technology specific precursors.
Baseline	Three projects to develop and certify technology specific precursors for the battery storage industry has been funded by a State Grant award (combined R1871k). All three projects are in year one and will form the basis of targeted technology developments over the next five years.
Objective 3	Reducing the water footprint of metallurgical processes
Objective statement	Minimisation of the water footprint of metallurgical processing through the integration of digital process twins with in-depth knowledge of membrane separation mechanisms.
Baseline	A project to establish a membrane test facility has been funded from the divisional capital allocation. A project to deepen the understanding of membrane separation mechanisms has been funded from Mintek's State Grant allocation (R909k) and is currently in year one. This is the first year of the programme that is expected to run over a 5-year period culminating in a Process advisor software package.
GOAL 2	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective 1	New industries: Establishing a rare earth production and manufacturing industry in South Africa
Objective statement	To facilitate the establishing of a rare earth production and refining facility in South Africa by leveraging the Mintek political influence and rare earth processing expertise.
Baseline	The current activity is funded from Mintek's state Grant (R1900k) and comprises of a facilitation initiative to bring all stakeholders together in the design and application of the SACREF concept. A project SteerCom has been established representing the major stakeholders such as Mintek, IDC, NRWDI, DTI, NECSA and Tronox. A project charter has been drafted to govern the project. An application has been made for funding of R240M from MTEF for an integrated demonstration of the REE processing technology for a centralised facility accepting ore from diverse sources.

Objective 2	Foster the industry by extending the life of South African Gold Mining Industry
Objective statement	Extending the life of gold producers through technologies, equipment supply, and technical support to improve efficiencies and maximise the value and life of mine of gold industries.
Baseline	Patented gold from carbon fines technology had been developed and piloted. A project to demonstrate the gold from carbon fines technology in order to transfer the technology had received State Grant Funding (R2009k). An industrial partner had been identified (GoldPlat) and a LOI had been signed. This is year-one of the technology transfer project
Objective 3	Foster the industry by transferring cost saving technologies to the industry
Objective statement	Enhancing the competitiveness of copper and cobalt producers through technologies, equipment supply, and technical support to improve efficiencies and maximise the value of production.
Baseline	Patented MgO recycling technology had been developed and piloted. A project to demonstrate the MgO recycling technology in a relevant production environment had received State Grant Funding (R995k). An industrial partner had been identified (Metorex) an agreement had been reached to test the technology at a Cu/Cooperation in the DRC. This is year-one of the technology transfer project.
Objective 4	Foster the industry by transferring mining and process impacted water treatment technology to the mining and related industries.
Objective statement	The objective of this programme is to lower the water footprint of mining and manufacturing industry processes by leveraging the SAVMIN™ technology and know-how to provide a cost competitive product to treat and re-use impacted water.
Baseline	Patented SAVMIN™ technology has been tested and demonstrated to TRL 8 A front-end engineering datapack had been compiled for a SAVMIN™ installation. State grant funding had been awarded to a project aimed at commercialising SAVMIN™ (R3000K). This is year one of the commercialisation project.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Developing and maintaining a world-class research team tailored to the HMD value proposition.
Objective statement	Develop a team of researchers that are able to deliver applicable technologies and scientific output at a SET ratio of 3 researchers per output by increasing the number of world class researchers through development and recruitment over a three year period.
Baseline	3 PhDs 2 Masters 2 journal papers per annum (base of 12 researchers) 3 book chapters per annum (base of 12 researchers) 4 conference papers (from a baseline of 12 researchers) 1 discoveries 3 patents
GOAL 4	**ENSURE FINANCIAL SUSTAINABILITY**
Objective 1	Offering high value-to-cost and diversified services to industry
Objective statement	Developing new and digital services to support and grow the commercial revenue stream. Modelling capacity to support and grow the business development for the division.
Baseline	1 PhD modeller
Objective 2	Increase revenue earning capacity
Objective statement	Appointment of experienced senior researchers to increase revenue earning capacity to build a SET capacity from 4 to 6 senior researchers able to lead research teams.
Baseline	2 PhD 2 Masters

GOAL 5	DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRASTRUCTURE
Objective	Establishing and maintaining fit for purpose infrastructure
Objective statement	Securing funding for flexible and fully instrumented pilot plant facility for the verification of process models and staff development.
Baseline	Mintek funded continuous POX pilot plant (R10) MTEF funded Automated Solvent extraction pilot plant (R15M) Mintek funded membrane pilot scale test rig (R2M)

PROGRAMME 6: BIOTECHNOLOGY

Mintek's Biotechnology programme is a branch of extractive metallurgy which describes biotechnological processes that involve interactions between microorganisms and metal-bearing minerals. Bioleaching and bioremediation are two of the most studied branches in this field and are employed worldwide at commercial scale. Bioleaching involves the use of naturally occurring microorganisms to recover gold, base metals and uranium from mineral ores, concentrates and a range of waste materials. The programme is a well-established programme of Mintek that is internationally recognised for the treatment of sulphide ores and concentrates bearing gold and base metals. The objectives that will be pursued over the next financial year are outlined below.

GOAL 1	CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION
Objective	Building capacity to support innovation and technology development in the environmental and energy sector
Objective statement	In line with the increasing push for the development and implementation of green technologies capable of delivering on energy, water and carbon efficiency targets, the division aims to increase its capability to provide technology solutions to the water, waste and energy sector as it is applied to the minerals industry.
Baseline	Production of value added products from waste effluents jointly funded by the Water Research Commission and Mintek. Journal papers submitted for review. Conversion of waste coal to energy funded by Mintek. Review of opportunities as a first stage to develop a value proposition and potential role for the division in the energy space.
GOAL 2	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective 1	Unlocking value from low-grade ore and waste material
Objective statement	Grow the current reputation and footprint of BIO's heap leach technology in the copper, copper / cobalt heap leaching services market and expand into the market for treatment of gold and PGM-bearing ores and waste material.
Baseline	Cu and Co technology established and marketed as service. Precious metal (gold and PGM) processes in concept demonstration PhD in progress
Objective 2	Foster the industry by transferring mining and process impacted water treatment technology to the mining and related industries.
Objective statement	Demonstrate Mintek's biological sulphate reduction process for treatment of mine effluent (cloSURE™), integrated with irrigation trials, at a coal mine site to provide a sustainable solution for treatment and re-use of mine impacted water post mine closure and enabling the development of various business opportunities that will benefit local communities and medium- to large-scale Agri-businesses.
Baseline	The technology has been piloted at a coal mine site (400L/day). Currently the process is being integrated with irrigation trials. Detailed design of a 50m3/d plant in progress in collaboration with a coal mine and the plan is to build a demonstration scale plant at a closed mine site. Contract research funding and Mintek funding have been received to perform optimisation in parallel with the piloting activities.

Objective 3	Foster the industry by extending the life of gold operations in South Africa
Objective statement	Extending the life of gold producers through technologies, equipment supply, and technical support to improve efficiencies and maximise the value and life of mine of gold industries.
Baseline	Concept of alkaline gold heap leach technology to treat sulphide refractory gold ore and waste rock through simultaneous sulphide oxidation and gold dissolution in the heap, eliminating the need for washing / neutralization stages prior to gold cyanidation since the ore is already oxidatively pretreated in an alkaline medium, has been proven (year 1).
Objective 4	Valorisation of electronic waste
Objective statement	To establish, in partnership with relevant stakeholders, a local hydrometallurgical facility for the recycling of electronic waste, which will include recovery of valuable metals from printed circuit boards and Li-ion batteries.
Baseline	Processing of printed circuit boards: Technology at TRL5. In discussion with OEM to design and operate a pilot plant. Discovery Master's degree DSI funding to establish business case for establishment of Li-ion battery recycling facility.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Develop and maintain a world-class research team that provide innovative solutions to the mining and metallurgical industries with a strong emphasis on knowledge and technology transfer.
Objective statement	Develop a highly skilled team of researchers through continued upskilling of staff and through creating collaborations and relationships with research institutes and universities locally and globally, which will lead to collaborative research programmes, sharing of resources and exposure of staff to world-class research opportunities.
Baseline	The skills base of the division is currently developed through support of one MSc and two PhD candidates. The junior staff is being developed and mentored by senior technical staff. 4 journal papers per year (base of 13 researchers) 6 conference papers per year (base of 13 researchers) 1 discovery 1 trade mark
GOAL 4	**ENSURE FINANCIAL SUSTAINABILITY**
Strategic Goal 4	**Ensure financial sustainability**
Objective	Increase revenue earning
Objective statement	Increase revenue from commercial work and significantly expand the contract research income.
Baseline	A number of long-term commercial and contract research projects have been secured from mining industries and funding agencies such as the WRC, DSI and Coaltech.
GOAL 5	**DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRASTRUCTURE**
Objective	Maintain fit for purpose infrastructure to support RDI and commercial opportunities
Objective statement	Secure funding for: (i) Upgrading and increasing the capacity of the existing column facilities (ii) Investment in laboratory and piloting facilities related to the divisions diversification into environmental technologies.
Baseline	Mintek funded centrifuge and atomic adsorption spectrophotometer (R1M). Updated geomechanical equipment (R500k)

PROGRAMME 7: MEASUREMENT AND CONTROL

The Measurement and Control programme focuses on process control solutions and measurement instruments that deliver tangible and significant improvements in recovery, and reductions in reagent and energy usage to minerals processing plants and smelters all over the world. Areas of research for measurement and control are typically "applied research", "technology development", and "product development", which are at the latter stages of the technology readiness level continuum. There has been a slight shift in emphasis from "product" specific research to "applied" research reflecting the change in strategy from developing purpose-specific products towards more generic technologies and tools that can be applied to a variety of processes and applications. The objectives that will be pursued in the next financial year are as indicated below.

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION**
Objective 1	Product/Application Diversification
Objective statement	Diversify MAC's portfolio of products/solutions through research and development (including solutions for Spiral Measurement and Control, Xanthate Measurement, Solvent Extraction Measurement and Control) by the end of FY2025. Impact: Opens up completely new process units and market for MaC's measurement and control systems.
Baseline	The existing portfolio consists of Flotation Control and Optimisation, Milling Control and Optimisation, Furnace Control, Carbon Concentration Measurement and Control, Cyanide Concentration Measurement and Control.
Objective 2	Product differentiation
Objective statement	Differentiate MaC's software products/control systems by coupling them with complementary instruments that unlock value (even if it is just perceived value). The success of this approach has been proven through MaC's collaboration with ProcessIQ where a gadget (MillSlicer offered by ProcessIQ) was used as a "foot in the door" for marketing MaC's MillStar control system. The programme will first focus on research and development of these methods that will enable online particle size and Peak Air Recovery measurements. These measurements will later be integrated with the control systems for milling and flotation optimisation respectively. The online particle size measurement is expected to be ready by end of FY2024, whereas that of Peak Air Recovery (PAR) by end of FY2021. The success of these measurements highly depends on repeatable and convincing evidences shown by long-term onsite test-work campaigns. Impact: More integrated and better differentiation of MaC's offerings to clients with a potential to lock-out competition, and providing more comprehensive solutions to industry
Baseline	Milling and flotation optimisations are done with software-based products only. This is similar to competition's offering, hence no differentiation in the eyes of clients.
Objective 3	New Research Initiatives and Areas
Objective statement	Undertake research in the areas of the Fourth Industrial Revolution (4IR), Deep Reinforcement Learning and strengthen Innovation efforts in MAC by the end of FY2025. Impact 1: Value creation and differentiation through 4IR Impact 2: Stimulate early stage innovation and creativity for research and development
Baseline	• Educational phase in the area of the Fourth Industrial Revolution • Innovation initiative is currently employed in MAC, with the aim to expand to the rest of Mintek

GOAL 2	FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION
Objective 1	Improve Production Capacity
Objective statement	Select alternative suppliers, at least 2 for each of the following aspects: production of circuit boards, assembly of instruments and manufacture of mechanical components by the end of FY2021. Impact: Back-up supply and streamlined manufacturing to ensure timeous delivery of products to industry through risk mitigation
Baseline	Currently only 1 additional supplier, and none in one particular case, have been selected.

GOAL 3	DEVELOP A CAPABLE WORKFORCE
Objective 1	Increase staff capacity
Objective statement	Ensure that MAC has sufficient capacity to execute R&D, manufacturing and commercial work by increasing the head-count of suitably skilled SET employees to 23 persons (through recruitment, head-hunting, joint research and fast tracking employees) by the end of FY2021. Impact: Improve MAC's research profile to enable intensified R&D
Baseline	Current baseline is 22 SET employees.
Objective 2	Improve Staff Retention
Objective statement	The objective of this programme is to retain and grow the skills base of existing staff. Much of the efforts will align with the Human Capital Development Programme (furthering studies, professorships, career development plans etc.) being formulated at corporate level. A distinct initiative by the division as part of furthering studies involves bursars completing the core modules of the UP honours course in control systems on a part-time basis as part of their Graduate Development Programme (GDP). This will bolster the confidence of new graduates and motivate them to remain in their present fields. Another initiative involves investigating options for alternative modes of employment such as establishment of "satellite offices" for those staff planning to emigrate, or have recently emigrated, to support project execution globally. The objective will be to establish what is possible, should the need arise. Impact: Retention of relevant skill force to support industry and execute R&D to plan
Baseline	• GDP excludes an option of furthering studies. • All staff are currently based in one office in Randburg.

GOAL 4	ENSURE FINANCIAL SUSTAINABILITY
Objective 1	Improve Competitive Advantage
Objective statement	This programme is aimed at lowering the barrier to entry for MAC products and services (by developing low cost versions of equipment and design attractive pricing models) by the end of FY2023. Impact 1: Opening up new markets (particularly junior miners), and accelerating adoption and market penetration. Impact 2: Increased sales of new products Impact 3: Stable and more predictable service support revenue
Baseline	• Junior miners struggle to justify investment to purchase MaC's instruments at the same price used for large mining companies • Current pricing model is an outright purchase of unbundled products (usually at high cost), with optional service contract, resulting in ~R30 million in P&S sales.

Objective 2	Effective Marketing
Objective statement	Increase visibility of MAC's products and services (through targeted marketing efforts, conference publications, social media activity, website improvements, selection of agents, distributors and partners, negotiations with EPCM and system integrators, and dedicated business development roles). Impact: Maintain or increase revenue target in each financial year
Baseline	Revenue target in FY20 for P&S sales is R31.5 million
GOAL 5	**DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRASTRUCTURE**
Objective	Infrastructure development
Objective statement	This programme evaluates equipment investment such as CNC machining and 3D printing for rapid prototyping, as well as maintain and grow our workshop/laboratory infrastructure for faster, better quality and consistent output. Mintek also attends world-class mining exhibitions as part of technology demonstration and marketing. To maintain a world leading position in the rapidly changing market environment, this programme aims at evaluating how technologies such as Virtual Reality/Augmented Reality/3D Simulation, can be featured in our demonstrations. Impact: Improved marketing. Rapid prototyping, decreasing time to market on new products
Baseline	Basic 3D printer (old technology) and entry level CNC

PROGRAMME 8: ADVANCED MATERIALS

The Advanced Materials programme focuses on research, development and innovation sub programmes that focus on the end-use of metals in the mining, fabrication and manufacturing industries. Through the use of advanced process technologies, the programme produces high value-added products by deploying cross-cutting skills from various disciplines that range from chemical sciences, physics, materials science and engineering, biochemistry to chemical engineering. The focus areas through which these are attained are in physical metallurgy, catalysis, biomedical and nanotechnology. In physical metallurgy, the sectors of interest are the broader metals-related industry that require novel materials for application in conventional and extreme environments. Catalysis, on the other hand, finds special application in the hydrogen economy sector through the manufacture of fuel cells for various application. Nanotechnology has a special focus for application in health, where biomedical adds value, and in water and waste water technologies.

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION**
Objective	Publications in peer-reviewed journal articles, conference papers, book chapters and books. At higher TRL levels these includes inventions, patents, trade secrets, system demonstrations
Objective Statement	The impact of the quality of publications and other technological outputs is demonstrated through the potential of the outputs to support Mintek's mandate to "foster the establishment and expansion of industries in the field of minerals and products derived therefrom". For Journals: (0.25) x (60 SET Employees) = 15; For Conference Papers: (0.5) x (60) = 30. Book chapters to be factored in the score as Paper Equivalents.
Baseline	The current AMD baseline is 4.6 per SET Employee per Paper

GOAL 2	FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION
Objective 1	Develop a global hydrogen and platinum-based fuel cell economy to promote platinum value addition
Objective statement	The objective is to expand RD & I activities beyond the catalysts production. This will henceforth include **MEA production** in the short term (i.e. FY 2020/21). In the medium-to-long term, this will be followed by **incorporation into a fuel cell stack** to eventually produce a **fuel cell system**. Some capability will be developed at Mintek, whereas other will be attained in partnership with industrial partners
Baseline	The performance against this strategic objectives in the Catalysis Group mainly centres around the **fuel cell catalyst production**
Objective 2	Develop and manufacture high value medical and diagnostic device products
Objective statement	The objective is, through the beneficiation of local metals, to manufacture for point-of-care detection of human and animal diseases. Currently, the HIV RDT is ready for manufacture. In the short term (i.e. FY 2020/21), the **Malaria RDT** will added. In the medium term (FY 2021/22), the Malaria SERS, Rift Valley Fever will added. Followed by the TB and Cancer Rapid Diagnostic kits afterwards.
Baseline	Currently, there is **one (1) product** are at TRL = 9 (i.e. HIV RDTs) that is ready to be manufactured for commercial exploitation.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Recruit and develop SET staff to improve capacity to deliver on Strategic Programmes
Objective statement	Recruit 3 senior staff members across AMD's groups to lead and direct research and commercialization/innovation. 3 junior SET employees to be seconded to industry for experience enhancement. 2 junior SET employees to be mentored by senior academics to enhance their research experience.
Baseline	The current staff, although sufficiently educated, lack the requisite industry and research experience. There is a less that critical number of senior and experienced researchers, inclusive of those with commercial experience
GOAL 4	**ENSURE FINANCIAL SUSTAINABILITY**
Objective	Ensure financial sustainability through revenue diversification
Objective statement	AMD to accelerate efforts to attract contract research revenue from local and international industry through contract research to reduce the percentage reliance to 65%. The Division to submit funding applications to other funding sources such as EU-H2020, US funding agencies and other local public funding. Finally, AMD will seek to generate revenue due to the sale of high value manufactured products, such as the RDT kits.
Baseline	The Division is currently highly depended on 70% of its revenue from the DSI-funded programmes. This over-reliance on a single revenue source is high risk towards the financial sustainability of the Division
GOAL 5	**DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRASTRUCTURE**
Objective	Acquisition of new infrastructure, replacement and refurbishing of existing infrastructure to support strategic programmes
Objective statement	Acquisition of Computational packages (Modelling & Simulation) to support all AMD research programmes – this will include collaboration with the CHPC.; Acquisition of a Lithography equipment to support ISO 3 research facility; and refurbish the foundry thermo-mechanical treatment infrastructure
Baseline	There is currently **aging infrastructure** that is costly to maintain and impacts negatively on productivity. In other areas, there is **lack of critical infrastructure** to support existing strategic programmes.

PROGRAMME 9: SMALL SCALE MINING

The Small Scale Mining and Beneficiation programmes focuses on advancing small scale mining sector in South Africa. This sector is characterised by limited resources, primitive mining methods, lack of understanding of mining laws, inefficient and unsafe processing methods and other developmental challenges. Mintek promotes the small scale mining sector through minerals processing focusing on extractive technology development, small scale operational support, environmental matters and sustainability, formalisation and safer mining practices through training.

GOAL 1	**CONDUCT RELEVANT, APPLIED RESEARCH & TECHNOLOGICAL INNOVATION**
Objective	To conduct cutting edge research and development aimed at the small scale mining sector
Objective statement	To conduct research and development programmes aimed at enhancing operational efficiencies in the small scale mining sector, with outputs recorded as high impact journal publications, Intellectual Property and new technologies and processes. This is expected to cover 60% of Divisional activities by 2025 and translating to at least five journal articles, one patent and one technology fully tested. This will entail the unpacking of the four Divisional pillars, namely, environmental management in mining and minerals processing, mineral ore development and plant and equipment support and training and skills development. This will be augmented by the continued improvement of current programmes based on research and development findings.
Baseline	As of the end of the financial year 2018/2019, the Division produced seven peer-reviewed conference papers and eleven conference presentations. Over the last five years, the Division produced six peer-reviewed journal articles compared to the preceding five year period, where zero peer-reviewed articles were produced.
GOAL 2	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective	Develop new and improve existing technologies to support the small scale mining sector and the establishment of viable SMMEs
Objective statement	To develop and implement small scale technologies for processing and beneficiation to support activities within the small scale mining sector. This will also entail plant and equipment support of small operations through auditing of their processes and plant for improvement on cost, product quality, recoveries, and production. The expected return on investment in research and development funding towards this programme is expected to fund itself by 2025. The programme will look into adapting Mintek technologies to suit unique conditions of small scale mining and beneficiating operations as regards their capability, affordability, and environment. This will be done in partnership with internal and external stakeholders on the engineering and commissioning. This programme will also include intensifying activities that support the Division's incubation programmes to enhance the beneficiation of minerals to stimulate sustainable mining and beneficiation entrepreneurship.
Baseline	The Division has successfully conducted five plant audits during the 2018/2019 financial year. These plants were processing different commodities and these were manganese, chrome, and aggregates. The Division can conduct this work in collaboration with other Divisions of Mintek and external companies.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Create an innovation-focused performance culture
Objective statement	To foster a culture of performance and innovation, through learning and growth by attainment of higher degree qualifications by the Divisional staff members; with 3 staff members obtaining Master's degrees and 4 staff obtaining PhDs by 2025.
Baseline	The Division currently has 24% (5 people) of its staff with Masters (4) or PhD (1) qualifications. Three of the four Master's holders have applied for PhD bursary funding. One Honours graduate (Met Eng.) has registered for a Master's degree at Wits University as of January 2020.

GOAL 4	**ENSURE FINANCIAL SUSTAINABILITY**
Objective	Increase revenue streams from new and existing product and services
Objective statement	To grow the revenue of the Division from products and services (both new and existing) to reach a target of R15m per annum by 2025. The target will be reached through the sale of products and services that the Division already has and from the development of the new ones. In terms of programmes, the following is envisaged: • Environmental management in mining and minerals processing: From the regulatory point of view, the Division will support the Department of Mineral Resources and Energy (DMRE) with technical know-how when evaluating compliance documents from mining companies. The Division will also draft environmental authorisation reports and develop technologies that will be commercialised. • Small scale mineral ore development. Continued support of small operators through minerals processing of their deposits. • Training and skills development. Enhancing the skills development and transfer initiatives by tapping into the know-how of the Division. This would include minerals processing training programmes that will be funded externally.
Baseline	The current Divisional projection for this financial year (2019/2020) is around R2m of commercial revenue. The Division continues to take advantage of the existent beneficiation programmes that are mainly funded by the Mining Qualifications Authority (MQA).
GOAL 5	**DEVELOP AND MAINTAIN WORLD-CLASS RDI INFRATSRUCTURE**
Objective	Invest in cutting edge mobile processing equipment
Objective statement	Invest in mobile equipment aimed at the analysis of minerals, processing, and environmental monitoring and be fully equipped by 2025. The intention is to capacitate the Division with all key equipment to generate quality results while enabling the small scale mining operators in their operations. The equipment will mainly be for concentration and extraction of commodities commonly-mined by small scale miners (e.g. gold, chromite, diamonds, manganese, etc.)
Baseline	The Division currently has a portable hand-held XRF machine that is used for on-the-spot elemental quantification and quantification of samples.

PROGRAMME 10: MINERAL ECONOMICS

The Mineral Economics programme provides market insights and techno-economic analysis related to the extraction, processing, use, recycling, and disposal of mineral commodities. As part of the programme, Mintek also undertakes market and sectoral analyses for external clients in the public and private sectors and engages with government and research entities on issues pertaining to mineral beneficiation, resource management, renewable energy, and electronic waste recycling. The bulk of the work over the next financial year will be on mineral economics and techno-economics data and analysis. The objectives that will be pursued are as highlighted below.

GOAL 2	**FOSTER INDUSTRY ESTABLISHMENT AND EXPANSION**
Objective	Provision of Mineral Economics and Techno-Economics Data and Analysis
Objective statement	MESU supports the development of minerals-based industries in South Africa and extending the minerals-based value chain within and beyond the Mining and Minerals sector through the provision of relevant, high-impact mineral economic and techno-economic research, analysis and data and policy guidance to clients within Mintek as in the private and public sector. MESU has identified the following priority areas for the Division over the short- to medium-term: • The provision of commodity, project and operational data and analysis; • Mineral policy and strategy advisory services; • Product and sectoral market research and analysis; • Development of methods and tools to determine the commercial potential of a product, idea or innovation; and • Data analysis, complex modelling and simulation development. Value addition will arise through the provision of specialist knowledge, expert systems, effective databases and generation of concise, accurate and well-informed reports. MESU's differentiating factor, amongst other things, is being able to understand the contribution and role it plays in the entire mining value chain and offer its clients services that are tailored to their needs, quick turn-around time while maintaining and delivering on scope as well as credibility, visibility and continuous customer engagement.
Baseline	MESU succeeded in securing two commercial projects per year prior to the 2019/2020 financial year. The aim is to increase this to eight over the medium-term.
GOAL 3	**DEVELOP A CAPABLE WORKFORCE**
Objective	Develop a capable mineral economics workforce
Objective statement	MESU will support Mintek's goals to attract, develop and retain a globally competitive workforce, particularly in the fields of science, engineering and technology, with the requisite expertise and capabilities to drive and support rigorous research and analysis, specifically in the fields of mineral economics and techno-economic feasibility studies
Baseline	In MESU, 75% (6) of the staff are currently in possession of a Masters (5) or PhD (1) qualifications. One staff member is pursuing a PhD and is expected to graduate in 2021. No additional MSc and PhDs are expected in the short-term. Priority will rather be afforded to building capability in techno-economic feasibility assessments, data analysis, complex modelling and simulation development.
GOAL 4	**ENSURE FINANCIAL SUSTAINABILITY**
Objective	Increase revenue streams from new and existing services
Objective statement	Maintain financial sustainability through the establishment of a pipeline of commercial projects and research collaborations
Baseline	The baseline is currently very small; however the goal is to increase commercial revenue component to comprise 55% of the Division's revenues by 2023

APPENDIX II – MATERIALITY FRAMEWORK FOR 2020/21

1. PURPOSE

The purpose of the Materiality Framework is to record the level and reasoning for the suggested levels of materiality for consideration by the Board and approval by the Executive Authority as required. It outlines management's assessment of qualitative and quantitative materiality, taking cognisance of the existing framework of risks and controls within Mintek. The materiality framework, as set out below, represents management's assessment of the potential impact of transactions and other events within Mintek on the presentation of financial information used for decision making by management, and other users of the financial statements.

Corporate accountability in essence requires companies to be accountable for their decisions and performance that have a potentially large impact on people, the environment or company value.

Materiality as a concept is therefore used to determine the materiality or significance of the issues to be reported for Mintek as noted above.

2. BACKGROUND

Vision
The vision of Mintek is to be a leading partner in innovative mineral solutions.

Mission
Mintek is driven by a mission to lead research, development and innovation utilising minerals to drive sustainable industry development and inclusive economic growth.

Strategic Goals
Mintek's strategic goals are to:
i) Conduct relevant, applied research and technological innovation
ii) Foster industry establishment and expansion
iii) Develop a capable workforce
iv) Ensure financial sustainability
v) Develop and maintain world-class RDI infrastructure

3. SCOPE

The materiality framework is developed in accordance with Treasury Regulation 28.3.1 which requires that for the purposes of materiality [sections 50(1), 55(2), & 66(1) of the Public Finance Management Act (PFMA)] and significance [section 54(2) of the PFMA], the Accounting Authority must develop and agree on a framework of acceptable levels of materiality and significance with the relevant Executive Authority. This framework will be reviewed annually prior to the commencement of the financial year.

4. DEFINING 'MATERIAL' AND 'SIGNIFICANT'

The materiality concept states that financial information is material to the financial statements if it would change the opinion or view of a reasonable person. In other words, all important financial information that would sway the opinion of a financial statement user should be included in the financial statements.

International Accounting Standards (IAS 1), Presentation of Financial Statements, read together with South African Accounting Standards (SAAS 320.03), defines items as material 'if they could, individually or collectively, influence the economic decisions of users taken on the basis of the financial statements. Materiality depends on the size and nature of the omission or misstatement judged in the surrounding circumstances. The size or nature of the item, or a combination of both, could be the determining factor.' Materiality can thus be either quantitative or qualitative or both. Materiality is inherently subjective in nature and it enables a company to measure and disclose only those transactions that are sufficiently large amounts to be of concern to the users of financial statements.

'Significant' implies a higher level of importance than 'material'. A significant transaction impacts on Mintek as a whole. An occurrence may be material but not necessarily significant, whereas any occurrence that is significant will be material, as it will have an impact on the fulfilment of Mintek's mandate as a public entity and its operative effectiveness. In terms of Mintek's nature of business and extent of operations, a significant item is defined as one which exceeds the maximum monetary limit that the Chief Executive Officer of Mintek can authorise, in terms of Mintek's Delegation of Authority.

In the Mintek environment, the public nature of the funds that constitute a significant portion of Mintek's income necessitates a narrower definition of "material" than merely being an influence on economic decisions. As such, therefore, the definition of "material" transactions within Mintek will necessarily include any transactions that may have an impact on the presentation of the annual financial statements, as an accurate representation of the "full and proper records of the financial affairs" of Mintek, as required by Section 55(1) (a) of the PFMA.

Implications

An understanding and application of the concept of materiality helps to manage, and be seen to be managing significant impacts and issues better. Matters that rise to the level of 'materiality' are those that require high-level, co-coordinated effort. Many other issues, whilst not material, will still be addressed and managed by the company, and need to be communicated to stakeholders – but in focused, targeted ways – not in the annual report.

With a full understanding of materiality and how it works, stakeholders should become better equipped to raise the issues that matter most to them.

5. DETERMINATION OF MATERIALITY - GUIDELINES APPLIED IN THE COMPUTATION OF MATERIALITY

Quantitative Materiality can be based on a number of financial indicators of the type that is widely used and accepted in the accounting profession as a basis of calculating materiality.

The following table depicts acceptable basis used in the computation of materiality.

Basis	Acceptable Ranges
Gross Revenue/Turnover	0.2% – 1 %
Net Income	1 – 5 %
Total Asset	1 – 2 %
Equity	0.5 – 2 %

5.1 Significance of Indicators

The nature of Mintek is such that both the balance sheet and the income statement indicators are of significance. Mintek has significant assets and revenue streams – both are significant to the users of the financial information.

5.2 Stability of Indicators

Gross revenue and total assets remained stable indicators for Mintek despite the volatile economic conditions of recent years and will therefore be used in the calculation of materiality. The gross revenue for the first 6 months of a previous financial year would be considered during the midterm review and a forecast would be made that appear to be indicative of the likely results for the year.

Net income should be disregarded as Mintek is not a profit making institution, and there are fluctuations and many dependencies that influence this figure.

Mintek has historically used a rate of 0.3% in calculating the materiality level. This is within the range specified above of 0.2% - 1% of gross revenue and provides a level that is acceptable both quantitatively and qualitatively.

5.3 Computation of Materiality

Gross revenue:
The 2020/2021 forecast budget as indicated in the compact will be used for the computation of materiality. The calculations are as follows:

Gross Turnover:
0.3% of R 568 353 000= R1 705 059
Asset calculation
Use 1% of R893 636 000(Q3 2020-total assets) = R8 936 360

Different levels can be set for different classes of transactions. Mintek has however decided to take a more conservative approach by using gross revenue and not assets as the basis for calculating Materiality. The Materiality level will cover all classes of transactions.

The materiality for the previous financial period was set at R1.5m, representing the lower end of the range for gross revenue. Gross revenue/turnover includes 100% state grant allocation, revenue from contract research, and sales of products and services. The calculations above results in the materiality figure of R1.7 million however Mintek has decided to keep materiality at the same levels as in the previous financial period mainly because the sudden increase in revenue is project driven and may decrease in future.
Therefore the materiality for the current period will be kept at R1.5 million.

6. CONTROL ENVIRONMENT

The Board of Directors consists of independent non-executive members who are appointed by the Minister of Mineral Resources. The Audit and Risk Committee consists of some Board members and two independent non-Board members.

Mintek is managed by a CEO assisted by five General Managers, who together make up the Executive Management team. Mintek maintains a system of internal controls designed to provide reasonable assurance as to the integrity and reliability of its financial statements, to safeguard its assets and to minimise the risk of fraud. In terms of the Audit Committee charter, the Audit and Risk Committee reviews the effectiveness of the system of internal controls.

A Risk Steering Committee assists in reviewing the risk management process and significant risks facing the organisation. In terms of the Risk Management Framework, this review is delegated to the CEO.

The Internal Audit function is established and operational. The performance of the Internal Audit function is subject to evaluation by the Audit and Risk Committee, in terms of the Audit and Risk Committee and Internal Audit charters. Additionally, the Audit and Risk Committee reviews and approves the Internal Audit charter, internal audit plans and ongoing internal audit reports on the effectiveness of Mintek's internal controls.

Although Mintek is an entity within the Department of Mineral Resources and Energy (DMRE), it is also accountable to the Department of Science & Innovation (DSI) for its Research and Development (R&D) and technology related activities. Strategic goals encompassing economic, technical, social and environmental objectives, determined by the Government and DMRE, provide Mintek with a basis for evaluating its activities. These criteria are, therefore, also used in the assessment of significant risks facing Mintek.

6.1 Stakeholders

The primary stakeholders are the Departments of Mineral Resources and Science & Innovation.

Users of financial statements:
- i) Department of Mineral Resources and Energy
- ii) Department of Science & Innovation
- iii) National Treasury
- iv) Banking institutions
- v) South African Revenue Services
- vi) Suppliers and other creditors

7. QUANTITATIVE MATERIALITY

Materiality refers to the extent or nature of a misrepresentation and/or omission of financial information which, individually or collectively, can, in the light of surrounding circumstances cause the judgment or decision of a reasonable person to be influenced by such misrepresentation and/or omission when making a decision on the basis of the said information.

In addition to the overall quantitative materiality determined, all transactional items exceeding R50, 000 in value which meet the necessary prerequisites for recognition as accruals at year-end, will be classified as such.

Items less than R50, 000 which meet the criteria will be considered on merit. Where it is too difficult to value small items, these will be regarded as immaterial. The overriding criteria, however, is that the aggregate of all such small items, individually judged to be immaterial, may not exceed 0.3% of Gross revenue.

In addition, items that individually or collectively meet the definition of "significant" or "material", as defined earlier in this framework will be considered separately for assessment of materiality and risk. The figure of R1.5million therefore, functions as a guideline to inform management in the overall consideration and management of risk.

8. QUALITATIVE MATERIALITY

Materiality is not merely related to the size of the entity and elements of the financial statements. Misstatements that are large individually or in aggregate may affect the reasonable users' judgement. Misstatements may also be material on qualitative grounds. The following are some of the qualitative factors to be considered:

- Any breaches to procedures or processes required by legislation or regulation
- Transaction entered into that could result in the reputation risk to Mintek.
- Unusual transaction entered into that are not of a repetitive nature as well as new ventures that Mintek has entered into. These are purely disclosed due to their nature and the knowledge that they could affect the decision of the users of financial statements.
- Any fraudulent and dishonest behaviour of officers or staff.

APPENDIX III – COST CONTAINMENT PLAN

1. Introduction

The definition of cost containment is "The process of controlling the expenses required to operate an organisation or perform a project within pre-planned budgetary constraints." The cost containment process is an important management function that helps keep costs down to only necessary and intended expenses in order to satisfy financial targets. Budget monitoring is performed on a regular basis to ensure that there is no excessive spend. The focus for Mintek is to improve efficiencies through better utilisation of resources.

Accounting officers and accounting authorities are in terms of section 38(1)(c)(iii) and 51(1)(b)(iii) of the PFMA required to implement control measures to ensure that all expenditure in their respective institutions is necessary, appropriate, cost-effective and is recorded and reported, as prescribed by the relevant legislative framework.
In giving effect to this requirement, accounting officers and accounting authorities are responsible for ensuring that all employees are mindful of the current economic realities and the need to intensify efforts to improve efficiency in expenditure.

The cost containment plan as set in the National Treasury Instruction/circular No. 02 of 2016/2017 issued on the 30th September 2016 gives account of some of the measures that Mintek will continue to implement over the planning period.

2. Background

Operational /discretionary expenditure reduced from 43% of total expenditure in 2012/2013 to 36% in 2016/2017. This was partly attributed to the cost containment measures implemented over the years and other efficiencies.

The internal control environment was enhanced to identify excessive costs, such as detailed monthly management reports and quotation based sourcing of goods and services.

The effectiveness of controls is measured throughout the year by the internal audit function and annually by the Auditor General. Mintek has also achieved clean audit status for the last two years. Mintek, has been implementing some cost containment measures over the years and some of those already implemented include the following:

- Energy efficient lighting;
- Printing initiatives that includes double sided, no colour default on all printing machines;
- Energy monitoring;
- Oversight over catering expenses;
- Utilisation of discount agreements such as PURCO; and
- Freezing of vacant post.

3. Supply Chain Management

Mintek maintains a turnkey supply chain management solution where all procurement of goods and services are centralised. This ensures proper control and adherence to policies and procedures. Additional controls to curb wasteful expenditure include:

- Review of all requisitions above R10 000 by Chief Financial Officer for validity and reasonability;
- Authorisation of all requisitions in terms of Delegation of Authority; and
- Thorough tender process for expenditure exceeding R500 000.

4. Areas for cost containment

Cost Containment	Action	Metric	Responsible	Time Frame
4.1 Reduce unnecessary expenditure on consultants	• Consultants to be limited to specialist services to ensure increase of knowledge base. • Limit expenditure to consultants who offer independent advice. • Ensure that as part of the approval process normal Mintek procurement processes are followed when consultant services are required and that the criteria as set out on Cost Containment Measures Circular are adhered to.	Track, monitor and report: • No of specialist services consultants. • No of consultants offering independent advice. • Expenditure on engagement of consultants. • Consultant appointments approved in terms of procurement processes.	Mintek Divisional Managers	Monthly/Quarterly/ Annually
4.2 Reduce travel and accommodation expenditure	• The requirements for travel should be assessed on a needs basis and approved at manager's discretion. • Travel should be planned in advance, where possible, to optimise cost savings. • Travel options with various service providers should be considered and the most cost effective option should be selected. • Discounts with third parties, such as PURCO. • Foreign travel may only be conducted as contained in the International Travel Plan and where exceptions occur, travel must be approved by the Chief Executive Officer.	Track, monitor and report: • Approval of travel expenditure by managers. • Approval of travel in advance. • Whether travel options with various service providers are selected. • Value of travel related discounts. • Foreign travel conducted in terms of the International Travel Plan	Mintek divisional Managers	Monthly/Quarterly/ Annually
4.3 Reduce expenditure on catering and social events	• Expenditure controlled at managerial level with Finance oversight • No catering for internal meetings except where the meeting is longer than 5 hours. • Official engagements that are conducted for longer than 5 hours such as training, board and its subcommittees, conferences may incur catering costs. • Meetings with external customers on discretion of the manager.	Track, monitor and report: • Expenditure control at managerial level with Finance oversight. • Catering costs incurred for meetings that are no longer than 5 hours. • Catering costs incurred for meetings that are longer than 5 hours.	Mintek divisional Managers	Monthly/Quarterly/ Annually
4.4 Reduce expenditure on events, meetings and conferences	• Manager discretion to be applied when approving the attendance of local/foreign conferences and events. Budget availability and benefits to be considered when applications are reviewed. • The number of delegates attending such events should be considered and approved at manager's discretion.	Track, monitor and report: • Local conferences and events approved by managers. • Budget availability and benefits analysis conducted when applications are reviewed by managers. Approval of number of delegates attending events, meetings and conferences.	Mintek Divisional Managers	Monthly/Quarterly/ Annually

APPENDIX IV – FRAUD PREVENTION PLAN

1.1 Background

Mintek's Fraud Prevention Plan has been developed in compliance with Section 27.2.1 of the Treasury Regulations, issued in terms of the Public Finance Management Act, 1999 which states that the Accounting Authority must ensure that a risk assessment is conducted regularly so as to identify emerging risks of the public entity. A risk management strategy, which must include a fraud prevention plan, must be used to direct internal audit effort and priority and to determine the skills required of managers and staff to improve controls and to manage these risks.

The Plan recognises basic fraud prevention initiatives within Mintek. Furthermore, it identifies key risks of fraud that will be addressed as these risks could jeopardise the successful implementation of the various components of the Plan.

The Plan is dynamic and it will continuously evolve as Mintek makes changes and improvements in its drive to promote ethics and prevent fraud.

1.2 Glossary of Terms

Throughout this document, unless otherwise stated, the words in the first column below have the meanings stated opposite them in the second column (and cognate expressions shall bear corresponding meanings):

"Cabinet"	Parliamentary Cabinet of the Republic of South Africa
"Code"	For Mintek Staff Members as prescribed in the Mintek Code of Conduct and Business Ethics policy

"Fraud and corruption" includes, but is not limited to, the following legal definitions:

(i) Fraud, i.e. "the unlawful and intentional making of a misrepresentation resulting in actual or potential prejudice to another";

(ii) Theft, i.e. the unlawful and intentional misappropriation of another's property or property which is in his/her lawful possession, with the intention to deprive the owner of its rights permanently";

(iii) Offences in respect of corrupt activities as defined in the Prevention and Combating of Corrupt Activities Act, 2004, i.e.:

- The general offence of corruption which could be summarised as directly or indirectly accepting or agreeing to accept any gratification from another person; giving or agreeing to give any other person any gratification in order to influence that person directly or indirectly to exercise his powers, duties or legal obligations in a manner which is/amounts to:

    a. Illegal, dishonest, unauthorised, incomplete, or biased;
    b. Misuse or selling of information or materials acquired;
    c. Abuse of position of authority;

d. Breach of trust;
e. Violation of a legal duty or set of rules;
f. Designed to achieve an unjustified result; and
g. Any other unauthorised or improper inducement to do or not to do anything.

- Corrupt activities in relation to:

a. Public officials;
b. Foreign public officials;
c. Agents;
d. Judicial officers;
e. Members of the prosecuting authority;
f. Unauthorised gratification received or offered by or to a party to an employment relationship;
g. Witnesses and evidential material during certain proceedings;
h. Contracts;
i. Procuring and withdrawal of tenders;
j. Auctions;
k. Sporting events; and
l. Gambling games or games of chance.

- Conflicts of interests and other unacceptable conduct, e.g.:

a. Acquisition of private interests in contract, agreement in or investment in public body;
b. Unacceptable conduct relating to witnesses; and
c. Intentional interference with, hindering or obstruction of investigation of offence;

- Other offences relating to corrupt activities, viz.:

a. Accessory to or after an offence;
b. Attempt, conspiracy and inducing another person to commit offence; and

- Failure to report corrupt transactions.

Fraudulent and corrupt acts may include:

i. Systems: where a process/system exists which is prone to abuse by employees, the public or other stakeholders, e.g.:

a. Procurement fraud, e.g. irregular collusion in the awarding of tenders or orders for goods and/or services;
b. Deliberate non-compliance with delegation of authority limits;
c. Collusion in contracts management;
d. Revenue fraud; e.g. Mintek officials' reluctance in verifying the suppliers/contractors VAT details before any contractual agreement can be entered into with the purposes of rendering services to Mintek.
e. Travel and subsistence fraud;
f. Abuse of sick leave or other permissible leave;
g. Disclosing confidential or proprietary information to outside parties.

ii. Finances: i.e. where individuals or companies have fraudulently obtained money from Mintek, e.g.:

a. Syndicate fraud;
b. Creditors fraud, e.g. diverting payments to incorrect creditors;
c. Suppliers submitting invalid invoices or invoicing for work not done; and
d. Payroll fraud, e.g. creation of "ghost employees".

iii. Research: i.e. where individuals or employees make use of research facilities and Intellectual property for one's own benefit, individuals or researchers falsifying research outputs, fabricating of scientific results.

iv. Equipment and resources: i.e. where Mintek's equipment or other sources utilised for personal benefit or stolen, e.g.:

a. Theft of assets, e.g. computers, face value forms, consumables, (stationery, globes, fuses) etc.;
b. Personal use of resources, e.g. telephones, internet, e-mail; vehicles and
c. Irregular destruction, removal, or abuse of records (including intellectual property); and
d. Misuse of the Mintek's official time for personal gain/purposes.

v. Other: i.e. activities undertaken by employees of Mintek, which may be against policies or fall below established ethical standards, e.g.:

a. Soliciting gifts or favours from consultants or other suppliers, e.g. acceptance of "kick-backs";
b. Pursuing private business interests without permission;
c. Nepotism; and Favouritism.

"Fraud Policy"	Fraud risk and whistle blowing policy
"Managers"	Includes all Members of Management and, where appropriate Supervisors
"PFMA"	The Public Finance Management Act (PFMA), 1999 (Act No. 1 of 1999)
"Plan"	Fraud Prevention Plan
"Protected Disclosures Act"	Protected Disclosures Act, Act 26 of 2000

2. APPROACH TO UPDATING THE PLAN

2.1 Mintek has a risk register/plan in place, which is updated on a regular basis. The plan was updated with the view to put measures in place to mitigate the effects of the risks identified in the risk register of Mintek.

2.2 The Plan also incorporates principles contained in the Public Sector Anti-Corruption Strategy dated January 2002, endorsed by Cabinet.

2.3 The Code and the Fraud Policy, as approved, forms an integral part of the Fraud Prevention Plan.

2.4 The fraud and corruption risks identified in the updating of the Plan cannot be relied upon as an indication of the full spectrum of fraud and corruption risks facing Mintek, but rather as an indication of the type of risks.

2.5 The Plan does not guarantee that Mintek will not be impacted by incidents of fraud and corruption but is intended to serve as an additional measure to assist in the limitation of fraud and corruption risk with a particular focus on creating awareness and promoting ethical business conduct.

3. COMPONENTS OF THE PLAN

The main principles of the Plan are the following:

- Creating a culture which is intolerant to fraud and corruption;
- Deterrence of fraud and corruption;
- Preventing fraud and corruption which cannot be deterred e.g. misuse of internet, conducting private affairs during official hours, etc.;
- Detection of fraud and corruption;
- Investigating detected fraud and corruption;
- Taking appropriate action against fraudsters and corrupt individuals, e.g. prosecution, disciplinary action, etc.; and
- Applying sanctions, which include redress in respect of financial losses.

The objectives of the Plan could be summarised as follows:

- Encouraging a culture within Mintek where all employees, the public and other stakeholders continuously behave ethically in their dealings with, or on behalf of Mintek;
- Improving accountability, efficiency and effective administration within Mintek;
- Improving the application of systems, policies, procedures and regulations;
- Effectively managing aspects of Mintek which could facilitate fraud and corruption and allow these to go unnoticed or unreported;

- Encouraging all employees and other stakeholders to strive towards the prevention and detection of fraud and corruption impacting or having the potential to impact on Mintek's activities;
- Encouraging all employees and stakeholders to report suspicions of fraudulent activities without fear of reprisals or recriminations; and
- Providing a focus point for the allocation of accountability and authority.

The above is not intended to detract from the premise that all the components are equally essential for the successful realisation of the Plan. The components of the Plan for Mintek are the following:

(a) The Code of Conduct and Business Ethics policy in which the management of Mintek believes, and requires their employees to subscribe;
(b) Mintek's systems, policies, procedures, rules and regulations;
(c) The Disciplinary and Grievance Code;
(d) Sound control environment;
(e) Sound internal controls to prevent and detect fraud and corruption;
(f) Physical and information security management;
(g) Internal Audit;
(h) Ongoing risk assessment and management, which includes systems for fraud and corruption detection;
(i) Reporting and monitoring of allegations of fraud and corruption;
(j) A Fraud Policy which includes the policy stance of Mintek on fraud and corruption and a response plan which incorporates steps for the reporting as well as proper resolution of reported and detected incidents and allegations of fraud and corruption;
(k) Creating awareness amongst employees, the public and other stakeholders (e.g. goods and service providers) through communication and education relating to relevant components of the Plan, the Code and the Fraud Policy; and
(l) Ongoing maintenance and review of the Plan to ensure effective project-management of its further implementation and maintenance.

An illustration of the Plan is contained in the figure below:

4. PREVENTING FRAUD AND CORRUPTION

4.1 Code of Conduct and Business Ethics

4.1.1 The ethical principles contained in the Code are applicable to all employees of Mintek. Therefore, the Code forms part of the Plan for Mintek.

4.1.2 Processes and mechanisms to manage professional ethics are key to the fight against fraud and corruption. In line with the principles contained in the Public Sector Anti-Corruption Strategy, Mintek will pursue the following additional steps to communicate the principles contained in the Code:

a) A copy of the Code will continue to be circulated to all employees and included in induction packs for new employees.

b) Include relevant aspects of the Code in further awareness presentations, training sessions and communication programmes to create awareness thereof amongst employees and other stakeholders. Further objectives of this training will be the following:

- Helping employees to understand the meaning of unethical behaviour (including harassment in any form) in line with expectations of Mintek;

- Presenting case studies which will assist in developing behaviour to articulate and encourage attitudes and values which support ethical business conduct;
- Helping employees to understand issues involved in making ethical judgements; and
- Communicating the implications of unethical behaviour and its impact for individuals, the workplace, professional relationships, Mintek as whole and external stakeholders including the public.

4.1.3 There is a system in place for the declaration of private business interests, actual or potential conflicts of interest by all employees. The Code of Conduct and Business Ethics is used as a guide regarding acceptance and offering of business courtesies. The declaration of private business interests, actual or potential conflict of interest is done on SharePoint.

4.2 Mintek's Systems, Policies, Procedures, Rules and Regulations

4.2.1 Mintek has a number of systems, policies, procedures, rules and regulations designed to ensure compliance with government legislation.

4.2.2 The management of Mintek will ensure continuous awareness and knowledge of the relevant systems, policies, procedures, rules and regulations, including the requirements of the PFMA and the Preferential Procurement Policy Framework Act amongst its employees. Mintek will continue to develop clearly defined communication and training strategies to create awareness of existing and new policies and procedures in order to ensure that all employees are made aware of, and adequately trained in the implementation of policies and procedures relevant to their duties and responsibilities, including:

(a) Provisions for all employees to acknowledge, in writing, that they have read the policies and procedures applicable to their duties, have undergone relevant training and/or are aware of these policies and procedures;
(b) The keeping of adequate records serving as proof that employees have been made aware of the policies and procedures relevant to their duties; and
(c) The development and distribution of a regular communiqué outlining the importance of complying with policies and procedures and the implications for employees; for example, the taking of corrective action against offenders not complying with policies and procedures.

4.2.3 A structured monitoring mechanism has been administrated for the keeping of proper records of the policies and procedures that are being updated, and of new policies and procedures that are being developed in order to set clear targets and monitor progress.

4.2.4 Mintek is committed to developing human resources systems, policies and procedures, which will incorporate the fraud and corruption prevention practices detailed below.

(a) The administration of a system for transparent and merit-based hiring and promotion practices with objective standards in order to reduce the risk of nepotism and favouritism, both of which are damaging forms of fraud and corruption;

(b) Thorough pre-employment and security clearance screening of candidates for sensitive positions. Mintek will verify at least the previous employment, qualifications, citizenship, and criminal records of all persons before they are employed; and

(c) Mintek recognises that, despite ongoing organisational and policy changes, for example employment equity policies, matching of competence to the job is extremely important. As part of its approach to the management of human resources, Mintek will continue to pursue steps to limit the risk of incompetent people being appointed.

4.2.5 Management must be held accountable for complying with, and implementing, Mintek's systems, policies, procedures, rules and regulations and for preventing fraud and corruption. This will be addressed in job descriptions, agreed work plans and performance contracts.

4.2.6 Mintek will also administrate a system with clear guidelines for the placing of prohibitions on individuals and restriction of entities found guilty of fraud and corruption against it.

Disciplinary and grievance code

4.2.7 The disciplinary and grievance code prescribes appropriate steps to be taken to resolve disciplinary matters.

4.2.8 Mintek recognises the fact that the consistent and efficient application of disciplinary measures is an integral component of effective fraud and corruption prevention. The following steps to expedite the consistent, efficient and speedy application of disciplinary measures will be initiated:

(a) Creating awareness amongst employees of conduct which is forbidden in terms of the disciplinary and grievance code. Where disciplinary standards are not adhered to, action will be taken against offenders;

(b) Ongoing training of managers in the application of disciplinary measures and the disciplinary process, and sustaining this training;

(c) Developing a system to facilitate the consistent application of disciplinary measures; and

(d) Regular monitoring and review of the application of discipline with the objective of improving weaknesses identified.

4.2.9 Where managers are found to be inconsistent and/or inefficient in the application of discipline corrective action will be implemented.

Sound Control Environment

Mintek's Audit and Risk Committee significantly influences the fraud control environment, particularly by overseeing the tone at the top. This is done in the discharge of its duties in terms of the PFMA and Treasury Regulations. The Audit and Risk Committee systematically oversees, and periodically reviews the internal controls established by the management of Mintek. Oversight extends to:

(a) Risk management including fraud risk management;
(b) Mechanisms for employees and all stakeholders to report fraud and corruption incidents;
(c) Development of policies and practices for detecting, reporting and preventing fraud and corruption, serious breaches of business conduct, and whistle-blowing procedures;
(d) Reviewing of quarterly reports describing the nature, status and eventual resolution of alleged or suspected fraud;
(e) Reviewing the effectiveness and the maintaining of Mintek's systems of internal control, including internal financial control and business risk management; and
(f) Reviewing the effectiveness of the system for monitoring compliance with laws and regulations and the results of management's investigation and follow-up (including disciplinary action) of any instances of non-compliance.

Internal Controls

4.2.10 This section of the Plan relates to basic internal controls to prevent and detect fraud and corruption and the training of employees in internal control and the conducting of their day-to-day duties. The systems, policies, procedures, rules and regulations of Mintek prescribe various controls, which if effectively implemented, would limit the risk of fraud and corruption. These controls may be categorised as follows, it being recognised that the categories contain overlapping elements:

Prevention controls: These are divided into two sub-categories, namely, Authorisation and Physical;
Detection controls: These are divided into four categories, namely, Arithmetic and Accounting, Physical, Supervision, and Management Information; and

Segregation of duties: Separation of responsibilities i.e. an internal control designed to prevent an error and fraud by ensuring that at least two individuals are responsible for the separate parts of any task.

Prevention controls:

(a) *Authorisation:*
(i) All transactions require authorisation or approval by an appropriate responsible person.
(ii) The limits for these authorisations are specified in the delegations of authority of Mintek as well as in various government prescripts.

(b) *Physical:*
These controls are concerned mainly with the custody of assets and involve procedures and security measures designed to ensure that access to assets is limited to authorised personnel.

Detection controls:

(a) *Arithmetic and accounting*

(i) These are basic controls within the recording function which check that transactions to be recorded and processed have been authorised, that they are complete, and that they are correctly recorded and accurately processed.

(ii) Such controls include checking the arithmetical accuracy of records, the maintenance and checking of totals, reconciliations, control accounts, and accounting for documents.

(b) *Physical*

(i) These controls relate to the security of records. They therefore underpin arithmetic and accounting controls.

(ii) Their similarity to preventive controls lies in the fact that these controls are also designed to limit access.

(c) *Supervision*

This control relates to supervision by responsible officials of day-to-day transactions and the recording thereof.

(d) *Management information*

(i) This relates to the review of management accounts and budgetary control.

(ii) These controls are normally exercised by management outside the day-to-day routine of the system.

Segregation of duties

(a) One of the primary means of control is the separation of those responsibilities or duties that would, if combined, enable one individual to record and process a complete transaction, thereby providing him/her with the opportunity to manipulate the transaction irregularly and commit fraud and corruption;

(b) Segregation of duties reduces the risk of intentional manipulation or error and increases the element of checking;

(c) Functions that should be separated include those of authorisation, execution, custody, and recording and, in the case of computer-based accounting systems, systems development and daily operations; and

(d) Placed in context with fraud and corruption prevention, segregation of duties lies in separating either the authorisation or the custodial function from the checking function.

4.2.11 Mintek will continue to initiate steps to address the problem of lack of training, expertise and knowledge in systems, policies, procedures, rules and regulations to improve internal control. Areas of weakness will be identified during audits and risk assessments.

4.2.12 Furthermore, Mintek will also continue to re-emphasise to all supervisors that consistent compliance by all employees with internal control is one of the fundamental controls in place to prevent fraud and corruption.

4.2.13 Where managers do not comply with basic internal controls, e.g. non-adherence to the delegation of authority limits, firm disciplinary action(s) will be considered.

Physical and Information Security

Physical security

4.2.14 Mintek will consider conducting a regular detailed review of the physical security arrangements at its offices and improve weaknesses identified. Specific focus areas will be physical security over infrastructure, assets and staff.

Information security

4.2.15 Mintek will ensure that all employees are sensitised on a regular basis to the fraud and corruption risks associated with information security and the utilisation of computer resources, in particular – access control, and ensure that systems are developed to limit the risk of manipulation of computer data.

4.2.16 Regular communiqués will be forwarded to employees pointing security policy, with a particular emphasis on e-mail and Internet usage and the implications (e.g. disciplinary action) of abusing these and other computer related facilities. Where employees are found to have infringed on prevailing policy in this regard, disciplinary action will be taken.

4.2.17 Regular reviews of information and computer security will also be considered. Weaknesses identified during these reviews will be addressed.

5. DETECTING AND INVESTIGATING FRAUD AND CORRUPTION

5.1 Internal Audit

5.1.1 Mintek recognises the fact that the positive support by all its managers for Internal Audit and its functions, speedy response to, and the addressing of queries raised by Internal Audit is vital to the success of the Plan. Where managers are found to be slow in addressing internal control queries raised by Internal Audit, firm action will be taken.

5.1.2 Mintek will regularly re-emphasise to all managers that consistent compliance by employees with internal control is one of the fundamental controls in place to prevent fraud and corruption. Managers will be encouraged to recognise that internal control shortcomings identified during the course of audits are, in many instances, purely symptoms and that they should strive to identify and address the causes of these internal control weaknesses, in addition to addressing the control weaknesses.

5.2 Ongoing Risk Assessment and Management

5.2.1 Acknowledging the fact that Mintek faces diverse business risks from both internal and external sources, Mintek is administrating an ongoing process of risk identification and risk management. This information will be used to assist management with the following:

(a) Prioritising areas for attention and subsequently developing appropriate controls to limit the material risks identified; and

(b) To enable management to continually assess and update the risk profile (incorporating fraud and corruption risk) of Mintek.

5.2.2 Presentations to employees of Mintek will be conducted in order to ensure that they have a more detailed understanding of the fraud and corruption risks facing Mintek and the areas wherein these risks exist, thus enhancing the prospect of detecting irregularities earlier.

5.2.3 Mintek will also consider performing specific fraud and corruption detection reviews in the following areas on a regular basis:

(a) Asset and inventory management;
(b) Procurement/Supply Chain Management;
(c) Conflicts of interest;
(d) Project management and maintenance;
(e) Contracts management;
(f) Fleet management;
(g) Compliance to delegations of authority;
(h) Budget control;
(i) Creditor payments;
(j) Revenue management;
(k) Payroll;
(l) Travel and subsistence; and
(m) Human Resources.

This will include the conducting of presentations to managers and staff to ensure that they have a more detailed understanding of the fraud and corruption risks associated with these areas, thus also enhancing the prospect of detecting irregularities earlier.

5.3 Reporting and Monitoring

5.3.1 Mintek has implemented a Fraud Hotline, which is controlled by an independent service provider and is intended to achieve the following:

(a) To deter potential fraudsters and corrupt individuals by making all employees and other stakeholders aware that Mintek is not a soft target, as well as encouraging the participation of employees in supporting, and making use of this facility;

(b) To raise the level of awareness that Mintek is serious about fraud and corruption;

(c) To detect incidents of fraud and corruption by encouraging whistle blowers to report incidents which they witness;

(d) To assist Mintek in managing the requirements of the Protected Disclosures Act by creating an additional channel through which whistle blowers can report irregularities which they witness or which come to their attention; and

(e) To further assist Mintek in identifying areas of fraud and corruption risks in order that preventive and detective controls can be appropriately improved or developed.

5.3.2 Mintek has ensured that a fraud and corruption information system is developed for the following purposes:

(a) Recording all allegations;

(b) Tracking progress of investigation of allegations;

(c) To facilitate the early identification of systemic weaknesses and recurring risks, and inform managers and employees of systemic weaknesses/risks; and

(d) Provide feedback to employees and other whistle blowers on the management of allegations.

The Fraud Policy and Response Plan:

5.3.3 A Fraud Policy, which contains the policy stance of Mintek to fraud and corruption as well as the response mechanisms in place to report, investigate and resolve incidents of fraud and corruption which impact it, has been developed for Mintek.

5.3.4 The Fraud Policy will be circulated to all employees of Mintek and appropriate sections to the public and providers of goods and services.

5.3.5 Fraud and corruption must be reported according to the provisions of the fraud policy.

6. FURTHER IMPLEMENTATION AND MAINTENANCE

6.1 Creating awareness

This component of the Plan comprises two approaches, namely education and communication.

6.1.1 Education: The creation of awareness amongst employees is intended to address the following issues:

(a) Informing employees on an ongoing basis on what constitutes fraud and corruption;

(b) Promote Mintek's and national policies that must be adhered to;

(c) Informing employees of fraud and corruption risks to enable understanding of specific risks to which Mintek may be exposed, thus enhancing the prospect of detecting irregularities earlier;

(d) Encouraging employees to blow the whistle on fraud and corruption;

(e) Employee awareness of the current legislative framework as it relates to fraud and corruption, and their obligations and rights should they blow the whistle on fraud and corruption, the nature of the witness protection system and the roles and responsibilities of existing anti-corruption institutions; and

(f) Inform employees of their obligations and rights in terms of the Access to Information Act.

6.1.2 Communication: The objective of the communication approaches is to also create awareness amongst employees, the public and other stakeholders, in order to facilitate a culture where all stakeholders strive to contribute toward making the Plan a success as well as for sustaining a positive, ethical culture within Mintek. This will increase the prospect of fraud and corruption being reported and improve Mintek's prevention and detection ability.

6.1.3 Communication strategies that will be considered by Mintek are the following:

(a) Posters, newsletters, pamphlets and other publications to advertise the Code and the Fraud Policy, aimed at employees, the public and other stakeholders;

(b) Screensavers on computers with appropriate anti-fraud and corruption and pro-ethics messages;

(c) Attachments to tender invitation documents relating to Mintek's stance to fraud and corruption, where such irregularities can be reported and the actions which will be considered;

(d) Appropriate attachments to offers of employment and inclusion of appropriate items in induction and training programmes;

(e) Prudent terms in contracts signed with providers of goods and/or services relating to offering of gifts to employees of Mintek;

(f) Ensuring that fraud and corruption prevention is a fixed agenda item in meetings;

(g) Signing of declarations of commitment by all employees to the Plan; and

(h) Endorsements of correspondence directed at providers of goods and/or services with anti-fraud and corruption and pro-ethics messages.

6.2 Ongoing Maintenance and Review

6.2.1 The Chief Executive Officer will be responsible for ensuring the ongoing maintenance and review of the Plan. This includes appointing appropriate officials to ensure that:

(a) Reports of fraud and corruption received are evaluated and highlight areas of fraud and corruption risk within Mintek;

(b) Fraud and corruption threats to Mintek are considered and recommendations to appropriate committees or management are made;

(c) Criminal activities threatening Mintek are considered and fraud and corruption prevention recommendations with regard to areas that should be examined are made;

(d) Action taken to implement recommendations relating to incidents of fraud and corruption are monitored;

(e) The Code and the Fraud Policy are reviewed and appropriate amendments are made;

(f) The awareness programme as necessary is amended, and the changes are implemented; and

(g) Ongoing communication and implementation strategies are developed and implemented.

6.2.2 The Plan will be reviewed as the risk profile of Mintek changes, whilst progress with the implementation of the various components will be reviewed regularly. In the latter regard, specific priorities stemming from the Plan, actions to be taken, responsible persons and feedback dates relating to progress made will also be set.

APPENDIX V – GOVERNANCE & MANAGEMENT STRUCTURE

MINTEK EXECUTIVE MANAGEMENT TEAM

NAMES	POSITION	GENDER	RACE	QUALIFICATIONS	YEARS OF SERVICE AT MINTEK	AREAS OF EXPERTISE	BOARD MEMBERSHIPS
Molefi Motuku	Chief Executive Officer	Male	African	PhD and MSc degrees in Materials Engineering, BSc in Mechanical Eng., BSc Physics	1 Year	Research and development, technology and innovation management, strategy, leadership and management.	Graduate School of Technology & Management (GSTM), University of Pretoria
Sakhi Simelane	GM: Finance	Male	African	MBA, BCom Hons (Auditing), BCom	11 Years	Finance and Auditing. General Management	UNISA Council; National Department of Economic Development (EDD), Public Service Commission (Audit Committee), MINDEV (Pty) LTD.
Gugu Nyanda	GM: Corporate Services	Female	African	MBA, BA Hons; B Paed; Dip. HRM	6 Years	Human Resources Management, Strategic Planning, Communication, Integrity & Compliance Management and General Management	None
Alan McKenzie	GM: Technology	Male	White	MSc, BSc Hons	28 years	Pyrometallurgy, Mineral Processing and General Management	None

APPENDIX VI – RISK MANAGEMENT POLICY

1. Legal Mandate

Mintek is classified in terms of The Public Finance Management Act (PFMA), 1999, as a Schedule 3 Public Entity. The following sections of the PFMA are relevant to this Risk Management Policy:

Section	Description
49 (1)	Every public entity must have an authority which must be accountable for the purposes of this Act.
(2)	If the public entity has a board or other controlling body, that board or controlling body is the accounting authority for that entity.
51 (1)	An accounting authority for a public entity –
(a)	must ensure that public entity has and maintains –
(i)	effective, efficient and transparent systems of financial and risk management and internal controls;
(ii)	a system of internal audit under the control of an audit committee.
56 (1)	The accounting authority for a public entity may –
(a)	in writing delegate any of the powers entrusted or delegated to the accounting authority in terms of this Act, to an official in that public entity.
(2)	A delegation or instruction to an official in terms of subsection (1) –
(b)	may either be to a specific individual or to the holder of a specific post in the relevant public entity; and
(c)	Does not divest the accounting authority of the delegated power or the performance of the assigned duty.

In terms of the above, the Mintek Board delegates the duties of risk management to the General Manager: Business Development, who will, hereafter, be referred to as the Risk Management Officer (RMO). A model for the governing structures responsible for the management of risk in Mintek is illustrated in Figure 1.

2 Corporate Governance

'Corporate governance' is the system by which an organisation is directed and controlled at its most senior levels, in order to achieve its objectives and meet the necessary standards of accountability, probity and openness.

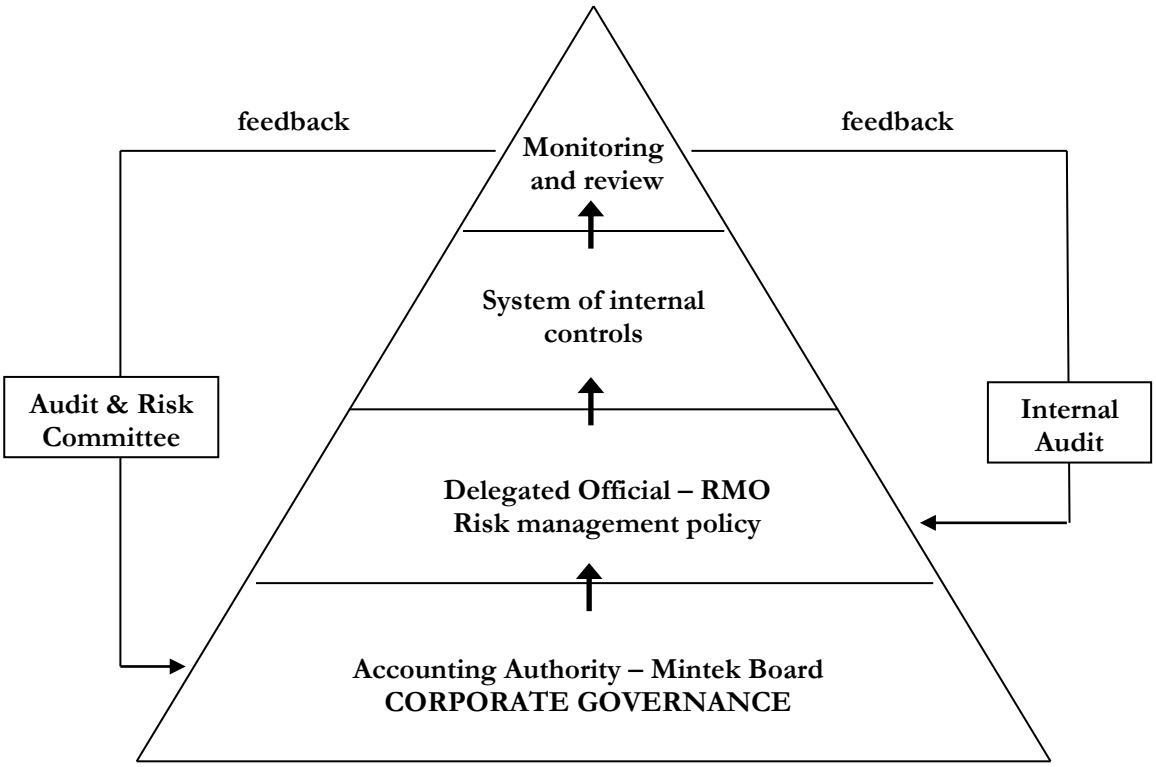

Figure1. Governing structure for the management of risk (RMO is the Risk Management Officer)

Demand for improved corporate governance has grown over the last decade. This has led to a body of guidance on corporate governance, including risk management and internal control. A set of responsibilities must be established in order to cascade the governance requirements down into Mintek. These responsibilities cover:

a. Establishing an appropriate accountability framework encompassing management structures and practices (leadership, committees, reporting arrangements, policies and strategies etc.) within which the system of internal control can operate.

b. Ensuring that the core and supporting processes are in place to produce the desired outcome (including a risk management process).

c. Having the necessary capability (leadership, knowledgeable and skilled staff and adequate financial and physical resources) to ensure the processes and internal controls can work effectively.

d. Regularly monitoring and reviewing the system of internal control.

e. Ensuring proper communication and consultation at all levels within Mintek and with external stakeholders.

f. Obtaining sufficient independent and objective assurance as to the robustness of Mintek's key processes.

The Board fully accepts its responsibility to discharge these governance obligations, including the management of risk. In order to deliver its accountability responsibilities, the Board has agreed a risk management policy that sets out its approach to risk management and the context for the system of internal control.

3 Risk Implementation Plan

Mintek is encouraged to adopt well managed risk-taking. It therefore needs to have in place the skills, management arrangements, and organisational structures to take advantage of opportunities to do things better and to reduce the possibility of failing to achieve key objectives. This document defines Mintek's approach to risk and how risk management will be embedded into management processes to ensure that the key strategic risks are being effectively managed.

Risk management needs to allow for the effective assessment and exploitation of opportunities while also identifying what would prevent us from achieving our objectives, and ensuring we have in place procedures to minimise, or manage, those risks. Risk management therefore involves a planned and systematic approach to the identification, assessment and mitigation of the risks which could hinder the achievement of strategic objectives.

3.1 The Role of the Risk Steering Committee

The Risk Management Officer (RMO) is responsible, on behalf of the Board, for ensuring that Mintek has an effective and operational system for managing risks. All types of high-level risk will be covered. The effectiveness of the system will be reviewed on a regular basis. The RMO will constitute a Risk Steering Committee with the following members:

- Chairperson (RMO)
- Chief Executive Officer
- General Manager: Finance
- General Manager: Technology
- General Manager: Research & Development
- General Manager: Corporate Services
- Manager: Finance
- Manager: Human Resources
- Manager: Engineering Management Services
- Head: Information and Communications Technology
- Head: Security
- Head: SHEQ

The Committee may, at their discretion, co-opt other participants with specialised knowledge or skills to attend any meeting. The key activities of the Risk Steering Committee will be to:

- identify the key strategic risks that would prevent achievement of Mintek's objectives;
- assign ownership of specific identifiable risks;
- evaluate the significance of each risk;
- assess Mintek's risk appetite;
- identify suitable responses and mitigating actions to each risk;
- ensure that the internal control system helps manage the risks; and
- regularly review the Risk Management Policy and the Risk Implementation Plan.

Copies of the Minutes of each meeting of the Risk Steering Committee, together with the latest version of the Risk Management Policy and the Risk Implementation Plan, will be submitted to the Audit and Risk Committee for discussion. Any comments received will be incorporated into the documents and submitted to the Mintek Board for approval.

Running in tandem with the Risk Steering Committee is Mintek's corporate quality, environmental, and safety management programmes. Mintek has been certified compliant with ISO 9001: 2000, ISO 14001: 2004, and OHSAS 18001: 2007. The identification of technical risks, the implementation of appropriate risk mitigation measures, and continuous improvement is an integral part of these management programmes. Mintek is audited annually by external auditors, SGS South Africa (Pty) Ltd, who check for consistency, compliance, and conformity with the international standards.

A meeting of the Corporate Safety Committee is held four times per year, whereas the Corporate Quality and Corporate Environmental committees meet twice per year. The Chairman of these committees, (viz. the General Manager: Technology) is also a permanent member of the Risk Steering Committee, thereby ensuring effective communication between these bodies.

3.2 Critical Success Factors

In order to assess the adequacy and success of our approach to risk management a number of critical success factors have been identified:

- senior management support, own, and lead on risk management;
- risk management policies and the benefits of effective management are clearly communicated to all staff;
- the organisational culture supports well thought through risk taking and innovation;
- management of risk is fully embedded in management processes and consistently applied;
- management of risk is closely linked to achievement of objectives;
- risks associated with working with other organisations are assessed and managed;
- risks are actively monitored and regularly reviewed.

3.3 Risk Identification

A strategic approach to risk management depends on identifying risks against key organisational objectives. Operating within this framework helps ensure a consistent approach across the organisation and enables a clear structure to be established.

The mandate of Mintek is set out in the Mineral Technology Act (Act No. 30 of 1989), which is to serve the national interest through research, development and technology transfer, to promote mineral technology and to foster the establishment and expansion of industries in the field of minerals and products derived therefrom.

The vision of Mintek is to be a global leader in mineral and metallurgical innovation.

The mission of Mintek is to serve our stakeholders by adding value to the mineral sector through research, development and technology transfer, in support of national priorities and sustainable growth.

In order to support the mission the Mintek Board will, from time to time, identify Strategic Objectives for the guidance of Management. These Strategic Objectives will be expanded further into Targeted Activities (TAs) to aid the identification of risks.

The Strategic Objectives and TAs will be listed in the Risk Implementation Plan. Mintek will identify the risks relevant to these TAs, which forms the basis of Mintek's Risk Implementation Plan (copy appended), and each risk is cross-referenced to one or more of these TAs.

3.4 Evaluating the significance of each risk

Mintek has followed the method outlined by National Treasury in their document "Final Risk Management Framework" for the Public Sector for assessing the significance of each risk. The significance, or rating, of risk is a combination of impact multiplied by probability. A system of risk rating can be created by assessing the impact and probability of every risk on a 10 point scale. Such a system results in a 1 to 100 scale, where a score of 1 is indicative of an insignificant risk, and 100 would indicate a potentially catastrophic risk.

The best quantitative criterion for assessing risk is to calculate the financial value of the occurrence. This provides the guideline basis for the risk rating in the table above. However, sometimes there are consequences which cannot be quantitatively reduced to a financial value. Examples include major reputational set-backs, loss of life, decrease in staff morale, etc. All these consequences should be taken into account in determining the impact of the occurrence and corresponding risk rating – the economic impact is only one criterion. The following tables are to be used to assist management in quantifying the potential that a risk exposure may have on the organisation:

Rating	Title	Description of Impact
9-10	Catastrophic/ fundamental	Disaster with the potential to significantly harm the business and is fundamental to the non-achievement of objectives.
7-8	Critical	Critical event which can be endured but which may have a prolonged negative impact and extensive consequences.
5-6	Serious	Major events which can be managed but requires additional resources and management effort.
3-4	Significant	Event which can be managed under normal operating conditions.
1-2	Minor	Not worth worrying about.

Rating	Title	Description of Probability
9-10	Almost Certain	The event is expected to occur in most circumstances.
7-8	Likely	The event will probably occur in most circumstances.
5-6	Moderate	The event should occur at some time.
3-4	Unlikely	The event could occur at some time.
1-2	Rare	The event may occur in exceptional circumstances.

The economic impact of an identified risk includes both the direct cost of the event associated with the risk occurring (e.g. the cost of repairs after a fire) and the indirect costs that are a consequence of the event (e.g. the loss of production and income while the repairs are taking place).

Most of the risks in a business environment are controllable, so that the probability of a risk actually occurring is dependent upon the effectiveness of the control measures in place. Added value is therefore to be gained by estimating

the probability of each risk before and after the implementation of suitable control measures, resulting in the assessed inherent and controlled risk.

The assessment of the potential impact of Mintek's risks and their associated probabilities are determined by the members of Mintek's Risk Steering Committee. The assessment process is designed to be as objective and quantitative as possible, but still contains a degree of judgement. Some risks will be connected to, or dependent upon, other risks. It is important to understand the relationships between risks so that they can be effectively prioritised. The table below places the risk rating in an economic framework:

Risk rating	Qualitative assessment	Economic assessment
70-100	Catastrophic	>R150m
50-69	High	R60m – R150m
35-49	Medium-high	R20m – R60m
24-34	Medium	R7.5m – R20m
15-23	Low-medium	R1.5m – R7.5m
1-14	Low	<R1.5m

All risks that are determined as having a rating in excess of 15 (greater than R1 million) will be identified and recorded for future monitoring and control, and is in line with Mintek's Materiality Framework.

Management response to each risk:

Having identified the key strategic risks, the Risk Steering Committee will consider the different ways that Mintek can respond to these risks, and the responses will be recorded in the Risk Implementation Plan. The options for responses include:

- ***avoiding*** the risk by not starting the activity that creates exposure to the risk;
- ***mitigating*** the risk through improvements to the control environment (risk treatment may include methods, procedures, applications, management systems, and the use of appropriate resources that reduce the probability or possible severity of the risk);
- ***transferring*** the risk exposure, usually to a third party better able to manage the risk, e.g. through insurance or outsourcing;
- ***exploiting*** the risk, where the risk exposure represents a potential missed or poorly-realised opportunity;
- ***terminating*** the activity that gives rise to the intolerable risk; and
- ***integrating*** some or all of the risk responses outlined above.

3.5 Assigning ownership

Having identified the key strategic risks, the responsibility for managing them must be allocated. Whereas the Chief Executive Officer remains personally accountable for the organisation as a whole and for its risk management, a framework of senior level delegation of the key risks is essential to effective risk management. The delegation of responsibility has been effected in the Risk Implementation Plan by assigning ownership of every risk element to an appropriate position in Mintek.

3.6 Risk appetite

The main focus of private sector risk management is on maintaining and enhancing profitability. In contrast, the public sector focuses on the fulfilment of objectives and delivery of a beneficial outcome in the public interest. Mintek, as a Schedule 3 Public Entity, is positioned between the private and public sectors.

Mintek must adopt well-managed risk taking where it is likely to lead to improvements in service delivery. It is recognised that risk taking is essential if Mintek is to innovate and improve. Mintek's risk appetite is reflected in our strategic objectives. Our overall portfolio of risks must be balanced to ensure, as far as possible, that the mix of risks remains tolerable.

3.7 Control assurance sources

Having identified the key risks, we have then considered how we manage them to reduce their probability or impact, should they occur. The control assurance sources available to Mintek are listed below, and each identified risk in the Risk Implementation Plan is cross-referenced to one or more of these sources:

- Internal audit
- ISO 9001 internal audits
- ISO 9001 external audits
- ISO 14001 internal audits
- ISO 14001 external audits
- OHSAS 18001 internal audits
- OHSAS 18001 external audits
- Legal compliance audits
- GMR(2) inspections
- Workplace inspections
- IT Steering Committee reviews
- SAP project steering committee
- Security audits
- Wellness Committee reviews

4. System of Internal Control

A control is any action or procedure performed by management to increase the likelihood of activities achieving their objectives. In other words, control is a response to risk, either to contain the risk to an acceptable level or to increase the likelihood of a desirable outcome.

A system of internal control provides a framework for all processes and activities designed to give reasonable assurance regarding achievement of objectives. Such systems should be designed to manage, rather than eliminate, the risk of failure. Controls are broken down into three categories:

Operational	relating to the effective and efficient use of resources
Financial	relating to the proper management and oversight of the organisation's finances, leading to the preparation of reliable published financial statements
Compliance	relating to compliance with applicable laws and regulations

The Chief Executive Officer participates in the exercise of many of the key internal controls or, through participation in activities, sees evidence of their existence and operation. In addition the Chief Executive Officer receives confirmation from the Council's General Managers and others that the controls are working effectively.

5. Monitoring and Review

Because risk management is explicitly linked to the achievement of objectives, reporting will be embedded within the regular processes for reporting on our operating performance. The monitoring and reporting of risks is therefore linked to the operating plan and budget cycle.

The Risk Steering Committee will meet four times per year. The minutes of these meetings, and any review or update of any of the risk documentation, will be included in the pack of documents submitted to members of the Audit and Risk Committee and the Mintek Board at least two weeks prior to the date of the meeting.

6. Roles and Responsibilities

6.1 The Board and Audit and Risk Committee

As the Accounting Authority in terms of the PFMA, the Board has a fundamental role in the management of risk. It will:

- receive an opinion from the Audit and Risk Committee that will include its review of the processes of risk management and internal control;
- consider risk issues as they affect Board decisions;
- review key strategic risks that will be analysed annually alongside the strategic plan; and
- periodically review risks as part of the monitoring of the annual operating plan.

6.2 The Chief Executive Officer

The Chief Executive Officer remains ultimately accountable for the organisation and its management of risk. He must:

- have a clear understanding and assessment of the risks that could prevent delivery of objectives;
- ensure that the organisation has effective risk management and control processes; and
- be provided with assurance that the processes and the key strategic risks are being effectively managed.

As part of this process the Chief Executive Officer must undertake an annual review of the effectiveness of the system of internal control, which will enable the appropriate statement to be made in Mintek's annual accounts.

6.3 Executive Management

Mintek's General Managers have a key role in facilitating the flow of information from the Board to staff and vice versa. They should:

- report to the Chief Executive Officer on key strategic risks as and when necessary;
- discuss the findings of internal and external audits and implement changes as appropriate;
- take responsibility for the risks that relate to the objectives of their line management;
- ensure that all Board papers identify impact on strategic risks;
- promote a consistent approach within Mintek with respect to risk management; and
- act as mentors to all employees and promote a risk awareness culture.

6.4 Risk Management Officer (RMO)

The RMO is responsible for:

- facilitating the identification of key strategic risks and controls mechanisms;
- establishing and co-ordinating Mintek's action plan for implementing appropriate risk reduction management;
- integrating Mintek's ISO 9001, 14001, and OHSAS 18001 quality, environmental, and occupational health / safety management systems into the Risk Management Policy; and
- promoting risk awareness and skills in risk assessment and reporting.

6.5 All employees

All staff should be aware of, and understand, the Mintek's Risk Management Policy, the policies on risk, and how these apply to their own roles and responsibilities. In particular, project managers need to understand and manage the risks relating to their activities and the impact on Mintek's key strategic risks.

APPENDIX VII – RISK PLAN

Mintek's Risk Implementation Plan: an assessment of Mintek's major corporate and operational risks

Mintek has identified five Strategic Objectives to support Mintek's Mission. These Strategic Objectives, in accordance with the requirements of the Risk Management Policy, have been expanded further into Targeted Activities (TA's) to aid the identification of risks.

Strategic Objective 1: Conduct relevant, applied research and technological innovation by pursuing a focussed approach to research and technology development that emphasises high-impact scientific outputs and outcomes;

a) Broaden Mintek's local and international marketing footprints;
b) Improve interaction with key stakeholders, and develop suitable intervention strategies; and
c) Improve quality of service and response time.

Strategic Objective 2: Foster industry establishment and expansion of existing industries, including nascent, emerging, mature and declining industries, as well as new industries;

d) Identify, and respond to, the needs of Mintek's clients (public and private) with innovative technologies, services, and products;
e) Create business opportunities for SMMEs; and
f) Where appropriate, leverage Mintek technology into business opportunities via Mindev.

Strategic Objective 3: Develop a capable workforce that has the requisite skills, expertise and capabilities to drive and support rigorous scientific research and technological development in pursuit of Mintek's mandate of conducting research and fostering industry development and expansion. The workforce profile will reflect the demographic profile of South Africa;

g) Maintain effective safety and environmental programmes, and reduce Mintek's Lost Time Injury Frequency Rate to below 1.0
h) Improve Mintek's succession and internal transformation processes; and
i) Continual on-the-job training and multi-skilling.

Strategic Objective 4: Ensure financial sustainability and securing Mintek's future by achieving a solid research portfolio that is funded through both private and public sources and commercialising Mintek's technologies; and

j) Prudent financial management;

k) Implementation of effective financial controls; and
l) Maintain the integrity of ICT and financial systems;

Strategic Objective 5: Develop and maintain world-class Research, Development and Innovation (RDI) infrastructure that supports Mintek's research, technology innovation and the development of products and services that encourage industry growth and expansion.

m) Protect and maintain returns from Mintek's Intellectual Property; and
n) Maintain the effectiveness of Mintek's technical assets and infrastructure.

Mintek will identify the risks relevant to these TA's. The Strategic Objectives and TA's will be listed in the Risk Implementation Plan. Further evaluation of these risks forms the basis of Mintek's Risk Implementation Plan (copy appended), and each risk is cross-referenced to one or more of these TA's.

Evaluating the significance of each risk

Mintek has followed the method outlined by National Treasury in their document "Final Risk Management Framework" for the Public Sector for assessing the significance of each risk. The significance, or rating, of risk is a combination of impact multiplied by probability. A system of risk rating can be created by assessing the impact and probability of every risk on a 10 point scale. Such a system results in a 1 to 100 scale, where a score of 1 is indicative of an insignificant risk, and 100 would indicate a potentially catastrophic risk.
The following tables are to be used to assist management in quantifying the potential that a risk exposure may have on the organisation:

Rating	Title	Description of Impact
9-10	Catastrophic/ fundamental	Disaster with the potential to significantly harm the business and is fundamental to the non-achievement of objectives.
7-8	Critical	Critical event which can be endured but which may have a prolonged negative impact and extensive consequences.
5-6	Serious	Major events which can be managed but requires additional resources and management effort.
3-4	Significant	Event which can be managed under normal operating conditions.
1-2	Minor	Not worth worrying about.

Rating	Title	Description of Probability
9-10	Almost Certain	The event is expected to occur in most circumstances.
7-8	Likely	The event will probably occur in most circumstances.
5-6	Moderate	The event should occur at some time.
3-4	Unlikely	The event could occur at some time.
1-2	Rare	The event may occur in exceptional circumstances.

The economic impact of an identified risk includes both the direct cost of the event associated with the risk occurring (e.g. the cost of repairs after a fire) and the indirect costs that are a consequence of the event (e.g. the loss of production and income while the repairs are taking place).

Most of the risks in a business environment are controllable, so that the probability of a risk actually occurring is dependent upon the effectiveness of the control measures in place. Added value is therefore to be gained by estimating the probability of each risk before and after the implementation of suitable control measures, resulting in the assessed inherent and controlled risk.

The assessment of the potential impact of Mintek's risks and their associated probabilities are determined by the members of Mintek's Risk Steering Committee. The assessment process is designed to be as objective and quantitative as possible, but still contains a degree of judgement. Some risks will be connected to, or dependent upon, other risks. It is important to understand the relationships between risks so that they can be effectively prioritised. The table below places the risk rating in an economic framework:

Risk rating	Qualitative assessment	Economic assessment
70-100	Catastrophic	>R150m
50-69	High	R60m – R150m
35-49	Medium-high	R20m – R60m
24-34	Medium	R7,5m – R20m
15-23	Low-medium	R1,5m – R7,5m
1-14	Low	<R1,5m

All risks that are determined as having a rating in excess of 15 (greater than R1.5 million) will be identified and recorded for future monitoring and control. This is in line with Mintek's Materiality Framework.

Management response to each risk

Having identified the key strategic risks, the Risk Steering Committee will consider the different ways that Mintek can respond to these risks, and the responses will be recorded in the Risk Implementation Plan. The options for responses include:

- ***avoiding*** the risk by not starting the activity that creates exposure to the risk;
- ***mitigating*** the risk through improvements to the control environment (risk treatment may include methods, procedures, applications, management systems, and the use of appropriate resources that reduce the probability or possible severity of the risk);
- ***transferring*** the risk exposure, usually to a third party better able to manage the risk, e.g. through insurance or outsourcing;
- ***exploiting*** the risk, where the risk exposure represents a potential missed or poorly-realised opportunity;
- ***terminating*** the activity that gives rise to the intolerable risk; and
- ***integrating*** some or all of the risk responses outlined above.

Mintek's Risk Implementation Plan: an assessment of Mintek's major risks

#	Risk classification Risk owner Risk Category	Description of Risk	Risk reduction measures	Before			After			Present status of risk reduction measures	Targeted Activity (The Roman numerals refer to the Targeted Activities associated with Mintek's Strategic Objectives, as listed in the beginning of this document)	Control assurance
				Risk Rating	Impact	Probability	Risk Rating	Impact	Probability			
1	**Business Risk** **Executive Management** **Strategic Risk**	Loss of commercial revenue Management response: Mitigate	• Ensure top quality control of all products and services • Timely delivery of all products and services – business focused project managers/chief investigators • Ensure competitive pricing • Good maintenance backup and/or after sale customer care • Adequate business planning • Maximise alternative revenue streams • Ensuring adequate marketing e.g. visits by EXM to various company CEOs, technology showcases, exhibition stands at identified conferences/events, place greater emphasis on Western African events in future • Improved website needed and being looked at, current one is inadequate and compares poorly with websites of other similar organisations • Keeping customers Improving productivity without compromising quality • Focus should be on sharing of resources as well as where it is mostly needed • Science vote cluster discussions –focus on projects that Mintek can really benefit from (short-term)	64	8	8	56	7	8	**Adequate**	d Identify, and respond to, the needs of Mintek's clients (public and private) with innovative technologies, services, and products l Continual on-the-job training and multi-skilling c Improve quality of service and response time k Implementation of effective financial controls	• Internal audit • ISO 9001 internal audits • ISO 9001 external audits
2	**Physical and Operational Risk** **GM: Technology** **Managers** **Head: Corp. SHEQ** **Operational Risk**	Operational-incident causes injuries, destruction of building and equipment or loss of license to operate scheduled processes Management response: Mitigate	• Procedures for storing, maintaining and handling of flammable and explosive substances • Training of staff • Three yearly fire risk assessments performed • Hazop studies conducted • Bag house and gas monitoring on stacks (at least one accredited check per campaign) • Monitoring of interlocks and emergency shutdown devices, evacuation procedures and airline breathing system • Safety related inspections conducted • Testing of systems before operation • Implement electrical protection/tripping systems to our client • Installing of protection networks on contractors to protect feed transformers to DC drives • Servicing and checking all oil breakers • Infrared assessments of High Tension switchgear performed on a yearly basis by external company • A possible cause of explosions could be water leaks into a furnace. Various interlocks (fatal alarms, etc.) installed to monitor water flows, temperature, etc. • Totally enclosed chlorine plant • Regular checks and continuous improvement to ensure compliance with regulations • Emergency response and evacuation procedures (including site evacuation) are in place • Training of staff on emergency response and evacuation procedures • Improve internal fire equipment to supplement that of the Fire Department • Firefighting equipment is serviced once a year and checked once a month	70	10	7	40	10	4	**Adequate**	n Maintain the effectiveness of Mintek's technical assets and infrastructure i Continual on-the-job training and multi-skilling g Maintain effective safety and environmental programmes n Maintain the effectiveness of engineering solutions	• OHSAS 18001 internal audits • OHSAS 18001 external audits • ISO 14001 internal audits • ISO 14001 external audits • Legal compliance audits • GMR(2) inspections • Workplace inspections • Fire risk assessment

 All risks are ranked according to the Risk Rating value. The Risk Rating is the product of the Impact and the Probability. The system of risk rating is based on assessing the impact and probability of every risk on a 10 point scale. For impact: 1 = insignificant; 10 = catastrophic. For probability: 1 = extremely unlikely to occur; 10 = will most likely occur. This system results in a 1 to 100 scale for the Risk Rating.

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3	**Human Resource Risk** **Executive Management** **GM: Corp. Services** **Managers** **Strategic Risk**	Failure to attract and retain skilled personnel Management response: Mitigate	• Constant monitoring of best practice strategies for attraction and retention of skilled personnel • Annual performance appraisals conducted on all employees to identify necessary skills for accelerated development • Coaching and Mentoring program • Succession planning • Benchmark salary scales against industry and comparable entities • A more detailed exit interview process to determine the root cause reasons for staff resigning from Mintek • Implement a number of initiatives on social media platforms to attract young talent into the organisation • Continuous benchmarking and market analysis to inform internal strategies	42	7	6	36	6	6	**Adequate**	h Improve Mintek's succession and internal transformation processes i Continual on-the-job training and multi-skilling	• Internal audit
4	**Business Risk** **CEO** **Executive Management** **Strategic Risk**	Changing Government policy and priorities Management response: Mitigate	• Continuous monitoring of opportunities for funding • Increased visibility of Mintek at National Treasury and DMRE specifically focusing on funding issues • Continuous monitoring of departmental strategic plans and other notifications • Participation in departmental task teams and strategy sessions to remain abreast of policy changes and emerging priorities	35	7	5	35	7	5	**Adequate**	d Identify, and respond to, the needs of Mintek's clients (public and private) with innovative technologies, services, and products	• Senior management
5	**Financial Risk** **Executive Management** **Managers** **Strategic Risk**	Surge in operational costs Management response: Mitigate	• Comply to accurate and realistic budgeting and implementation thereof to prevent/minimize loss of profitability • Designed ability to pass through increased costs to customers via change in rates/tariffs • Pro-active management accounting and variance/trend analysis thereon • Regular reviews of pricing policy for Mintek's products and services undertaken • Implementation of bi-annual review of workforce planning. • Adequate business process analysis • Monitor procurement/local content, assembly and fabrication	40	5	8	25	5	5	**Adequate**	j Prudent financial management of Mintek's investments & liabilities k Implementation of effective financial controls	• Internal audit
6	**Physical and Operational Risk** **GM: Technology** **Managers** **Head: Corp. SHEQ** **Operational Risk**	Employee exposure to hazardous substances. Management response: Mitigate	• Entry medical which may detect pre-existing conditions or identify possible problem areas e.g. allergies to certain commodities • Regular occupational hygiene surveys • Extraction systems in use, flow rate checked annually • PPE issued to employees • PIC completed before commencement of project • SHEQ briefings conducted. • Procedures and training on safe handling of hazardous materials provided to employees working with hazardous materials • Minimise volume of samples stored on Mintek site • Correct storage of hazardous material, e.g. implement access control to hazardous	72	9	8	24	6	4	**Adequate**	i Continual on-the-job training and multi-skilling g Maintain effective safety and environmental programmes	• OHSAS 18001 internal audits • OHSAS 18001 external audits • Legal compliance audit • GMR(2) inspections • Workplace inspections

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			materials • Monthly site inspections to monitor sample volume and condition • HazChem database, containing updated Material Safety Data Sheets, made available to all SHEQ officers and the project team • Annual employee medicals and biological monitoring of employees exposed to hazardous materials where appropriate • First Aiders trained and available on all shifts. • Medical Oxygen available in areas where Cyanide is used • Job observations conducted									
7	**Physical and Operational Risk** **GM: Technology** **Managers: SBU** **Head: Corp. SHEQ** **Operational Risk**	Spillage of hazardous substances including radioactive substances Management response: Transfer	• Appointment of Radiation Protection Officer to ensure that the transporting of radioactive material is done according to the regulations for the safe transport of radioactive material. (International Atomic Energy Agency TS-R-1) • Procedures, training, and supervision of staff working with hazardous solutions • Mintek has the required insurance cover in cases where Mintek is held jointly liable with client • Mintek only uses transporters approved by the Department of Mineral Resources and Energy, National Nuclear Regulator and Department of Health • Emergency response plan developed to respond to accidents both at Mintek outside of Mintek e.g. accident associated with the transporting of Radioactive Material which may give rise to a risk of spillage and possible nuclear exposure and/or damage • Public communication procedure (Emergency Response Procedure) developed to deal with communication aspects involved in the case of any spillages, or gas releases, affecting the public • All work on radioactive material done in a designated area. Samples are kept in a physically secure area that will prevent unauthorised access and the unauthorised removal of such material • Work areas where there is a risk of spillages, are situated north of Bays. All drains in this area lead to the decantation ponds. Water from the decantation ponds gets treated in effluent plant before release to sewer • The storm water drains, situated in the road that runs directly south of the Bays, have been routed to the effluent treatment system to prevent hazardous material entering the sewer • Guideline document drawn up specifying the control and handling of radioactive samples entering and leaving Mintek • Condition of vehicles entering the site is checked at the gate • Vehicles must have the required signage • Drivers to have required permits	64	8	8	24	6	4	**Adequate**	k Implementation of effective financial controls (Insurance) n Relevant engineering controls that prevent spillages i Continual on-the-job training and multi-skilling g Maintain effective safety and environmental programs	• OHSAS 18001 internal audits • OHSAS 18001 external audits • ISO 14001 internal audits • ISO 14001 external audits • Legal compliance audit • NNR external audits
8	**Physical and Operational Risk** **GM: Finance** **Head: ICT**	Inadequate ICT Security Management response: Mitigate	• Next generation firewall with intrusion prevention and detection system(IPS/IDS) • No unsecured file shares allowed on servers. Hidden and normal file shares have been implemented for all user shares • ICT has implemented secure remote connection using a Secure Sockets Layer Virtual	42	6	7	24	6	4	**Adequate**	l Maintain the integrity of IT and financial systems	• IT Steering Committee reviews • Internal audit • ISO 9001 internal audits

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	Operational Risk		Private Network (SSL VPN) • A filtering solution is implemented to review the incoming e-mail messages content to determine spam • ICT supplies cable locks for all our users who have Mintek laptops • Firewalls maintained and antivirus software kept up to date • Users are continually trained via awareness campaigns to comply with security policies • A document management system with strict control over access to Mintek IP where required is enforced • Multi-level PC security is implemented to prevent unauthorized insider attack .This is based on group security membership and user profiles • Developed and implemented a frequent password change policy • Back-up and disaster recovery processes in place									• ISO 9001 external audits
9	**Product Risk** **GM: Technology** **Managers: SBU** **Head: Corp. SHEQ** **Operational Risk**	Non Compliance to Foreign laws relating to safety, health and or environment Management response: Mitigate	• When applicable for contracts in foreign countries, this will be handled on a project specific basis. Project Information Chart (PIC) prompts Chief Investigator to state whether foreign laws are applicable. If foreign laws are applicable CI will get the requirements from the client • Client is made responsible for these items in the contract	42	7	6	20	4	5	**Adequate**	g Maintain effective safety, health and environmental programmes	• ISO 14001 internal audits • ISO 14001 external audits • OHSAS 18001 internal audits • OHSAS 18001 external audits • Legal compliance audits • ISO 9001 internal audits • ISO 9001 external audits • Legal compliance audits
10	**Physical and Operational Risk** **GM: Finance** **Manager: EMS** **Operational Risk**	Loss of external electrical power Management response: Mitigate	• Mintek has a 250kVA, a 350 kVA, a 500kVA, 2 x 700kVA, and a 750kVA power generator to ensure adequate emergency power to overcome events such as loss of power from City Power's infrastructure, load shedding from Eskom etc. • Availability of gas to operate some equipment. SBU's emergency power requirements have been analysed. The outcome of this exercise provided information on Mintek's UPS and emergency generator requirements • Design and configure an internal integrated emergency power grid to enable load distribution across all E-power plants	35	7	5	20	4	5	**Adequate**	n Maintain the effectiveness of Mintek's technical assets and infrastructure	▪ Routine inspections
11	**Physical and Operational Risk** **GM: Finance** **Head: ICT** **Operational Risk**	Loss of server functionality. Management response: Mitigate	• Physical security measures in place, e.g. locked doors, biometric access and recording system • Server room fire rated and gas based fire-extinguishing (checked periodically) • Daily backups of user and server data , off-site storage of backup tapes and backup tapes tested on regular basis by doing restores • Regular maintenance checks of server room infrastructure, e.g. air conditioning and UPS • Hardware is readily available from vendors if servers had to be damaged or stolen • Developed and implemented IT disaster recovery process • Dedicated UPS systems with built-in redundancy • Server virtualization allows for automated migration of a server to another location	35	5	7	20	5	4	**Adequate**	l Maintain the integrity of IT and financial systems n Maintain the effectiveness of Mintek's technical assets and infrastructure	• IT Steering Committee reviews • Internal audit • ISO 9001 internal audits • ISO 9001 external audits • Security audits • Workplace inspections

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				Risk Rating	Impact	Probability	Risk Rating	Impact	Probability			
			• SAP servers runs in a private cloud environment hosted in a secure tier 3 datacenter • Exchange databases moved to three separate fast SCSI arrays to increase the speed and minimise the impact of hard drive failure. • Veeam backup schedule optimized to minimise chances of it running into business hours.									
12	**Product Risk** **GM: Technology** **GM: R&D** **Managers: SBU** **Operational Risk**	Loss of product Management response: Transfer	• Ensure goods are adequately insured on a project specific basis. "All risk" insurance required for high value items, e.g. plant • Mintek's All Risk Policy provides some cover • Limitation of Liability clauses included in Mintek's "Conditions of Sale" template (available on the intranet)	40	8	5	20	4	5	**Adequate**	k Implementation of effective financial controls	• Internal audit
13	**Financial Risk** **GM: Finance** **Manager: FIN** **Strategic Risk**	Volatility of Mintek's liquidity ratio. Management response: Mitigate	• Increased effort to collect outstanding debt • Cash flow planning to increase investment returns • Control over expenditure	30	5	6	20	4	5	**Adequate**	k Implementation of effective financial controls	• Internal audit
14	**Business Risk** **Executive Management** **GM: Business Development** **Strategic Risk**	Loss of revenue due to Ineffective marketing Management response: Mitigate	• Annual Marketing Plan which reviews the current market conditions and looks at possible areas of focus for commercial and State funded research work • GM's to ensure that the individual divisions have adequate marketing plans in view of the fact that they have direct responsibility to prevent missed business opportunities. • Maintain regular contact with our clients • Attend appropriate events where Mintek can interact with clients and potential clients • Improved visibility in areas that are not currently being serviced but may have opportunities	24	4	6	20	4	5	**Adequate**	d Identify, and respond to, the needs of Mintek's clients (public and private) with innovative technologies, services, and products a Broaden Mintek's local and international marketing footprints	• Internal audit
15	**Physical and Operational Risk** **GM: Finance** **Manager: EMS** **Head: Corp. SHEQ** **Operational Risk**	Gas (flammable and inflammable) storage and reticulation causes' explosion. Management response: Mitigate	• Three yearly fire risk assessments performed • Procedures for proper storing, maintaining and handling of flammable substances • Safety related inspections • LPG bulk tanks are protected by water sprays and shut off valves, which are checked and maintained by gas supplier on a yearly basis. EMS checks these on a monthly basis • Leak detection in the tunnels conducted weekly by EMS • A professional consultant has done an MHI and fault tree analysis. He has determined that the installation complies with MHI requirements • Gas supplier did a risk assessment and Mintek is complying with all their requirements • Monthly safety inspections are done and recorded by EMS maintenance and gas supplier does two yearly inspections • The emergency response and evacuation procedures officially tested at least three times per year, and the site evacuation once per year	50	10	5	20	10	2	**Adequate**	n Maintain the effectiveness of Mintek's technical assets and infrastructure i Continual on-the-job training and multi-skilling g Maintain effective safety and environmental programmes	• OHSAS 18001 internal audits • OHSAS 18001 external audits • Legal compliance audits • GMR(2) inspections • Workplace inspections • Two yearly gas reticulation inspection.

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				Risk Rating	Impact	Probability	Risk Rating	Impact	Probability			
			• Site evacuation alarm installed • Overall disaster response procedure developed									
16	**Business Risk** **Executive Management** **Managers** **Head: Corp. SHEQ** **Operational Risk**	Non-compliance to applicable legislation Management response: Mitigate	• Database for Occupational Health & Safety, as well as Environmental, legislation, is available to Mintek staff. Database kept updated with new or changed legislation – updates communicated to SHEQ Department. Applicable new and updated legislation communicated to relevant Divisions for implementation e.g. Labour Act, Environmental Act, OHS Act, PFMA, Mintek Act, Companies Act, Tax Ac etc. • Mintek is subscribed to Sabinet Netlaw and it gets updated when legislation is updated • Keep abreast of changes to the relevant legislation through training • Employment of skilled personnel • Legislation compliance software system implemented • Project Information Chart and Risk Registers state which legislation Mintek should comply with	60	6	10	18	6	3	**In Progress**	k Implementation of effective financial controls g Maintain effective safety and environmental programs	• ISO 14001 internal audits • ISO 14001 external audits • OHSAS 18001 internal audits • OHSAS 18001 external audits • Legal compliance audit • Internal audit • Compliance checklists (FIN)
17	**Physical and Operational Risk** **GM: Technology** **Head: Corp. SHEQ** **Managers** **Strategic Risk**	Loss of SHEQ certification Management response: Mitigate	• Integrated Safety, Health, Environment and Quality (SHEQ) Management System implemented • SHEQ management system audited internally and externally against ISO 9001, ISO 14001, ISO 17025 and OHSAS 18001 requirements • Regular internal audits and checking of system compliance. Audit reports submitted to Divisional Management • Legal compliance audits done by third party to ensure Mintek's compliance to all legislation that impact on Mintek's operations • Regular management reviews by SHEQ Committee to monitor, review and modify policies and procedures	56	8	7	18	6	3	**Adequate**	d Identify, and respond to, the needs of Mintek's clients (public and private) with innovative technologies, services, and products c Improving quality of service and response time l Continual on-the-job training and multi-skilling n Maintain the effectiveness of Mintek's technical assets and infrastructure g Maintain effective safety and environmental programmes	• ISO 9001 internal audits • ISO 9001 external audits • ISO 14001 internal audits • ISO 14001 external audits • ISO 17025 internal audits • ISO 17025 external audits • OHSAS 18001 internal audits • OHSAS 18001 external audits • Legal compliance audits • GMR(2) inspections • Workplace inspections
18	**Physical and Operational Risk** **GM: Corp. Services** **Manager: EMS** **Manager: IAC** **Operational Risk**	Destruction or loss of physical documents and records Management response: Mitigate	• Pyroshield fire extinguishing systems has been installed and is in operation. System is serviced every three months by external company • Archived material scanned into electronic format. If a fire destroys the hard copies, the electronic versions of the documents will still be available. This also allows for backups	40	8	5	18	6	3	**Adequate**	l Maintain the integrity of IT and financial systems m Protect and maintain returns from Mintek's Intellectual Property (IP) n Maintain the effectiveness of Mintek's technical assets and infrastructure	• OHSAS 18001 internal audits • OHSAS 18001 external audits • ISO 9001 internal audits • ISO 9001 external audits • GMR(2) inspections • Workplace inspections • Legal compliance audits

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				Risk Rating	Impact	Probability	Risk Rating	Impact	Probability			
19	**Financial Risk** **GM: Finance** **Manager: FIN** **Strategic Risk**	Impact of foreign currency fluctuations Management response: / Mitigate	• Proposals quoted in Rands whenever possible to prevent impact of fluctuations on procurement and sales. • If managers do business in a foreign currency, they must contact the Manager: Finance for the best exchange rate at that specific stage. This forms part of the pricing policy • Maintain an awareness of currency fluctuations in Mintek's exposure to particular currencies.	35	7	5	18	6	3	**Adequate**	k Implementation of effective financial controls	• Internal Audit
20	**Financial and Business Risk** **GM: Finance** **Head: ICT** **Strategic Risk**	Inadequate change control on ICT projects Management response: Mitigate	• Clear identification of milestones and the monitoring thereof by the project manager • Change control process in place to prevent loss due to destabilisation of the business or technical systems.	30	6	5	18	6	3	**Adequate**	k Implementation of effective financial controls l Maintain the integrity of IT and financial systems	• Project steering committee
21	**Physical and Operational Risk** **GM: Finance** **Manager: EMS** **Operational Risk**	Danger to employees on Mintek site arising from criminal activity. Management response: Mitigate	• Camera surveillance to cover major vulnerable areas • Improve camera monitoring, security reaction times and procedures • Adequate security presence in high risk areas • Improve enforcement of access control • Increase general staff and security staff awareness of risk • Implement access control of parking area	24	6	4	18	6	3	**Adequate**	g Maintain effective safety and environmental programs	• Campus inspections • Compliance with security audits • Security committee
22	**Business Risk** **GM: Corporate Services** **Manager: HRD** **Operational Risk**	Industrial action Management response: Mitigate	• Keep abreast of developments • Reviewed strike management policy and procedure • Reviewed security procedure for industrial action • Defined roles in dealing with media, police and public • Developed communication strategy	24	6	4	18	6	3	**Adequate**	i Continual on-the-job training and multi-skilling	• HR Committee • Internal audit
23	**Financial Risk** **Executive Management Managers** **Fraud Risk**	Inadequate internal controls to limit fraudulent transactions. Management response: Mitigate	• Review all internal controls, reporting systems and procedures on a regular basis • Clearly formalised powers and responsibilities and delegation thereof • Fraud hotline available • Fraud prevention and awareness programme • Accounts Payable procedure stipulates requirements for changes made to SAP master data, e.g. supplier bank details	50	5	10	16	4	4	**Adequate**	k Implementation of effective financial controls	• Internal audit • Fraud hotline
24	**Financial Risk** **Executive Management Managers** **Operational Risk**	Inadequate asset management system Management response: Mitigate	• Review and modify Fixed Assets standard operating procedure and policy, and monitor compliance • Undertake asset audit, document and rectify all anomalies • Developed and implemented asset tagging system aligned to serial numbers of asset • Implementation of an electronic asset movement system	35	5	7	16	4	4	**In Progress**	k Implementation of effective financial controls n Maintain the effectiveness of Mintek's technical assets and infrastructure	• Asset verification • Internal Audit

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				Risk Rating	Impact	Probability	Risk Rating	Impact	Probability			
			• Improved productivity from implementation of planned maintenance system. • Ensure effective procurement and utilisation of assets									
25	**Product Risk** **Executive Management** **Managers: SBU** **Operational Risk**	Consequential damage caused by Mintek service, product or process. Including penalty and warrantee claims. Management response: Transfer	• Adequate quality control during manufacturing process • Procedures and training of operators by chief investigators and divisional heads • Subject our products to the necessary certification/accreditation process • Covered by contracts and indemnity insurance • Mintek's responsibility for consequential damages caused by Mintek products is specifically excluded in contracts signed with clients • Standard conditions of agreements in use • Special conditions for agreements, which do not fit into the standard contract agreement, in use • Limitation of Liability clauses included in Mintek's "Conditions of Sale" template (available on the intranet) • Where required provided for warrantee.	45	9	5	16	4	4	**Adequate**	c Improve quality of service and response time	• Internal audit • ISO 9001 internal audits • ISO 9001 external audits
26	**Business Risk** **Executive management** **Strategic Risk**	Loss of revenue due to poor quality of product and services Management response: Mitigate	• Well defined project scope/proposal discussed with the client and the project team • Team meetings/briefings related to the project or product required at appropriate stages in the project. • Clear communication with the client and team members • Training, coaching and mentoring of team members as required and/or appropriate • Testing and/or commissioning of systems before operation • Calibration of testing/measurement equipment or analyzers • Internal control, repeat and duplicate samples in the laboratories. External assays for comparison if required. • Project to submit own control/check/duplicate samples to laboratories without disclosure of this to the laboratories • True "products" like MAC systems and SARM standards well developed and tested prior to market entry • Product after sales support available at MAC	40	8	5	16	4	4	**Adequate**	d Identify, and respond to, the needs of Mintek's clients (public and private) with innovative technologies, services, and products i Continual on-the-job training and multi-skilling c Improve quality of service and response time	• Internal audit • ISO 9001 internal audits • ISO 9001 external audits • ISO17025 internal audit • ISO17025 external audit • Calibrations • External test samples • Supervision, proactive project management and clear communication at all levels
27	**Physical and Operational Risk** **GM: Finance** **Manager: EMS** **Operational Risk**	Loss of internal electrical power Management response: Mitigate	• Mintek has a 250kVA, a 350 kVA, a 500kVA, 2 x 700kVA, and a 750 kVA power generator to ensure adequate emergency power if, e.g. the supply from the main transformer is lost Availability of gas power for some equipment • Weekly maintenance checks on the emergency power generators. This includes running of all generators for 10-15 minutes • The cabling has been upgraded to handle 7.9MVA (main incoming supply from City Power) • Those sub-stations around Mintek that are fitted with low Voltage circuit breakers have been upgraded • The substation switchgears have been upgraded from fuse, oil and vacuum circuit breakers to ring main unit (RMU) gas switch gears	32	8	4	16	4	4	**Adequate**	n Maintain the effectiveness of Mintek's technical assets and infrastructure	• ISO 9001 internal audits • ISO 9001 external audits • ISO 14001 internal audits • ISO 14001 external audits • GMR(2) inspections • Workplace inspections

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			• SBU's emergency power requirements have been analysed. The outcome of this exercise provided information on Mintek's UPS and emergency generator requirements • A programme has been implemented in cases where Mintek's power consumption nears the 7.9MVA limit • Annual oil transformer oil test • Planned quarterly load shedding to test operation of all generators									
28	**Financial Risk** **GM: Finance** **Manager: FIN** **Operational Risk**	Loss of Credit Rating with suppliers Management response: Mitigate	• Ensure that payment of all creditors are within stipulated timeframes • Regular review of creditor age analysis • Review all terms and conditions with approved suppliers - Letters sent to all suppliers stipulating Mintek requirements i.t.o. payments • Supplier evaluations • Regular review of procurement policy	20	4	5	16	4	4	**Adequate**	k Implementation of effective financial controls	• Internal audit
29	**Financial Risk** **Manager: EMS** **Managers** **Head: Security** **Fraud Risk**	Poor key control Management response: Mitigate	• Use of specialized key safes where practical to prevent unauthorized access to certain areas • Use of biometric access where practical in high risk areas e.g. server room, radioactive areas	20	4	5	16	4	4	**Adequate**	k Implementation of effective financial controls	• Internal audit • Security audits
30	**Physical and Operational Risk** **GM: Finance** **Manager: EMS** **Operational Risk**	Underground diesel tank leaks Management response: Mitigate	• Monthly check on stock levels indicates whether there are leaks • Overall emergency response procedure developed	20	4	5	16	4	4	**Adequate**	n Maintain the effectiveness of Mintek's technical assets and infrastructure g Maintain effective safety and environmental programmes	• ISO 14001 internal audits • ISO 14001 external audits • Legal compliance audits
31	**Financial Risk** **GM: Finance** **Manager: EMS** **Head: Security** **Operational Risk**	Theft or loss of physical assets and/or consumables. Management response: Mitigate	• Security on site 24/7/365 • Access control systems implemented • Regular asset and stock counts • Staff and vehicles searched upon leaving the premises • Removal permits for items leaving the premises • Laptop computers have their own ID card linked to the authorized user • Visitors sign in laptop computers upon entry and documentation showed on existing Mintek • Surveillance cameras installed	54	6	9	15	3	5	**Adequate**	k Implementation of effective financial controls. n Maintain the effectiveness of Mintek's technical assets and infrastructure	• Internal audit • Security audits
32	**Management Risk** **CEO** **GM: Bus. Development** **Risk Management Officer**	Inadequate risk management Management response:	• Developed and implemented a risk management framework • Risks identified, categorized, impacts assessed and mitigation strategies thereof determined • Risks reviewed quarterly	49	7	7	15	5	3	**Adequate**	k Implementation of effective financial controls	• Internal audit • ISO 9001 internal audits • ISO 9001 external audits

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				Risk Rating	Impact	Probability	Risk Rating	Impact	Probability			
	Strategic Risk	Mitigate										• ISO 14001 internal audits • ISO 14001 external audits • OHSAS 18001 internal audits • OHSAS 18001 external audits
33	**Business Risk** **Executive Management Managers** **Strategic Risk**	Inadequate pace of transformation Management response: Mitigate	• Understand the legislative requirements of the Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry • Developed and implemented a BBSEE strategy to prevent a low/poor rating • Reviewed, modified and implemented procurement policy to align to BBBEEE scorecard to achieve accreditation • Undertook a supplier audit to verify Broad-Based Black Economic Empowerment accreditation with focus on the preferred supplier list • Investigate new suppliers to achieve goal • Ensure that Mintek attains its employment equity and skills development targets	40	8	5	15	5	3	**Adequate**	k Implementation of effective financial controls h Improve Mintek's succession and internal transformation processes	• Internal audit
34	**Physical and Operational Risk** **GM: Finance** **Manager: MESU** **Manager: EMS** **Operational Risk**	High carbon footprint Management response: Mitigate	• Evaluate and update Mintek's carbon footprint annually • Ensure that electricity is being used as effectively as possible to reduce carbon footprint, arising from high electricity usage and prevent possible financial penalties • Demonstrate that Mintek's R&D, which is resulting in the direct electricity usage, focuses on technologies to reduce industry's electricity consumption, and that the net effect will be beneficial to the SA economy	28	4	7	15	3	5	**Adequate**	g Maintain effective safety and environmental programmes k Implementation of effective financial controls	• ISO 9001 internal audits • ISO 9001 external audits • ISO 14001 internal audits • ISO 14001 external audits • OHSAS 18001 internal audits • OHSAS 18001 external audits
35	**Financial Risk** **Executive Management Managers** **Fraud Risk**	Inadequate overtime control Management response: Mitigate	• Overtime policy implemented	24	4	6	15	3	5	**Adequate**	k Implementation of effective financial controls	• Internal Audit
36	**Financial Risk** **GM: Finance** **Manager: FIN** **Fraud Risk**	Lack of sufficient controls on identification on goods received Management response: Mitigate	• Reviewed and updated Procurement Policy and Standard Operating procedure	36	6	6	12	3	4	**Adequate**	k Implementation of effective financial controls	• Internal Audit
37	**Human Resource Risk** **GM: Technology** **Managers**	Fatality caused by Mintek operations or plant	• Controlled access of external parties to Mintek campus • Controlled access to hazardous areas, work permits issued, no-entry signs in plant areas as appropriate during plant operations	24	6	4	12	6	2	**Adequate**	i Continual on-the-job training and multi-skilling g Maintain effective safety and	• OHSAS 18001 internal audits • OHSAS 18001 external

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	Head: Corp. SHEQ **Operational Risk**	Management response: Mitigate	• Engineering controls on plant • Induction and training of employees and contractors on plant and operations • Safety and Health risk assessment conducted in the divisions • Job observations done to ensure that training was adequate • Mintek ensures that contractors provide a Letter of Good Standing from the Compensation Commissioner. This ensures that the labour broker (if used) and contractor personnel can claim workmen's compensation via the companies officially employing them • In cases where a third party claim (civil case) is made by someone injured on campus management has ensured that Mintek is adequately insured • Incorporated limited liability clauses in Mintek's "General Conditions of Contract" and "Conditions of Service" (for claims by people that are not employed by Mintek but seriously injured, or from his/her family in the event of a fatality)								environmental programs	audits • Legal compliance audit • GMR(2) inspections • Workplace inspections • Internal audit
38	**Physical and Operational Risk** **GM: Finance** **Head: ICT** **Operational Risk**	Loss of business critical electronic data. Management response: Mitigate	• Storage Area Network (SAN) in place with RAID configuration (disk redundancy) • Backup process in place. Daily incremental backups and weekly full tape backups done. Backup tapes stored off-site Critical servers can be restored from two different sources (backup tapes and Platespin Forge) • The DRP implemented by ICT caters for business continuity of critical ICT services • In-house IT skills developed, e.g. SAP basis and Exchange • SLA in place with SAP consulting company to ensure availability of required SAP basis and functional skills • Skills transfer with retention clause • Staff redundancy where practical through training programme • Relevant paper records and original contracts stored in an area fitted with gas based fire-extinguishing system as a back-up where appropriate	56	8	7	12	4	3	**Adequate**	Maintain the integrity of IT and financial systems Continual on-the-job training and multi-skilling	• IT Steering Committee reviews • Internal audit • ISO 9001 internal audits • ISO 9001 external audits
39	**Security Risk** **GM: Finance** **Manager: EMS** **Head: Security** **Operational Risk**	Inadequate access control. Management response: Mitigate	• Implemented database to record and control visitor access • Electronic access control for employees • CCTV at all gates • ICT server room fitted with biometric access control • Biometric access in place in controlled areas e.g. radioactive laboratories • Manual access control on secondary gates, these gates are only opened at specific times, at which time it is also guarded • Additional lighting provided at critical areas and gates • Patrols of fence, buildings and grounds • Armed response linked to panic alert system • PSIRA rated security company used • Security audits performed by external company on annual basis	50	5	10	12	3	4	**Adequate**	Maintain the effectiveness of Mintek's technical assets and infrastructure	• Internal audit • Security audits
40	**Financial Risk** **GM: Finance** **Manager: FIN**	Non-compliance to Pension & Medical aid fund Legislation.	• Keep abreast of developments • Total cost to company packages aligned the benefit as a defined contribution • Capped liability for post-retirement medical aid funding by contracting liability to an external	50	5	10	12	2	6	**Adequate**	Prudent financial management of Mintek's investments & liabilities	• Internal audit • Board of Trustees

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	Strategy Risk	Management response: Mitigate	financial service provider • Liability settled for Group 1 and 2 employees									
41	**Financial and Business Risk** **GM: Finance** **Head: ICT** **Manager: HRD** **Strategy Risk**	Lack of capacity to maintain business critical ICT systems. Management response: Mitigate	• Employ adequately trained and qualified staff • Enter into SLA with SAP partner for maintenance • Skills transfer with retention clause • Staff redundancy where practical through training program • Opportunity to contract in skills	42	7	6	12	4	3	**Adequate**	l Maintain the integrity of IT and financial systems i Continual on-the-job training and multi-skilling	• IT Steering Committee
42	**Financial Risk** **Executive Management Managers** **Fraud Risk**	Non-compliance to the delegation of authority Management response: Mitigate	• Clearly defined and communicated organisational structure • Delegation of authority document approved and communicated	25	5	5	12	4	3	**Adequate**	k Implementation of effective financial controls	• Internal Audit
43	**Physical and Operational Risk** **GM: Corporate Services and R&D** **Head: Corp. SHEQ Clinic** **Operational Risk**	Exposure to contaminated biological matter Management response: Mitigate	• Mintek makes use of an approved Health Care Waste disposing company • Spillages of medical waste by the medical waste disposing company, e.g. in the case of a vehicle accident, is cleaned up by trained personnel from that company • Mintek is compliant with the Waste Classification and Management Regulations (WCMR)	50	10	5	10	5	2	**Adequate**	i Continual on-the-job training and multi-skilling g Maintain effective safety and environmental programmes	• OHSAS 18001 internal audits • OHSAS 18001 external audits • Legal compliance audit • GMR(2) inspections • Workplace inspections
44	**Physical and Operational Risk** **GM: Technology** **Head: Corp SHEQ** **Manager: EMS** **Operational Risk**	Natural disasters, e.g. hailstorms, earthquakes Management response: Mitigate	• Emergency response and evacuation procedures available. • Regular training and awareness of staff on emergency response and evacuation procedures.	10	10	1	9	9	1	**Adequate**	n Maintain the effectiveness of Mintek's technical assets and infrastructure g Maintain effective safety and environmental programmes	• ISO14001 internal and external
45	**Financial Risk** **GM: Finance** **Manager: FIN** **Operational Risk**	Client unable to complete payment for plant, product or process. Management response: Mitigate	• Review debtors ageing report regularly. Seek legal advice on long outstanding debts • No services to be rendered until a credit rating has been obtained from credit bureau • Have a policy and framework in relation to new and existing clients in relation to credit vetting, invoicing and collection • Credit guarantees on foreign customers	30	6	5	9	3	3	**Adequate**	k Implementation of effective financial controls	• Internal audit • Mancom
46	**Physical and Operational Risk** **GM: Finance** **Manager: EMS**	Loss of water supply. Management response: Mitigate	• Ultrasonic level detector has been installed at the water tower to indicate the level is low • A technical review of Mintek's entire water reticulation system is being undertaken, which will focus on reduction of Mintek's Rand Water Board water use, as well as minimising impacts of any future supply disruption	18	6	3	9	3	3	**Adequate**	n Maintain the effectiveness of Mintek's technical assets and infrastructure	• ISO 9001 internal audits • ISO 9001 external audits • GMR(2) inspections • Workplace inspections

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	Operational Risk											
47	**Financial Risk** **GM: Finance** **Managers** **Fraud Risk**	Internal requisition fraud – staff taking goods etc. Management response: Mitigate	• Automated requisition process via maintenance system • Matching of requisition to job card • Clearly formalised powers and responsibilities and delegation thereof • Reviewed and improved access control • Exit permit required when taking items off site which is authorised appropriately and checked by security • Ensure all goods are adequately insured	24	3	8	8	2	4	**Adequate**	k Implementation of effective financial controls	• Internal audit
48	**Financial Risk** **Executive Management** **Managers:** **Fraud Risk**	Procurement fraud Management response: Mitigate	• Review all Internal Controls and reporting systems and procedures on a regular basis • Check and ensure compliance with procurement policy • Clearly formalise powers and responsibilities and delegation thereof	16	2	8	8	2	4	**Adequate**	k Implementation of effective financial controls	• Internal audit
49	**Human Resource Risk** **GM: Corporate Services** **Manager: HRD** **Fraud Risk**	Fraudulent misrepresentation of qualifications Management response: Mitigate	• Verification check on new employee qualifications to prevent misrepresentation and potential hiring of an unqualified person • Regular qualifications audit of employees	16	2	8	8	2	4	**Adequate**	k Implementation of effective financial controls	• Internal audit
50	**Financial Risk** **GM: Finance** **Manager: FIN** **Operational Risk**	Inaccuracy of financial reporting Management response: Mitigate	• Regular review of financial system (SAP) and system of internal controls for integrity allowing informed decision making • Measurement against budgets. Reporting on major variances • Implemented a financial reporting framework, incorporating due dates, responsibilities, delegated authority	30	5	6	4	2	2	**Adequate**	k Implementation of effective financial controls l Maintain the integrity of IT and financial systems	• Internal audit • MANCOM • EXCO • Board and subcommittees
51	**Financial Risk** **GM: Finance** **Manager: FIN** **Operational Risk**	Adequacy insurance cover Management response: Mitigate	• Review annually current insurance policy for completeness and accuracy with respect to fire, theft, public liability, product recall, professional indemnity, fidelity and accident cover. • Implement asset management system, incorporating detailed asset register to monitor possible asset losses	25	5	5	4	2	2	**Adequate**	k Implementation of effective financial controls	• Internal audit
52	**Financial Risk** **Executive Management** **Operational Risk**	Equity position of Mintek in other companies causes Mintek to incur financial loss. Management response: Mitigate	• Due diligence and regular financial reporting • Investment and disinvestments policy in place	12	4	3	4	2	2	**Adequate**	j Prudent financial management of Mintek's investments & liabilities	• Internal audit • Mindev Board • EXCO • Mintek Board

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53	**Financial Risk** **GM: Finance** **Manager: FIN** **Operational Risk**	Poor investment of cash Management response: Mitigate	• Surplus reserves to be invested as per investment policy • Compliance to investing activities by Schedule 3 PFMA companies • Accounting treatment and disclosure of such investments	10	2	5	2	1	2	**Adequate**	Prudent financial management of Mintek's investments & liabilities	• Internal audit
54	**Business Risk** **GM: R&D** **Strategic Risk**	Lack of integrated business model for rural and marginalised communities. Management response: Mitigate	• SSMB business model was developed	4	2	2	2	2	1	**Adequate**	Create business opportunities for SMMEs	• Internal audit

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