THIS DOCUMENT IS IMPORTANT AND REQUIRES YOUR IMMEDIATE ATTENTION. If you are in any doubt about the contents of this Document, or the action you should take, you should seek your own personal financial advice immediately from your stockbroker, bank manager, solicitor, accountant, fund manager or other independent financial adviser duly authorised under the Financial Services and Markets Act 2000 ("FSMA") if you are in the United Kingdom or, if not, from another appropriately authorised independent adviser who specialises in advising on the acquisition of shares and other securities.

The Company and the Directors, details of which or whom appear on page 5 of this Document, accept responsibility both individually and collectively for the information contained in this Document and compliance with the AIM Rules for Companies. To the best of the knowledge and belief of the Company and the Directors, who have taken all reasonable care to ensure that such is the case, the information contained in this Document is in accordance with the facts and does not omit anything likely to affect the import of such information.

Application will be made for the Enlarged Share Capital to be admitted to trading on AIM, a market operated by the London Stock Exchange ("AIM"). No application has been or is being made for the Placing Warrants to be admitted to trading on AIM. **AIM is a market designed primarily for emerging or smaller companies to which a higher investment risk tends to be attached than to larger or more established companies. AIM securities are not admitted to the Official List of the United Kingdom Listing Authority. A prospective investor should be aware of the risks of investing in such companies and should make the decision to invest only after careful consideration and, if appropriate, consultation with an independent financial adviser. Each AIM company is required, pursuant to the AIM Rules for Companies, to have a nominated adviser. The nominated adviser is required to make a declaration to the London Stock Exchange on admission in the form set out in Schedule Two to the AIM Rules for Nominated Advisers. The London Stock Exchange has not itself examined or approved the contents of this Document.** The Common Shares are admitted to trading on the TSX Venture Exchange and apart from the application for Admission and for Admission to the TSX Venture Exchange, no such other applications have been or are intended to be made. The Directors expect that Admission will become effective and that dealings in the Common Shares will commence on AIM on 15 June 2016. The Company is listed on the TSX Venture Exchange.

This Document, which comprises an AIM Admission document, has been drawn up in accordance with the AIM Rules for Companies. This Document does not constitute an offer of transferable securities to the public within the meaning of section 102B of FSMA and is not required to be issued as a prospectus in accordance with the provisions of section 85 of FSMA and is not a Prospectus (as defined in the AIM Rules for Companies). Accordingly, this Document has not been prepared in accordance with the Prospectus Rules (as defined in the AIM Rules for Companies), nor has it been approved by the Financial Conduct Authority (the "FCA") pursuant to section 85 of FSMA and a copy has not been and will not be delivered to the FCA.

MKANGO

MKANGO RESOURCES LTD.

(Incorporated and registered in Canada under the Business Corporations Act (Alberta), registered number 2013624792)

Placing of 30,303,030 Placing Shares at a price of 3.3 pence per share and Admission of the Common Shares to trading on AIM and issue of 1 Placing Warrant for each Placing Share

Nominated Adviser & Broker

SPANGEL
YOUR BRIDGE TO A BETTER BUSINESS

SP Angel Corporate Finance LLP

The attention of persons receiving a copy of this Document is drawn to the Risk Factors set out in Part II of this Document. The AIM Rules are less demanding than those of the Official List. No liability whatsoever is accepted by SP Angel Corporate Finance LLP for the accuracy of any information or opinions contained in this Document, or for the omission of any material information, for which the Company and the Directors are solely responsible. The whole of the text of this Document should be read.

SP Angel Corporate Finance LLP, which is authorised and regulated in the United Kingdom by the FCA and is a member of the London Stock Exchange, is the Company's Nominated Adviser and Broker respectively in connection with the Admission for the purposes of the AIM Rules for Companies and is acting exclusively for the Company and no one else in connection with the matters described herein and will not be responsible to anyone other than the Company for providing the protections afforded to customers of SP Angel Corporate Finance LLP or for advising any other person in respect of the proposed Placing and Admission or any acquisition of shares in any company. The responsibilities of SP Angel Corporate Finance LLP, as Nominated Adviser under the AIM Rules for Companies, are owed solely to the London Stock Exchange and are not owed to the Company or any Director or to any other person in respect of their decision to acquire Common Shares or Placing Warrants in reliance on any part of this Document.

Prospective investors should rely only on the information in this Document. No person has been authorised to give any information or make any representations other than those contained in this Document and, if given or made, such information or representations must not be relied upon as having been so authorised. No representation or warranty, express or implied, is made by SP Angel Corporate Finance LLP as to any of the contents of this Document. SP Angel Corporate Finance LLP has not authorised the contents of any part of this Document for any purpose and no liability whatsoever is accepted SP Angel Corporate Finance LLP for the accuracy of any information or opinions contained in this Document. Without prejudice to the Company's obligations under the AIM Rules for Companies, neither the delivery of this Document hereunder nor any subsequent subscription or sale made for Common Shares or Placing Warrants shall, under any circumstances, create any implication that the information contained in this Document is correct as of any time subsequent to the date of this Document.

Statements made in this Document are based on the law and practice currently in force in the provence of Alberta, Canada and the Federal Laws of Canada applicable herein, Malawi and England and Wales and are subject to change.

The contents of this Document are not to be construed as legal, financial, business, investment or tax advice. Each prospective investor should consult his, her or its own legal adviser, financial adviser or tax adviser for legal, financial or tax advice.

Prospective investors must inform themselves as to: (a) the legal requirements within their own countries for the purchase, holding, transfer or disposal of Existing Common Shares, or Placing Warrants Placing Shares; (b) any foreign exchange restrictions applicable to the purchase, holding, transfer or other disposal of Existing Common Shares, Placing Shares or Placing Warrants which they might encounter; and (c) the income and other tax consequences which may apply in their own countries as a result of the purchase, holding, transfer or other disposal of Existing Common Shares Placing Shares or Placing Warrants. Prospective investors must rely on their own representatives, including their own legal advisers and accountants, as to legal, tax, investment, or any other related matters concerning the Company and an investment therein.

Copies of this Document will be available free of charge during normal business hours on any weekday (except public holidays) at the offices of SP Angel Corporate Finance LLP, Prince Frederick House, 35-39 Maddox Street, London W1S 2PP from the date of this Document and shall remain available for a period of one month from Admission. Additionally, an electronic version of this Document will, from Admission on an ongoing basis, be available on the Company's website: www.mkango.ca

An investment in the Company may not be suitable for all recipients of this Document. Any such investment is speculative and involves a high degree of risk. Prospective purchasers of Common Shares should carefully consider whether an investment in the Company is suitable for them in light of their circumstances and the financial resources available to them. Attention is drawn, in particular, to the Risk Factors set out in Part II of this Document.

OVERSEAS SHAREHOLDERS

This Document does not constitute, and may not be used for the purposes of, an offer to sell, or a solicitation to buy, the Existing Common Shares, and/or Placing Shares and/or Placing Warrants in any jurisdiction in which such offer or solicitation is unlawful. In particular, this Document is not, subject to certain exceptions, for distribution in or into the United States of America, Canada, Australia, the Republic of South Africa, Japan or the Republic of Ireland. The Common Shares and Placing Warrants have not been nor will be registered under the United States Securities Act of 1933, as amended, nor under the securities legislation of any state of the United States or any province or territory of Canada, Australia, the Republic of South Africa, Japan, the Republic of Ireland or in any country, territory or possession where to do so may contravene local securities laws or regulations. Accordingly, the Common Shares and Placing Warrants may not, subject to certain exceptions, be offered or sold directly or indirectly in or into the United States of America, Canada, Australia, the Republic of South Africa, Japan, the Republic of Ireland or to any national, citizen or resident of the United States of America, Canada, Australia, the Republic of South Africa, Japan or the Republic of Ireland. The distribution of this Document in certain jurisdictions may be restricted by law. No action has been taken by the Company or SP Angel Corporate Finance LLP that would permit a public offering of the Existing Common Shares, and/or Placing Shares and/or Placing Warrants, or possession or distribution of this Document where action for that purpose is required. Persons into whose possession this Document comes should inform themselves about, and observe any such restrictions. Any failure to comply with these restrictions may constitute a violation of the securities laws of any such jurisdiction.

Holding Common Shares and Placing Warrants may have implications for overseas Shareholders under the laws of the relevant overseas jurisdictions. Overseas Shareholders should inform themselves about and observe any applicable legal requirements. It is the responsibility of each overseas Shareholder to satisfy himself as to the full observance of the laws of the relevant jurisdiction in connection therewith, including the obtaining of any governmental, exchange control or other consents which may be required, or the compliance with other necessary formalities which are required to be observed and the payment of any issue, transfer or other taxes due in such jurisdiction.

No US federal or state securities commission or regulatory authority has approved or disapproved of the Existing Common Shares, the Placing Shares or the Placing Warrants or passed upon the adequacy or accuracy of this Document. Any representation to the contrary is a criminal offence in the United States.

Canada

The issuance of the Placing Shares and Placing Warrants will be exempt from the prospectus requirements of the securities legislation of the provinces and territories of Canada. The Placing Shares have not been qualified for sale in the Province of Alberta, Canada, and may not be offered or sold in the Province of Alberta, Canada, directly or indirectly, on behalf of the Company.

This Document has been provided to you on the basis that you are at the time of the offer and sale of the Placing Shares and Placing Warrants resident outside of the Province of Alberta, Canada and are acquiring the Placing Shares and Placing Warrants for investment purposes only, and not with a view to resale of the Placing Shares and Placing Warrants to a person resident in the Province of Alberta, Canada for a period of four months and one day from the time of the offer and sale of the Placing Shares and Placing Warrants. Persons who do not fall within the foregoing criteria should not rely on or act upon this Document. If you are uncertain whether or not you fall within the above categories, you should consult a professional adviser for advice.

FORWARD-LOOKING STATEMENTS

Certain statements in this Document are forward-looking statements. These forward-looking statements are not based on historical facts but rather on the Directors' expectations regarding the Company's future growth, results of operations, performance, future capital and other expenditures (including the amount, nature and sources of funding thereof), competitive advantages, planned exploration and development activity and the results of such activity, business prospects and opportunities. Forward looking statements are identified by their use of terms and phrases, including without limitation, statements containing the words "believe", "anticipated", "expected", "could", "envisage", "estimate", "may" or the negative of those, variations or similar expressions including references to assumptions. Such forward-looking statements reflect the Directors' current beliefs and assumptions and are based on information currently available to management. Forward-looking statements involve significant known and unknown risks and uncertainties. A number of factors could cause actual results to differ materially from the results discussed in the forward-looking statements including risks associated with vulnerability to general economic and business conditions, competition, environmental and other regulatory changes, the results of exploration and development drilling and related activities, actions by governmental authorities, the availability of capital markets, reliance on key personnel, uninsured and underinsured losses and other factors, many of which are beyond the control of the Company. These forward-looking statements are subject to, *inter alia*, the risk factors described in Part II of this Document. Although the forward-looking statements contained in this Document are based upon what the Directors believe to be reasonable assumptions, the Company cannot assure investors that actual results will be consistent with these forward-looking statements.

CONTENTS

Part I of this Document contains cross-references to information contained in the Competent Person's Report ("CPR") set out in Part III of this Document. The Company confirms that the information contained in Part I which has been extracted from the CPR has been accurately reproduced and that so far as the Company is aware and is able to ascertain from the CPR, no facts have been omitted which would render the extracts inaccurate or misleading. The Competent Person has reviewed the information contained in this Document which relates to information contained in the CPR and has confirmed in writing to the Company and SP Angel Corporate Finance LLP that the information presented is accurate, balanced and complete and not inconsistent with the CPR.

PLACING STATISTICS AND DEALING CODES

Placing Price (per share)	3.3 pence
Number of Existing Common Shares in issue before Admission and Consolidation[1]	121,256,956
Number of Existing Common Shares in issue at Admission and post Consolidation	40,418,985
Number of Placing Shares being issued pursuant to the Placing on a post Consolidation basis	30,303,030
Number of Common Shares in issue following the Placing and Consolidation on Admission[2]	71,055,348
Placing Shares as a percentage of the Enlarged Share Capital	42.65%
Number of Placing Warrants	30,303,030
Number of Common Shares under option or warrant following the Placing, Consolidation and Admission	53,640,475
Number of Common Shares on a fully diluted basis following Admission and Consolidation[3]	124,695,823
Gross proceeds of the Placing receivable by the Company	£1,000,000
Estimated cash proceeds of the Placing receivable by the Company (net of commissions and expenses)	£545,000
Market capitalisation of the Company on Admission at the Placing Price	£2.34 million
AIM symbol	MKA
TSX-V symbol	MKA
ISIN	CA60686A4090

(1) Note: On Consolidation Shareholders will be entitled to 1 Common Share for every 3 Common Shares held with any fractions being rounded to the nearest whole share. The Consolidation will be effective immediately prior to Admission.
(2) Including 333,333 Common Shares to be issued to Jub Capital as referred to in paragraph 14.4(b)(i) of Part V of this document.
(3) Note: Assuming exercise of all outstanding Options and Warrants further details of which are set out in paragraph 5 of Part V of this document

EXPECTED TIMETABLE OF PRINCIPAL EVENTS

	2016
Expected Admission and commencement of dealings in the Enlarged Share Capital on AIM	8am on 15 June 2016
Issue of Placing Warrants	22 June 2016
CREST accounts expected to be credited with Depository Interests by	15 June 2016
Despatch of definitive share certificates (where applicable)	22 June 2016
Despatch of definitive Warrant certificates for the Placing Warrants	22 June 2016

Note: All references to times in this timetable are to London times. The times and dates may be subject to change.

DIRECTORS, SECRETARY AND ADVISERS

Directors	William Drummond Dawes (*CEO & Co-founder*) Alexander Mark Lemon (*President & Co-founder*) Derek Norman Linfield (*Non-executive Chairman*) Adrian James Reynolds (*Non-executive Director*) David Andrew Berg (*Non-executive Director*) Eugene Chen (*Non-executive Director*)
Corporate Secretary	David Andrew Berg
Registered Office	Mkango Resources Ltd 259 Windermere Road SW Calgary, Alberta T3C 3L2 Canada
Website	www.mkango.ca
Nominated Adviser and Broker	SP Angel Corporate Finance LLP Prince Frederick House 35-39 Maddox Street London W1S 2PP
Placing Agent	Jub Capital Limited 100 New Bond Street London W1S 1SP
Canadian Legal Counsel to the Company	Gowling WLG (Canada) LLP 1600, 421 – 7 Avenue SW Calgary, Alberta T2P 4K9 Canada
English Solicitors to the Company	Gowling WLG (UK) LLP 4 More London Riverside London SE1 2AU
Solicitors to the Nominated Adviser and Broker	Memery Crystal LLP 44 Southampton Buildings London WC2A 1AP
Reporting accountants to the Company	BDO LLP 55 Baker Street London W1U 7EU
Auditor	MNP LLP 300-111 Richmond SW Toronto, ON M5H 2G4
Competent Person	The MSA Group (Pty) Ltd 20B Rothesay Avenue Craighall Park Johannesburg 2196

Canadian Registrars and Transfer Agent	Computershare Trust Company of Canada Suite 600 530 – 8th Avenue SW Calgary, AB TSP 3S8
Depositary Interest Agent	Computershare Investor Services plc The Pavilions Bridgwater Road Bristol BS99 6ZZ

DEFINITIONS

The following definitions apply throughout this Document unless the context otherwise requires:

"Act"	the Companies Act 2006 of the United Kingdom (as amended from time to time);
"Admission"	the admission of the Enlarged Share Capital to trading on AIM and such admission becoming effective in accordance with the AIM Rules;
"Admission Document" or **"Document"**	this document;
"AIM"	the AIM Market operated by the London Stock Exchange;
"AIM Rules for Companies" or **"AIM Rules"**	the London Stock Exchange's rules and guidance notes contained in its "AIM Rules for Companies" publication relating to companies whose securities are traded on AIM, as amended from time to time;
"AIM Rules for Nominated Advisers"	the London Stock Exchange's rules and guidance notes contained in its "AIM Rules for Nominated Advisers" publication relating to the nominated advisers of companies whose securities are traded on AIM, as amended from time to time;
"Articles"	the amended and restated articles of incorporation of the Company for the time being, a summary of which is set out in paragraph 6 of Part V of this Document;
"Audit Committee"	the audit committee of the Board comprises of David Berg (chairman), Adrian Reynolds and Eugene Chen;
"BCA"	the Business Corporations Act (Alberta), as amended from time to time;
"Board"	the board of Directors of the Company;
"Broker"	the broker to the Company for the purposes of the AIM Rules, being SP Angel Corporate Finance LLP;
"BVI"	British Virgin Islands;
"By-laws"	the amended and restated by-laws of the Company for the time being, a summary of which is set out in paragraph 6 of Part V of this Document;
"Canadian dollar" or **"C$"**	Canadian dollars, the lawful currency of Canada;
"certificated" or **"in certificated form"**	a share or other security recorded on the relevant register of the share or security concerned as being held in certificated form and title to which may be transferred by means of a stock transfer form;
"City Code"	The City Code on Takeovers and Mergers issued by the Takeover Panel;
"Common Shares"	common shares without par value in the capital of the Company in issue from time to time;
"Competent Person" or **"CP"**	The MSA Group (Pty) Limited, the competent person responsible for the information contained within the CPR in accordance with the AIM Rules;

"Competent Person's Report" or **"CPR"**	the report prepared by the Competent Person, as set out in Part III of this Document;
"Consolidation"	the consolidation of the Common Shares on the basis of 1 new Common Share for each 3 issued and outstanding Common Shares on the effective date of the consolidation, which is intended to occur prior to or concurrently with Admission, being the date when the Articles of Amendment will be filed with the Register of Companies (Alberta) under the BCA giving effect to such consolidation, with all fractional Common Shares after such consolidation being rounded to the nearest whole share;
"CREST"	the computerised settlement system to facilitate the transfer of title of shares or other securities in uncertificated form operated by Euroclear;
"CREST Regulations"	the Uncertificated Securities Regulations 2001 (SI 2001 No.3755), including any enactment or subordinate legislation which amends or supersedes those regulations and any applicable rules made under those regulations or any such enactment or subordinate legislation for the time being in force;
"Deed Poll"	the deed poll dated 20 November 2015 executed by the Depositary in relation to the issue of DIs by the Depositary, described in paragraph 19.1 of Part V of this Document;
"Depositary"	Computershare Investor Services plc;
"DIs" or **"Depositary Interests"**	uncertificated depositary interests issued by the Depositary and representing Common Shares in the Company, pursuant to the Deed Poll;
"Directors"	the Directors of the Company whose names are set out on page 5 of this Document;
"Disclosure and Transparency Rules" or **"DTRs"**	the Disclosure and Transparency Rules (in accordance with section 73A (3) of FSMA) being the rules published by the FCA from time to time relating to the disclosure of information in respect of financial instruments which have been admitted to trading on a regulated market, or for which a request for Admission to trading on such a market has been made;
"Enlarged Share Capital"	the enlarged share capital of the Company upon Admission, and post Consolidation being 71,055,348 Common Shares, comprising the Existing Common Shares and the Placing Shares;
"Euroclear"	Euroclear UK & Ireland Limited, a company incorporated in England and Wales with registration number 02878738;
"Existing Common Shares"	the 121,256,956 Common Shares in issue as at the date of this Document and before Consolidation;
"Existing Shareholders"	the holders of Existing Common Shares;
"Existing Warrants"	the 49,012,353 outstanding warrants as at the date of this document and before Consolidation, (Following Consolidation, there will be 16,337,445 outstanding warrants) to subscribe for Common Shares, details of which are set out in paragraph 5.10 of Part V of this Document;

"Financial Conduct Authority" or **"FCA"**	the United Kingdom Financial Conduct Authority;
"FOB"	Freight on Board;
"FSMA"	the Financial Services and Markets Act 2000 of the United Kingdom, as amended from time to time;
"Group"	the Company and its subsidiaries and subsidiary undertakings as at the date of Admission;
"Gross Proceeds"	£1,000,000 being the proceeds of the Placing for the Company before the deduction of expenses and commission;
"HMRC"	Her Majesty's Revenue & Customs;
"ISIN"	International Security Identification Number;
"Jub Capital"	Jub Capital Limited, the Company's Placing Agent;
"Lancaster BVI"	Lancaster Exploration Limited, a company incorporated under the laws of the British Virgin Islands with company number 14223524;
"Lancaster Malawi"	Lancaster Exploration Limited, a company incorporated under the laws of Blantyre, Malawi with company number 11357;
"Leominex"	Leo Mining & Exploration Limited, a company incorporated under the laws of the British Virgin Islands;
"Licences"	together the Phalombe Licence and the Thambani Licence;
"Lock-in Agreements"	the lock-in agreements described in paragraph 14.4 of Part V of this Document;
"London Stock Exchange"	London Stock Exchange plc;
"Malawi"	the Republic of Malawi;
"Mkango Resources" or **"Mkango"** or **"the Company"**	Mkango Resources Limited, a Limited company incorporated under the laws of the province of Alberta, Canada with registration number 2013624792;
"Net Proceeds"	£545,000 being the estimated proceeds of the Placing for the Company after the deduction of expenses and commissions;
"NI 43-101"	National Instrument 43-101 – *Standards of Disclosure for Mineral Projects* issued by the Canadian Securities Administrators which provides standards of disclosure for companies with mineral projects;
"NI 58-101"	National Instrument 58-101 – *Disclosure of Corporate Governance Practices*, issued by the Canadian Securities Administrators, which prescribes disclosure of corporate governance practices;
"NP 58-201"	National Policy 58-201 – *Corporate Governance Guidelines* issued by the Canadian Securities Administrators, which prescribes effective corporate governance guidelines;
"Official List"	the list maintained by the UKLA in accordance with section 74(1) of FSMA for the purposes of Part VI of FSMA;

"Options"	the options to subscribe for Common Shares pursuant to the Stock Option Plan;
"Phalombe Licence"	EPL0284/10 granted to Lancaster BVI by the Government of Malawi in southern Malawi;
"Placees"	investors to whom Placing Shares and Placing Warrants are issued pursuant to the Placing Agreement;
"Placing"	the conditional placing by SP Angel and Jub Capital on behalf of the Company of the Placing Shares at the Placing Price pursuant to the Placing Agreement;
"Placing Agreement"	the conditional placing agreement dated 31 May 2016 between the Company, SP Angel and Jub Capital relating to the Placing, details of which are set out at paragraph 14.4 of Part V of this Document;
"Placing Price"	3.3 pence per Placing Share;
"Placing Shares"	30,303,030 new Common Shares to be issued to the Placees at the Placing Price pursuant to the Placing and Consolidation;
"Placing Warrant Certificates"	the Warrant Certificate pursuant to which the Placing Warrants will be granted to each Placee;
"Placing Warrants"	30,303,030 unlisted warrants to be issued to the Placees on the basis of one Placing Warrant for each Placing Share subscribed for, details of which are set out in paragraph 14.4(f) of Part V of this document;
"Preferred Shares"	preferred shares, issuable in series, in the capital stock of the Company;
"Registrar"	Computershare Trust Company of Canada;
"Remuneration Committee"	the remuneration committee of the Board comprises of Eugene Chen (chairman), Adrian Reynolds, David Berg and Derek Linfield;
"SEDAR"	the System for Electronic Document Analysis and Retrieval being the mandatory document filing and retrieval system for Canadian listed companies;
"Service Provision Agreement"	the agreement dated 20 September 2010 between Lancaster BVI and Leominex;
"Shareholders"	the persons who are registered as holders of the Common Shares from time to time;
"SP Angel"	SP Angel Corporate Finance LLP, the Company's Nominated Adviser and Broker;
"Sterling" or **"£"**	the legal currency of the UK;
"Stock Option Plan"	the stock option plan established by the Company, a summary of which is set out in paragraph 12 of Part V of this Document;
"Subsidiary" or **"Subsidiary undertaking"**	have the meanings given to them by the Act;
"Takeover Panel"	The Panel on Takeovers and Mergers which administers the City Code;

"Thambani Licence"	EPL0303/10 granted to Lancaster BVI by the Government of Malawi over the Thambani licence area;
"TSX"	the Toronto Stock Exchange;
"TSX-V"	the TSX Venture Exchange, on which the Existing Common Shares are currently listed for trading;
"TSX-V Rules"	the rules and policies, appendices and forms of TSX-V as set forth in the TSX-V Corporate Finance Manual, as amended from time to time;
"UK" or **"United Kingdom"**	the United Kingdom of Great Britain and Northern Ireland;
"UKLA"	the United Kingdom Listing Authority, being the FCA acting in its capacity as the competent authority for the purposes of Part VI of FSMA;
"US" or **"United States"**	the United States of America, its territories and possessions, any states of the United States of America and the District of Columbia and all other areas subject to its jurisdiction;
"US dollar" or **"US$"**	the legal currency of the United States; and
"uncertificated" or **"in uncertificated form"**	a share or other security recorded on the relevant register of the share or security concerned as being held in uncertificated form in CREST and title to which may be transferred by means of CREST.

GLOSSARY OF TECHNICAL TERMS

The following table provides an explanation of certain technical terms and abbreviations used in this Document. The terms and their assigned meanings may not correspond to standard industry meanings or usage of these terms.

"Feasibility Study"	a comprehensive technical and economic study of the selected development option for a mineral project that includes appropriately detailed assessments of applicable Modifying Factors together with any other relevant operational factors and detailed financial analysis that are necessary to demonstrate, at the time of reporting, that extraction is reasonably justified (economically mineable). The results of the study may reasonably serve as the basis for a final decision by a proponent or financial institution to proceed with, or finance, the development of the project. The confidence level of the study will be higher than that of a Pre-Feasibility Study;
"EPL"	exclusive prospecting licence;
"HREE"	heavy rare earth elements;
"HREO"	heavy rare earth oxide;
"Lanthanide Series"	the fifteen metallic chemical elements with atomic numbers 57 through 71, from lanthanum through lutetium;
"LREE"	light rare earth elements;
"LREO"	light rare earth oxide;
"Modifying Factors"	considerations used to convert Mineral Resources to Mineral Reserves. These include, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors;
"Mineral Resource"	a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade or quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade or quality, continuity and other geological characteristics of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge, including sampling;
"Mineral Reserve"	the economically mineable part of a Measured and/or Indicated Mineral Resource. It includes diluting materials and allowances for losses, which may occur when the material is mined or extracted and is defined by studies at Pre-Feasibility or Feasibility level as appropriate that include application of Modifying Factors. Such studies demonstrate that, at the time of reporting, extraction could reasonably be justified;
"Pre-Feasibility Study"	a comprehensive study of a range of options for the technical and economic viability of a mineral project that has advanced to a stage where a preferred mining method, in the case of underground mining, or the pit configuration, in the case of an open pit, is established and an effective method of mineral processing is determined. It includes a financial analysis based on reasonable assumptions on the Modifying Factors and the evaluation of any other relevant factors which are sufficient for a

Qualified Person, acting reasonably, to determine if all or part of the Mineral Resource may be converted to a Mineral Reserve at the time of reporting. A Pre-Feasibility Study is at a lower confidence level than a Feasibility Study;

"Probable Mineral Reserve" an economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource. The confidence in the Modifying Factors applying to a Probable Mineral Reserve is lower than that applying to a Proven Mineral Reserve;

"Qualified Person" an individual who;

(a) is an engineer or geoscientist with a university degree, or equivalent accreditation, in an area of geoscience, or engineering, relating to mineral exploration or mining;

(b) has at least five years of experience in mineral exploration, mine development or operation or mineral project assessment, or any combination of these, that is relevant to his or her professional degree or area of practice;

(c) has experience relevant to the subject matter of the mineral project and the technical report;

(d) is in good standing with a professional association; and

(e) in the case of a professional association in a foreign jurisdiction, has a membership designation that

   (i) requires attainment of a position of responsibility in their profession that requires the exercise of independent judgment; and

   (ii) requires

      A. a favourable confidential peer evaluation of the individual's character, professional judgement, experience, and ethical fitness; or

      B. a recommendation for membership by at least two peers, and demonstrated prominence or expertise in the field of mineral exploration or mining;

"Rare Earth Elements" or **"REE"** 15 elements of the Lanthanide Series ranging from atomic number 57 (Lanthanum) to atomic number 71 (Lutetium);

"REO" rare earth oxide;

"Scandium" a chemical element with the atomic number 21;

"TREO" total rare earth oxide; and

"Yttrium" a chemical element with atomic number 39, which behaves chemically in a similar fashion to the HREE and is typically included with the HREE for purposes of economic valuation from the Canadian classification rules.

PART I

INFORMATION ON THE GROUP

1 Introduction

Mkango Resources is a Canadian mineral exploration and development company focused on REE and associated minerals in Malawi. Mkango holds a 100 per cent. interest in two exclusive prospecting licences, the Phalombe Licence, within which lies the Songwe Hill REE Project, and the Thambani Licence, covering a combined area of 986km^2 in southern Malawi. Mkango's main focus is on the advanced stage Songwe Hill REE Project.

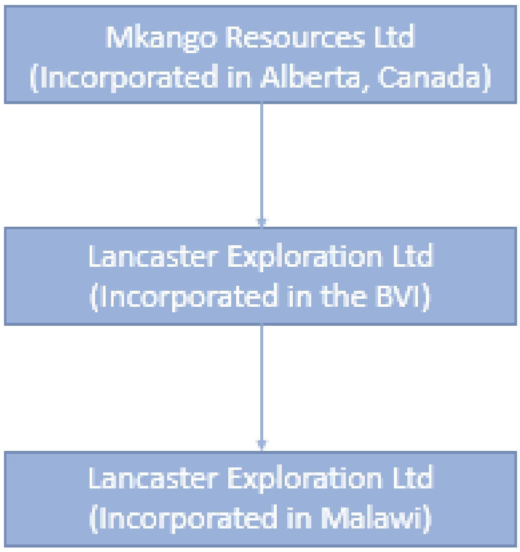
Detailed information on the Group and its licences is set out in this Part I and in Part III of this Document.

The Company is seeking Admission to AIM and has conditionally raised £1 million before expenses by way of the Placing. Details of the proposed use of funds raised pursuant to the Placing are outlined in paragraph 12 of Part I of this Document.

The Common Shares are currently listed on the TSX-V and will continue to be listed and traded on the TSX-V following Admission.

2 Background and Group Structure

The Group's legal structure is as follows:



Resources Ltd (

Mkango Resources was incorporated under the name Alloy Capital Corp in Alberta, Canada in 2007. The Company completed its initial public offering on 27 August 2008 as a Capital Pool Company ("CPC") as defined in TSX-V Policy 2.4 (the "CPC Policy") and was listed on the TSX-V. Under the CPC Policy, a company has a period of 24 months to identify an appropriate business for its qualifying transaction and then must enter into an agreement to acquire such business. In December 2010, the Company completed its qualifying transaction by acquiring all of the issued and outstanding shares of Lancaster Exploration Limited ("Lancaster BVI") through a reverse takeover, whereby Lancaster BVI became a wholly-owned subsidiary of the Company. Also in December 2010 Alloy Capital Corp changed its name to "Mkango Resources Ltd." Lancaster BVI was incorporated in the British Virgin Islands in 2007. In May 2011 Lancaster Exploration Limited ("Lancaster Malawi") was incorporated in Malawi.

Both of the Licences are held by Lancaster BVI which was granted the rights to the Phalombe Licence in January 2010 and the rights to the Thambani Licence in September 2010.

On 6 January 2011, after successful completion of its qualifying transaction, the Company's Common Shares were reinstated for trading and began trading on the TSX-V under the symbol "MKA".

3 Background on and trends in the REE market

Introduction

The term Rare Earth Elements ("REE") is a collective name for the 15 elements in the Lanthanide Series. Due to similar properties, scandium and yttrium are also often considered REEs making a wider group of 17 elements. REEs are divided into two groups: light rare earth elements ("LREE") and heavy rare earth elements ("HREE") based on their atomic weight. A further grouping termed critical rare earths ("CRE") has been established based on their importance to clean energy and potential supply risk. This has been supplemented to a certain extent by a grouping of rare earths used in the high strength permanent magnet sector which currently has the most favourable supply demand outlook. The groupings of the 17 REEs are generally as follows:

LREEs	*HREEs*	*CREs*	*Magnet' REEs*
Lanthanum	Europium	Neodymium	Neodymium
Cerium	Gadolinium	Europium	Praseodymium
Praseodymium	Terbium	Terbium	Dysprosium
Neodymium	Dysprosium	Dysprosium	Terbium
Promethium	Holmium	Yttrium	
Samarium	Erbium		
	Thulium		
	Ytterbium		
	Lutetium		
	Scandium		
	Yttrium		

All REEs are metallic in nature and are typically discussed together due to their similar chemical and physical properties. With the exception of scandium, they generally occur within the same ore deposits, although the metal ratio differs considerably between different deposit types. Despite the name, REEs are not particularly rare, they are relatively evenly distributed in the Earth's crust but do not often form sufficient concentrations for it to be economic to extract them. Europium and Gadolinium are sometimes classified as light rare earths.

Markets

The end uses of REEs can be grouped into two broad categories:

- In the first category, REEs act as 'process enablers' in that they are used in production processes but they are not actually contained in the end product. For instance, LEEs are used in polishing powders in the glass, electronics and optic industries. They also serve as fluid-cracking catalysts in refining and other chemical processes.

- In the second category, REEs act as 'product enablers' that give advanced materials properties that play a key role in the performance of high-tech products. REE-based permanent magnets are currently perhaps the most important of these product-enabling applications. The addition of REEs can boost the strength of permanent magnets considerably. This discovery revolutionised magnet-based technologies such as electric motors and turbines. REE phosphors for lighting and displays are another key application, enabling technologies such as compact fluorescent lamps and LCD screens. Other important uses are in batteries; in the coating of autocatalysts used to clean exhaust; and as additives in high-tech alloys, glass and ceramics.

In summary, the principal markets for REEs are as follows:

- Magnets. Key applications for permanent magnets include industrial motors, hard disc drives and automotive applications. Emerging and growing markets for permanent magnets are expected to be hybrid and electric vehicles and wind turbines.

- Batteries. Nickel metal hydride batteries are used extensively in portable tools and also in hybrid vehicles.

- Metallurgy. REEs are used to improve the mechanical characteristics of alloyed steel and in desulphurisation.
- Catalysts. REEs are used in catalysts, such as in catalytic converters in cars.
- Polishing powders and glass additives as a polishing agent and for decolourisation and removing impurities.
- Phosphors. REEs are an important constituent of tri-band phosphor lighting used in fluorescent tubes and lamps as well as LCD backlights for flat panel displays.
- Other applications for REEs include ceramics, fibre optics and lasers.

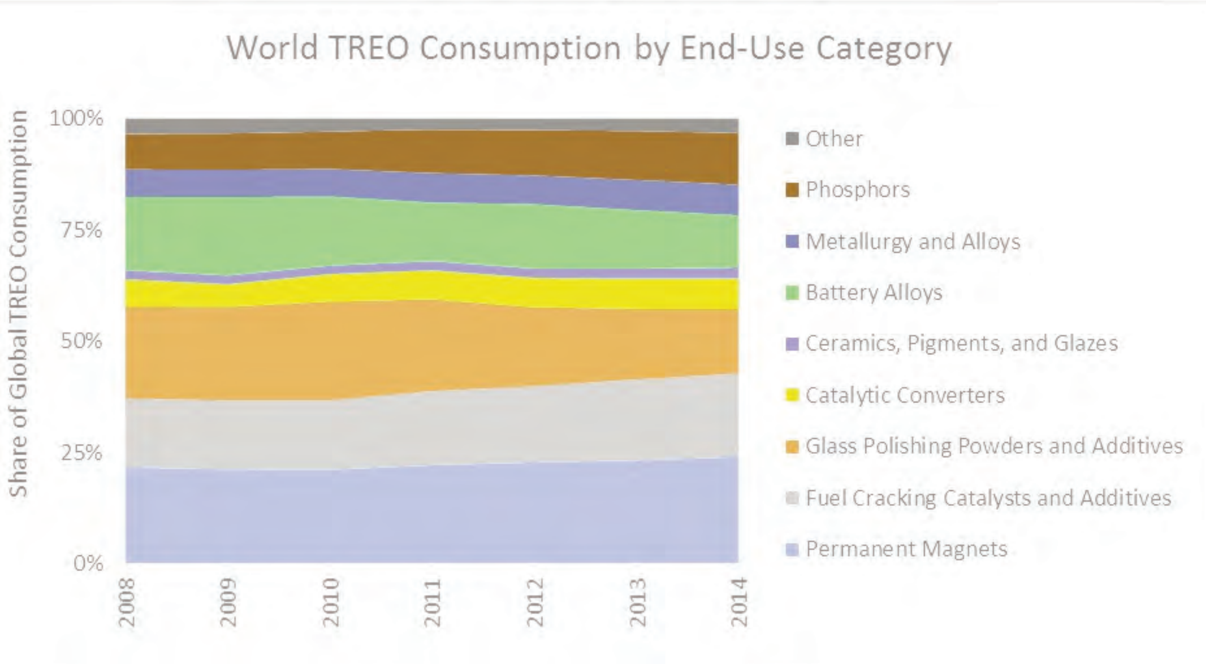


Figure 1: World consumption of TREO by end-user category.
Source: Adamas Intelligence

Stages of Production

The stages of production for hard rock deposits in the rare earth sector generally comprise mining, beneficiation, hydrometallurgical processing, separating, refining, alloying, and manufacturing rare earths into end-use items and components:

- The first stage is actual mining, where the ore is taken out of the ground from the mineral deposits.
- The second stage is beneficiation which concentrates the ore minerals into a mineral concentrate.
- The third stage is hydrometallurgical processing, which extracts and concentrates the rare earths into a mixed chemical concentrate.
- The fourth stage is separating and refining into individual REOs. The oxides can be dried, stored and shipped for further processing into metals.
- The fifth stage is converting the REOs into metals with different purity levels.
- The sixth stage is forming the metals into rare earth alloys.
- The seventh stage is manufacturing the alloys into devices and components such as permanent magnets.

World mine production of rare earths

According to U.S. Geological Survey (USGS) data, from 1960 to 1965 global annual REO production tripled from 2,300 tonnes to 7,000 tonnes (see Figure 2). In the early 1960s production was global, led by a handful of countries, including South Africa, Australia, the U.S., Brazil and India. A number of other nations also yielded small quantities of rare earth minerals and concentrates as by-products of uranium, thorium, tin, and heavy mineral mining operations.

From 1965 to 1980, however, the U.S. dominated global REO production, producing an average of 13,700 tonnes of REO and REO equivalent per annum over the period. During that 15-year period, China's REO production was negligible and production from all other nations combined averaged approximately 7,100 tonnes per annum (see Figure 3).

By 1980, however, through improving technology, China's REO production grew to almost 5,000 tonnes per annum and tripled by 1986 to 15,000 tonnes per annum. From 1987 to 2000, China's REO output grew steadily, reaching approximately 28,100 tonnes in 1992, 48,000 tonnes in 1995, and 83,500 tonnes in 2000 (see Figure 3).

In the wake of China's explosive production growth, U.S. REO production remained steady, averaging approximately 18,000 tonnes per annum from 1980 to the end of 1997 while production from most other nations collapsed in the early-90s due to increased availability of cheaper Chinese REOs.

Throughout the 1990s, prior to joining the World Trade Organization, China dramatically undercut world prices for REOs, leading to the eventual discontinuance of production from most other nations by the end of the decade, including the U.S., Russia, Malaysia, and India. Despite bearing only 30 to 40 per cent. of the world's estimated REO reserves, China has since assumed a near-monopoly on global production (see Figure 3).

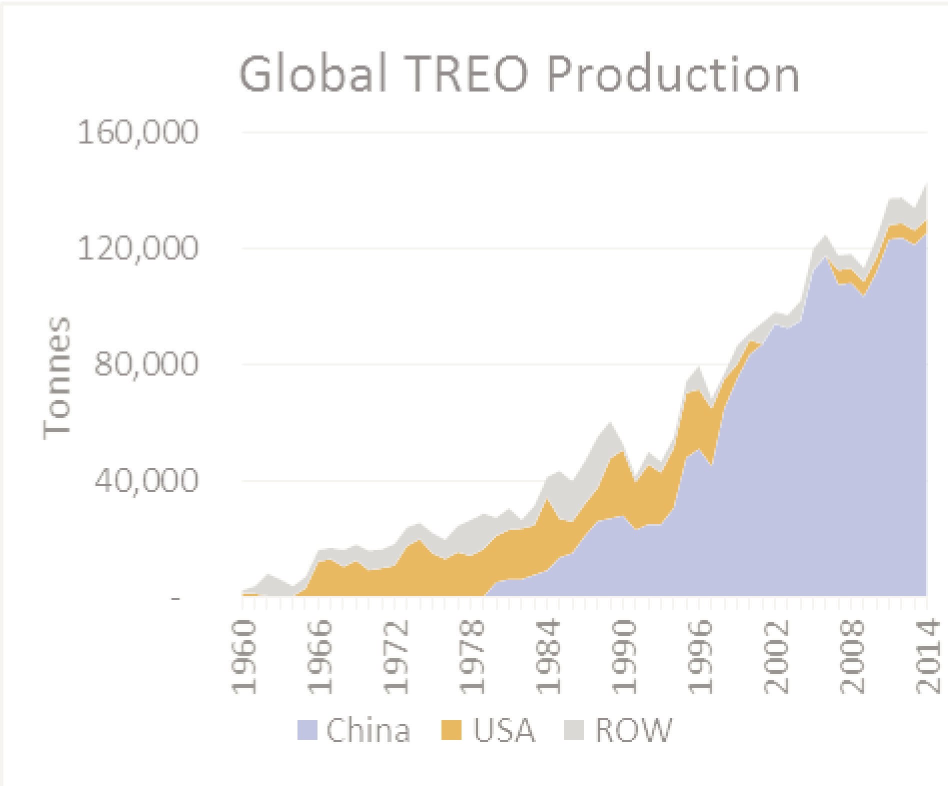


Figure 2: World mine production of TREO region from 1960 – 2014 (Source: USGS, U.S Bureau of Mines, Adamas Intelligence estimates)

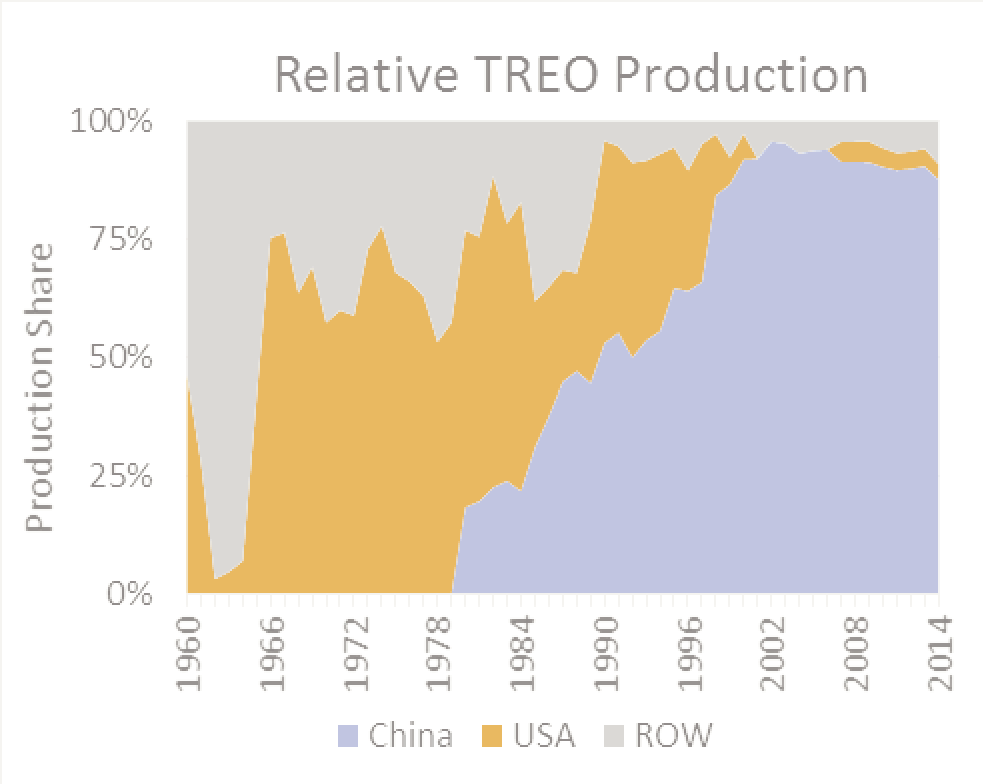


Figure 3: Relative TREO Production from 1960 – 2014 (Source: USGS, U.S Bureau of Mines, Adamas Intelligence estimates)

In a recent market research report titled "Rare Earth Market Outlook", independent research firm Adamas Intelligence ("Adamas") estimated global mine production by REO and country from 2008 to 2014 based on a bottom-up analysis of production by mine and producer.

Adamas estimates that from 2008 through 2014 global mine production of TREO increased at a compound annual growth rate (CAGR) of 3.3 per cent., from 118,200 tonnes in 2008 to 143,300 tonnes in 2014 (see Figure 4). Over the same period Adamas estimates that global LREO production grew from

107,700 tonnes to 125,100 at a CAGR of 2.5 per cent. (see Figure 4), and global HREO production grew from 10,500 tonnes to 18,200 tonnes at a CAGR of 9.6 per cent. (see Figure 5).

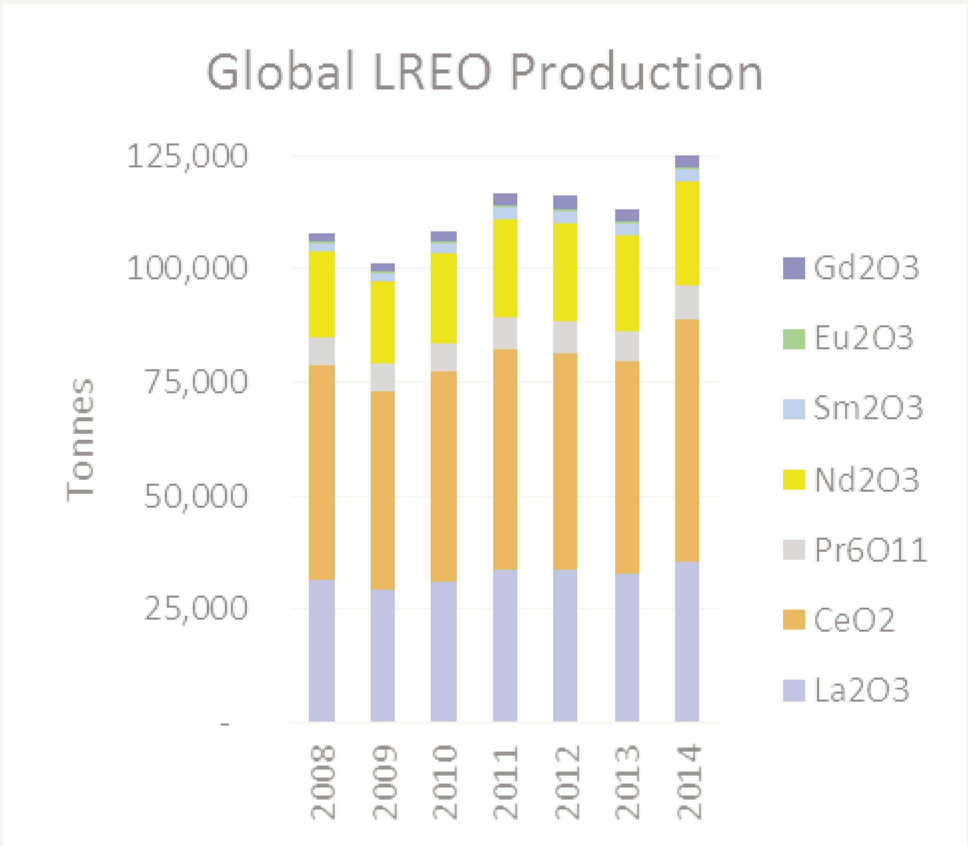


Figure 4: Global LREO Production 2008–2014 (Source: Adams Intelligence's "Rare Earth Market Outlook" report)

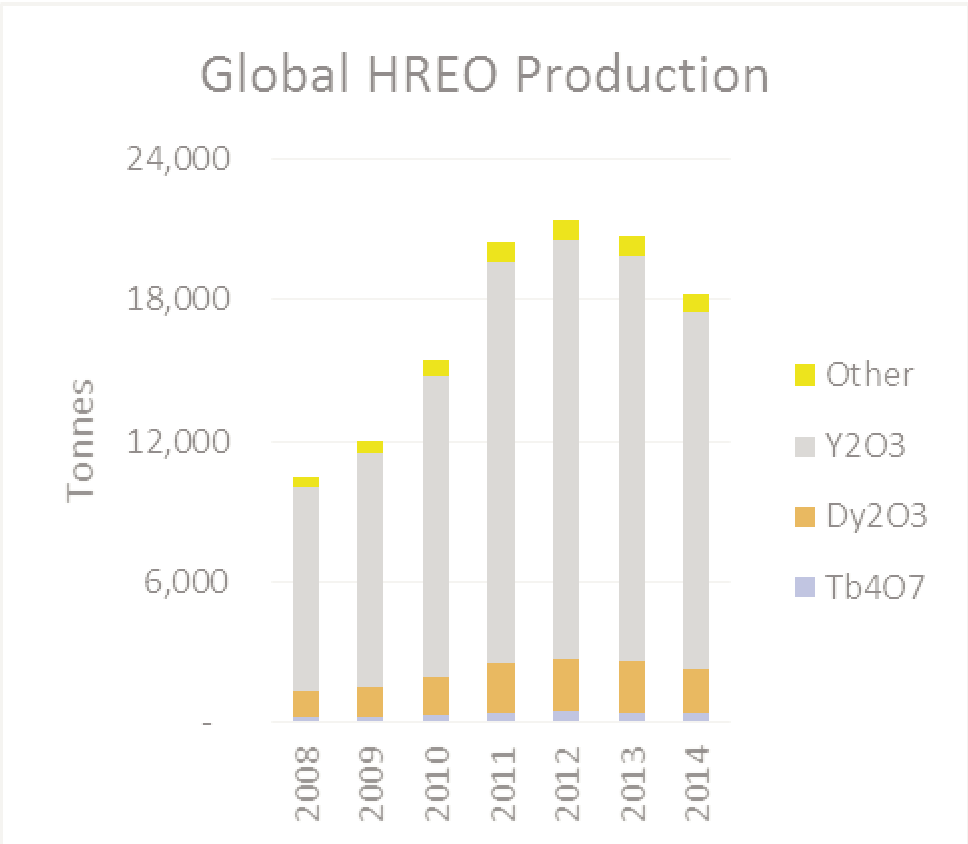


Figure 5: Global HREO Production from 2008–2014 (Source: Adamas Intelligence's "Rare Earth Market Outlook" report)

Adamas estimates that global HREO production increased very sharply between 2008 and 2012 owing to a surge of illegal mining in China brought on by a rise in global REO prices and an increase in domestic resource taxes that made illegal production in the nation more lucrative than ever. It is believed that illegal production from China's HREO-rich ion-adsorption clay deposits was particularly rampant given that such ores can often be exploited in-situ, offering a low technical hurdle for China's unregulated producers.

Adamas estimates that illegal TREO production in China peaked in 2012 and has since declined year-on-year on the back of increased efforts by Chinese officials to crackdown on illegal producers (Figure 6). However, Adamas estimates that illegal REO production in China is still very substantial, serving to undermine global prices for REOs, but forecasts a continued reduction in illegal production, strengthening the pricing power of China's legitimate producers.

Adamas estimates that U.S. production of TREO averaged approximately 5,000 tonnes per annum from 2008 through 2014 with material initially derived from ore stockpiles and later from new production at Molycorp's Mountain Pass mine in California. Adamas also estimates that Australian TREO production grew from 2,200 tonnes in 2008 to 7,191 tonnes in 2014 as Lynas Corp. commenced production at its Mt. Weld mine, from which it continues to increase output (see Figure 6).

India produced approximately 2,800 tonnes of TREO annually from 2008 to 2014, primarily in the form of REO-containing mineral concentrates produced as by-products of heavy mineral mining operations, and Russia produced an average of 2,400 tonnes of TREO per annum in the form of mineral concentrates from the Murmansk region (see Figure 6).

Adamas estimates that production from all other regions combined, being Malaysia, Brazil, and Vietnam, averaged 690 tonnes per annum from 2008 to 2014 stemming from primary REO mines in Brazil and Vietnam, and by-product production of mineral concentrates in Malaysia (see Figure 6). From 2008 to 2014, China's total share of global TREO production decreased slightly from 91 to 88 per cent., however, with the discontinuance of TREO production from Molycorp's Mountain Pass mine in the U.S. in mid-2015, this trend is poised to reverse should new sources of production not emerge in the near-term.

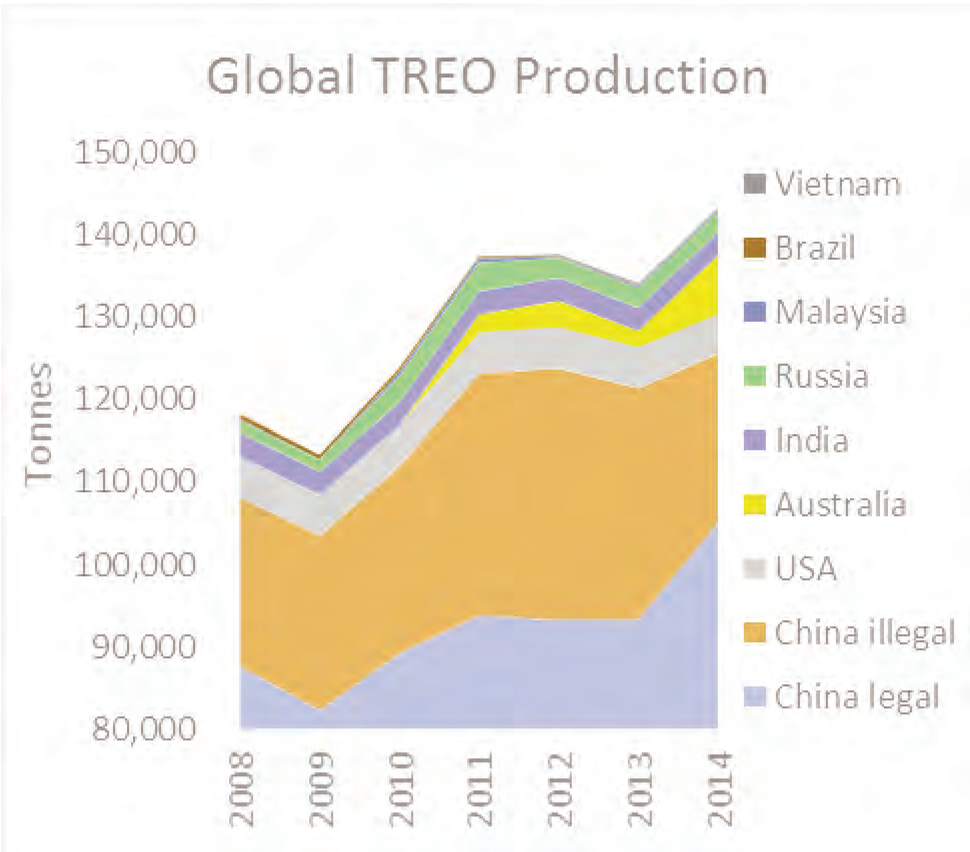


Figure 6: World mine production of TREO by country, 2008 – 2014 (Source: Adams Intelligence)

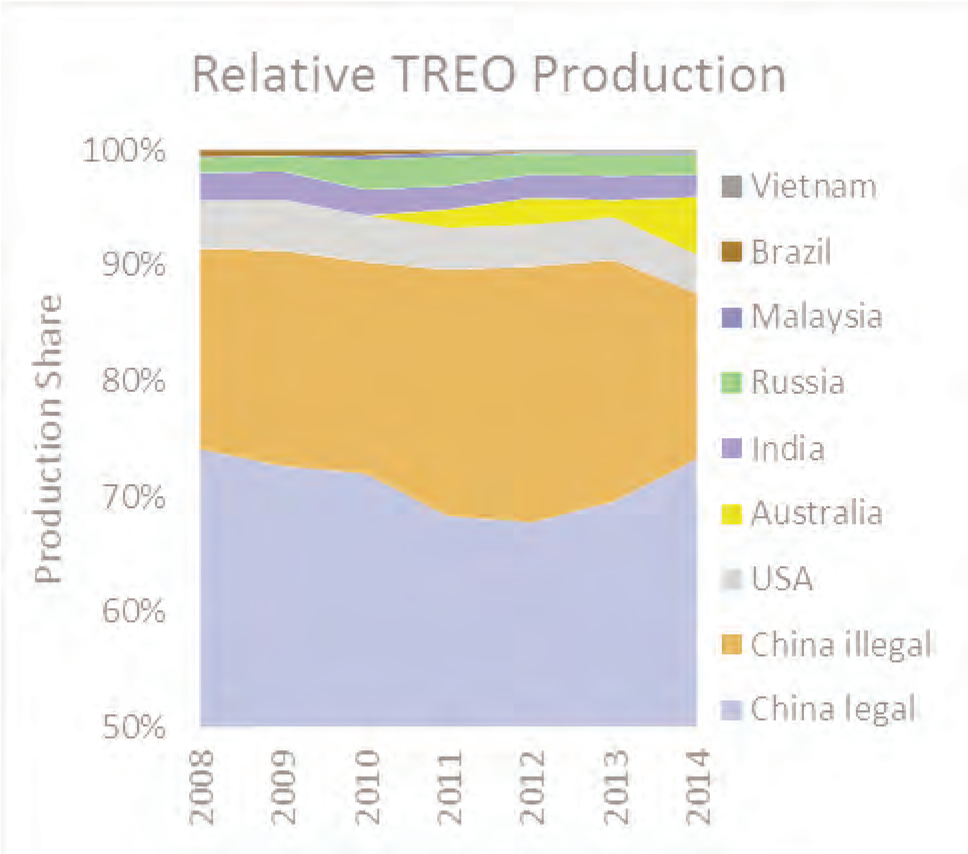


Figure 7: World mine relative TREO production by country, 2008 – 2014 (Source: Adams Intelligence)

Pricing

REEs are not exchange traded but are sold on private markets which can make their prices difficult to monitor. REE prices are generally established independently by producers in China and the materials are spot traded between willing buyers and willing sellers. Rare earth traders and producers regularly quote 'offer' prices to metal price reporting agencies which serve as benchmarks for prevailing market prices.

From 2008 to 2011, the average Chinese prices of all REOs increased substantially. This increase was caused largely by China reducing the supply of REOs available for export, causing concern among foreign end-users about possible supply shortages. This concern pushed prices to record high levels in mid-2011. It also resulted in a surge in illegal Chinese REO production that has in part led to a reduction in prices from the 2011 highs.

Overall, 2015 was a negative year for rare earth prices although some sectors of the market began to show signs of a turnaround. The first quarter of 2015 saw prices of several rare earths rally on strong demand in anticipation of the abolishment of China's rare earth export tariffs and rumored changes to the resource tax levied from domestic miners that many were speculating would drive prices higher. However, the second and third quarters of 2015 saw rare earth prices decline steadily. High levels of stock meant, end-users were largely absent from the market, fueling a build-up of supplies in China that, coupled with a lack of pricing discipline, sent prices falling. However, in the fourth quarter of 2015, neodymium prices began to recover and have trended still higher in 2016 to date.

Both Chinese domestic and Chinese FOB prices reached multi-year lows in 2015, challenging the profitability of China's major producers. China's (and the world's) largest producer of REOs and value-added products, China Northern Rare Earth Group, reported a net operating profit margin of just 8 per cent. in the first half of 2015 – which would have been much less were it not for a rally in the first quarter of the year. Other producers with more upstream-focused operations have fared no better. China Minmetals Rare Earth reported a net operating profit margin of just 4 per cent. in the first half of 2015 and Xiamen Tungsten reported a net operating profit margin of less than 1 per cent.

Producers in China have cited weak prices, overcapacity issues, and excessive illegal production as the main hindrances to profit, spurring a number of producers to ationalize production or temporarily cease operations in a bid to draw-down inventories and increase prices. In 2015, a number of rare earth mining and processing companies in Jiangsu, Sichuan, Guangdong, Ganzhou, Inner Mongolia, and elsewhere opted to curtail or suspend production in order to reduce inventories and allow the government to crackdown on illegal production.

Outlook for REEs

Most market commentators expect REE demand to increase, possibly considerably, in the medium term. Greater market penetration for many products that need REEs, such as hybrids and electric vehicles, lower REE prices and a recovering world economy are all contributing to higher REE demand. The European Rare Earths Competency Network ("ERCON") has suggested that magnet applications in particular could see double-digit growth rates in the coming years. ERCON also believes that while further gains in terms of material efficiency are clearly possible, they will require intensified R&D efforts and are unlikely to lead to advancements that could significantly slow demand for REEs in the near term. According to estimates by Curtin University and IMCOA, REE demand is projected to increase by more than 20 per cent. between 2014 and 2017 and could be over 50 per cent. higher by 2020.

Adamas estimates that global TREO demand was approximately 125,000 tonnes in 2015 and will increase for individual REOs by 1 per cent. to 13 per cent. annually through to 2020. Adamas forecasts that in 2020, global TREO demand will conservatively amount to approximately 150,750 tonnes. Global TREO demand growth is forecast to be driven heavily by strong demand growth for neodymium oxide, praseodymium oxide, dysprosium oxide, lanthanum oxide, and others from 2015 through to the end of the decade, with the permanent magnet and fuel cracking catalyst sectors the key drivers. In all three supply-demand scenarios considered from 2015 through 2020, Adamas forecasts that global demand for oxides of neodymium, praseodymium, dysprosium, terbium, lanthanum, and yttrium will significantly exceed global annual production in the year 2020 implying significantly higher prices than those in 2015.

4 Overview of the Songwe Hill REE Project

Location

Songwe Hill is located in southeastern Malawi, between Lake Chilwa and the Mulanje Massif. It lies within exclusive prospecting licence EPL 0284/10 which Mkango refers to as the 'Phalombe Licence'. The EPL lies entirely within the Southern Region of Malawi and Songwe Hill is within the Phalombe administrative district. It is approximately 70km from the former capital, Zomba and approximately 90km from the commercial centre of Blantyre (which has an international airport and a railhead). The national highway S145 passes within 15km of Songwe Hill and is being upgraded. Secondary gravel and dirt roads provide vehicle access to the exploration camp.

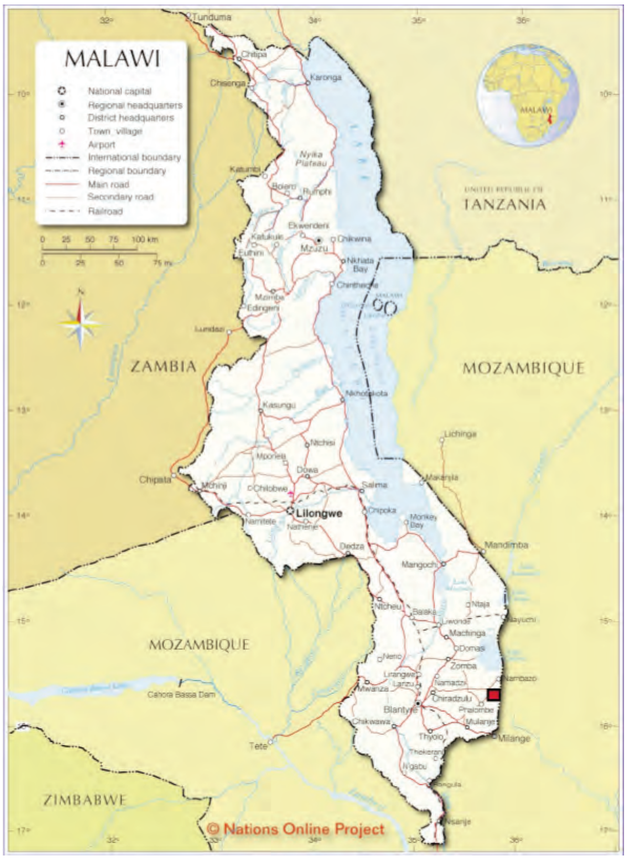


Figure 8: Location of the Songwe Hill REE Project

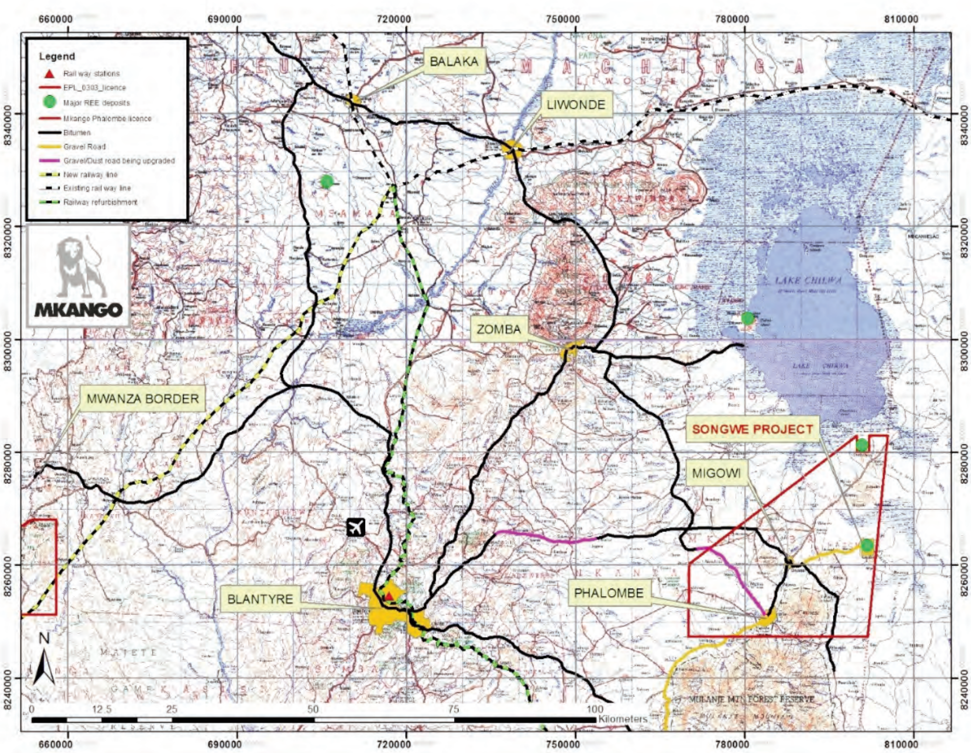


Figure 9: Location of the Songwe Hill REE Project

The deposit lies on the north-facing slopes of Songwe Hill, a steep-sided conical hill with a diameter of approximately 800m that rises to a summit elevation of 990m. Songwe Hill abuts onto the slopes of the adjacent and larger Mauze Hill which rises above the alluvial plains south of Lake Chilwa and straddles the border with Mozambique. The slopes of Songwe Hill are densely vegetated with elephant grass following the rainy season but, in other times of the year, vegetation does not hinder access.

Climate

The Songwe Hill area has a sub-tropical climate. Maximum monthly rainfall is between 125cm and 218cm during the rainy season of December to March. The project area is warm from September to April with average daytime maximum temperature of around 26˚C. The monthly average temperature ranges from 22˚C in August to 27˚C in December. The monthly minimum average temperature ranges from 11.4˚C in August to almost 21˚C in October. The climatic conditions are not expected to impact on the operation of the proposed mine, which has been planned to operate all year round.

Geology and mineralisation

Songwe Hill is interpreted as a volcanic vent that is expressed as a steep-sided hill approximately 800m in diameter. Information from surface mapping and drill core indicates that the vent complex consists of a multi-phase intrusion characterised by diverse carbonatites and breccias. The carbonatite is best exposed along the north-eastern slope of Songwe Hill. The vent complex cuts the western end of the large Mauze nepheline syenite intrusion, but the external contacts on the western and northwestern sides of the vent are hidden beneath recent surficial eluvial deposits.

The principal lithologies that comprise the Songwe Hill vent complex are carbonatite, fenite and breccia. The carbonatites are dominantly grey calcic carbonatites, although subordinate ferro-carbonatites are present. The fenites comprise dominantly K-feldspar rocks and appear to form an aureole around the carbonatite. They are interpreted to have formed through metasomatism related to the carbonatite intrusion. The breccias range from clearly abraded pebble-sized fragments (pebble dykes) to angular blocks that are metres in diameter and include significant volumes of breccia in which the fragments appear to have undergone little or no movement.

The principal zone of REE mineralisation outcrops along the northeastern slope of Songwe Hill. REE mineralisation is present in carbonatites, fenites and breccias, which are exposed intermittently over a surface area of approximately 350m by 100m. The REE mineralisation is untested to the northeast and southwest beyond the limits of the present drilling and below the deepest vertical intersection of approximately 350m below the surface of Songwe Hill and there is additional regional exploration potential in the Songwe and other carbonatites. The mineralised body is interpreted to be a carbonatite plug with essentially sub-vertical margins. In plan view, it is elongated in a northeast-southwest direction.

The dominant REE-bearing minerals are synchysite and apatite. The apatite is anomalously enriched in the HREO's compared to apatites in most carbonatite deposits. The REE mineralisation is closely associated with strontianite and baryte and is interpreted to have formed through sub-solidus hydrothermal alteration following the carbonatite intrusion.

Project Overview

Mkango completed a Pre-Feasibility Study for the Songwe Hill Project in September 2014, which was subsequently updated in November 2015. The Pre-Feasibility Study is based on a conventional open pit operation using contract mining, a mine life of 18 years and is focused only on the Probable Mineral Reserve Estimate.

The Songwe Hill Project features broad zones of outcropping REE mineralisation on the northern slopes of a steep sided hill. The annual processing capacity was assumed at 500,000 tonnes per year of ore with a view to producing an average of approximately 2,840 tonnes of REO in mixed chemical concentrate per year with a large proportion of the cerium removed during the hydrometallurgical process. Cerium is currently considered to have challenging market fundamentals and, under Mkango's current strategy to produce a concentrate, there is a strong economic rationale to remove as much as possible of the cerium from the final concentrate.

A summary of the key outputs of the Pre-Feasibility Study is presented in the tables below:

Total ore mined and processed	tonnes	8,482,603
Average strip ratio	x	4.5
Total waste mined	tonnes	38,441,726
Average life of mine TREO grade	%	1.60%
Mine life	years	18
Total REO recovered to concentrate	tonnes	48,275
Annual ore processed[2]	tonnes	500,000

Rare earth oxide		*Overall recovery to concentrate*	*REO production in concentrate*
Lanthanum	La_2O_3	55%	1,075
Cerium[1]	CeO_2	9%	341
Praseodymium[4]	Pr_6O_{11}	57%	227
Neodymium[4]	Nd_2O_3	57%	756
Samarium	Sm_2O_3	60%	114
Europium	Eu_2O_3	59%	27
Gadolinium	Gd_2O_3	58%	62
Terbium[4]	Tb_4O_7	56%	7
Dysprosium[4]	Dy_2O_3	58%	35
Yttrium	Y_2O_3	58%	165
Holmium[3]	Ho_2O_3	57%	6
Erbium[3]	Er_2O_3	57%	13
Thulium[3]	Tm_2O_3	56%	2
Ytterbium[3]	Yb_2O_3	56%	10
Lutetium[3]	Lu_2O_3	53%	1
Average annual production REO in concentrate	tonnes		2,841
Average "magnet" REO production in concentrate[4]	tonnes		1,026

1 A large proportion of the cerium will be selectively removed during the hydrometallurgical process
2 Average annual at full capacity excluding first and last years
3 No value currently attributed to these rare earths in the financial evaluation
4 "Magnet" rare earths are assumed to be neodymium, praseodymium, dysprosium and terbium

It is currently anticipated that the product of the Songwe Hill Project in Malawi will be a high grade, purified chemical concentrate. The project is connected by road to Blantyre, the largest commercial centre in Malawi located approximately 70km away, and which has a rail head and international airport. For the purposes of import of reagents and export of product, it is assumed that the project will utilise the existing road and rail network, in addition to the new railway being completed through Malawi to the Nacala port in Mozambique and a proposed new dry port facility near Liwonde.

Economic Analysis

A detailed financial model has been constructed based on input parameters from the Pre-Feasibility Study. Free cash flows were modelled in both real and nominal terms for a range of discount rates, and on a debt free basis.

Long term rare earth price assumptions are based on the 2020 Base Case pricing scenario prepared by Adamas Intelligence, resulting in the equivalent price for a total rare earth basket for Songwe Hill of US$59.8 per kg REO. Prices are assumed to remain flat in real terms over the life of the mine.

The outcomes of the financial model are summarised below:

Financial evaluation	*Nominal discount rate*[1]	*Real discount rate*	*November 2015 Pre-Feasibility Study Base Case Pricing Post tax NPV US$m*	*November 2015 Pre-Feasibility Study Scenario 3 Pricing Post tax NPV US$m*	*November 2015 Pre-Feasibility Study Scenario 2 Pricing Post tax NPV US$m*
	9.0%	6.3%	385	258	446
Base case	10.0%	7.3%	345	228	400
	11.0%	8.3%	308	201	359
	12.0%	9.3%	276	177	323
	13.0%	10.2%	248	156	290
	14.0%	11.2%	222	137	261
Nominal internal rate of return			37%	29%	40%
Real internal rate of return			33%	26%	36%
Long term basket value assumption (US$/kg)			59.8	52.0	63.8
% of basket value attributable to "Magnet" rare earths[2]			83%	84%	82%

1 Includes inflation at 2.5 per cent.
2 "Magnet" rare earths are assumed to neodymium, praseodymium, dysprosium and terbium

The main revenue drivers are neodymium (53 per cent.), praseodymium (14 per cent.) and dysprosium (12 per cent.) as illustrated below.

Rare earth oxide		*REO in conc*[1] *tonnes*	*REO in conc split*	*REO in conc US$/kg*	*REO in conc split by value*
Lanthanum	La_2O_3	1,075	37.8%	3.1	5.2%
Cerium	CeO_2	341	12.0%	0.4	0.7%
Praseodymium[2]	Pr_6O_{11}	227	8.0%	8.6	14.4%
Neodymium[3]	Nd_2O_3	756	26.6%	31.6	52.8%
Samarium	Sm_2O_3	114	4.0%	0.2	0.3%
Europium	Eu_2O_3	27	0.9%	4.5	7.6%
Gadolinium	Gd_2O_3	62	2.2%	1.2	2.0%
Terbium	Tb_4O_7	7	0.3%	1.9	3.3%
Dysprosium[3]	Dy_2O_3	35	1.2%	7.2	12.1%
Yttrium	Y_2O_3	165	5.8%	1.0	1.7%
Holmium[2]	Ho_2O_3	6	0.2%		
Erbium[2]	Er_2O_3	13	0.5%		
Thulium[3]	Tm_2O_3	2	0.1%		
Ytterbium[2]	Yb_2O_3	10	0.3%		
Lutetium[2]	Lu_2O_3	1	0.0%		
Average annual production REO in concentrate		2,841	100.0%	59.8	100.0%
Average "magnet" REO production in concentrate[3]		1,026	36.1%	49.3	82.6%

1 Average annual at full capacity excluding first and last years
2 No value currently attributed to these rare earths in the financial evaluation
3 "Magnet" rare earths assumed to be neodymium, praseodymium, dysprosium and terbium

Operating costs

Cash operating costs include the costs of contract mining, milling, flotation, leaching, purification and precipitation in addition to other costs associated with the operation. The Pre-Feasibility Study also assumes an additional cost of US$10.0 per kg REO to account for the cost or implied discount associated with toll separation or the sale of a mixed chemical concentrate.

Real operating costs	*Life of mine US$/kg REO*	*Life of mine US$/t processed*	*2018-2022 US$/kg*	*2018-2022 US$/t processed*
Mining	4.1	23.5	3.0	21.1
Beneficiation	3.7	21.2	3.0	21.0
Hydrometallurgical	7.1	40.4	5.7	40.3
G&A/other	1.5	8.6	1.3	8.6
Cash operating costs	16.4	93.6	13.0	91.1
Tolling/conc sale	10.0	56.9	10.0	70.9
Total cash costs	26.4	150.5	23.0	162.0

Capital expenditure

The largest capital expenditure ("capex") component is an integrated processing plant comprising a mill, flotation plant, hydrometallurgical plant, and a sulphuric acid plant with power co-generation capacity. The capex estimate for the integrated processing plant was completed by SNC-Lavalin (Pty) Ltd. and is to an accuracy defined as (20 per cent. + 25 per cent.) covering the design, engineering, procurement, supply/manufacture, construction and pre-commissioning of the proposed new processing facility and associated plant complex infrastructure. Other major capex items include the cost of a lined tailings storage facility provided by Epoch Resources (Pty) Ltd.

Initial capital expenditure	*US$m*
Site facilities and infrastructure	21.8
Power supply	14.5
Mining	1.7
Beneficiation plant	43.0
Hydrometallurgical plant	54.4
Sulphuric acid plant	34.7
Tailings storage facility	12.7
Other costs	14.0
Total initial capital expenditure	196.6
Contingency	19.7
Total initial capital expenditure including contingency	216.3

Capital expenditure after initial project development costs are estimated to be US$1m per year for sustaining capital. The costs of future reclamation are assumed to be provided for by Mkango on an annual basis for the life of the mine and are included in operating costs (G&A/other).

Mineral Resource and Mineral Reserve Estimates

The Pre-Feasibility Study is based on the NI 43-101 Mineral Resource estimate in the technical report (the "Report") entitled "NI 43-101 Technical Report and Mineral Resource Estimate for the Songwe Hill REE Project, Phalombe District, and Republic of Malawi" filed on 22 November 2012 and authored by Scott Swinden, Ph.D, P.Geo. and Michael Hall, Pr.Sci.Nat., MAusIMM (who are independent "Qualified Persons" in accordance with National Instrument 43-101 – Standards of Disclosure for Mineral projects) and prepared by The MSA Group (Pty) Ltd. The Report's Mineral Resource Estimates, as previously announced, are summarised below.

Cut-off grade	*Indicated Mineral Resource Estimate*	*Inferred Mineral Resource Estimate*
1.0% TREO	13.2 mt grading 1.62% TREO	18.6 mt grading 1.38% TREO
1.5% TREO	6.2 mt grading 2.05% TREO	5.1 mt grading 1.83% TREO

TREO – total rare earth oxides including yttrium. In-situ – no geological losses applied. mt – million tonnes

The Pre-Feasibility Study supports the declaration of a Mineral Reserve Estimate for the project as summarised below.

Cut-off grade	*Probable Mineral Reserve Estimate*
1.0% TREO	8.5 mt grading 1.60% TREO

TREO – total rare earth oxides including yttrium.

The following Modifying Factors were used to convert the Mineral Resource Estimate to the Mineral Reserve Estimate:

Modifying Factors used in Mineral Reserve Estimate			
Factor	*Unit*	*Quantity*	*Comment*
Cut-off grade	% TREO	1%	Higher than pay limit of 0.51%
Mining recovery	%	95%	5% ore loss expected during mining
Mining Dilution	%	5%	Dilution assumed to carry zero grade
Plant recovery	%	34%	Accounts for the portion of Cerium which is removed by the metallurgical process and is not sold
Product price	US$/kg	59.76	Average recovered basket price per kg of recovered rare earth oxides
Operating Cost	US$/tonne processed	93.55	Average Life of Mine operating cost per tonne processed
Operating Cost	US$/kg	16.94	Average Life of Mine operating cost per kg of REO recovered

The economic parameters used for calculating the Mineral Reserve Estimate may vary from those used in the economic model for the Pre-Feasibility Study.

Indicated Mineral Resources are inclusive of Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. For further details of the Mineral Resource estimates, including the breakdowns thereof, please refer to the Report which is available at www.sedar.com.

Mining

The mine design was completed by The MSA Group (Pty) Ltd. It is based on a conventional open mining operation and assumed the use of a contract miner. The mine plan incorporates the use of stockpiles to manage the grade profile and maximize returns. As part of the Pre-Feasibility Study, a contract mining company visited the Songwe Hill site and was integrally involved in the estimation process.

Processing and Metallurgical Testwork

A comprehensive three year program of mineralogical studies formed the basis for the metallurgical testwork. Mineralogical work included investigations by High Definition Mineralogy incorporating QEMSCANTM completed by SGS Minerals Services and Camborne School of Mines, scanning electron microscope (SEM), electron microprobe and Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) analyses completed at the Natural History Museum in London, Aberystwyth University, Camborne School of Mines and the British Geological Survey. Further mineralogical work (SEM) on mineral concentrate was completed at Mintek and the Camborne School of Mines. The mineralogical program identified the fluorocarbonate mineral, synchysite, and the phosphate mineral, apatite, as the most important rare earth bearing minerals, and confirmed that the apatite contained significantly higher concentrations of heavy rare earths and yttrium relative to apatite in other carbonatites worldwide.

Songwe Hill's favourable mineralogy means that high capital and energy intensive kilns will not be required in the flow sheet. This contrasts to projects dominated by monazite, xenotime or other refractory REE minerals. Plant design comprises conventional technology largely comprised of tanks, pumps and filters, and will be modular, facilitating the potential for future expansions, the latter underpinned by a significant Mineral Resource base. The use of low strength acid enables the use of plastics or composite materials for tanks and pipework.

The design of the integrated processing plant and associated infrastructure was completed by SNC-Lavalin (Pty) Ltd. The metallurgical testwork was completed by Mintek, South Africa and Nagrom Laboratories, Australia.

A number of potential flow sheets were evaluated at Mintek and Nagrom Laboratories. Based on this testwork, a flowsheet was developed incorporating flotation, two stage leaching and acid regeneration.

The flotation process was largely developed at Mintek and then reproduced and verified at Nagrom Laboratories. This work demonstrated that flotation can be used to upgrade the mineralised material. In the flow sheet, this concentrate is then treated in the hydrometallurgical plant.

In the first leach step (gangue leach), dilute hydrochloric acid (HCl) is used to remove largely calcite, with minimal rare earth losses. A solution amenable for recycling HCl using sulphuric acid is thereby produced. This process has considerable merit in that sulphuric acid is considerably cheaper to produce versus the cost of importing HCl. Solid sulphur will be transported to site and used to produce concentrated sulphuric acid along with co-generation of power from a combined sulphur burner and steam turbine plant. HCl lost during the process will be replaced by importing solid calcium chloride.

The residue from the gangue leach is then subjected to a second, more intensive HCl leach during which the majority of the rare earths are solubilised. In addition, caustic conversion followed by HCl dissolution is completed on the rare earth leach residue to maximise overall rare earth leach recovery. The resultant pregnant liquor solution reports to the purification stage, during which impurities are removed and cerium is selectively precipitated for stockpiling and potential future sale.

Environmental, social and health impact studies

Pre-Feasibility environmental and social baseline studies were conducted during 2013 by Digby Wells Environmental in consultation with Malawian environmental specialists, based on the requirements of the Equator Principles, International Finance Corporation (IFC) Performance Standards as well as specific requirements and interpretations of Malawian Legislation as provided by their Department of Environmental Affairs (DEA). A project Brief for the proposed environmental and social studies for the Environmental, Social and Health Impact Assessment (ESHIA) was submitted to the DEA in the fourth quarter of 2013. The DEA has responded with a suggested Terms of Reference which will be addressed in the ESHIA for the Definitive Feasibility Study. Following completion of the PFS in September 2014, the first round of stakeholder consultation meetings took place and were completed during November 2014. Base line studies continue at the exploration site, including collection of monthly dust and climate data.

5 Thambani Licence

The Thambani exploration licence, located in the Mwanza District, was originally granted by the Malawi Minister of Natural Resources, Energy and Environment on September 10, 2010 in respect of an area of 468km^2. In September 2013 and September 2015, the Government of Malawi granted further two year renewals for the licence. At the second renewal the Company requested a reduction in the licence size to the current area of 136.9km^2.

Mkango's exploration activities to date include acquisition of Landsat7 and ASTER satellite imagery for the licence area, systematic ground radiometric surveys to confirm and detail previously-known airborne anomalies, reconnaissance geological mapping and litho-geochemical sampling programs. The work has identified a number of potential uranium and associated Nb-Ta targets over the Thambani Massif, which is mainly composed of nepheline-bearing syenite gneiss, forming two prominent ridges known as Thambani East Ridge and West Ridge.

A systematic ground radiometric survey completed by Mkango previously revealed two distinct uranium anomalies occurring across the Thambani East and West Ridges: A strong uranium anomaly, measuring approximately 3km by 1.5km, occurs along the length of the Thambani East ridge, with a north-south trend, and a second uranium anomaly, measuring approximately 1.5km by 0.4km, occurring on the West Ridge along the western contact of the nepheline-bearing syenite body with the biotite-hornblende gneisses.

Mkango completed a trenching program across the Thambani Massif primarily focused on two sites of historical uranium exploration, known as the Chikoleka and Little Ngona targets. An initial set of 9 trenches, selected on the basis of anomalous ground radiometric results, have been re-examined and geochemically sampled across profiles from soil/overburden into bedrock.

The first set of assay results of 142 soil and rock chip samples returned variably anomalous U, Nb and Ta values in most trenches, ranging up to 4.70 per cent. U^3O^8, 3.25 per cent. Nb^2O^5 in soil and up to 0.42 per cent. U^3O^8, 0.78 per cent. Nb^2O^5 and 972 ppm Ta^2O^5 in rock chips, notably higher than results from the 2013 reconnaissance surface geochemical sampling program. Results associated with the 10 best U^3O^8 assays are summarized in Table 1.

Preliminary mineralogical studies carried out on six rock samples from the Little Ngona River and Chikoleka targets, using SEM at the Natural History Museum London, indicate that pyrochlore group minerals, mainly betafite, are the principal carriers of U, Nb and Ta for these samples.

Assays from the 10 highest – U^3O^8 samples from the Thambani trenching program

Trench No.	*Profile*	*Sample No:*	*From (m)*	*To (m)*	*Rock type*	*U_30_8 ppm*	*Nb_2O_5 ppm*	*Ta_2O_5 ppm*
C3	A	U3622	0.5	1	Soil	47,094	32,462	45
C3	A	U3623	1	1.5	Soil	1,057	735	59
T11	C	U3508	0.5	1	Decomposed Feldspathic rock	4,231	7,805	743
T11	C	U3509	1	1.5	Decomposed Feldspathic rock	2,539	6,619	911
T11	B	U3505	0.5	1	Decomposed Feldspathic rock	2,369	5,424	972
T15	A	U3554	1	1.5	Feldspathic rock	1,657	4,346	67
T15	A	U3553	0.5	1	Feldspathic rock	1,616	3,754	431
T15	E	U3565	0.5	1	Feldspathic rock	1,553	3,525	41
T14	D	U3549	1.5	2	Feldspathic rock	1,432	3,034	434
T19	C	U3604	1	1.5	Feldspathic rock	1,367	5,525	675

6 Malawi

The following information is taken from a website maintained by The World Bank[1]. The East African nation of Malawi is bordered by Mozambique to the south and west, Zambia to the east and Tanzania to the north. It has an estimated population of 16.7 million as of 2014. With the support of the International Monetary Fund and the World Bank, Malawi has been able to make important economic and structural reforms and sustain its economic growth rates over the last decade.

Malawi enjoys a stable and democratic government. Since the end of a one party regime in 1993, it has organised five peaceful presidential and parliamentary elections. The current President, Professor Arthur Peter Mutharika is in his first five-year term which started in 2014. The next elections are due in 2019.

Real gross domestic product grew by 1.9 per cent. in 2012, 5.2 per cent. in 2013 and 5.7 per cent. in 2014. Growth in 2014 was primarily driven by growth of the agricultural, information, communication and wholesale and retail sectors. GDP growth in 2015 slowed to 2.9 per cent. and GDP growth for 2016 is projected to be 3.0 per cent.[2]

Malawi's main challenges include improving infrastructure, particularly energy supply and delivery. Plans are progressing for an electricity inter-connector network between Zambia and Mozambique. An agreement was signed in October 2015 between the Government of Malawi and EXIM Bank of China for the immediate construction of a coal fueled power station in southern Malawi which is expected to be operational in 2018.

1 http://data.worldbank.org/country/malawi
2 http://www.imf.org/external/pubs/ft/weo/2016/01/pdf/text.pdf 30

7 Mining in Malawi and the regulatory framework

Malawian mining legislation

Several Acts regulate the minerals sector in Malawi. Amongst these are the Mines and Minerals Act (1981) (and regulations), the Petroleum (Exploration and Production) Act (1983), and the Explosives Act (1968). In addition to the mining legislation there are also various environmental acts and policies which will apply.

The Mines and Minerals Act (1981) defines the rules under which participants in the minerals sector conduct business. It outlines the rights, duties and obligations of Government and of the exploration and mining investors as well as the applicable restrictions (Ministry of Minerals, 2013). Mkango has been granted exclusive mineral exploration rights in the form of Exclusive Prospecting Licences (EPL's). Mkango has completed a detailed Pre-Feasibility Study on the Songwe Hill REE Project within EPL 0284 and is therefore able to make an application to convert EPL 0284 into a Mining Licence in accordance with the clauses in sections 37 and 38 of the Malawian Mines and Minerals Act (1981). Mkango will need to complete an Environmental Impact Assessment ("EIA") prior to the mining licence being issued.

Mines and Minerals Policy

The Malawian Mines and Mineral Policy (2013) has the following objectives:

(i) To promote the development of the mining sector;

(ii) To contribute to socio-economic development of the country including poverty reduction and sustainable development;

(iii) To contribute to the country's foreign exchange base;

(iv) To optimise mining activities within Malawi so as to enhance "value added" elements of the sector and promote linkages with other sectors of the economy;

(v) To expand employment opportunities in Malawi;

(vi) To foster the needed economic diversification;

(vii) To promote artisanal and small scale mining; and

(viii) To promote women in mining.

Through the Mines and Minerals Policy (2013), the Government of Malawi seeks to guide and direct Mineral Resource development by stressing private sector initiatives and involvement and the need to attract modern technology and investment capital.

Environmental legislation

The National Environmental Policy (1996) provides an overall structure against which relevant sectoral environmental policies can be reviewed to ensure that the policies are consistent with the principles of sustainable development, while the Environment Management Act (1996) (EMA) and the Mines and Minerals Act (1981) contain sections that specifically deal with the protection and management of the environment. Section 24 of the EMA outlines the requirements for projects, for which an Environmental Impact Assessment (EIA) is needed (Ministry of Minerals, 2013).

Although the Mines and Minerals Act (1981) predates the environmental legislation, its provisions on environmental protection do not appear to have generated difficulties in implementing the ESHIA framework. The Mines and Minerals Act (1981) states that in granting mineral rights the Minister should consider the need to conserve natural resources in or on the land over which mineral rights are sought. This gives the Minister the power to integrate environmental conditions in mineral rights, including the requirement to lodge a security for the performance of rehabilitation of explored or mined areas. It is in the application of this mandate that licencees for minerals prospecting and exploration prepare a mitigation and rehabilitation plan for their activities which is included in their licence application. Importantly, these requirements respect and do not appear to have given rise to conflicts with the obligations that arise under an EIA approval. Mining activity, from mine construction to mine closure are covered by the EIA process.

Environmental Management Act (1996)

EIA provisions in the EMA are found in sections 24, 25, 26, 27, 29, 63, 69 and 76. An EIA is mandatory under Part V in sections 24 – 26 of the EMA for projects that will have adverse impacts on the environment. The EMA is the key piece of legislation for EIA as it establishes an administrative process and key players including the Technical Committee on the Environment (TCE) which is instrumental in the EIA process. The EMA is the instrument through which the National Environment Policy is implemented. It is the paramount law on environment to the extent that in Section 7 it establishes that any legislation that is inconsistent with it is considered irrelevant to the extent of the inconsistency.

One aim of the EMA is to prevent government departments and authorities operating independently and provides through the TCE, a coordinated approach to environmental protection with all relevant government departments playing an active role. The EMA established a process of environmental assessment and has precedence over other legislation where approvals may be required or licences are required under other Acts.

The EMA provides further details for the comprehensive management of the environment, ranging from pollution and waste management to the requirement of permits and licences.

Process of EIA in Malawi

Developers of exploration and mining projects have to submit an initial environmental assessment known as a project brief that may lead to the requirement of an EIA study. An approved EIA study comprises an environmental management plan which is incorporated into the mining licence. It is expected that social considerations to benefit local communities would be incorporated in the EIA study following good corporate social responsibility practices. Because of limited experience with EIAs for the mineral sector in Malawi, these expectations are mainly based in the experience of the Kayelekera uranium project which was sponsored by a foreign publicly listed mining company.

Licences and permits required

Mkango will require a number of permits and licences, most of which will be required prior to mining taking place.

The table below summarises the main permits currently required under Malawi legislation:

Licence Required and Applicable Authority

Category of Licence	*Authority to Apply to*
Mining Licence	Ministry of Energy
Air Pollution Licence	The Minister of Environmental and Climate Change
Waste Licence	The Minister of Environmental and Climate Change
Hazardous Waste Licence	The Minister of Environmental and Climate Change
Permit to discharge waste or effluent	Minister of Environmental and Climate Change
Explosive Import Permit	Registrar of Firearms
Storage licence	Chief Inspector of Explosives
Dealers licence	Chief Inspector of Explosives
Permit to possess	Chief Inspector of Explosives
Blasting licence	Chief Inspector of Explosives

8 Directors and senior management

Directors

Mr Derek Norman Linfield, Non-Executive Chairman, aged 59

Mr Linfield is a legal consultant and former Managing Partner of Stikeman Elliott (London) LLP, the London office of Canadian law firm Stikeman Elliott LLP between 2005 and 2015. He practiced as a Canadian lawyer in London for 20 years, where he focused on cross-border financings and M&A in the mining and oil & gas sectors, including taking internationally managed companies to the TSX and the TSX-V as well as Canadian companies to the London Stock Exchange. A former educator, Mr Linfield holds BA(Ed) and BSc degrees from Memorial University of Newfoundland as well as LLB and MBA degrees from McGill University. He is a Director of MUN (UK) Limited, the UK campus of Memorial

University of Newfoundland, as well as immediate past chairman of Canada Day in London and the Foundation for Canadian Studies in the UK as well as a former Director of the Canada UK Chamber of Commerce where he is now an advisor to the Board.

Mr William Drummond Dawes, Chief Executive Officer and Executive Director, aged 46

Mr Dawes is a graduate of Bristol University (BSc Geology) and Royal School of Mines, Imperial College, London (MSc Mineral Exploration with distinction). Having trained as a geologist in South Africa, he worked as a mining analyst based in London and then for Rio Tinto's exploration division. Subsequently, he gained significant global mining transaction experience in the metals and mining team of Robert Fleming & Co, Chase Manhattan Bank and JPMorgan. Mr Dawes is a founding Director of Mkango and Mkango's major Shareholder, Leominex, and since 2004 has been involved in the exploration and evaluation of a variety of projects throughout Central Asia, the Middle East and Africa. He has 13 years' experience in exploration and business development and 9 years in mining finance, mergers and acquisitions. He is a Fellow of the Geological Society, a Professional Member of the Institute of Materials, Minerals and Mining and holds the Chartered Financial Analyst designation.

Mr Alexander Mark Lemon, President and Executive Director, aged 46

Mr Lemon is a graduate of the Royal School of Mines, Imperial College, London (MSc Mineral Exploration) and Oxford Brookes University (BSc Geological Sciences). He has 21 years experience in mineral exploration and business development from 1994 to 2001 was the Managing Director of a gold mining company, which owned and operated a producing gold mine in Central Asia, where he gained extensive operating experience in emerging markets including government negotiations and project management. From 2001 to 2005, he worked for a family office, Allied Commercial as an investment adviser. Mr Lemon is a founding Director and President of Mkango and Mkango's major Shareholder, Leominex. He is a Fellow of the Geological Society and a Member of the Southern African Institute of Mining & Metallurgy.

Mr Adrian James Reynolds, MSc, Non-Executive Director, aged 62

Mr Reynolds has an MSc in Geology, a Graduate Diploma of Mining Engineering and over 30 years experience in the natural resources sector, including more than 15 years experience with Randgold Resources Limited. At Randgold, he was part of the executive team that developed that company's original successful strategy whereby it grew from an exploration company to a very profitable mid-tier mining company. His key responsibilities included technical oversight of the mining operations including Feasibility studies, audits, compliance and evaluation of new opportunities. He was also a Director of Morila Ltd and Société des Mines de Loulo S.A. Mr Reynolds initially built his experience in both oil and coal exploration and then moved into deep level gold mining with Gencor Ltd in the Free State Goldfields. Joining Rand Mines Limited in 1985, he held positions in geological management in Rand Mines Limited and its successor Randgold & Exploration Company Limited. Mr Reynolds is currently an independent consultant and the Non-Executive Chairman of Digby Wells Environmental, one of the foremost mining environmental consultancies in Africa. He is also a Non-Executive Director of Aureus Mining. Mr. Reynolds is a resident of Cape Town, South Africa.

Mr David Andrew Berg, Company Secretary and Non-Executive Director, aged 54

Mr Berg is currently an independent businessman. He spent 28 years of consecutive service with one of Canada's largest publicly traded companies, serving in the capacity of vice president of operations. He managed a business unit with over C$1.5 billion in annual revenue and a total of 8500 employees. His corporate experience has encompassed financial, retail services and petroleum businesses. As a former chairman and Director of Potash One, he actively contributed to its successful development from an early stage exploration company to its acquisition by K & S of Germany for C$434 million in 2011. He is also the adviser, founder and Director of numerous other private and publicly traded companies. Currently, he operates a private consulting business specialising in the provision of management services and the development of business models for public and private companies.

Mr Eugene Chen BSc, Non-Executive Director, aged 47

Mr Chen is an independent lawyer practicing corporate finance and securities law. Previous experience includes 2 years with McMillian LLP in Calgary, Alberta, Canada, six months with Heenan Blaikie (subsequently dissolved), 3 years with Gowling Lafleur Henderson LLP, 5 years with Fraser Milner Casgrain LLP and 9 years with McLeod & Company LLP.

Senior Management

Mrs Sandra Lois Beaulieu, Chief Financial Officer, aged 57

Mrs Beaulieu is a financial professional based in Calgary, Alberta, Canada with over 20 years' experience in the resource sector, both domestically and internationally. Her skills include controllership, treasury and internal control governance with extensive experience in North America. Sandra has held positions with international resource companies requiring her to oversee sound financial controls and her familiarity with and guidance of financial system implementation, upgrading and maintenance has given her a distinct advantage when advising and assisting emerging enterprises. As a consultant, Mrs Beaulieu has managed the entire financial function for a number of listed and/or quoted companies, TSX-V capital pool companies and sole proprietorships.

9 Financial Information

Set out in Part IV of this Document is the following financial information on the Group:

Part IV-A Audited consolidated historical financial information on the Group for the three years ended 31 December 2015; and

Part IV-B Unaudited consolidated historical financial information on the Group for the three month period ended 31 March 2016.

As required by the TSX-V Rules and applicable Canadian securities laws and regulatory policies, the Company announces its results quarterly.

10 Current Trading, Future Prospects and Significant Trends

The Company does not currently generate any operating revenue and controls costs and expenses carefully. The Company's strategy is to delineate further and develop the rare earth mineralisation at the Songwe Hill REE Project and, in the longer-term, to secure additional REE and other mineral opportunities in Malawi and elsewhere.

11 Reasons for the Admission and the Placing

The Directors believe that the Admission to AIM will benefit the Company by:

- Providing further access to UK and European based retail and institutional investors who may be able to assist the Company fund its growth and development.
- Provide an opportunity to increase the liquidity of the Common Shares particularly in respect of investors who wish to trade in Common Shares when they are admitted to AIM but do not wish to, or are unable to invest in Common Shares listed on the TSX-V.
- Raising further the profile and awareness of the Company with the investing community.

12 Use of Proceeds

	£
Exploration costs	213,000
G&A	273,000
Admission costs	455,000
Other	59,000
Total	**1,000,000**

13 The Placing

The Placing Warrants will be issued to Placees pursuant to the terms of their respective Placing Warrant Certificate. The Placing Warrants are exercisable in where at any time up to the third anniversary of Admission (such exercise period will be subject to an early acceleration if the Common Shares trade above a 500 per cent. premium). The exercise price will be a 100 per cent. premium to the Placing Price. The Placing Warrants are not transferable further details of the Placing Warrants are set out in paragraph 14.4(f) of Part V of this document.

The Company is seeking to raise Gross Proceeds of £1 million by the issue of the Placing Shares at the Placing Price. Placees will be granted one Placing Warrant with each Placing Share for which each of SP Angel and Jub Capital has conditionally agreed, pursuant to the Placing Agreement and as agent for the Company, to use its reasonable endeavours to procure subscribers for the Placing Shares at the Placing Price. The Placing Shares are being placed with institutional and other investors. The Placing Shares will represent 42.65 per cent. of the Enlarged Share Capital at Admission. The Placing has not been underwritten and is conditional, *inter alia*, on Admission occurring by 15 June 2016 and in any event no later than 30 June 2016 and on the Placing Agreement not being terminated. The Placing Agreement contains certain warranties from the Company in favour of SP Angel and Jub Capital in relation, *inter alia*, to the accuracy of the information contained in this Document and certain matters relating to the Company. Further details of the Placing Agreement we set out in paragraph 14.4 of Part V of this Document.

14 Admission, settlement and dealings in Common Shares

The Common Shares are listed and traded on the TSX-V. Application has been made to the London Stock Exchange for the Company's entire issued and to be issued share capital to be admitted to trading on AIM. It is expected that Admission will be effective and that dealings in the Common Shares on AIM will commence on 15 June 2016.

CREST is a computerised paperless share transfer and settlement system which allows securities to be transferred by electronic means, without the need for a written instrument of transfer. Securities issued by non-UK companies cannot be held or traded in the CREST system. To enable investors to settle such securities through the CREST system, a Depositary or custodian can hold the relevant foreign securities and issues dematerialised Depositary Interests representing the underlying securities.

With effect from Admission, it will be possible for CREST members to hold and transfer interests in Common Shares of the Company within CREST pursuant to a Depositary Interest arrangement established by the Company with the Depositary. CREST is a voluntary system and holders of Common Shares who wish to remain outside CREST may do so and will have their details recorded on the Company's share register in accordance with applicable laws.

The Depositary will issue Depositary Interests in respect of the underlying Common Shares pursuant to the terms of the Deed Poll. Under the terms of the Deed Poll, the Depositary will hold as bare trustee all of the rights pertaining to the relevant underlying securities for the benefit of, and on behalf of, the Depositary Interest holder. Any rights or entitlements to cash distributions, to information to make choices and elections, and to attend and vote at general meetings shall be passed to the Depositary Interest holder by the Depositary. Under the Deed Poll, a Depositary Interest holder can cancel or transfer its Depositary Interests by giving instructions to the Depositary.

The Depositary Interests will be independent securities constituted under English law and will be held on a register maintained by the Depositary. Depositary Interests will have the same ISIN as the underlying Common Shares and do not require a separate admission to AIM.

Each Depositary Interest will be treated as one Common Share for the purposes of, for example, determining eligibility for dividend payments. Any payments received by the Depositary, as holder of the Common Shares, will be passed on to each Depositary Interest holder noted on the Depositary Interest register as the beneficial owner of the relevant Common Shares.

All Common Shares will remain admitted to trading on the TSX-V. Shareholders wishing to migrate their holdings of Common Shares between the TSX-V and AIM and vice versa can do so by contacting the Depositary.

Application has been made by the Depositary for Depositary Interests, which represent the underlying Common Shares, to be admitted to CREST on Admission. Further details are set out in paragraph 19 of Part V of this Document.

The issuance of the Placing Shares will be completed in reliance upon exemptions from the prospectus requirements of the securities legislation of the provinces and territories of Canada. Accordingly, any certificates issued representing the Placing Shares will include legends in accordance with applicable Canadian securities laws and regulatory policies, in addition to the TSX-V Rules, which shall state that unless permitted under securities legislation, the holder of such securities shall not trade them until the date that is four months and one day after the date of distribution thereof. Notwithstanding the imposition of such legends, such settlement restrictions in relation to the Placing Shares will not restrict the trading of Depositary Interests through CREST provided that certain conditions are satisfied in order for the Company to rely upon exemptions from the prospectus and registration requirements under the laws of the Province of Alberta. In particular, each of the following conditions must be satisfied:

(a) the Placing Shares are not sold to a purchaser resident in Canada;

(b) the Placee certifies in a placing letter to be provided by SP Angel and/or Jub Capital in connection with the Placing that the Placee is not resident in Canada and the Company does not believe, and has no reasonable grounds to believe, that the certification is false; and

(c) the Placee acknowledges and confirms in a placing letter to be provided by SP Angel and/or Jub Capital in connection with the Placing that it is not a resident of Canada and is not acquiring the Placing Shares with a view to reselling the Placing Shares, for a period of four months and one day from Admission to a resident of Canada.

The Placing Warrants are not transferable and will not be admitted to trading on AIM.

15 Lock-in and Orderly Market Agreements

Each of the Directors and Leominex has undertaken to the Company and SP Angel that, other than in certain limited circumstances, they will not dispose of any interest they hold in Common Shares for a period of 12 months following Admission and that for a further period of 12 months following the expiry of the initial 12 month period, they shall only dispose of an interest in Common Shares provided such disposal is approved by SP Angel and in such manner as SP Angel may reasonably require with a view to the maintenance of an orderly market in the Common Shares. Each Director and Leominex has similarly undertaken to use all reasonable endeavours to ensure that associated parties of the Directors (including controlled companies and family members) also comply with these restrictions.

Christopher Williams has also agreed to a 2 year orderly market arrangement pursuant to a Relationship agreement entered into with the Company, SP Angel and Jub Capital, details of which are set out in paragraph 14.4(e) of Part V.

16 Options and Existing Warrants

Following Admission and Consolidation, the Company will have or has committed to issue:

- 16,337,445 Existing Warrants; and
- 7,000,000 Options[1]

(1) At the date of the document, 49,012,353 warrants and 6,310,000 options are outstanding. The options will be cancelled prior to Admission and the Existing Warrants will be Consolidated. 7,000,000 new Options will be issued immediately prior to Admission.

Further details of the Existing Warrants and Options are set out at paragraph 5 and 12 of Part V of this Document.

17 Dividend policy

The Company does not plan to pay cash dividends on the Common Shares for the foreseeable future. The Board anticipates that the Company's financial resources will be utilised to finance the development of the Group's activities. The Board will, however, review periodically the Company's dividend policy.

18 Corporate governance

The Company is not required to comply with the provisions of the UK Corporate Governance Code. It is however subject to certain Canadian corporate governance requirements as set out below.

General

The Company is subject, among other laws and regulations, to instruments published by relevant Canadian securities regulators. One such instrument, NI 58-101, prescribes certain disclosure by the Company of its corporate governance practices and another, NP 58-201, provides non-prescriptive guidelines on corporate governance practices for reporting issuers such as the Company. This section sets out the Company's approach to corporate governance and addresses the Company's compliance with NI 58-101 and NP 58-201.

As a result of its listing on the TSX-V and being a reporting issuer in the Canadian province of Alberta, British Columbia, the Company has already established corporate governance practices and procedures appropriate for a publicly listed company of its size and stage.

In particular, the Company has established and properly constituted an Audit Committee and a Remuneration Committee. Pursuant to the BCA and the Company's current By-laws, not less than 25 per cent. of the members of each of these committees must be Canadian residents.

Board Structure

On Admission, the Board will consist of two executive Directors and four non-executive Directors of whom three (Derek Linfield, David Berg and Eugene Chen) are considered by the Board to be independent. The Chairman is responsible for leadership of the Board and for the efficient conduct of the Board's function. The Chairman is expected to encourage the effective contribution of all Directors and promote constructive and respectful relations between Directors and senior management. The Directors believe that they have sufficient experience in implementing accounting systems and controls which will provide a reasonable basis for them to make proper judgements as to the financial position and prospects of the Company.

Audit Committee

The Company's audit committee comprises of Eugene Chen and Adrian Reynolds with David Berg appointed as chairman. The audit committee is to meet at such time as shall be determined by the audit committee and consider the integrity of the financial statements of the Company, including its annual and interim accounts; the effectiveness of the Company's internal controls and risk management systems; auditor reports; and terms of appointment and remuneration for the auditor.

Remuneration Committee

The Company's remuneration committee comprises of David Berg, Derek Linfield and Adrian Reynolds with Eugene Chen appointed as Chairman. The remuneration committee is to meet at such times as shall be determined by the remuneration committee and has as its remit the determination and review of, amongst others, the remuneration of executives on the Board and any benefit plans of the Company.

Nominations Committee

The Company considers that, at this this stage in its development, it is not necessary to establish a formal nominations committee. This decision will be kept under review by the Directors on an on-going basis.

Share Dealing Policy

The Company currently operates an insider trading and confidential information policy in respect of its listing on the TSX-V which applies to the Directors, officers and certain employees of the Company. The Company has adopted, with effect from Admission, a revised share dealing policy regulating trading and confidentiality of inside information for the Directors and other persons discharging managerial responsibilities which contains provisions appropriate for a company whose shares are admitted to trading on AIM (particularly relating to dealing during close periods, will be in line with the Market Abuse Regulation 596/2014 EU which will apply as from 3 July 2016). The Company will take all reasonable steps to ensure compliance by the Directors and any relevant employees with such policy.

Investor Relations

Where possible, the Company meets with and makes presentations to Shareholders. The annual general meeting is normally attended by senior management and the Directors, and Shareholders are invited to ask questions during the meeting and to meet with senior management and the Directors after the formal proceedings have ended. The Company maintains a corporate website at www.mkango.ca, which contains a wide range of information about the Company and its business. The website is updated with all formal communications to the investment community following their release through a regulatory news service. It is intended that with effect from Admission, the website will comply with the requirements of Rule 26 of the AIM Rules. In line with the continuous disclosure requirements in Canada, as a reporting issuer the Company is required to maintain and file certain documents on SEDAR at www.sedar.com.

Share Issues

Whilst the Company is not required under Canadian law to offer new Common Shares to existing Shareholders on a pre-emptive basis, as is required of companies incorporated under the UK Companies Act, the Company is subject to a number of anti-dilution provisions under the rules of the TSX-V. Should the Company cease to be listed on the TSX-V, the Company has undertaken pursuant to the nominated adviser and broker agreement, details of which are set out in paragraph 14.4(a) of Part V to SP Angel to adopt appropriate anti-dilution provisions for as long as the Company remains on AIM.

19 Canadian Takeover Law

Although the Common Shares will be admitted to trading on AIM, the Company will not be subject to takeover regulation in the UK and the City Code will not apply to the Company. However, Canadian laws applicable to the Company provide for early warning disclosure requirements and for takeover bid rules for bids made to security holders in various jurisdictions in Canada, a summary of which is set out below.

In Canada, securities laws are a matter of provincial/territorial jurisdiction and, as a result, bids are governed by applicable corporate and securities legislation in each province or territory in addition to policy and instruments implemented by Canadian Securities Administrators.

Under the laws of the Provinces of Alberta and British Columbia, the jurisdictions in Canada in which the Company is a reporting issuer (as defined under provincial securities law), when any person (an "acquiror") acquires, except pursuant to a formal take-over bid, beneficial ownership of, or control or direction over, voting or equity securities of any class of a reporting issuer or securities convertible into voting or equity securities of any class of a reporting issuer, that, together with such acquiror's securities of that class, constitute 10 per cent. or more of the outstanding securities of that class, such acquiror must promptly, and, in any event, no later than the opening of trading on the business day following the acquisition, issue and file a news release announcing the acquisition and containing the information required by applicable securities laws. The acquiror must also promptly, and, in any event, no later than two business days from the date of the acquisition file a report of such acquisition containing the information required by applicable securities laws with the applicable securities regulatory authorities. Once an acquiror has filed such report, the acquiror is required to issue further press releases and file further reports each time that the acquiror, or any person acting jointly or in concert with the acquiror, acquires or disposes beneficial ownership of, or acquires or ceases to have control or direction over securities, or securities convertible into, in an amount equal two per cent. or more of the outstanding securities that was the subject of the most recent report required to be filed by the acquiror under these provisions or if there is a change in any other material fact set out in the most recent report required to be filed under these provisions. Certain institutional investors may elect an alternative monthly reporting system, so long as they are not otherwise disqualified.

In Alberta and British Columbia and other Canadian jurisdictions, a take-over bid is generally defined as an offer to acquire outstanding voting or equity securities of a class made to any holder in the jurisdiction of securities subject to the offer to acquire, if the securities subject to the offer to acquire, together with securities held by the offeror and any person acting jointly or in concert with the offeror, constitute in aggregate 20 per cent. or more of the outstanding securities of that class of securities at the date of the offer to acquire. Subject to limited exemptions, a take-over bid must generally be made to all holders of securities of the class that is subject to the bid who are in the jurisdiction and must allow such security holders at least 35 days to accept the bid. Unless exemptions are available, the offeror must deliver to the security holders a takeover bid circular (in prescribed form) which describes the terms of the take-over bid and the Directors of the reporting issuer must deliver a Directors' circular not later than 15 days after the date of the bid, either making or declining to make a recommendation to security holders to accept or reject the bid and the reasons for their making or not making a recommendation. Whilst provincial securities laws in Canada only regulate offers to residents of the particular province, the Canadian Securities Administrators have adopted a policy whereby they may issue a cease trade order against a company if a takeover bid is not made to all Canadian security holders. It should be noted that one exemption from the aforementioned provisions is in the case of a "foreign take-over bid". Such an exemption may be available where (among other criteria):

(a) security holders whose last address as shown on the books of the offeree issuer is in Canada hold less than 10 per cent. of the outstanding securities of the class subject to the bid at the commencement of the bid;

(b) the offeror reasonably believes that security holders in Canada beneficially own less than 10 per cent. of the outstanding securities of the class subject to the bid at the commencement of the bid;

(c) the published market on which the greatest volume of trading in securities of that class occurred during the 12 months immediately preceding the commencement of the bid was not in Canada;

(d) security holders in the local jurisdiction are entitled to participate in the bid on terms at least as favourable as the terms that apply to the general body of security holders of the same class; and

(e) at the same time as material relating to the bid is sent by or on behalf of the offeror to security holders of the class that is subject to the bid, the material is filed and sent to security holders whose last address as shown on the books of the offeree issuer is in the local jurisdiction. For a complete description of the foreign take-over bid exemption, readers are referenced to Multilateral Instrument 62–104 – Take-over Bids and Issuer Bids, issued by the Canadian Securities Administrators.

20 Rule 17 of the AIM Rules

When acquiring shares in the Company, Shareholders are entitled under Canadian securities laws to categorise themselves as "objecting" ("Obos") or "non-objecting" ("Nobos"). By registering as such, which they usually do through the entity through which they acquired their shares, Obos are noting that they object to their interest and their details being disclosed to the Company, in respect of interests up to 10 per cent. of the issued share capital of the Company after which level Canadian securities law makes disclosure mandatory. Nobos on the other hand are noting the fact that they do not object to their shareholdings and their details being disclosed to the Company.

Rule 17 of the AIM Rules requires, *inter alia*, that an AIM quoted company must notify the market of any changes of which it is aware to its Shareholders' interests in three per cent. or more of the Common Shares and changes thereto (of any movements through a percentage point upwards or downwards). The Shareholders approved on 19 November 2015 a resolution, effective from Admission, to change the Company's constitution to require that Shareholders holding interests in three per cent. or more of the Company's Common Shares inform the Company thereof and to inform the Company of relevant subsequent changes thereto.

21 Taxation

Details of certain UK and Canadian taxation implications which may be relevant to holding or dealing in Common Shares are set out in paragraphs 5, 8 and 9 of Part V of this Document. These details are intended as a general guide to the current tax position under UK and Canadian taxation law. If you are in any doubt of your tax position you should consult your own tax adviser.

22 Additional Information

Prospective investors should read the whole of this Document, which provides additional information on the Company and should not rely on summaries or individual parts only. In particular, the attention of prospective investors is drawn to Part II of this Document which contains certain risk factors relating to any investment in the Common Shares and Part III of this Document which contains a copy of the Competent Person's Report.

PART II

RISK FACTORS

This Document contains forward-looking statements, which have been made after due and careful enquiry and are based on the Board's current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in such statements. These forward-looking statements are subject to, *inter alia*, the risk factors described in this Part II of the Document. The Directors believe that the expectations reflected in these statements are reasonable, but may be affected by a number of variables which could cause actual results or trends to differ materially. Each forward-looking statement speaks only as of the date of the particular statement.

Factors that might cause a difference include, but are not limited to, those discussed in this Part II of this Document. Given these uncertainties, prospective investors are cautioned not to place any undue reliance on such forward-looking statements. The Company disclaims any obligation to update any such forward-looking statements in this Document to reflect future events or developments.

There are significant risks associated with the Company. Prior to making an investment decision in respect of the Common Shares, prospective investors and Shareholders (as appropriate) should consider carefully all of the information within this Document, including the following risk factors. The Board believes the following risks to be the most significant for potential investors. However, the risks listed do not necessarily comprise all those associated with an investment in the Company. In particular, the Company's performance may be affected by changes in market or economic conditions and in legal, regulatory or tax requirements or a combination of these factors. The risks listed are not set out in any particular order of priority. Additionally, there may be risks not mentioned in this Document of which the Board is not aware or believes to be immaterial but which may, in the future, adversely affect the Company's business and the market price of the Common Shares.

If any of the following risks were to materialise, the Company's business, financial condition, results or future operations could be materially and adversely affected. In such cases, the market price of the Common Shares could decline and an investor may lose part or all of his investment. Additional risks and uncertainties not presently known to the Board, or which the Board currently deems immaterial, may also have an adverse effect upon the Company and the information set out below does not purport to be an exhaustive summary of the risks affecting the Company.

Before making a final investment decision, prospective investors should consider carefully whether an investment in the Company is suitable for them and, if they are in any doubt should consult with an independent financial adviser authorised under FSMA which specialises in advising on the acquisition of shares and other securities.

1. Risks relating to the Group's industry and its activities

Limited operating history

The Group is currently at an early stage of development in relation to its mining activities in Malawi, with operating losses expected to be incurred for the foreseeable future. The Group currently has no cash producing properties and therefore, no positive cash flow and the Group has earned no income or profit to date, and there is no assurance that it will do so in the future or that it will be successful in achieving a return on Shareholders' investment. The Group's ultimate success will depend on its ability to raise capital for the Group to further its exploration activities in order to reach the production stage and, if appropriate, search for and develop new mineral deposits and ultimately generate cash flow in the future. The Company recognises that significant capital investment is required in order to achieve commercial production. The Company anticipates it will continue to have negative cash flow from operating activities in future periods until commercial production is achieved at its projects.

Early stage of development

The Group's operations are at an early stage of development and future success will depend on the Group's ability to manage the Songwe Hill REE Project in Malawi and to take advantage of further opportunities that may arise, and on future rare earth prices. In particular, the Group's success is dependent upon the Directors' ability to implement the Group's strategy and to further develop the Project's rare earth deposit by commencing and maintaining production at the site.

Whilst the Directors are optimistic about the Group's prospects and its ability to reach the production stage of Project, there is no certainty that anticipated outcomes and sustainable revenue streams will be achieved. The Group will not generate income until it has successfully achieved the commercial production stage.

There can be no guarantee that the Group can or will be able develop past the current stage of the Project. Future development could be delayed or could experience interruptions or increased costs or may not be completed at all due to a number of factors, including:

- the market prices of the REEs relevant to the Project not being at sufficient levels to justify economic development of the Project at the time of the construction decision or at the time of future financings;
- delays in obtaining or an inability to obtain, or conditions imposed by, regulatory approvals;
- non-performance by third party contractors;
- inability to attract a sufficient number of qualified workers at the project;
- change in environmental compliance requirements;
- unfavourable weather conditions;
- contractor or operator errors;
- lack of availability of finance for further development of the Group's project and future mining sites and projects including those with which the Group has obtained EPL;
- lack of availability of infrastructure capacity;
- increases in extraction costs including plan, material and labour costs;
- lack of availability of mining equipment and other exploration services;
- catastrophic events such as fires, stores or explosions;
- the breakdown or failure of equipment or processes;
- construction, procurement and/or performance of the processing plant and ancillary operations falling below expected levels of output or efficiency;
- violation of permit requirements;
- the inability to further extend the Phalombe Licence past its current expiry date in 2017;
- the inability to obtain a full Mining Licence and enter favourable negotiations, or reach a commercially viable agreement with the Malawian Government;
- the lack of progress with respect to the development of extraction technologies;
- the political stability of Malawi; and
- taxes and imposed royalties.

Some of the risks associated with these factors are discussed further below. There can be no assurance that the Group will complete the various stages of development necessary in order to achieve its strategy in the timeframe pre-determined by the Company or at all. If the Group experiences significant time delays, materially changes its strategy or if the Group's envisioned costs exceed original budgets, any of these factors may have a material adverse effect on the Group's business, results of operations and activities, financial condition and prospects.

Exploration, development and operating risks

Whilst the Group has undertaken careful evaluation and has used the Directors knowledge and experience to mitigate risks, mineral development always involves significant risks which cannot always be eliminated or foreseen. There is no guarantee that development work on the Group's assets or any additional properties acquired by the Group in the future, will result in their economic exploitation. It is impossible to ensure that the Group's existing projects will result in profitable commercial mining operations. Additionally, the Company cannot guarantee that the tonnages and grades estimated for the projects outlined in this Document are achievable. Whether the Songwe Hill REE Project will be commercially viable will depend on a number of factors including but not limited to; the particular attributes of the material excavated from any future mine located at the project; the performance of the full-scale commercial production operations; the end prices that can be achieved from the REE's relevant to Mkango's production mix offered to customers which may be volatile and exposed to risks and external factors outside of the Group's control (the fluctuations risks in commodity prices is outlined in more detail below); government regulations, including regulations relating to prices, taxes, royalties, land use, importing and exporting of minerals and environmental production.

Costs outlined in the Competent Person's Report are based on certain assumptions with respect to the method and timing of development. These estimates are subject to significant uncertainty and the actual costs may differ materially. Accordingly, no assurance can be given that the cost estimates and underlying assumptions will be realised, which may materially and adversely affect the Group's viability. Whilst the Directors are of the opinion that the results of the Pre-Feasibility Study are encouraging, the performance, yields, operating costs and capital costs of the full scale mineral production plant may differ materially from expectations and the economic returns from processing the extracted ore into commercially saleable Neodymium, Dysprosium, Praseodymium, Europium, Terbium and Yttrium may be lower than anticipated. The exact effect of these factors cannot be accurately predicted, but the combination of these factors may result in the Company not receiving an adequate return on invested capital.

Risks and hazards inherent in the Mining Industry

Mining operations generally involve a high degree of risk. The Group's operations are and will continue to be subject to all the hazards and risks normally incidental to exploring, evaluating, developing and exploiting the production of mineral commodities. Whilst the Group has taken and will continue to take all precautions necessary to minimise risk, the Group's operations will be exposed to hazards including, but not limited to; environmental hazards, periodic interruptions due to bad or hazardous weather conditions, unusual or unexpected geologic formations or other geological or grade problems, unanticipated changes in metallurgical characteristics and mineral recovery, difficulties in commissioning and operating plant and equipment, mechanical failure or plant breakdown, unexpected shortages or increases in the cost of consumables, spare parts, plant and equipment, industrial disputes, seismic activity, rock bursts, cave-ins, flooding, fire, equipment failure, pit wall failure and other conditions involved in the drilling and mining of material. There are also physical risks to the personnel working in Malawi, often in varying climate conditions. Should any of these hazards or risk adversely affect the Group's operations or activities it may cause an increase in the cost of operations to the point where it is no longer economically feasible to continue, it may require the Group to write down the carrying value of one or more mines or projects. It may also cause work stoppages, damage to, or destruction of the Group's facilities, personal injury, damage to life or property, environmental damage or pollution, business interruption, monetary losses and possible legal liability which could have a material adverse impact on the business, operations and financial performance of the Group. The Group may become subject to liability for pollution or other hazards against which it has not insured or cannot insure, including those in respect of past mining activities for which it was not responsible. All of these hazards or risks may have a material adverse effect on the Group's financial condition, results of operations and future cash flows and could have an adverse effect on the value of the securities of the Company.

Should any of these hazards or risk adversely affect the Group's operations or activities it may cause an increase in the cost of operations to the point where it is no longer economically feasible to continue, it may require the Group to write down the carrying value of one or more mines or Projects.

Mineral rights and Licences and uncertainty of acquiring or extending the necessary Mining Licence, Permit and Access Rights in Malawi

The Group's existing projects are located in Malawi and are therefore subject to the laws of Malawi. The Group has secured two EPLs which are required for its current projects including the Songwe Hill REE Project. Government concessions, approvals, licences and permits are, as a practical matter, subject to the discretion of the applicable governments or governmental offices. These rights, concessions and any others acquired in the future, are subject to requirements, including certain financial commitments which, if not fulfilled, could result in the suspension or ultimate forfeiture of the relevant rights, concessions or licences. The Group must also comply with existing standards, laws and regulations that may result in the Group incurring greater costs and/or suffering delays, depending on the nature of the activity to be permitted and the permitting authority.

Failure by the Group to acquire and retain the necessary mining and environmental concessions, licences and permits or government consent, revocation of an existing concession or permit, failure to renew a concession, licence or permit or failure to obtain a concession, licence or permit that is required to move from one stage of the industry cycle to another could have a material adverse effect on the Group's financial performance and may lead to a reduction in the carrying value of assets and may jeopardise the viability of the projects. Where the Group fails to comply with its work programme, expenditure commitments including the minimum expenditure requirements outlined in the relevant Malawian legilsation or other obligations in respect of any such concessions, licences or permits, then the said concession, licence or permit may be lost, forfeited or not renewed by the grantor, or the relevant surface area may be reduced.

Maintenance of Company's concessions

The licences set out certain minimum spending commitments and whilst the Directors are satisfied that these commitments have been met, such opinion being supported by the recent renewal of the licences, it is unclear exactly what spending would be considered to be made to satisfy the minimum commitment.

Future Applications

The Group will need to obtain a Mining Licence prior to commencing commercial production of its existing projects. The Group will also be required to obtain further environmental and technical permits for the construction and development of its commercial operations. There is a risk that these further permits and licences may not be granted which would have a significant material adverse effect on the viability of the Group.

In addition, the granting of such approvals and consent may be withheld for lengthy periods or granted subject to satisfaction of certain conditions which the Group cannot or may consider impractical or uneconomic to meet. The result of which may result in the delay or inability to exploit its projects further and the Group may incur additional costs of losses.

The Group has successfully renewed both of the Licences and the Malawian authorities have thus far been cooperative in granting extensions. However, the Company is only entitled to renew the Licences twice, which it now has done in respect of both Licences. Prior to the end of the current Phalombe Licence the company plans to seek a Mining Licence. The Thambani Licence is at an earlier stage of development and a decision will be made at a later stage on development of this property. Whilst the Malawian Government has discretion to further extend the Licences in exceptional circumstances (should the Company decide it wishes to continue with EPLs instead of proceeding to obtain a Mining Licence), there is no guarantee that it will do so, or if it does, upon what terms the further extensions may be granted.

Commercial production of the Group's projects are dependent upon the Group successfully securing a full Mining Licence from the Malawian Government. At present, only one other mining company in Malawi has secured a full Mining Licence from the Malawian Government and thereby brought a mine into the full production stage.

While the Directors believe that there is minimal risk of the Group not being granted a Mining Licence in respect of its existing projects there can be no guarantees in this regard.

Obtaining a full Mining Licence in Malawi is further dependent upon an applicant entering into negotiations with the Malawian Government in respect of royalties and taxes. There is no guarantee that the Group will be able to secure a favourable agreement with the Government that would secure a commercially viable prospect.

The Group may experience regulatory, consent or permitting delays

The business of mineral exploration, project development, mining and processing is subject to various national and local laws and plans relating to, amongst others, permitting and maintenance of title; environmental consents; taxation; employee relations; heritage or historic matters; health and safety; royalties; land acquisition and other matters.

Although the Board believe that the Group will be well placed to have all of its permits issued in relation to its material assets, there is a risk that the necessary concessions, permits, licences, consents, titles, authorisations and agreements to implement planned exploration, project development, or mining may not be obtained or renewed under conditions or within time frames that make such plans economic, that applicable laws, regulations or the governing authorities will change or that such changes will result in additional material expenditures or time delays.

Title matters

Whilst the Group is satisfied that it has taken reasonable measures to ensure an unencumbered right to explore its licence areas in Malawi, the licences may be subject to undetected defects. If a defect does exist, it is possible that the Group may lose all or part of its interest in one or more of the licences to which the defect relates and its exploration of the licence areas and prospects of commercial production may accordingly be adversely affected. Moreover, operating licences in the jurisdiction of Malawi pose significantly greater risks in respect of legal, economic and political than in other more developed and politically stable jurisdictions.

Whilst the Group has no reason to believe that the existence and extent of any of its licences are in doubt, title to the Mineral Reserves could be subject to potential litigation by third parties claiming an interest in them.

The failure to comply with all applicable laws and regulations, including failure to pay taxes, meet minimum expenditure requirements or carry out and report assessment work may invalidate title to mineral rights held by the Group.

There is no assurance the Group will be able to sustain and expand Mineral Resources

The life of a mining operation is limited to its Mineral Resources. The Group's ability to commence, maintain or increase its annual production of iron ore in the future will be dependent in significant part on its ability to bring its projects into production.

Many factors are involved in the determination of the economic viability of a deposit including the achievement of satisfactory Mineral Resource estimates, the level of estimated metallurgical recoveries, capital and operating cost estimates and the estimate of future iron ore prices. Capital and operating cost estimates are based upon many factors, including anticipated tonnage and grades of REO to be mined and processed, the configuration of the REO body, ground and mining conditions, expected recovery rates of the REO and anticipated environmental and regulatory compliance costs. Each of these factors involves uncertainties and as a result the Company cannot give assurance that the Group's development or exploration projects will become operating mines. If a mine is developed, actual operating results may differ from those anticipated, thereby impacting on the economic viability of the project.

Uncertainty associated with Mineral Resource estimates

The estimation of Mineral Resources is a subjective process and involves a certain degree of supposition and the accuracy of these estimates is a function of the quality and quantity of available data and the assumptions used and judgements made in interpreting information. Mineral Resource estimates are therefore uncertain and may not be representative. There are numerous uncertainties inherent in any resource estimate and the assumptions used or judgements made may prove to be inaccurate; the economic viability of mining may differ materially from the Group's estimates. As further information becomes available through additional field work and analysis, the estimates are likely to change. This may result in alterations to development and mining plans, which may in turn adversely affect the financial position of the Group. The Group cannot give any assurance that the estimated Mineral Resources will be recovered if the Company proceeds to production. Furthermore, no assurance can be given that the anticipated tonnages and grades will be achieved, that the indicated level of recovery will be realised or that Mineral Resources can be mined or processed profitably. Actual resources may not conform to geological, metallurgical or other expectations and the volume and grade of ore recovered may be below or above the estimated levels.

Commodity prices

The ultimate profitability of the Group's operations will be dependent upon the market price of the products able to be sold by the Group. Mineral prices fluctuate widely and are affected by numerous factors beyond the control of the Company. General economic factors as well as the world supply of mineral commodities, the stability of exchange rates and political developments can all cause significant fluctuations in prices. The price of mineral commodities has fluctuated widely in recent years and future price declines could cause commercial production to be impracticable, thereby having a material adverse effect on the Group's business, financial condition and results of operations. Moreover, reserve estimates and Feasibility studies using different commodity prices than the prevailing market price could result in material write-downs of the Group's investment in its assets and even a reassessment of the feasibility of the Project which could result in putting the Project on care and maintenance and slowing down operations until a change in the commodity prices.

Lower market prices, increased production costs, reduced recovery rates and other factors therefore may render the Group's resources uneconomic to exploit and may result in revision of its resource estimates from time to time. Resource data is not indicative of future results of operations. If the Group's actual minerals resources are less than current estimates, the Group's results of operation and financial condition may be materially impaired.

Estimates in financial statements

Preparation of consolidated financial statements will require the Group to use estimates and assumptions. Accounting for estimates will require the Group to use its judgement to determine the amount to be recorded on its financial statements in connection with these estimates. In addition, the carrying amounts of certain assets and liabilities are often determined based on estimates and assumptions of future events. If the estimates and assumptions are inaccurate, the Group could be required to write down the value of certain assets. On an ongoing basis, the Group will re-evaluate its estimates and assumptions. However, the actual amounts could differ from those based on estimates and assumptions.

Changes in capital and operating costs

Changes in the Group's capital costs and operating costs are likely to have an impact on its profitability. The Group's main planned production expenses include mining costs, transport costs, treatment costs and other overheads. Changes in costs of the Group's mining and processing operations can occur as a result of unforeseen events and could result in changes in profitability or resource estimates, including rendering certain Mineral Resources uneconomic to mine. Many of these changes may be beyond the Group's control.

Project development risks

There can be no assurance that the Group will be able to manage effectively the expansion of its operations or that the Group's personnel, systems, procedures and controls on Admission will be adequate to support the Group's operations. This includes, *inter alia*, the Group managing the acquisition of required land tenure, infrastructure development and other related issues affecting local and indigenous populations, their cultures and religions. Any failure of the Board to manage effectively the Group's growth and development could have a material adverse effect on its business, financial condition and prospects. There is no certainty that all or, indeed, any of the elements of the Board's strategy will develop as anticipated. The Group's profitability will depend, in part, on the actual economic returns and the actual costs of developing the Project, which may differ significantly from the Group's current estimates. The development of the Group's Project may be subject to unexpected problems and delays.

Dependence on third party services

The Group will rely on products and services provided by third parties. If there is any interruption to the products or services provided by such third parties the Group may be unable to find adequate replacement services on a timely basis or at all.

The Group is unable to predict the risk of insolvency or other managerial failure by any of the contractors or other service providers currently or in the future used by the Group in its activities. Any of the foregoing may have a material adverse effect on the results of operations or the financial condition of the Group. In addition, the termination of these arrangements, if not replaced on similar terms, could have a material adverse effect on the results of operations or the financial condition of the Group.

External contractors and sub-contractors

When the world mining industry is buoyant there is increased competition for the services of suitably qualified and/or experienced sub-contractors, such as mining and drilling contractors, assay laboratories, metallurgical test work facilities and other providers of engineering, project management and mineral processing services.

As a result, the Group may experience difficulties in sourcing and retaining the services of suitably qualified and/or experienced sub-contractors. The loss or diminution in the services of suitably qualified and/or experienced sub-contractors or an inability to source or retain necessary sub-contractors or their failure to properly perform their services could have a material and adverse effect on the Group's business, results of operations, financial condition and prospects.

Transportation delays

Unusual or infrequent weather phenomena, sabotage, government or other interference in the maintenance or provision of such infrastructure could adversely affect the Group's operations, financial condition and results of operations. Any such issues arising in respect of the supporting infrastructure or on the Group's site could materially and adversely affect the Group's results of operations or financial condition. Furthermore, any failure or unavailability of the Group's operational infrastructure (for example, through equipment failure or disruption to its transportation arrangements) could adversely affect the production.

Infrastructure

Development of the Project depend to a significant degree on adequate infrastructure. In the course of developing its operations the Group may need to construct and support the construction of infrastructure, which includes, permanent water supplies, power, transport and logistics services which affect capital and operating costs. Unusual or infrequent weather phenomena, sabotage, government or other interference in the maintenance or provision of such infrastructure or any failure or unavailability in such infrastructure could materially adversely affect the Group's operations, financial condition and results of operations.

Uninsured Hazards

The Group may be subject to substantial liability claims due to the inherently hazardous nature of its activities or for acts and omissions of contractors, sub-contractors or operators. Any indemnities the Group may receive from such parties may be limited or may be difficult to enforce if such contractors or sub-contractors or operators lack adequate resources.

The Group can give no assurance that the proceeds of insurance applicable to covered risks will be adequate to cover expenses relating to losses or liabilities. Accordingly, the Group may suffer material losses from uninsurable or uninsured risks of insufficient insurance coverage. The Group is also subject to the risk of unavailability, increased premiums or deductibles, reduced cover and additional or expanded exclusions in connection with its insurance policies and those of operators of assets it does not itself operate.

Reliance on Directors and management team

The success of the Group will be highly dependent on the expertise and experience of its Directors and senior management. The loss of any key personnel could harm the business or cause delay in the plans of the Group whilst management time is directed to finding suitable replacements. In particular, the Group relies heavily on the experience of its Directors in developing and maintaining important relationships with governmental and regulatory authorities in Malawi. The Group's business therefore may be negatively affected by the failure to attract, or the departure of, any of these individuals, or any of a number of other key employees. There can be no guarantee that the Group will be able to continue to attract and retain required employees. The Company has entered into consulting arrangements with William Dawes and Alexander Lemon to secure their services, terminable on 30 days notice and as such the Company cannot guarantee the retention of such Directors.

The loss or diminution in the services of any of the Directors or any member of the management team or an inability to recruit, attract, train and/or retain necessary personnel with the requisite expertise and experience could have a material and adverse effect on the Group's business, results of operations, financial condition and prospects.

Workforce and labour risks

Certain of the Group's operations may be carried out under potentially hazardous conditions. Whilst the Group intends to operate in accordance with relevant health and safety regulations and requirements, the Group remains susceptible to the possibility that liabilities might arise as a result of accidents or other workforce-related misfortunes, some of which may be uninsurable or beyond the Group's control.

The Group may be unable to source personnel and equipment to meet its objectives, which could affect the Group's development schedule and financial position.

The Group's operations may be affected by labour-related problems in the future, such as union demands and litigation for pay rises and increased benefits. There can be no assurance that work stoppages or other labour-related developments (including the introduction of new labour regulations in Malawi) will not adversely affect the results of operations or the financial condition of the Group.

Environmental, health and safety and other regulatory standards

The Group's operations are subject to various laws and regulations relating to the protection of the environment (including regular environmental impact assessments and the obtaining of appropriate permits or approvals by relevant environmental authorities).The Group is also required to comply with applicable health and safety and other regulatory standards. Environmental legislation in particular can, in certain jurisdictions, comprise numerous regulations which might conflict with one another and which cannot be consistently interpreted. Such regulations typically cover a wide variety of matters including, without limitation, prevention of waste, pollution and protection of the environment, labour regulations and worker safety. The Group may also be subject under such regulations to clean-up costs and liability for toxic or hazardous substances which may exist on or under any of its properties or which may be produced as a result of its operations. The Directors intends that the Group will operate in accordance with the highest standards of environmental practice and comply in all material respects with applicable environmental laws and regulations however full compliance may not always be ensured.

Any failure to comply with relevant environmental, health and safety and other regulatory standards may subject the Group to extensive liability and fines and/or penalties and have an adverse effect on the business and operations, financial results or financial position of the Group. In particular, a violation of health and safety laws relating to a mine, or other plant or a failure to comply with the instructions of the relevant health and safety authorities could lead to, among other things, a temporary shutdown of all or a portion of the mine, or other plant, a loss of the right to mine or to use other plant, or the imposition of costly compliance procedures. If health and safety authorities require the Group to shut down all or a portion of a mine, or other plant or to implement costly compliance measures, whether pursuant to existing or new health and safety laws and regulations, such measures could have a material adverse effect on the Group's results or operations or financial condition. Furthermore, the future introduction or enactment of new laws, guidelines and regulations could serve to limit or curtail the growth and development of the Group's business or have an otherwise negative impact on its operations. Any changes to, or increases in the current level of regulation or legal requirements may have a material adverse effect upon the Group in terms of additional compliance costs.

Mining operations have inherent risks and liabilities associated with pollution of the environment and the disposal of waste products occurring as a result of mineral exploration and production. Laws and regulations involving the protection and remediation of the environment and the governmental policies for implementation of such laws and regulations are constantly changing and are generally becoming more restrictive. Although the Board believe that the Group will be in compliance in all material respects with applicable environmental laws and regulations and will hold all necessary approvals and permits under those laws and regulations by the time operations commence, there are certain risks inherent in the Group's activities and those which it anticipates undertaking in the future, such as, but not limited to, risks of accidental spills, leakages or other unforeseen circumstances, that could subject the Group to potential liability. The Company therefore cannot give any assurance that, notwithstanding its precautions, breaches of environmental laws (whether inadvertent or not) or environmental pollution will not materially and adversely affect its financial condition and its results from operations.

Sovereign risks

The Group may be adversely affected by changes in economic, political, judicial, administrative, taxation or other regulatory factors in Malawi, in Canada, in the UK or elsewhere. These risks and uncertainties include, but are not limited to: inflation; labour unrest; risk of war or civil unrest; expropriation and nationalisation; renegotiations or nullification of existing concessions, permits and contracts; illegal mining; changes in taxation policy; restrictions on foreign exchange and repatriation; terrorist activities; extreme fluctuations in currency exchange rates and changing political conditions, currency controls and government regulations that favour or require the awarding of contracts to local contractors or require foreign contractors to employ citizens of, or purchase supplies from, a particular jurisdiction.

No assurance can be given regarding the future stability of any countries in which the Group chooses to operate.

Retention of key business relationships

The Group will rely significantly on strategic relationships with other entities, on good relationships with regulatory and governmental departments and upon third parties to provide essential contracting services. There can be no assurance that its existing relationships will continue to be maintained or that new ones will be successfully formed, and the Group could be adversely affected by changes to such relationships or difficulties in forming new ones.

Risks associated with the need to maintain an effective system of internal controls

The Group's future growth and prospects will depend on its ability to manage growth and to continue to maintain, expand and improve operational, financial and management information systems on a timely basis, whilst at the same time maintaining effective cost controls. Any damage to, failure of or inability to maintain, expand and upgrade effective operational, financial and management information systems and internal controls in line with the Group's growth could have a material adverse effect on the Group's business, financial condition and results of operations.

General economic climate and political risk

The proposed operations of the Group will be in a foreign jurisdiction where there may be a number of associated risks over which it will have no control and which may affect its operations, business and profitability. These may include general economic, social or political instability or change, global or regional political events and international events, the supply and demand of capital, growth in gross domestic product, employment trends and industrial disruption, international economic trends, terrorism, hyperinflation, currency non-convertibility or instability/fluctuations, changes of laws affecting foreign ownership, government participation and monetary policies, taxation, working conditions, rates of exchange, exchange control, the level of interest rates and the rate of inflation, exploration and other licensing approvals. All such factors, as well as a range of other market forces, have a significant influence on demand, business costs, stock market prices and the outlook for projects and companies and the actual and potential returns to investors.

Further funding requirements

Whilst the Board are of the opinion that the proceeds of the Placing and consequent working capital will be sufficient for at least the 12 months following Admission and to implement the Company's strategy going forward, the Company will need to raise additional funds in order to fulfill its stated objectives. Further operations will require additional capital and will ultimately depend on the Company's ability to obtaining financing through debt, equity or other means. The Company's ability to meet obligations and to maintain operations is therefore contingent upon successful completion of additional financing arrangements. There is no guarantee that the prevailing market at that time will allow for such a raising or that new investors will be prepared to subscribe for Common Shares at or above the Placing Price. Any additional funding will dilute shareholdings and debt financing, if available, may involve restrictions on financing and operating activities. Failure to obtain additional funding on acceptable terms, or at all, could have a material adverse effect on the financial condition and prospects of the Group.

The competitive environment

The mining industry is intensely competitive in all of its phases. A number of other mining companies may seek to establish themselves in countries in which the Group operates and have already, or may be allowed to, tender for exploration and mining permits and other services, supplies or contracts, thereby providing competition to the Group. The Group will compete with numerous other local and international companies and individuals, including larger competitors with access to greater financial, technical and other resources than the Group, which may give them a competitive advantage in the exploration for and commercial exploitation of attractive properties. In addition, actual or potential competitors may be strengthened through the acquisition of additional assets and interests and competition could adversely affect the Group's ability to acquire suitable additional properties in the future.

The Group's success will depend on its ability to develop the Project and in addition, select and acquire exploration and development rights on properties and there can be no assurance that the Group will continue to be able to compete successfully with its rivals.

Market perception

Market perception of smaller extraction companies, as well as all mining companies, in general, may change which could impact on the value of investors' holdings and the ability of the Group to raise further funds through the issue of further Common Shares in the Company or otherwise.

Exposure to economic cycle

Market conditions may affect the value of the Group's share price regardless of operating performance. The Group could be affected by unforeseen events outside its control including economic and political events and trends, inflation and deflation, terrorist attacks or current exchange fluctuation. The combined effect of these factors is difficult to predict and an investment in the Group could be adversely affected by changes in economic, political, administrative, taxation or other regulatory factors in any jurisdiction in which the Group may operate.

Insurance coverage and uninsured risks

The Group plans to insure its operations in accordance with industry practice and the Group's needs and circumstances and plans to insure against the risks it considers appropriate. However, the Group's insurance may not cover all potential risks associated with the Group's business. In addition, the Group may elect not to have insurance against certain risks, due to the high premium costs associated with insuring those risks or for various other reasons, including an assessment that the risks are remote.

Furthermore, as a participant in extraction/mining activities, the Group may not be able to obtain insurance coverage at all or at acceptable premiums and some forms of insurance protection used in western countries may be unavailable in Malawi. In the event that insurance coverage is not available or the Group's insurance is insufficient to fully cover any losses, claims and/or liabilities incurred, the Group's business and operations may be disrupted and its financial results or financial position adversely affected. In addition, the payment by the Group's insurers of any insurance claims may result in increases in the premiums payable by the Group for its insurance cover and adversely affect the Group's financial performance. In the future, some or all of the Group's insurance coverage that is currently available may become unavailable or prohibitively expensive.

The Group's business is subject to a number of risks and hazards generally, including adverse environmental conditions, industrial accidents, labour disputes or slowdowns, unusual or unexpected geological formations or other geological or grade problems, ground or slope failures, cave-ins, flooding, rock bursts, changes in the regulatory environment or laws, and natural phenomena such as earthquakes, inclement or hazardous weather conditions and floods. Such occurrences could result in damage to mineral properties or production facilities, personal injury or death, environmental damage to the Group's properties or the properties of others, delays in development or mining, monetary losses and possible legal liability.

Insurance coverage may not continue to be available or may not be adequate to cover any resulting liability. Moreover, insurance against risks such as environmental pollution or other hazards as a result of exploration and production is not generally available to the Group or to other companies in the mining industry on acceptable terms. The Group might also become subject to liability for pollution or other hazards which may not be insured against or which the Group may elect not to insure against because of premium costs or other reasons. Losses from these events may cause the Group to incur significant costs that could have a material and adverse effect upon the Group's financial performance and results of operations.

Taxation

This document has been prepared in accordance with current Canadian tax legislation, practice and concession and interpretation thereof. Any change in the Group's tax status or the tax applicable to a holding of Common Shares or in taxation legislation or its interpretation, could affect the value of the investments held by the Group, affect the Group's ability to provide returns to Shareholders and/or alter the post-tax returns to Shareholders. It should be noted that the information contained in paragraphs 8 and 9 of Part V of this document relating to the taxation of the Group and its investors is based upon current tax law and practice which is subject to legislative change. The taxation of an investment in the Company depends on the individual circumstances of investors.

Changes in the tax laws of countries that are applicable to the Group, in particular Malawi, Canada, the BVI and the UK or any other subordinate legislation or the practice of any relevant taxation authority could have a material adverse effect on the Group. An investment in the Company may involve complex tax considerations which may differ for each investor and each investor is advised to consult their own tax advisers. Any tax legislation and its interpretation and the legal and regulatory regimes which apply in relation to an investment in the Company may change at any time.

Canadian corporate income taxes

The Company has filed, and will file all required income tax returns. However, such returns are subject to reassessment by the applicable taxation authority. In the event of a successful reassessment of the Company whether by re-charactersiation of exploration and development expenditures or otherwise, such reassessment may have an impact on current and future taxes payable.

Litigation

While the Group currently has no material outstanding litigation, there can be no guarantee that the current or future actions of the Group will not result in litigation since there have been a number of cases where the rights and privileges of natural resource companies have been the subject of litigation and the mining industry, as with all industries, may be subject to legal claims, both with and without merit, from time to time. The Board cannot preclude that such litigation may be brought against the Group in the future. Any defence and settlement costs can be substantial, even with respect to claims that have no merit. Due to the inherent uncertainty of the litigation process, there can be no assurance that the resolution of any particular legal proceeding will not have a material adverse effect on the Group's financial position, results or operations. The Group's business may be materially adversely affected if the Group and/or its employees or agents are found not to have met the appropriate standard of care or not exercised their discretion or authority in a prudent or appropriate manner in accordance with accepted standards.

Bribery

The Group has adopted a formal Anti-Corruption and Bribery Policy which complies with the UK Bribery Act 2010 and the Corruption of Foreign Public Officals Act (S.C. 1998, c. 34) and which applies to all staff, consultants and contractors that work with the Group across its operations. The policy seeks to ensure that the Group operates in an ethical and transparent manner in all business dealings and that the Company has a mechanism for staff to alert management should any issues or incidents occur. The Group will continue to review its anti-corruption procedures to ensure that they are sufficiently robust to prevent corruption and to mitigate the risk of any member of the Group committing an offence under applicable bribery legislation. There can be no guarantee that the employees of the Group or its other associates will abide by these procedures and as such the Group, its Directors and employees of the Group could be exposed to criticism or prosecution under the UK's Bribery Act 2010 and the Corruption of Foreign Public Officals Act (S.C. 1998, c. 34) or similar legislation in other jurisdictions.

2. Risks related to Malawi

General

The Group operates in the Republic of Malawi and as such its operations are applicable to the laws of the jurisdiction in which it operates. African economies in general are emerging markets and as such are different from those in more developed countries in many respects including economic structure, government, level of development, growth rates and foreign exchange controls. By virtue of this there are inherent risks involved when investing in such economies.

Investors in emerging markets such as Malawi should be aware that these markets are subject to greater risk than more developed markets, including in some cases significant legal, economic and political risks.

Investors should also note that emerging economies are subject to rapid change and that the information set out in this document may become outdated relatively quickly. Accordingly, investors should exercise particular care in evaluating the risks involved and must decide for themselves whether, in light of those risks, an investment in the Company is appropriate. Generally, investment in emerging markets is only suitable for sophisticated investors who fully appreciate the significance of the risks involved and investors are urged to consult with their own legal and financial advisers before making an investment in the Common Stock.

Economic, political and regulatory risks

The Group conducts its exploration in Malawi. The Group has therefore received the cooperation and support for its operations from the Malawian Government thus far. However, whilst the Directors are hopeful that the Malawi Government will continue to support the ongoing exploration by foreign investors, the future support of the Malawian Government is unchartered and uncertain territory. There can be no assurance that future political and economic conditions in Malawi will not result in its Government adopting different policies in relation to foreign development and ownership over rights to exploit Mineral Reserves. Any such changes in policy may result in changes in laws affecting ownership of assets, taxation, rates of exchange, environmental protection, labour relations, repatriation of income, return of capital and other areas, each of which may affect both the Group's ability to undertake operations and development activities in respect of the manner currently contemplated, as well as its ability to continue to explore in, and produce from, those properties in respect of which it has obtained exploration and production rights to date. Historically, in Malawi only one foreign mining company has reached the full production stage. Although, other companies have been able to reach negotiations with the Government and have successfully obtained development agreements there is no guarantee that the Malawian Government will continue to be cooperative in this respect.

Land title

Whilst the Company is satisfied that it has taken reasonable measures to ensure an unencumbered right to exploit its licence areas in Malawi, they are subject to greater risks than more developed markets, including significant legal, economic and political risks.

Currency fluctuations

Currency fluctuations may affect the costs that the Group incurs at its operations as a number of expenses are in South African rands and Canadian dollars. REEs are sold throughout the world based principally on a US dollar price, but a portion of the Group's operating expenses are incurred in Malawian Kwacha. The appreciation of the Malawian Kwacha against the US dollar would increase the costs of REE production at mining operations which could materially and adversely affect the Company's earnings and financial condition.

Changes in Malawi Government policy and Geopolitical climate

Adverse changes in the Malawian Government's policy or legislation affecting foreign ownership of mineral interests, taxation, imposition of additional fees, repatriation of profit, royalties, land access, labour relations, granting of approval or consent and mining or exploration activities may affect the operations of the Group. It is possible that the current systems of granting exploration and mining concessions in Malawi may change, resulting in impairment of rights and possibly expropriation of one or more of the Licences without adequate compensation. If at any stage the Group cannot pursue its exploration and development programmes because of such factors, the Group's financial condition and forward projections would be materially adversely affected.

The political climate in Malawi is currently stable and generally held to offer a favourable outlook for foreign investments. However, there is no guarantee that it will remain so in the future and changes in the government, regulatory and legislative regimes cannot be ruled out.

Proposed Changes in Malawian Mining Laws

The Malawian Government is in the process of writing, with a view to adopting, new mining laws. At the present time, the Company does not know what the effect of these new mining laws will be, or how they will affect the ability of the Group to maintain or renew the Licences, or on the ability of the Group to apply for mining licence in respect of the Project, or other projects in which the Group has an interest, or may in the future obtain an interest.

Exploration of assets

There is no guarantee that the Malawian Government will not introduce laws which should lower the effect of allowing them to expropriate the assets of the Group, or that they will not in any event attempt to expropriate such assets.

Re-instatement of land

Under the Mines and Minerals Act (1981) is the event that an exclusive prospecting licensc lapses without the holder applying for a mining licence the holder must re-instate any part of the licence area which may have been downgraded by its prospecting operations. This could be costly and may have an adverse impact on the financial state of the Group.

3. Risks related to the Placing, Admission and Common Shares

The trading price of the Common Shares may be volatile and investors may not be able to sell their shares at or above the Placing Price

Although the Company is applying for the Enlarged Share Capital to be admitted to trading on AIM, there can be no assurance that an active or liquid trading market for the Common Stock will develop or, if developed, that it will be maintained. AIM is a market designed primarily for emerging or smaller growing companies which carry a higher than normal financial risk and tend to experience lower levels of liquidity than larger companies. Accordingly, AIM may not provide the liquidity normally associated with the Official List or some other stock exchanges. The Common Shares may therefore be difficult to sell compared to the shares of companies listed on the Official List and the share price may be subject to greater fluctuations than might be the case on other markets.

The Company is principally aiming to achieve capital growth and, therefore, Common Shares may not be suitable as a short-term investment. The share price may be subject to greater fluctuation on small volumes of shares traded, and thus the Common Shares may be difficult to sell at a particular price. Prospective investors should be aware that the value of an investment in the Company may go down as well as up and that the market price of the Common Shares may not reflect the underlying value of the Company. There can be no guarantee that the value of an investment in the Company will increase. Investors may therefore realise less than, or lose all of, their original investment.

Volatility of share price

The share prices of publicly quoted companies can be highly volatile and the market in their shares illiquid. The price at which the Common Shares are quoted and the price which investors may realise for their Common Shares may be influenced by a large number of factors, some of which are general or market specific, others which are sector specific and others which are specific to the Group and its operations. These factors include, without limitation, the performance of the Company and the overall stock market, large purchases or sales of Common Shares by other investors, changes in legislation or regulations and changes in general economic, political or regulatory conditions and other factors which are outside of the control of the Company. Shareholders may sell their Common Shares in the future to realise their investment. Sales of substantial numbers of Common Shares following Admission, or the perception that such sales could occur, could materially adversely affect the market price of the Common Shares. Such sales may also make it more difficult for the Company to sell equity securities in the future at a time and price that is deemed appropriate. There can be no guarantee that the price of the Common Shares will reflect their actual or potential market value or the underlying value of the Group's net assets and the price of the Common Shares may decline below the Placing Price.

The following factors, in addition to other risks described in this document, may have a significant effect on the market price of the Common Shares:

- variations in operating results;
- actual or anticipated changes in the estimates of operating results or changes in stock market analyst recommendations regarding the Common Shares, other comparable companies or the industry generally;
- macro-economic conditions in Malawi;
- foreign currency exchange fluctuations relating to the denominations in which the Group conducts business and holds cash reserves;
- market conditions in the industry, the industries of customers and the economy as a whole;
- actual or expected changes in the Group's growth rates or competitors' growth rates;
- changes in the market valuation of similar companies;
- trading volume of the Common Shares;
- sales of the Common Shares by the Directors or Shareholders; and
- adoption or modification of regulations, policies, procedures or programmes applicable to the Group's business.

In addition, if the market for mining stocks or the stock market in general experiences loss of investor confidence, the trading price of the Common Shares could decline for reasons unrelated to the Group's business, financial condition or operating results. The trading price of the Common Shares might also decline in reaction to events that affect other companies in the industry, even if these events do not directly affect the Group. Each of these factors, among others, could harm the value of an investment in the Common Shares. In the past, following periods of volatility in the market, securities litigation has often been instituted against companies. Such litigation, if instituted against the Group, could result in substantial costs and diversion of management's attention and resources, which could materially and adversely affect the business, operating results and financial condition of the Group.

Future issues or sales of the Common Shares could cause the share price to decline

If the Company issues equity securities in the future or if Shareholders sell a substantial number of the Common Shares in the public market after Admission, or if there is a perception that these sales or issuances might occur, the market price of the Common Shares could decline.

The Company may issue Common Shares, or other securities, from time to time as consideration for future acquisitions and investments. In the event any such acquisition or investment is significant, the number of Common Shares, or the number or aggregate principal amount, as the case may be, of other securities that the Company may issue may in turn be significant, causing further downward pressure on the Company's share price.

The Board will have broad discretion over the use and investment of the net proceeds from the Placing, and Shareholders will be relying on the judgment of the Board regarding the application of these net proceeds.

Dilution of Shareholders' interests

During the life of the Options and Existing Warrants granted by the Company, as detailed in paragraph 5 and 12 of Part V of this document, the holders are given an opportunity to profit from a rise in the value of the Common Shares with a resulting dilution in the interest of the other Shareholders.

No Takeover Protection under the Takeover code

The Company is not subject to the provisions of the City Code and it is emphasised that, although the Common Shares will be admitted to trading on AIM, the Company will not be subject to takeover regulation in the UK. However, Canadian laws applicable to the Company provide for early warning disclosure requirements and for takeover bid rules for bids made to security holders in various jurisdictions in Canada, a summary of which is set out in paragraph 7.2 of Part V of this Document.

PART III

COMPETENT PERSONS REPORT

THE MSA GROUP

Specialist Consultants to the Mining Industry

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27 April 2016

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Dear Sirs

Re: Competent Person's Report on the Songwe Hill Rare Earth project

The MSA Group ("MSA") has been engaged by Mkango Resources Ltd. ("Mkango" or the "Company") to complete an independent Pre-Feasibility Study of Mkango's 100% interest in the Songwe Hill Rare Earth project located in Southern Malawi in accordance with the requirements of AIM (a market operated by The London Stock Exchange plc) for a competent person's report ("CPR"). The CPR will be included in the Company's AIM admission document ("Admission Document"). The CPR has been prepared in respect of the Company's proposed admission to AIM ("Admission") and is prepared in accordance with the AIM Rules for Companies dated May 2014 and the Guidance Note For Mining, Oil and Gas Companies dated June 2009 issued by AIM.

This CPR is an update of a previous independent NI 43-101 Pre-Feasibility Study report on the Songwe Hill Rare Earth project that we originally documented in a report published on 6 November 2014 with an effective date of 19 September 2014. The current CPR is dated 01 December 2015. There was no material change to either the content or the prospective mineral resource volumes in the CPR since 01 December 2015.

This CPR has been prepared consistent with the disclosure and reporting requirements set out in the Canadian National Instrument 43-101 Standards of Disclosure for Mineral Projects, the corresponding Companion Policy 43-101 CP, the corresponding Form 43-101F1 and the CIM Definition Standards – For Mineral Resources and Mineral Reserves (2014).

Summary Table of the Company's Assets

Asset	Holder	Interest	Status	License Expiry	License Area	Comments
1. EPL 0284/10R	Lancaster Exploration Ltd	100%	Valid and in good standing	19 Jan 2017	849.1 km^2	Mkango has a 100% interest in Lancaster Exploration Ltd

Summary of Mineral Resources and Mineral Reserves for Asset 1 EPL 0284/10R by status

Category	Gross tonnes (millions)	TREO[1] %	TREO content (t)	Net Attributable tonnes (millions)	TREO %	TREO content (t)	Operator
Mineral Resources[2]							
Measured	-	-	-	-	-	-	Mkango
Indicated	13.16	1.62	213,098	13.16	1.62	213,098	Mkango
Inferred	18.59	1.38	256,149	18.59	1.38	256,149	Mkango
Total Mineral Resources	**31.75**	**1.48**	**469,247**	**31.75**	**1.48**	**469,247**	Mkango
Mineral Reserves							
Proved	-	-	-	-	-	-	Mkango
Probable	8.48	1.60	136,139	8.48	1.60	136,139	Mkango
Total Mineral Reserves	**8.48**	**1.60**	**136,139**	**8.48**	**1.60**	**136,139**	Mkango

Notes: [1] total rare earth oxides including Yttrium
[2] inclusive of Mineral Reserves

The scope of our work, principal sources of information and our qualifications, experience and independence are set out in Section 2 of the CPR. Further information on MSA can be found at: http://www.msagroupservices.com. From April 2012 to June 2014 the Songwe Hill project was visited a total of twelve times by various members of the CPR team. Details of the site visits are set out in Section 2 of the CPR.

There is no certainty that any portion of the Mineral Resource or Reserve estimate will be discovered. If discovered, there is no certainty that it will be commercially viable to produce any portion of the Mineral Resource or Reserve.

We are responsible for this covering letter and the CPR that forms part of the Admission Document and declare that we have taken all reasonable care to ensure that the information contained herein, to the best of our knowledge, is in accordance with the facts and contains no omission likely to affect its import.

We confirm that there has been no material change of circumstances or available information since the CPR was compiled and we are not aware of any significant matters arising from our evaluation that are not covered by the CPR which might be of a material nature with respect to the proposed Admission.

We also confirm that where any information contained in the CPR has been provided by a third party, such information has been accurately reproduced and, so far as we are aware and are able to ascertain from the information published by that third party, no facts have been omitted which would render the reproduced information inaccurate or misleading.

We hereby consent to the issue by the Company of the Admission Document with the inclusion of the CPR, for which we accept responsibility, in the Admission Document, and the inclusion in the Admission Document of the references to the CPR and to our name in the form and context in which they appear in the Admission Document.

We have reviewed the information contained elsewhere within the Admission Document which relates to information contained in the CPR (specifically in Part I of the Admission Document) and can confirm that the information presented is accurate, balanced, complete and not inconsistent with the CPR.

We have reviewed Part I in the Admission Document and confirms that information that has been extracted from the CPR has been extracted directly from the CPR and presented in a manner which is not misleading and provides a balanced view of the CPR.

Yours faithfully
The MSA Group

www.msagroupservices.com

THE MSA GROUP

Specialist Consultants to the Mining Industry

Mkango Resources Limited
Songwe REE Project
Malawi

NI 43-101 Pre-Feasibility Report

Prepared By The MSA Group (Pty) Ltd for:
Mkango Resources Limited

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Effective Date: 09 November 2015
Report Date: 1 December 2015

MSA Project No.: J3273

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1 SUMMARY

This Technical Report has been prepared by the MSA Group (Pty) Ltd, SNC-Lavalin (Pty) Ltd, Epoch Resources (Pty) Ltd, Adamas Intelligence and Digby Wells Environmental (collectively the Consultants) on behalf of Mkango Resources Limited (Mkango). The Consultants were commissioned to prepare a Technical Report for a Pre-Feasibility Study (PFS) on the Songwe Hill Rare Earth Element Property (the Project) located in the Republic of Malawi. Mkango is a Canadian mineral exploration and development company listed on the TSX Venture Exchange (TSX-V) under the symbol "MKA". The Songwe Hill Rare Earth Element Project (the Project) is 100 % owned by Mkango through its wholly owned subsidiary Lancaster Exploration Limited. The Pre-feasibility Study with an effective date of 19 September 2014 has been updated to reflect changes due to movements in equipment, reagents and other costs, in addition to exchange rates. Furthermore, for the purposes of the updated Pre-feasibility Study, a rare earth market review was commissioned from Adamas Intelligence to evaluate the future rare earth market in the context of Mkango's potential development timeframe.

The Project is located within the 100 % owned Exclusive Prospecting Licence (EPL) 0284/10R (the Phalombe Licence, licence) in southeast Malawi.

This Technical Report has been prepared in accordance with the disclosure and reporting requirements set forth in the Canadian National Instrument 43-101 *Standards of Disclosure for Mineral Projects* (NI 43-101), the corresponding Companion Policy 43-101 CP, the corresponding Form 43-101F1 (Form F1), and the CIM Definition Standards – For Mineral Resources and Mineral Reserves (2014).

Unless specified otherwise, all costings have been undertaken at an accuracy level of +/- 25 %.

1.1 Property Description and Location

The Project is located within the 100 % owned Phalombe Licence, in the Phalombe District of the Southern Region of Malawi, approximately 70 km southeast of the city of Zomba and approximately 90 km east-northeast of the capital city of Blantyre. All-weather roads link these centres with the town of Migowi, approximately 15 km from Songwe Hill, and these are currently being upgraded. Secondary gravel roads provide vehicle access to the exploration camp.

The Songwe Hill area has a sub-tropical climate. Maximum monthly rainfall is between 125 cm and 218 cm during the rainy season of December to March.

The deposit lies on the north-facing slopes of Songwe Hill, a steep-sided conical hill with a diameter of approximately 800 m that rises to a summit elevation of 990 m. Songwe Hill abuts the slopes of the adjacent and larger Mauze Hill which rises above the alluvial plains south of Lake Chilwa and straddles the border with Mozambique. The slopes of Songwe Hill are densely vegetated with elephant grass following the rainy season but in other times of the year, vegetation does not hinder access.

1.2 History and Ownership

Early investigations of mineral occurrences in the license area date from the 1930s through the 1950s. The first significant evaluation of Rare Earth Elements (REE) in this area was a surface exploration and drill program carried out in the late 1980s by the Japan International Cooperation

Agency (JICA) and the Metal Mining Agency of Japan (MMAJ), in conjunction with the Geological Survey of Malawi. Little further work was reported until Mkango Resources Ltd. was granted the license in January 2010. A comprehensive exploration and research program ensued, which included a two phase drill program totaling approximately 6,850 metres. Upon completion of the drill campaign and a detailed REE mineralogical program, Mkango announced a Maiden Mineral Resource Estimate comprised of an *in situ* Indicated Mineral Resource of 13.2 Mt, grading 1.62 % and an *in situ* Inferred Mineral Resource of 18.6 Mt, grading 1.38 % at 1 % Total Rare Earth Oxides (TREO) cut-off grade. The NI 43-101 Technical Report and Mineral Resource Estimate for the Songwe Hill REE Project was filed on November 22, 2012.

1.3 Geology and Mineralization

Basement rocks in the Songwe Hill area are Precambrian charnockitic granulites and gneiss. During the Jurassic/Cretaceous period (206 Ma to 65 Ma), these were intruded by a variety of alkalic intrusions referred to as the Chilwa Alkaline Province. In the area of Songwe Hill, there are a number of large alkaline intrusions as well as many small plugs and dykes. The dominant lithologies are alkaline syenitic rocks with locally associated carbonatites.

Songwe Hill is interpreted as a volcanic vent that is expressed as a steep-sided hill approximately 800 m in diameter. The carbonatite is best exposed along the north- eastern slope of Songwe Hill and, together with a somewhat smaller area along its north western edge, is tentatively interpreted to form a ring structure. Information from surface mapping and drill core indicates that the vent complex consists of a multi-phase intrusion characterized by diverse carbonatites and breccias exhibiting a range of alteration from potassic fenitisation to low temperature hydrothermal / carbo-hydrothermal overprinting. The vent complex cuts the western end of the large Mauze nepheline syenite intrusion, but the external contacts on the western and northwestern sides of the vent are hidden beneath recent surficial eluvial deposits.

The principal lithologies that comprise the Songwe Hill vent complex are carbonatite, fenite and breccia. The carbonatites are dominantly grey calcic carbonatites, although subordinate ferro-carbonatites are present. The fenites comprise dominantly K-feldspar rocks and appear to form an aureole around the carbonatite. They are interpreted to have formed through metasomatism related to the carbonatite intrusion. The breccias range from clearly abraded pebble-sized fragments (pebble dykes) to angular blocks that are metres in diameter and include significant volumes of breccia in which the fragments appear to have undergone little or no movement. The breccias can essentially be divided into two types: feldspathic-rich breccias and carbonatite-rich breccias and are interpreted to be related to high level explosive processes during the formation of the vent complex.

The principal zone of REE mineralization outcrops along the northeastern slope of Songwe Hill. REE mineralization is present in carbonatites, fenites and breccias, which are exposed intermittently over a surface area of approximately 350 m by 100 m. The REE mineralization is untested to the northeast and southwest beyond the limits of the present drilling and below the deepest vertical intersection of approximately 350 m below the surface of Songwe Hill and there is additional regional exploration potential in the Songwe and other carbonatites. The mineralized body is interpreted to be a carbonatite plug with essentially sub-vertical margins. In plan view, it is elongate in a northeast-southwest direction.

For the purposes of the Mineral Resource definition, three geological domains have been identified in the Songwe Hill deposit: a carbonatite domain; a fenite domain; and a 'mixed' domain consisting of breccia and/or finely intermixed carbonatite and fenite. REE mineralization is dominantly within the carbonatites, but locally also occurs within the fenite and mixed domains. The dominant REE-bearing minerals are synchysite and apatite. The apatite is anomalously enriched in the heavy rare earth oxides (HREO) compared to apatites in most carbonatite deposits. The REE mineralization is closely associated with strontianite and baryte and is interpreted to have formed through sub-solidus hydrothermal alteration following the carbonatite intrusion.

1.4 Status of Exploration

Mkango has compiled an extensive exploration database over Songwe Hill, comprising geological, geochemical and geophysical data. The quality of exposure on Songwe Hill has allowed detailed geological mapping and surface sampling which helped identify the outcrop extent of the carbonatite. Surface radiometric surveys have been useful in better defining the areas of carbonatite exposure. Systematic outcrop stripping and channel sampling along the surface trace of the diamond drill lines has helped to characterize the mineralized zone at surface and connect it with mineralization identified by diamond drilling.

A total of 38 inclined and vertical diamond drill holes totaling 6,852.28 m have been drilled in a series of fences spaced approximately 25 m apart to obtain different depth intersections of the mineralization. The outcropping position of the mineralized zone on each drill fence was constrained by channel sampling. The channels and drill core were sampled at a nominal interval of one metre and the assay results together with the bulk density measurements were incorporated into the Project database.

1.5 Mineral Resources

The following an *in situ* Mineral Resource Estimate for TREO, Total Heavy Rare Earth Oxides (HREO) and Total Light Rare Earth Oxides (LREO) have been declared from Songwe Hill and represent 100 % of the estimated Mineral Resources defined to date over the Project effective September 30, 2012 (Table 1-1 and Table 1-2). A cut-off of 1 % TREO is currently considered to be appropriate. All references to rare earths in this Technical Report include yttrium as a heavy rare earth.

Table 1-1
In situ Indicated Mineral Resources for Songwe Hill: All domains at a 1% TREO cut-off as at 30th September 2012

Domain	Million Tonnes	LREO %	HREO %	TREO %	TREO Tonnes	HREO Proportion
Carbonatite	11.10	1.50	0.12	1.62	179,499	7.3 %
Fenite	1.37	1.51	0.10	1.61	22,145	6.5 %
Mixed	0.69	1.58	0.07	1.65	11,454	4.5 %
Totals	13.16	1.50	0.11	1.62	213,098	7.1 %

Source: *Hall (2012)*

Table 1-2
In situ Inferred Mineral Resources for Songwe Hill: All domains at a 1% TREO cut-off as at 30th September 2012

Domain	Million Tonnes	LREO %	HREO %	TREO %	TREO Tonnes	HREO Proportion
Carbonatite	8.64	1.24	0.11	1.35	116,967	8.2 %
Fenite	8.27	1.24	0.10	1.35	111,318	7.5 %
Mixed	1.68	1.59	0.06	1.65	27,863	3.8 %
Totals	18.59	1.28	0.10	1.38	256,149	7.4 %

Source: *Hall (2012)*

1.6 Mineral Reserves

The process followed in converting the Mineral Resources to Mineral Reserves was as follows:

- a pit optimisation and design exercise/analysis was completed
- only the Indicated Mineral Resources were considered in the pit optimisation and design exercise ;
- input criteria were developed for the pit optimisation analysis;
- a practical pit design was completed using the optimum pit shell generated by the pit optimisation. The practical pit design includes ramps, safety berms and other aspects not considered by the optimisation software;
- a production schedule was generated from the pit design, based on the mine owner's stated production target;
- capital and operating costs were estimated for the construction and operation of the mine; and
- the production schedule and cost estimates were used in a discounted cash flow model, together with the expected realised product prices and plant recoveries. The result of the financial modelling was positive showing that, based on the assumptions and estimations made in this study, the Project is viable.

The modifying factors used in converting the Mineral Resource to a Mineral Reserve are shown in Table 1-3.

Table 1-3
Modifying factors used in the Mineral Reserve Estimate

Factor	Unit	Quantity	Comment
Cut-off grade	% TREO	1	Higher than pay limit of 0.51 %
Mining recovery	%	95	5 % ore loss expected during mining
Mining Dilution	%	5	Dilution assumed to carry zero grade
Plant recovery	%	34	Accounts for the portion of Ce which is removed by the metallurgical process and is not sold
Product price	US$/kg	59.76	Average recovered basket price per kg of recovered rare earth oxides
Operating Cost	US$/tonne processed	93.55	Average Life of Mine operating cost per tonne processed
Operating Cost	US$/kg	16.44	Average Life of Mine operating cost per kg of REO recovered

Note: *REO – rare earth oxides*

Table 1-4 shows a summary of the Estimated Mineral Reserves.

Table 1-4
Estimated Mineral Reserve

Category	Tonnes	TREO (%)	TREO Content (t)
Probable Mineral Reserves	8,482,603	1.60	136,139
Proven Mineral Reserves	-	-	-
Total Mineral Reserves	**8,482,603**	**1.60**	**136,139**

Note: *TREO – Total Rare Earth Oxides including yttrium*

1.7 Mining

A geotechnical study was undertaken which included:

- a site visit;
- the geotechnical logging of core;
- the collation of geotechnical data; and
- the analysis of the data and assimilation to determine the mine design criteria.

Table 1-5 shows a summary of geotechnical properties of the deposit at Songwe Hill.

Table 1-5

Summary of geotechnical properties for the material at Songwe Hill REE

Material properties	Nepheline Syenite	Weathered Fenite and Carbonatite / Breccias?	Fresh Carbonatite	Fresh Fenite	Mixed Carbonatite and Fenite	Feldspathic breccia
Inferred thickness for a ±200m slope (m)	15.00	20.00	60.00	50.00	60.00	20.00
Average RMR_{89}	58.00	45.00	63.13	63.13	54.50	45.00
Average GSI	58.00	48.00	65.00	65.00	60.38	48.00
UCS (Range)	100 - 300	30 - 100	100 - 300	100 - 300	100 - 300	30 - 100
Disturbance factor (D)	0.70	0.70	0.70	0.70	0.70	0.70
Density ρ (kg/m^3)	2700.00	2000 - 2700	2700 - 3000	2700	2700 - 3000	2000 - 2700
Cohesion (kPa)	5000 - 15000	700 - 5000	5000 - 15000	5000 - 15000	5000 - 15000	700 - 5000
Friction angle φ (°)	25 - 30	20 - 25	25 - 30	25 - 30	25 - 30	20 - 25

Note: *RMR_{89} = Rock Mass Rating (Bieniawski, 1989)*

Based on this data, design criteria were developed for the open pit. Table 1-6 shows the recommended slope design and Figure 1-1 shows a diagram of the recommended slope configuration.

Table 1-6

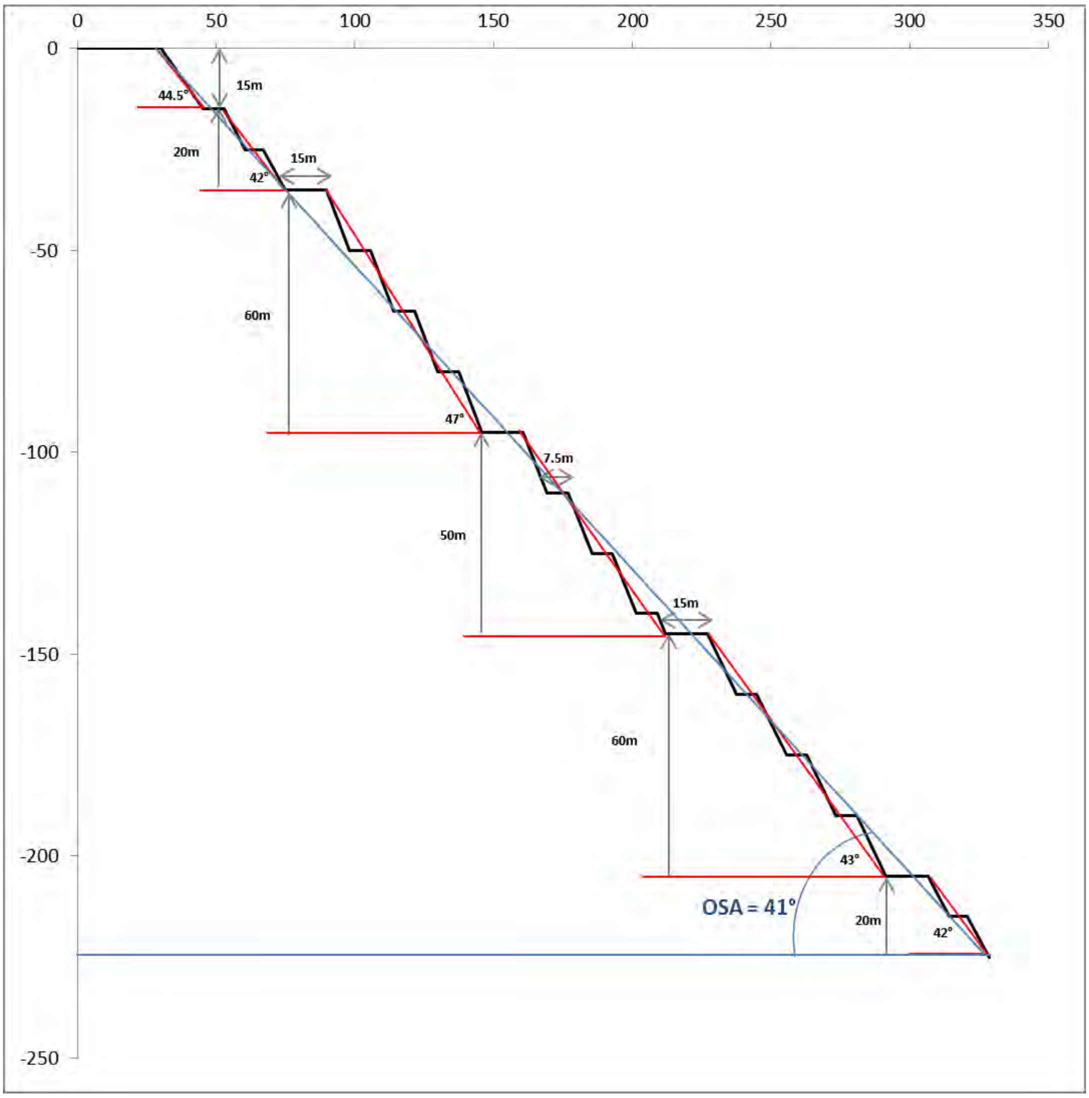
Slope configurations for Songwe Hill Project

	Threshold Safety Factor	150 m slope height	200 m slope height	250 m slope height
	Overall Slope Angles (degrees)			
Moderate design	**1.30**	**45.67**	**41.17**	**36.67**

Based on a moderate design using empirical methods, an overall slope angle of 41° was selected for the open pit.

Figure 1-1

Diagram showing slope configuration, Songwe Hill Project



A pit optimisation exercise was completed using the geotechnical design criteria and the techno-economic data shown in Table 1-7.

Table 1-7
Techno-economic data set for pit optimisation.

Item	Amount	Units
Operating Costs		
Mining Cost	4.24	US$/t rock mined
Processing Cost	58.20	US$/t milled
General and Administration cost	8.73	US$/t milled
Capital Cost		
Mining Capital	1.657	US$ million
Plant Capital	135.5	US$ million
Infrastructure	41.4	US$ million
Other Project Capital	30.1	US$ million
Sustaining Capital	1.0	US$ million per year
Technical Factors		
Mining Dilution	5	%
Mining Loss	5	%
Metallurgical Recovery	34%	%
Cut-off Grade	1.00	% TREO
Production Rate	500,000	tpa
Geotechnical		
Overall Slope Angle uphill (high) side of pit	41	Degrees
Overall Slope Angle downhill (low) side of pit	46	Degrees
Economic		
Royalties	5	%
Discount Factor	10	%
TREO Price	43,100	US$/tonne TREO

Note: *1) It is specifically noted that data used in this evaluation is preliminary in nature and it may not exactly match the final data used in the Project evaluation elsewhere in this document.*
2) The mining costs are quoted as per tonne of rock mined and will be applied to ore and waste.
3) TREO recovery is quoted excluding cerium, i.e. cerium is extracted as a waste product and attracts no value.
4) The TREO price used is the forecast price realised after toll treatment and transport.

The optimum pit shell, which produced the maximum NPV, was selected as a base for the practical open pit design.

The open pit mining method that will be employed is a standard drill, blast, truck and shovel method.

Loading and hauling of waste will be a 24 hour operation. Ore mining will only be carried out during the day shift to ensure effective grade control.

A pit design was complete using the DeswickCad suite of mine design software. The overall dimensions of the final open pit will be approximately 650 m north to south, 450 m east to west, and at its deepest will be 300m deep when measured from the highest point of the pit on the southern side of the pit. The upper most bench is on an elevation of 945 m and the final pit floor is on 645 m elevation.

The pit will be mined in a series of five push backs, with the mining of pushback 1 commencing on the 775 m elevation with the initial ramp. There is no pre-strip required as the initial mining is in ore with strip ratio of less than 1.5:1 in the first year of mining. The overall strip ratio of the final pit is 4.5:1 (tonne:tonne).

Mining will be undertaken by a mining contractor. A mining contractor was consulted during the study and provided budget mining costs. The contractor visited the site and has an operational base in Tete Province of Mozambique.

A mining schedule was developed, based on the pit design. The annual plant throughput is 500,000 tonnes per year. In order to optimise the grade of material processed, particularly in the early years, the mining rate was increased and lower grade material is stockpiled until later in the mine life.

No Inferred Mineral Resources were included in the production schedule. The life of mine production is 8.483 million tonnes of ore at a grade of 1.60 % TREO, delivered to the plant. The exclusion of Inferred Mineral Resources also allows for some upside, either in mine life or in increasing the annual production rate, in the future if the Inferred Mineral Resources can be upgraded to Measured or Indicated Mineral Resources. The current pit design includes 3.877 million tonnes of Inferred Mineral Resources at an average grade of 1.50 % TREO (in-situ grade), which has not been considered as ore in this study.

The mining capital cost consists mainly of contractor mobilisation, site preparation and security arrangements around the pit and amounts to US$ 1.657 million.

Mining operating costs were estimated based on a budget quote of $4.24/tonne mined received from the mining contractor.

1.8 Process Overview

The process flow sheet consists of the beneficiation plant and the recovery plant.

The beneficiation plant comprises of the comminution and flotation circuits. The purpose of the comminution circuit is to reduce the size of solid ore particles and thus increase the surface area of solids to enable the liberation of valuable materials that are locked within the gangue minerals. This is achieved by means of crushing and milling. Flotation is used to upgrade the mineralized material. Flotation is a method of separation, which uses the differing surface properties of the various minerals in the ore. It involves the selective attachment of mineral particles to air bubbles generated in the flotation cell which float to the surface of the slurry and then flow over the lip of the cells into the launders. A selective flotation reagent regime is used to separate rare earth oxide minerals from gangue minerals.

The recovery process flow sheet comprises a two stage selective hydrochloric acid leach process. The hydrochloric acid is recycled via calcium sulphate precipitation with sulphuric acid. The process flow sheet also includes caustic conversion, rare earth dissolution, purification, cerium rejection and rare earth hydroxide precipitation. This approach offers advantages including a significant reduction in acid costs as well as a further concentration of the rare earths thus providing a reduction in downstream capital and operating costs.

1.8.1 Processing plant capital cost estimate

The capital cost estimate for the process plant, acid plant and associated infrastructure is summarised in Table 1-8 and Table 1-9.

Table 1-8
Summary of process plant capital cost estimate

Description	Direct Costs (US$)	Indirect Costs[1] (US$)	Other Costs[2] (US$)	Total (US$)
Process plant (0.5 Mtpa RoM)	54,136,874	19,032,486	24,322,938	97,322,938
270 TPD acid plant	25,658,205	2,571,631	6,451,048	34,680,884
Plant complex infrastructure	22,556,660	5,745,267	7,982,007	36,283,534
TOTAL				**168,287,356**

Note: *[1] Indirect costs include commissioning spares, construction camp facilities and services, vendor assistance and engineering, procurement, construction and management (EPCM) costs;*
[2] Other costs include estimating allowance and owner's costs

Table 1-9
Capital cost estimate split between concentrate and hydrometallurgy processing plants

Description	Total (US$)
Milling and Flotation Processing Plant	42,961,553
Hydrometallurgy Processing Plant	54,361,385
TOTAL	**97,322,938**

1.8.2 Processing plant operating cost estimate

The cash operating costs include the costs of milling, flotation, leaching, purification and precipitation in addition to other costs associated with the operation of the facilities.

The operating cost estimate for both the beneficiation plant and hydrometallurgical plant is summarised in Table 1-10.

Table 1-10 Summary of operating cost estimate*			
Description	**US$/annum**	**US$/kg REO**	**US$/t RoM**
Beneficiation plant	10,485,553	3.7	21.0
Hydrometallurgical plant	20,166,324	7.1	40.3
TOTAL	**30,651,877**	**10.8**	**61.3**

Note: ** Steady state*

The annual processing capacity was assumed at 500,000 tonnes per year of ore with a view to producing an average of approximately 2,840 tonnes per annum of REO in mixed chemical concentrate with the majority of Cerium removed as per the hydrometallurgical flow sheet. Cerium is currently considered to be a low value REO.

1.9 Tailings

The design of the tailings storage facility (TSF) and related infrastructure includes:

- a TSF constructed using the self-raising day wall deposition method at a depositional rate of 41,667 tpm;
- a Return Water Dam (RWD) and Storm Water Dam (SWD) associated with the TSF; and
- the associated infrastructure for the TSF (i.e. perimeter slurry deposition pipeline, storm water diversion trenches, access roads etc.).

The key design features of the TSF and related infrastructure are:

- a compacted earth starter embankment wall, constructed with suitable material sourced from within the RWD/SWD/TSF basins, with the following dimensions:
    - 9 m high (i.e. crest elevation at 672 mamsl);
    - 6 m wide crest;
    - 1V:2H internal side slope; and
    - 1V:3H external side slope;
- a compacted bund wall, constructed with suitable material sourced from within the RWD/SWD/TSF basin, with the following dimensions:
    - 1 m high (i.e. from elevation 671 mamsl);
    - 4 m wide crest;
    - 1V:2H internal side slope; and
    - 1V:3H external side slope;
- the supply and installation of a liner to the tailings dam basin and inside slope of the starter walls comprising (from top to base):
    - a 1,500 micron High Density Polyethylene (HDPE) liner; and
    - A6 Kaymat geotextile;
- the self-rising portion of the TSF is battered at an overall side slope of 1V:3H;

- a 5 m wide elevated toe drain positioned along the inside toe of the starter wall embankment;
- a 3 m wide Natural Ground Level (NGL) toe drain extending the length of the inside perimeter alongside the bund wall toe of the TSF;
- 160 ND non-slotted HDPE drainex piping, spaced at 50 m intervals and positioned along the perimeter of the elevated and NGL toe drains. Seepage water emanating from the drains is collected and channelled into the solution trench;
- 20 m wide toe catchment paddocks extending the perimeter of the tailings dam;
- a solution trench around the TSF from which seepage and catchment paddock runoff water is directed to the silt traps and, subsequently, into the RWD;
- an energy dissipater for the collection of supernatant water from the penstock as well as seepage water from the toe drains;
- a two compartment reno-mattress/basket silt trap;
- a clean storm water diversion channel with its associated cut-to-fill berm upstream of the TSF;
- a seepage cut-off trench downstream of the TSF, on the western and eastern side, to an average depth of 5 m below NGL, from which possible collected seepage water is pumped into the RWD;
- a 450 ID HDPE, PE 100, PN 8 reinforced concrete encased penstock outfall pipe compromising double intermediate and final vertical 510 ID precast concrete penstock ring inlets. The penstock pipeline is fully encased in reinforced concrete along its entire length and has an average gradient of 1V:65H;
- wooden catwalks shall be constructed along the penstock pipeline with platforms at the intermediate and final intakes to allow access to the penstocks during operation of the TSF; and
- a 120 mm ID HDPE slurry distribution pipeline along the perimeter length of the TSF starter wall embankment.

The key design features of the RWD and SWD are:

- the RWD/SWD combined capacity caters for the three day, 1 in 100 year storm event (307.6 mm of rainfall);
- an integrated design approach whereby the RWD is situated inside the SWD;
- the RWD storage capacity is equivalent to seven days of slurry return water (4,600 m^3) for day to day operations; and
- the storage capacity in the SWD (50,209 m^3) is for the accommodation of the high rainfall storm events.

The total capital cost associated with the TSF is estimated at US$ 12.65 million and is summarised in Table 1-11.

Item	Description	Amount (US$ millions)
	Tailings Storage Facility	
1	Schedule B: Site clearance and topsoil stripping	1.10
2	Schedule C: TSF starter embankment	1.70
3	Schedule D: drainage system to TSF starter embankment	0.23
4	Schedule E: decant penstock, drainage collection sumps and access platform	0.62
5	Schedule F; Slurry delivery system	0.46
6	Schedule G: Surface water management works	0.17
7	Schedule H: miscellaneous	0.13
8	Schedule I: liner	2.64
	Total Measured Works	**7.06**
	Storm Water and Return Water Dam	
9	Schedule B: site clearance and topsoil stripping	0.06
10	Schedule C: TSF starter embankment	0.48
11	Schedule D: miscellaneous	0.03
12	Schedule I: liner	0.16
	Total Measured Works	0.73
	Total Cost Calculation	
	Unmeasured Items @ 25 %	1.95
	P & Gs @ 30 %	2.92
	TOTAL COST	**12.65**

Table 1-11
Summary of estimated capital costs

The following qualifications apply to the above mentioned capital cost estimate associated with the TSF:

- unmeasured items are estimated at 25 % of the measured works; and
- preliminary and general (P & G) have been estimated at 30 % of the total works.

The TSF operational cost has been estimated based on current prices for similar TSF operations operated by specialist contractors elsewhere in Africa. In the case of low tailings depositional rates, the operating costs are dictated by the costs associated with establishing and maintaining the staff and equipment necessary to manage the facility. The operating cost for the Project is estimated at US$ 1 per tonne of tailing deposition (at 500 ktpa the cost shall be US$ 0.5 million per annum). The total operational cost associated with the TSF is estimated at US$ 0.59 million per annum and comprises:

- US$ 1 per tonne of tailing deposition management (500 ktpa amounts to US$ 0.5 million per annum);
- US$ 45,700 per annum for pipe and valve replacements per annum; and
- quarterly inspections and annual reviews of the facility at US$ 40,000 per annum.

In addition to the capital costs associated with the construction of the TSF, provision has been made for engineering design and construction site supervision. The total initial cost up to the completion of construction of the TSF is estimated at US$ 13.29 million and comprises the following:

- construction of the TSF at US$ 12.65 million;
- engineering Definitive Feasibility Study at US$ 160,000;
- engineering detailed design at US$ 180,000; and
- engineering construction supervision at US$ 300,000.

The cost for the rehabilitation and closure of the TSF is not included in the above LoM expenditure estimate. It is accounted for in Section 4.3.

1.10 Environmental Aspects

Pre-Feasibility Study environmental and social baseline studies were conducted in 2013 in collaboration with Malawian specialists. These studies were conducted in line with the requirements of the Equator Principles, International Finance Corporation (IFC) Performance Standards as well as specific requirements and interpretations of Malawian Legislation as provided by the Malawian Department of Environmental Affairs (DEA).

A Project Brief for the proposed environmental and social studies for the Environmental, Social and Health Impact Assessment (ESHIA) was submitted to the DEA in the fourth quarter of 2013. The DEA has responded with a suggested Terms of Reference which will be addressed in the ESHIA which is planned for the Definitive Feasibility Study. The first series of stakeholder meetings were carried out during November 2014. A weather station was installed during August 2014 and the data continues to be collected and monitored. Dust bucket monitoring continues to be carried out on a monthly basis.

1.10.1 Legal framework

Several Acts regulate the minerals sector in Malawi. Amongst these are the Mines and Minerals Act 1981 (and regulations), the Petroleum (Exploration and Production) Act 1983, and the Explosives Act 1968. Once Mkango has completed its' Pre-Feasibility and Definitive Feasibility Studies, it will be in a position to convert the current Exclusive Prospecting License (EPL) into a Mining License, in terms of the Malawi Mines and Minerals Act 1981.

The Malawi Mines and Minerals Act 1981 is expected to be reviewed and modified within the next two years to bring it in line with current international standards. This may have a bearing on the Project going forward, but the effect is currently unknown.

The Malawian authorities issued a Mines and Mineral Policy in 2013. Through this Policy, the Government seeks to guide and direct mineral resource development by stressing private sector initiatives and involvement and the need to attract modern technology and investment capital.

The National Environmental Policy (1996) provides an overall structure against which environmental policies can be assessed to ensure that the policies are consistent with the principles of sustainable development, while the Environment Management Act (1996) contains sections that specifically deal with the protection and management of the environment. Section 24 of the Environment Management Act outlines the requirements for projects, for which an Environmental Impact Assessment (EIA) is needed.

Developers of exploration and mining projects are required to submit an initial environmental assessment known as a Project Brief to the DEA, which may lead to the authorities requiring an EIA study. As mentioned above, a Project Brief for the proposed environmental and social studies for the ESHIA was submitted to the DEA in the fourth quarter of 2013. The DEA has responded with a Terms of Reference which is planned to be addressed in the ESHIA phase to be carried out in conjunction with the Definitive Feasibility Study.

A number of permits and licences dealing with environmental issues will be required for the Project, most of which will be required prior to the commencement of mining.

A comprehensive legal review, detailing the permits required and the applicable laws and regulations, is available in Section 24.1.

1.10.2 Potential environmental risks

The risk assessment carried out as part of the PFS was aimed at identifying the main environmental and social risks to the Project so that these could be managed through the project development cycle. While it is not possible to have a totally risk-free environment, it should be possible to avoid, reduce, eliminate or transfer some of the risks.

It is believed that all the risks identified and discussed below can be effectively mitigated or managed and that they are not significant enough to be considered fatal flaws to the Project. Similar risks have been effectively managed on similar mining and processing projects.

1.10.2.1 Reputational risk

There are various examples in Malawi where a mining company has suffered severe reputational damage due to miscommunication, failure to address certain issues, not complying with local legislation and raising expectations unduly. Often the consequences are so severe that the company cannot proceed with the project due to opposition from local communities and NGOs'.

1.10.2.2 Approvals and timeframes

Mkango will have to go through a number of administrative processes in order to ensure it is legally compliant before proceeding with the Project. The timeframes involved in obtaining all of the necessary permits and authorisations should be taken into account in Project plans.

1.10.2.3 Institutional constraints

Although Malawi's environmental legal and regulatory framework follows good international practice, in reality environmental and social management is constrained by an acute lack of capacity within Government structures. Unless this situation is addressed, a significant expansion of the mineral sector could result in wider risk of environmental degradation and an increase in social conflicts and social marginalization.

1.10.2.4 Potential contaminant

REE milling and processing has potential for environmental contamination when not controlled and managed properly due to constituents in the orebody and chemicals used in processing. Contaminants are usually heavy metals, radionuclides and the processing chemicals.

1.10.2.5 Water provision

Water for processing and potable use is likely to be sourced from groundwater. The exact water requirements for the Project and potential impacts which the groundwater abstraction could have on other water users still needs to determined.

1.10.2.6 Closure and rehabilitation

The mine facilities will need to be appropriately designed, constructed and monitored to ensure compliance with environmental standards. In order to do this, Mkango needs to ensure there is adequate funding to provide for on-going rehabilitation, closure and long term monitoring in accordance with these standards.

1.10.2.7 Resettlement

Resettlement of some communities and land users will be required for the Project. Resettlement needs to be undertaken with extreme sensitivity and through a well-defined process. If not undertaken effectively, resettlement can cause fear, resentment and unhappiness and has the ability to delay the Project. The policy and framework applied will have cost implications.

1.10.2.8 Perceptions and expectations

A project of this nature has the ability to raise expectations, particularly with regards to the number of jobs available and the benefits that the Project will bring. If expectations are not met, the communities could become disgruntled and oppose the Project.

1.10.2.9 Civil society and community liaison

There have been several examples in Malawi where Community and Civil Society Organisations (CSO) have opposed a mining development. CSOs have the ability to cause confusion and mistrust amongst the local communities, which ultimately breaks down the relationships formed between the Project owners and the local communities.

1.10.2.10 Radiological Concerns

Concerns over radiation have the potential to create concerns, even where not substantiated by facts. Further investigation is required to facilitate effective communication with the communities on the actual risks involved and to ensure that the baseline levels are well understood.

1.11 Market Studies and Contracts

The market review was based on an independent study completed by Adamas Intelligence.

Adamas forecasted three different scenarios for future global REO production from 2015 through 2020:

- "Business as Usual" scenario (Base Case):
  - China's Ministry of Land and Resources (MLR) holds production quotas steady at 2015 levels through 2020;
  - illegal/unregulated REO production in China will decrease by 56% over the same period;
  - Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter;
  - production from all other nations combined will remain flat at 2015 levels through 2020;
- "Low Production" scenario (Scenario 2):
  - MLR will hold the nation's production quotas steady at 2015 levels through 2020;
  - illegal/unregulated REO production in China fully eliminated by 2020;
  - Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter;
  - production from all other nations combined will remain flat at 2015 levels through 2020; and
- "High Production" scenario (Scenario 3):
  - MLR will increase national production quota levels by 4,000 tonnes in 2017 (versus 2015), and by an additional 4,000 tonnes in 2019, thereafter holding steady through 2020
  - illegal/unregulated REO production in China fully eliminated by 2020
  - Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter
  - production from all other nations combined will remain flat at 2015 levels through 2020; and
  - one new light rare earth producer and one new heavy rare earth producer come into production in 2018.

Adamas forecasts that global TREO demand will total approximately 125,000 tonnes in 2015 and will increase for individual REOs by 1 % to 13 % annually through 2020. In 2020, Adamas forecasts that global TREO demand will conservatively amount to approximately 150,750 tonnes.

Global TREO demand growth is forecasted to be driven heavily by strong demand growth for neodymium oxide, praseodymium oxide, dysprosium oxide, lanthanum oxide, and others from 2015 through the end of the decade, with the permanent magnet and fuel cracking catalyst sectors the key drivers. In all three supply-demand scenarios considered from 2015 through 2020, Adamas forecasts that global demand for oxides of neodymium, praseodymium, dysprosium, terbium, lanthanum, and yttrium will significantly exceed global annual production in the year 2020 implying significantly higher prices versus those currently in 2015 (Table 1-12).

Table 1-12				
Forecasted per-REO contribution to Songwe Hill basket value in 2020				
	Adamas 2020 Price Scenarios			
Rare Earth Oxide	**November 2015 "Business as Usual" Base Case US$/kg**	**November 2015 "High Production" Scenario 3 US$/kg**	**November 2015 "Low Production" Scenario 2 US$/kg**	**September 2014 Pre-Feasibility Study US$/kg**
Lanthanum	3.12	2.35	3.61	2.91
Cerium	0.42	0.33	0.43	0.71
Praseodymium	8.62	7.52	8.98	7.31
Neodymium	31.56	28.19	33.24	20.58
Samarium	0.18	0.15	0.18	0.32
Europium	4.52	3.49	4.67	10.04
Gadolinium	1.17	1.02	1.23	1.07
Terbium	1.94	1.69	2.12	2.35
Dysprosium	7.22	6.37	7.87	7.81
Yttrium	1.00	0.84	1.41	1.91
Songwe Hill Basket (US$/kg TREO)	**59.76**	**51.95**	**63.75**	**55.01**
% "Magnet" rare earths[1]	**82.6**	**84.3**	**81.9**	**69.2**

Note: *[1] "Magnet" rare earths assumed to be neodymium, praseodymium, dysprosium and terbium*

1.12 Capital and Operating Cost Estimates

Unless specified otherwise, costings have been undertaken at an accuracy level of ±25 %.

1.12.1 Capital Costs

The capital cost estimate is based upon an engineering, procurement and construction management (EPCM) approach where the owner assumes the risk.

Table 1-13 is a summary of the initial capital expenditure of the Project.

Table 1-13	
Summary of initial capital expenditure	
Description	**Amount (US$ millions)**
Site Facilities and Infrastructure	21.8
Power Supply	14.5
Mining	1.7
Beneficiation Plant	43.0
Hydrometallurgical Plant	54.4
Sulphuric Acid Plant	34.7
Tailings Storage Facility	12.7
Other	14.0
Total Initial Capital Expenditure	**196.6[1]**
Contingency	19.7
Total Initial Capital Expenditure including Contingency	**216.3**

Note: *[1] Totals may not represent the sum of the parts due to rounding*

Sustaining capital and reclamation capital costs are estimated to be US$ 24.5 million.

1.12.2 Operating Costs

The mining of the open pit will be conducted by a mining contractor. The mining contractor's costs are US$ 4.24/t.

The operating costs are summarised in Table 1-14 below.

Table 1-14
Estimated total cash cost summary

Item	LoM US$/kg REO	LoM US$/t processed	2018 – 2022 US$/kg	2018-2022 US$/t processed
Mining	4.1	23.5	3.0	21.1
Beneficiation (Mill/Flotation)	3.7	21.2	3.0	21.0
Hydrometallurgical	7.1	40.4	5.7	40.3
G & A and Other	1.5	8.6	1.3	8.6
Cash Operating Costs	**16.4**	**93.6**	**13.0**	**91.1**
Tolling/Concentrate Sales	10.0	56.9	10.0	70.9
Total Cash Costs	**26.4**	**150.5**	**23.0**	**162.0**

1.13 Financial Valuation

The capital expenditure and operating costs of the Pre-Feasibility study completed in September 2014 have been updated to reflect changes due to escalations in equipment prices, exchange rate movements and changes in reagent prices. In addition, Mkango commissioned an independent rare earth market review from Adamas Intelligence (Adamas) to evaluate the future rare earth market in the context of Mkango's potential development timeframe. Adamas forecasted three different scenarios for future global REO production from 2015 through 2020:

- "Business as Usual" or the Base Case. China's Ministry of Land and Resources (MLR) holds production quotas steady at 2015 levels through 2020 and illegal/unregulated REO production in China will decrease by 56% over the same period. Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter. Production from all other nations combined will remain flat at 2015 levels through 2020;
- "Low Production Scenario" (higher prices). The MLR will hold the China's production quotas steady at 2015 levels through 2020. Illegal/unregulated REO production in China fully eliminated by 2020. Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter. Production from all other nations combined will remain flat at 2015 levels through 2020; and
- "High Production Scenario" (lower prices). The MLR will increase national production quota levels by 4,000 tonnes in 2017 (versus 2015), and by an additional 4,000 tonnes in 2019, thereafter holding steady through 2020. Illegal/unregulated REO production in China fully eliminated by 2020. Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter. Production from all other nations combined will remain flat at 2015 levels through 2020. One new light rare earth producer and one new heavy rare earth producer come into production in 2018.

An updated financial valuation has been conducted for the Project using a cash flow model based on the mining and processing schedules and the estimated costs.

Long term rare earth price assumptions were derived from Adamas Intelligence's "Business as Usual" 2015 to 2020 pricing scenario, projected flat in real terms beyond 2020. This equates to a basket value for Songwe Hill of approximately US$ 60 per kg REO in 2020 and beyond.

The main revenue drivers are neodymium (53 %), dysprosium (12 %) and praseodymium (14 %) as illustrated in Table 1-15.

Table 1-15
2020 REO Basket Value (Base Case – Adamas "Business as Usual" Case)

Rare Earth Oxide		REO in conc[1] (tonnes)	REO in concentrate split	REO in concentrate (US$/kg)	REO in concentrate Split by value
Lanthanum	La_2O_3	1,075	37.8 %	3.1	5.2 %
Cerium	CeO_2	341	12.0 %	0.4	0.7 %
Praseodymium	Pr_6O_{11}	227	8.0 %	8.6	14.4 %
Neodymium	Nd_2O_3	756	26.6 %	31.6	52.8 %
Samarium	Sm_2O_3	114	4.0 %	0.2	0.3 %
Europium	Eu_2O_3	27	0.9 %	4.5	7.6 %
Gadolinium	Gd_2O_3	62	2.2 %	1.2	2.0 %
Terbium	Tb_4O_7	7	0.3 %	1.9	3.3 %
Dysprosium	Dy_2O_3	35	1.2 %	7.2	12.1 %
Yttrium	Y_2O_3	165	5.8 %	1.0	1.7 %
Holmium[2]	Ho_2O_3	6	0.2 %		
Erbium[2]	Er_2O_3	13	0.5 %		
Thulium[2]	Tm_2O_3	2	0.1 %		
Ytterbium[2]	Yb_2O_3	10	0.3 %		
Lutetium[2]	Lu_2O_3	1	0.0 %		
Total REO in concentrate		**2,841**	**100.0 %**	**59.8**	**100.0 %**
"Magnet" REO in concentrate[3]		**1,026**	**36.1 %**	**49.3**	**82.6 %**

Note: [1] *Average annual at full capacity excluding first and last years*
[2] *No value currently attributed to these rare earths in the financial evaluation*
[3] *"Magnet" REO assumed to be neodymium, praseodymium, dysprosium and terbium*

Table 1-16 and Table 1-17 summarises the mining and processing inputs and results.

Table 1-16
Mining and Processing Inputs and Results

Item	Unit	Value
Life of Model	Years	18
MINING		
Total life-of-model ore production	000't	8,483
Waste mined	000't	38,442
Strip ratio	W:O	4.5
Total LoM Plant feed	000't	8,483
Average yearly Plant Feed	000't	500
PROCESSING		
Tonnes to hydrometallurgical plant	000't	8,483
Contained REOs in product	000't	48.3
Average annual production Of REOs (excl. 1st and last year)	tpa	2,841

Table 1-17
Processing recoveries

Rare Earth Oxide		Overall recovery to concentrate	REO production in concentrate[2]
Lanthanum	La_2O_3	55 %	1,075
Cerium[1]	CeO_2	9 %	341
Praseodymium	Pr_6O_{11}	57 %	227
Neodymium	Nd_2O_3	57 %	756
Samarium	Sm_2O_3	60 %	114
Europium	Eu_2O_3	59 %	27
Gadolinium	Gd_2O_3	58 %	62
Terbium	Tb_4O_7	56 %	7
Dysprosium	Dy_2O_3	58 %	35
Yttrium	Y_2O_3	58 %	165
Holmium[3]	Ho_2O_3	57 %	6
Erbium[3]	Er_2O_3	57 %	13
Thulium[3]	Tm_2O_3	56 %	2
Ytterbium[3]	Yb_2O_3	56 %	10
Lutetium[3]	Lu_2O_3	53 %	1
Average annual production REO in concentrate		**Tonnes**	**2,841**
Average "magnet" REO in concentrate[4]		**Tonnes**	**1,026**

Note: 1 *A large proportion of the cerium will be removed during the hydrometallurgical process*
2 *Average annual at full capacity excluding first and last years*
3 *No value currently attributed to these rare earths in the financial evaluation*
4 *"Magnet" rare earths are assumed to be neodymium, praseodymium, dysprosium and terbium*

The key outcomes of the economic evaluation for 100 % of the Project pre any financing costs are summarized in Table 1-18.

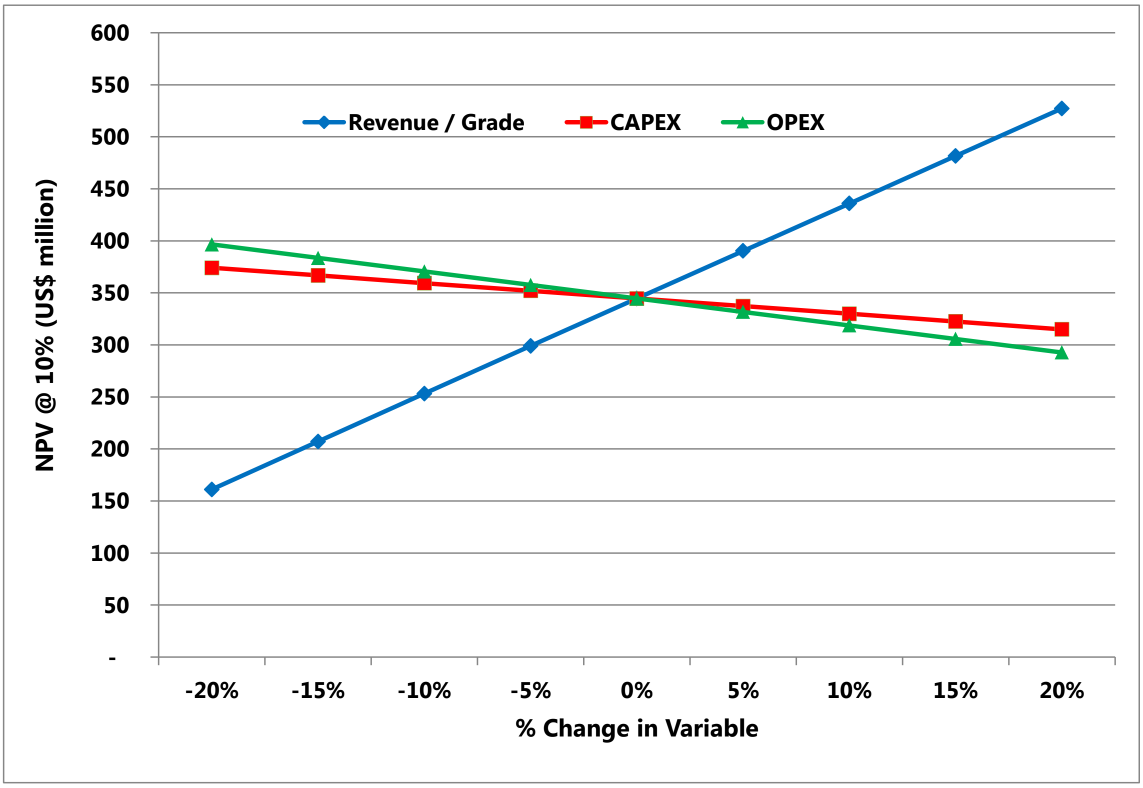
Table 1-18
Summary of Valuation Results (Nominal) – Post Tax valuation

Item	Unit	Value
Post Tax Valuation		
Project cash flow post-tax (including royalty)	US$ million	1,118
Payback period from Project start	Years	4.8
Payback period from start of production	Years	2.8
Post-tax NPV @ 10 % (Nominal) discount rate	US$ million	345
Post-tax IRR (Nominal)	%	37 %

The valuation model was used to test the Project's robustness to changes in the key value driver assumptions. A sensitivity analysis, as summarized in Figure 1-2, indicates that the Project is most sensitive to metal prices (or ore grade) fluctuations, followed by operating cost fluctuations, and then capital cost fluctuations.

Figure 1-2

NPV @ 10 % (Nominal) Sensitivity Analysis



2 INTRODUCTION

2.1 Scope of Work

This Technical Report has been prepared by the MSA Group (Pty) Ltd, SNC-Lavalin (Pty) Ltd, Epoch Resources (Pty) Ltd, Adamas Intelligence and Digby Wells Environmental (collectively the Consultants) on behalf of Mkango Resources Limited (Mkango). The Consultants were commissioned to prepare a Technical Report for a Pre-Feasibility Study (PFS) on the Songwe Hill Rare Earth Element Property located in the Republic of Malawi. Mkango is a Canadian mineral exploration and development company listed on the TSX Venture Exchange (TSX-V) under the symbol "MKA". The Songwe Hill Rare Earth Element Project (the Project) is 100 % owned by Mkango through its wholly owned subsidiary Lancaster Exploration Limited. The Pre-feasibility Study with an effective date of 19 September 2014 has been updated to reflect changes due to movements in equipment, reagents and other costs, in addition to exchange rates. Furthermore, for the purposes of the updated Pre-feasibility Study, a rare earth market review was commissioned from Adamas Intelligence to evaluate the future rare earth market in the context of Mkango's potential development timeframe.

The Project is located within the 100 % owned Exclusive Prospecting Licence (EPL) 0284/10R (the Phalombe Licence, licence) in southeast Malawi.

This Technical Report has been prepared in accordance with the disclosure and reporting requirements set forth in the Canadian National Instrument 43-101 *Standards of Disclosure for Mineral Projects* (NI 43-101), the corresponding Companion Policy 43-101 CP, the corresponding Form 43-101F1 (Form F1), and the CIM Definition Standards – For Mineral Resources and Mineral Reserves (2014).

Unless specified otherwise, all costings have been undertaken at an accuracy level of +/- 25 %.

All monetary figures expressed in this PFS are in US$ unless otherwise stated. This PFS uses metric measurements unless otherwise stated.

2.2 Principal Sources of Information

The review of the Project has been on information provided by

- Mkango Resources Limited,
- The MSA Group (Pty) Ltd: overall co-ordination of the Technical Report, Mining, and Financial Valuation;
- SNC-Lavalin (Pty) Ltd: process design and cost estimation for the integrated processing plant for the PFS; and design and cost estimation for the infrastructure associated with the integrated processing plant for the PFS;
- Met-Chem Consulting (Pty) Ltd: scientific and technical information contained in relation to metallurgical testwork;
- Epoch Resources (Pty) Ltd: Tailings Storage Facility;
- Adamas Intelligence: Market Studies; and
- Digby Wells Environmental: Environmental, social and health impact assessment.

2.3 Qualifications, Experience and Independence

This Technical Report has been compiled by a number of contributing authors, who have the appropriate relevant qualifications, experience, competence and independence to provide a review and analysis for the preparation of this PFS in accordance with the requirements of National Instrument 43-101 (Standards of Disclosure for Mineral Projects) (NI 43-101). The contributing authors are set out below in Table 2-1.

Table 2-1
Contributing Authors

Qualified Person / Contributing Author	Employer	Date of Site Visit	Area of Technical Responsibility	Sections of this PFS
Rob Croll (QP)	MSA	19th May 2014	Project Supervisor, QP	1,5.1, 5.3, 18, 21-27
Dr Scott Swinden (QP)		21st-25th April 2012 11th-16th October 2012	History, Geology, Exploration	1, 4-11, 23, excl. 4.3 and 5.2
Michael Hall (QP)	MSA	1st-3rd September 2012	History, Geology, Mineral Resource Estimation	1, 12, 14,
Clive Brown (QP)	MSA	19th May 2014	Mineral Reserve Estimation, Mining	1, 15, 16, 21, 22, 25 26
Nick Dempers (QP)	Consultant	19th May 2014	Recovery Methods, Infrastructure	1, 13, 17, 18, 21, 22, 25, 26
Craig de Jager (QP)	SNC Lavalin	-	Recovery Methods, Infrastructure	1, 17, 18, 21, 22, 25, 26
Guy Wiid (QP)	Epoch Resources	-	Tailings	1, 18, 21, 22, 25, 26
George Papageorgiou (Contributing Author)	Epoch Resources	19th May 2014	Tailings	1, 18, 21, 22, 25, 26
Dirk Loots (Contributing Author)	Epoch Resources	19th May 2014	Tailings	1, 18, 25, 26
Ryan Castilloux (Contributing Author)	Adamas Intelligence	-	Market Studies	19
John Sexton (Contributing Author)	MSA	-	Economic Analysis, Financial Model	21, 22
Graham Errol Trusler (QP)	Digby Wells Environmental	20th June 2012	Environmental	1, 4.3, 5.2, 20, 21, 22, 24-26
Bradly Thornton (Contributing Author)	Digby Wells Environmental	23rd – 26th April 2013 19th May 2014 20th-21st June 2014	Environmental	1, 4.3, 5.2, 20, 21, 22, 24-26

None of the Consultants or any associates employed in the preparation of this Technical Report has any beneficial interest in Mkango. The Consultants are not insiders, associates or affiliates of Mkango. The Consultants are being paid a fee for their work in accordance with normal professional consulting practice.

3 RELIANCE ON OTHER EXPERTS

The disclosure of information relating to land, legal, title and related issues relies on the following document:

- a legal opinion from Blantyre's law firm, Gustave and Company, that Lancaster is the legal holder of 100 % interest in EPL 0284/10R which is valid and existing as of the date of this opinion, 09 November 2015. The opinion further states that the EPL is unencumbered and in good standing.

The Consultants are not responsible for such information, which is found in Section 4 of this Technical Report, but have assumed it to be accurate for the purposes of this Technical Report.

4 PROPERTY DESCRIPTION AND LOCATION

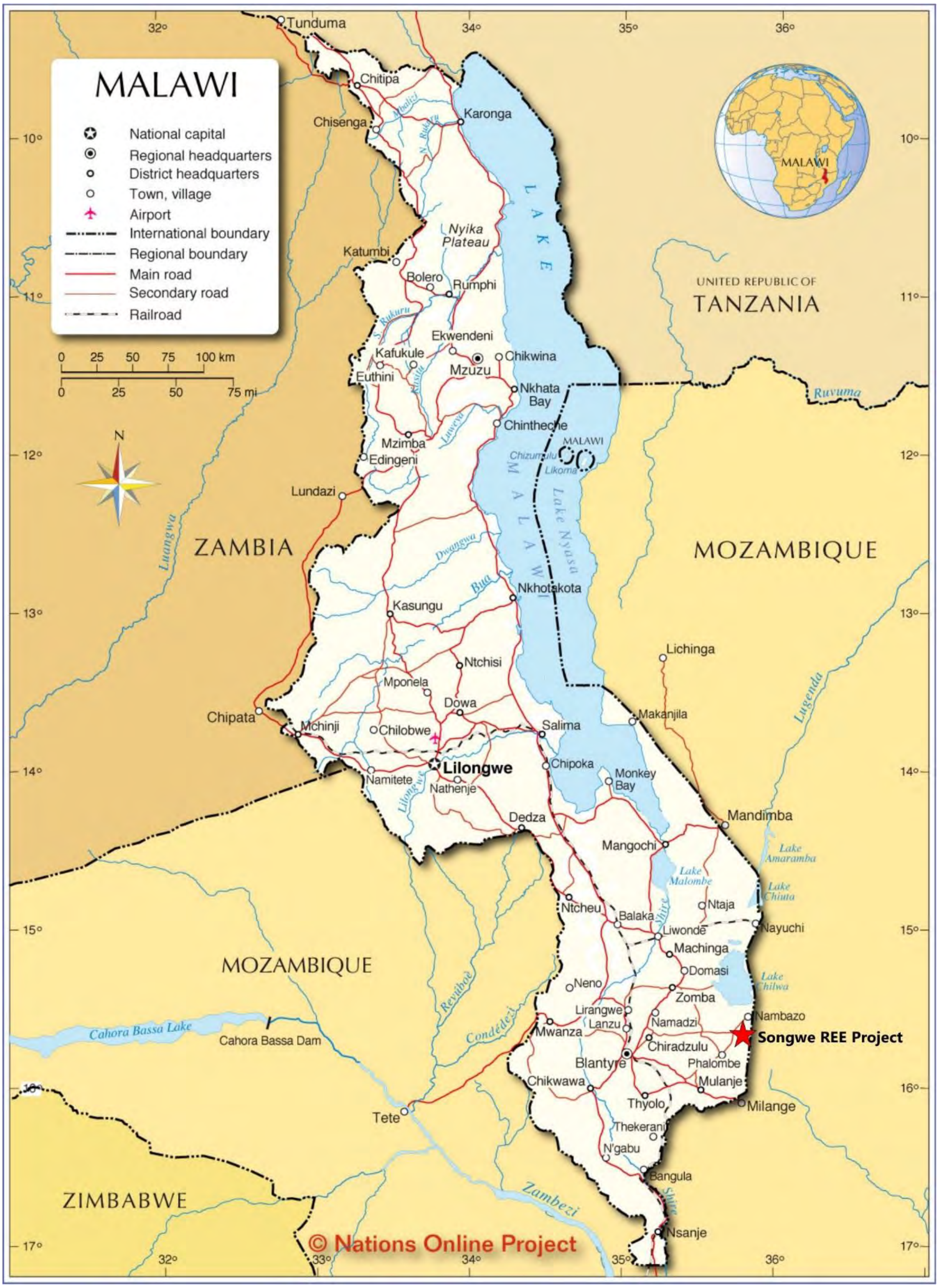
4.1 Location

Songwe Hill is located in southeastern Malawi, between Lake Chilwa and the Mulanje Massif and close to the eastern border of Malawi with Mozambique (Figure 4-1). It lies within Exclusive Prospecting License (EPL) 0284/10 which Mkango refers to as the "Phalombe License".

EPL 0284/10 lies entirely within the Southern Region of Malawi and Songwe Hill is within the Phalombe administrative district. It lies approximately 70 km in a straight line SE from the former capital of Zomba and approximately 90 km in a straight line ENE of the commercial centre of Blantyre. Songwe Hill can be reached from these centres via national highways S144 and S145, respectively. The S145 passes within 15 km of Songwe Hill.

Figure 4-1

Location of the Songwe Hill (red star) southeast of Zomba



Source: *Background map – Nations Online (2014)*

4.2 Mineral Tenure, Permitting, Rights and Agreements

4.2.1 Exclusive Prospecting Licenses in Malawi

The search for, the mining of, and the disposal of minerals in Malawi is governed by the Mines and Minerals Act (1981). The administration of the Act is the responsibility of the Commissioner for Mines and Minerals in the Ministry of Energy and Mining.

It is the objective of Malawi's mining policy to maximize the economic benefits to the Nation by exploiting the Nation's mineral resources. The Government encourages investors to explore, delineate, evaluate, and where, viable exploit the country's mineral resources.

The rights to carry out a programme of prospecting operations for specified minerals over a particular area are conveyed by way of an EPL. On application for an EPL, a detailed programme of exploration and expected expenditures is presented by the applicant together with a proposal for the training and employment of Malawi citizens.

4.2.2 EPL 0284/10R Phalombe

Mkango, through its 100 % owned subsidiary Lancaster Exploration Ltd (Lancaster), holds a 100 % interest in EPL 0284/10R (the Phalombe License or Permit) which includes the Songwe Hill REE deposit. The EPL covers an area of 849.1 km^2 and was originally granted to Lancaster on January 21, 2010 for three years. It was then renewed for two years, until 20th January 2015 and for a further two years, until 19th January 2017, by the Minister of Natural Resources, Mines and Energy under the Malawi Mines and Minerals Act from 1981 (Cap. 61:01). Mkango is in receipt of a legal opinion from Blantyre's law firm, Gustave and Company, that Lancaster is the legal holder of 100 % interest in EPL 0284/10R which is valid and existing as of the date of this opinion, 09 November, 2015. The opinion further states that the EPL is unencumbered and in good standing.

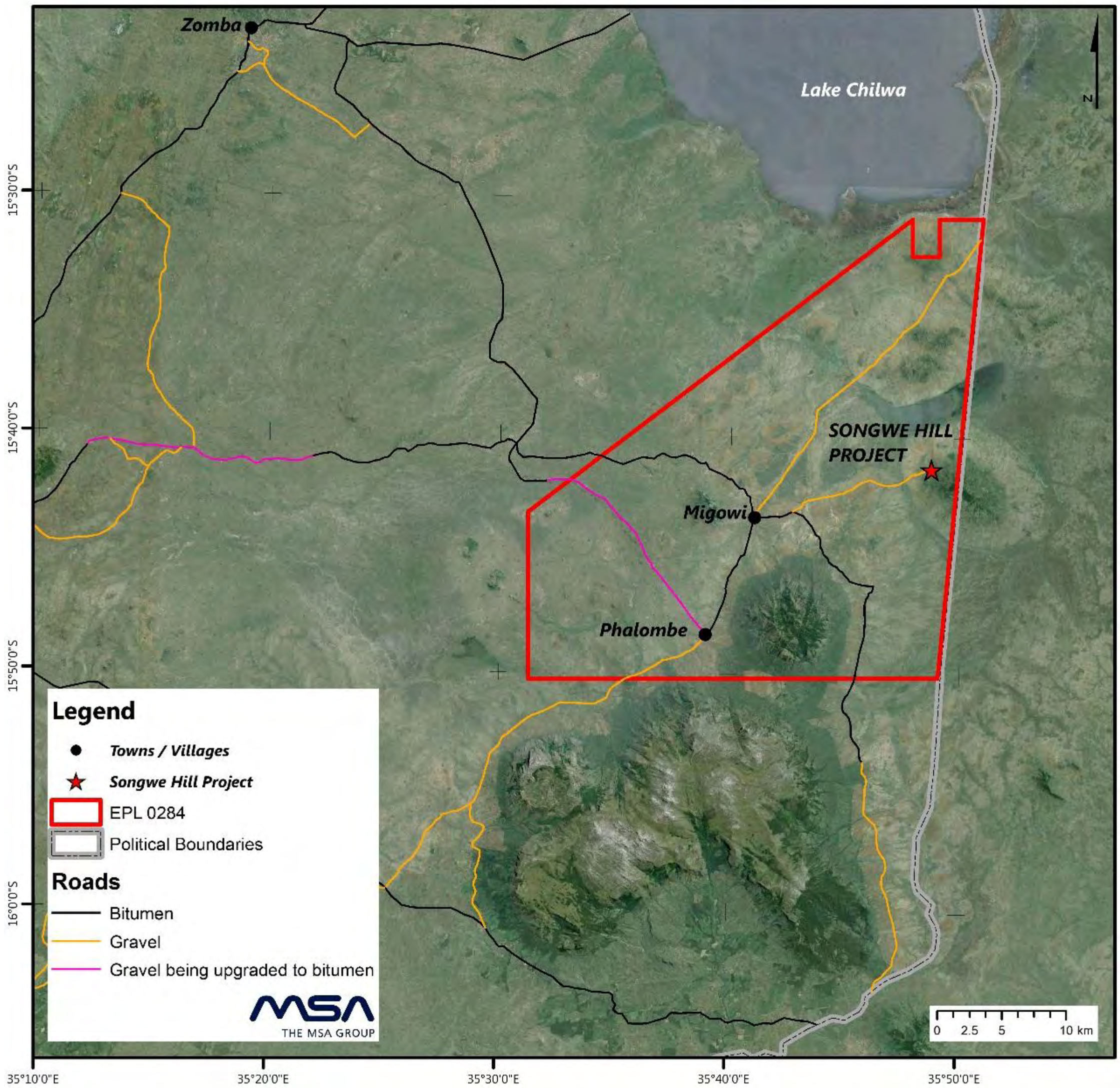
The EPL allows Mkango to explore for "rare earth elements, yttrium, strontium, niobium, iron ore, manganese, gold, silver, copper, bauxite, fluorite, phosphate, uranium, thorium, monazite, nepheline syenite, zircon, tantalum, clay and kaolinite".

The boundaries of the EPL are determined by reference to the Universal Transverse Mercator (UTM) Grid using the ARC1950 Datum in Zone 36 (Southern Hemisphere). The coordinates of the corner points of the EPL are given in Table 4-2 and its location is shown in Figure 4-2.

Table 4-1
History of tenure of EPL 0284/10 (Phalombe)

Application	Applied	Granted	Validity	Comment
Original	Nov 16, 2009	Jan 21, 2010	Jan 20, 2013	1,283 km^2; work program of prospecting, geochemical, geophysical work and drilling totalling MWK 43,500,000
1st Renewal	Oct 15, 2012	Jan 09, 2013	Jan 20, 2015	Proposed work program totalling MWK 150,000,000 with no size reduction
2nd Renewal	Dec 12, 2014	Jan 05, 2015	Jan 19, 2017	Proposed work program totalling MWK 150,000,000. Size reduced to 849.1 km^2

Figure 4-2
Location of EPL 0284/10 and access roads



Note: *The Songwe carbonatite abuts against Mauze Hill on its northwestern flank and is entirely within the Republic of Malawi. UTM Zone 36S and WGS84 Datum*
Source: *Base map sourced from Microsoft Bing (2012)*

Table 4-2
Coordinates of the current EPL 0284/10 as valid until January 20, 2015

Corner Point	Easting	Northing
A	770083	8247300
B	770083	8260258
C	799900	8282900
D	799900	8280000
E	802000	8280000
F	802000	8282900
G	805400	8282900
H	801800	8247300

Note: *The line between points G and H follows the international boundary between Malawi and Mozambique. Co-ordinates based on the Blantyre Map Sheet, 1:250,000. Coordinates in* Table 4-2 *use ARC1950 Datum*

The expenditure commitment for two years (2015 and 2016) of the EPL amounts to 150,000,000 Malawian Kwacha (MWK) (in United States Dollars (US$) approximately US$ 274,000 as at October 21st 2015 based on the Standard Bank Mid rate (MWK 547.5/US$) exchange rate).

4.2.3 General Provisions

Except for the general rights of the local communities to graze livestock or to cultivate the land, which rights may not interfere with the prospecting operations, there are no restrictions on surface access to the area pertaining to the Permit.

Under existing legislation the holder of an EPL may apply for the renewal of the Permit over an area which is not greater in extent than half of the originally granted prospecting area, unless otherwise approved by the Minister. If the application for the renewal of an EPL meets the set criteria, the Minister shall renew the License for a period not exceeding two years. The legislation provides for only two renewals of two years each and any further extension of the License is subject to Ministerial discretion.

The Government of Malawi has no rights or options to acquire any interest in the License save that the Government would be entitled to cancel or suspend the License if the holder of the Permit:

1. fails to use in good faith the land subject to the Permit for the purpose for which the relevant Permit was granted;
2. uses that land for any purpose other than the purpose for which the Permit was granted;
3. fails to comply with any requirement of the Mines and Minerals Act;
4. fails to comply with a condition of the Permit;
5. fails to comply with a direction lawfully given under the Mines and Minerals Act or with a condition on which any certificate of surrender is issued or on which any exemption or consent is given under the Mines Act;

6. fails to comply with the conditions, relating to the exercise of its rights under the Permit, which are contained in a relevant agreement entered between the Government and the holder of the Permit; and/or

7. fails to pay any amount payable by it under the Mines and Minerals Act within one month after the amount becomes due.

As far as is known, there has been no commercial exploitation of minerals within the License area and thus there are no existing mine workings, tailing ponds or waste dumps. There are no known legal encumbrances to the License area and no environmental liabilities, apart from the obligations of the Permit holder, as outlined in the Terms and Conditions of the EPL.

All necessary permits, approvals, consent, endorsements and permissions have been made in order to permit the company to conduct exploration work of the type contemplated by the Permit, including geochemical sampling, geophysical surveying, diamond drilling and core sampling in the area covered by the EPL.

There are no known significant factors or risks that may affect access, title, or the right or ability to perform work on the property as contemplated by the EPL.

4.2.4 Overlapping EPLs

There are no overlapping EPLs, or other factors or risks known to the authors that might affect Mkango's right or ability to perform work on EPL 0284/10.

4.3 Environmental Liabilities

Currently the environmental liabilities on the site are minimal as only exploration has taken place and it is a greenfields project. Should the Project not proceed to construction, the site will need to be closed and rehabilitated. Current liabilities would include the removal of the tented construction camp, the closure of boreholes and the rehabilitation of access and drilling roads.

Closure and Rehabilitation financial requirements for the Project have been calculated to provide an indication of what it could cost to close and rehabilitate the site once mining has been completed. These costs need to be updated as the Project advances.

The preliminary planned closure cost estimate was calculated using the block plan provided by SNC Lavalin. The estimated total cost for the closure of the Songwe REE Project is US$ 7,508,000. Table 4-3 below provides a summary of the costs.

Table 4-3
Summary of closure costs for Songwe

Summary of liability costs – Life of Mine		
No.	**Description**	**Amount (US$)**
1	Demolition	4,410,000
2	Rehabilitation	1,196,000
	Subtotal	**5,606,000**
3	Groundwater Monitoring	213,000
4	Vegetation Maintenance	53,000
5	Vegetation Monitoring	2,000
6	Project Management (12%)	673,000
7	Contingency (10%)	561,000
	Subtotal	**7,108,000**
8	Rock Dump Reshaping and Rehabilitation	400,000
	Total	**7,508,000**

The following key assumptions were used for the closure cost estimate:

- the block plan is representative of the infrastructure and liabilities associated with the proposed mine;
- the closure estimate excludes potential liabilities associated with social obligations to surrounding communities, retrenchment payments and long term water management;
- a contingency of 10 % has been included to allow for areas which may have been undervalued or which may have been overlooked;
- for the post-closure period, monitoring of groundwater and surface water has been assumed to take place for a period of five years, with sampling taking place on a quarterly basis. Vegetation monitoring and maintenance will take place for three years.

It is recommended that:

- an environmental obligations register be compiled during the ESHIA process to ensure that all environmental obligations related to rehabilitation and closure are recorded;
- the closure cost estimate be updated once the Definitive Feasibility Study is completed; and
- a preliminary closure plan be developed to guide the closure cost estimate in terms of likely closure actions and methodologies.

These recommendations should be actioned in the ESHIA phase of the Project.

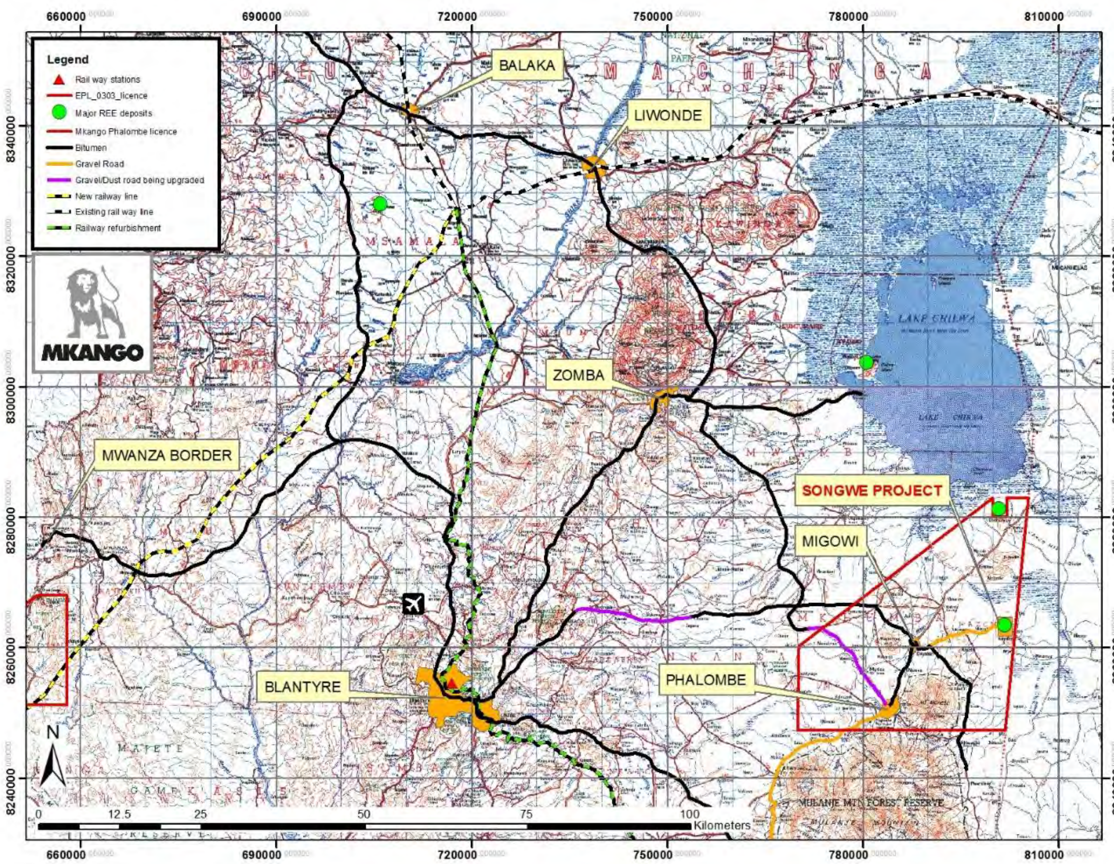
5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

5.1 Accessibility

Migowi, approximately 15 km from Songwe Hill, is the nearest town to the Project area (Figure 5-1). Phalombe, the largest nearby town, is located approximately 25 km from Songwe Hill (Figure 5-1). All-weather roads connect Migowi and Phalombe to Zomba, the former capital, and Blantyre, the principal commercial city of Malawi, which are both approximately 55 km from Migowi.

Figure 5-1

Regional geography and road access to the Songwe Hill Project area



Source: *Mkango (2015); background base map supplied by the Department of Surveys, Blantyre, Malawi (1991) and modified by Mkango in 2015.*

The S144 national road connecting Zomba and Phalombe and the S145 connecting Blantyre with Phalombe via Migowi are currently being upgraded from all-weather gravel to Class 1 bitumen roads (Figure 5-1). Local gravel roads provide access from Migowi to the exploration camp at the base of Songwe Hill. Total travel time from Zomba is approximately 1.5 hours, which will reduce as the roads continue to be upgraded.

The closest airports to the Project area are located at Zomba and Blantyre which are approximately 70 km to the northwest and to the west-southwest respectively. South African Airways (SAA) operates regular flights and an air cargo service from Johannesburg to Blantyre.

The nearest rail head for cargo is currently at Blantyre although a new dry port is also planned close to the junction of the north – south and east – west rail lines to the west of Liwonde.

5.2 Climate and Physiography

5.2.1 Climate and Meteorological Overview

Malawi is located between two climatic mega-zones, equatorial Africa and southern Africa. The climate in Malawi is largely dictated by the oscillations of the Inter-Tropical Convergence Zone (ITCZ), i.e., the converging of, and interaction between the zonal Congo air mass and the meridional southeastern trade winds and monsoonal northeastern winds. The ITCZ, which provides Malawi with a typically tropical bimodal seasonal pattern, moves over the country in late October and ranges south throughout November, reaching the likes of Mulanje in late November. It begins its journey back north in late March to April, leaving the country to its dry season, which is subdivided into cool (May-August) and hot (September–April) periods. Malawi is said to experience three seasons: wet, cool dry and hot dry. The climatic conditions are not expected to impact on the operation of the mine, which has been planned to operate all year round.

This seasonal pattern is further influenced by the Indian Ocean's southwestern cyclonic weather patterns, i.e., by a cool, dry westerly frontal system and by the ocean's surface temperature variability. The latter is especially responsible for annual variations leading to abnormal weather effects, particularly the effects of the El Nino Southern Oscillation. In the north of Malawi and in common with the experience of east African countries, El Nino leads to increased precipitation and risk of flooding, while in the south of Malawi, in line with its effects on southern African countries, El Nino has the opposite effect with less rain and an increased risk of drought. In the event of the ocean's surface temperatures decreasing (La Nina), the reverse picture is true, with the north drier, and the south wetter.

Malawi's climate is moderated by a high percentage of surface water, and by the fact that it possesses an altitudinal range from 500 metres above mean sea level (mamsl) (Lake Malawi and Limonde) to peaks over 3,000 mamsl high (Mt Mulanje). Spatially, precipitation levels increase south to north, with patches receiving 600 mm to 750 mm per annum, the majority of the country receives between 750 mm and 1,000 mm per annum and much of the coastal lake plains, the north and the highlands garnering between 1,000 mm and 2,500 mm per annum. Winter temperatures average from 18 °C to 19 °C, and summer temperatures between 22 °C and 27 °C.

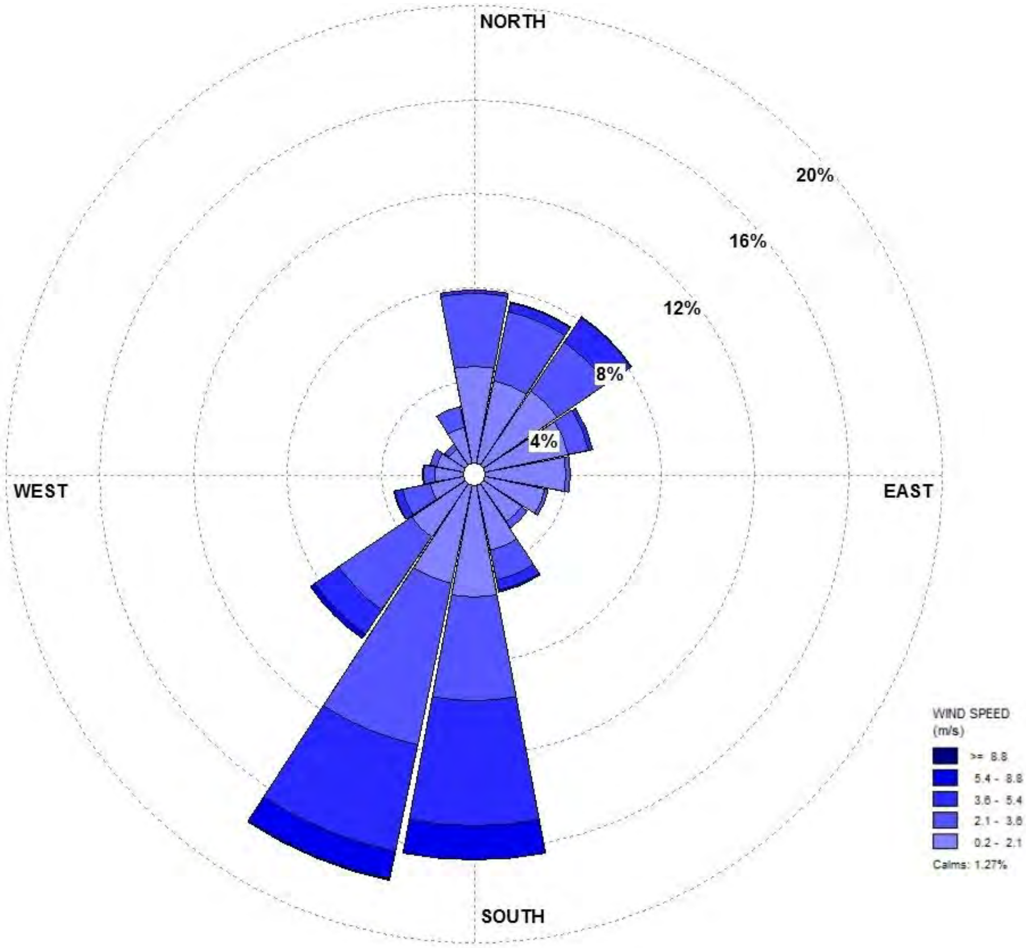
In August 2014, a weather station was installed on site in order to start recording site specific climatic data. The weather station is monitored remotely from South Africa in order to ensure the reliability and integrity of data collected.

Prior to August 2014, meteorological data was obtained from the LocClim database, an online database capable of producing climate maps of the average monthly climate conditions (eight variables) taken from the agroclimatic database of the Agromet Group of the Food and Agriculture Organisation of the United Nations (http://www.fao.org/nr/climpag/pub/en0201_en.asp). The information obtained from LocClim is more regional in nature and is compiled by interpolative techniques, based on data from nearby weather stations in Malawi. This chapter refers to both data obtained from the weather station on site and from LocClim.

5.2.1.1 Wind Speed and Direction

From the long term LocClim data, the predominant wind direction was determined as south-southeasterly. On site monitoring over a one year period from August 2014 to September 2015, revealed that the predominant winds are from the south-southwest and south (Figure 5-2), with a frequency of occurrence of 17.6 % from the south-southwest and 16.4 % from the south. Calm conditions (wind speeds < 0.5 m/s) occurred for 1.27 % of the time. The average wind speed during the period was 2.21 m/s. Winds from the northeast sector are also dominant in the overall wind regime for the area.

Figure 5-2
Period surface wind rose for Songwe Hill site specific data, August 2014 – September 2015



An analysis of site specific wind data over the one year period indicates that although the wind speeds were generally moderate at an average of 2.21 m/s, wind speeds of between 3.6 m/s and 5.4 m/s occurred 14 % of the time. Wind speeds of greater than 5.4 m/s, which have the ability to generate fugitive dust from open areas, waste rock dumps and the TSF, occurred 1.3 % of the time. Diurnal variability in the wind fields was also assessed (Table 5-1). During the night, wind field conditions from the south prevail for 23.1 % of the time and from the south-southwest direction for 17.7 % of the time. Wind speeds of between 3.6 m/s and 5.4 m/s and between 5.4 m/s and 8.8 m/s occurred 14.6 % and 4.2 % of the time respectively.

The morning time is dominated by wind fields from the north northeast, northeast, north and south-southwest directions, accounting for 14.2 %, 12.7 %, 12.3 % and 12.1 % respectively. Wind speeds between 3.6-5.4 m/s and 5.4-8.8 m/s occurred 8.7 % and 1.6 % of the time respectively. The northeast and southwest sectors dominated the wind regime.

In the afternoon, the dominant wind fields were from the south southwest (17.8 %), north (16.7 %) and southwest (14.7 %). Secondary components were observed from the north northeast and northeast. The evening wind field conditions were concentrated in the southwest sector, with winds from the south (27.4 %) and south southwest (22.9 %) directions respectively. Wind speeds between 3.6-5.4 m/s and 5.4-8.8 m/s occurred 24.2 % and 5.7 % of the time.

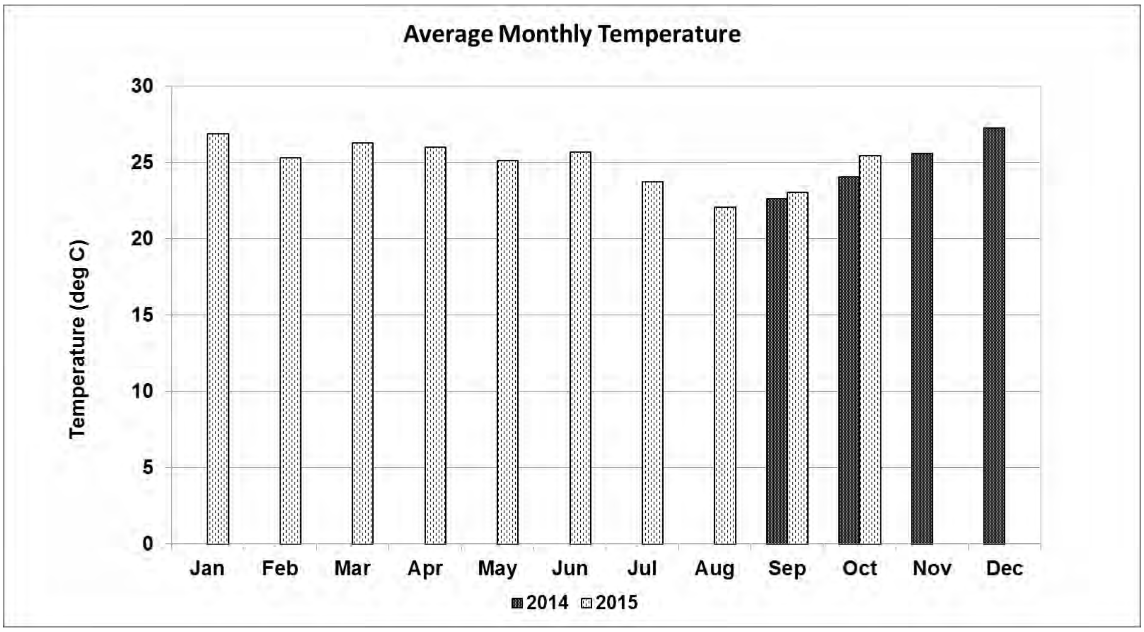
Table 5-1
Diurnal variability in wind fields

Period	Prevailing wind fields	Wind speeds of 3.6 m/s to 5.4 m/s	Wind speeds of 5.4 m/s to 8.8 m/s
Night	From south (23.1 % of the time) and from south southwest (17.7 % of the time)	14.6 % of the time	4.2 % of the time
Morning	From north northeast, northeast, north and south southwest predominantly	8.7 % of the time	1.6 % of the time
Afternoon	From south-southwest (17.8 % of the time), north (16.7 %) and southwest (14.7 %) with secondary components from north northeast and northeast	8.6 % of the time	0.8 % of the time
Evening	From south (27.4 %) and south southwest (22.9 %)	24.2 % of the time	5.7 % of the time

5.2.1.2 Temperature

The Project area is warm from September to April, with average daytime maxima around 26 °C. The monthly average temperature ranges from 22.2 °C in August to 27.3 °C observed in December. The monthly minimum ranges from 11.4 °C in August to 20.7 °C in October (Figure 5-3) based on the site specific meteorological data for the Songwe Hill area.

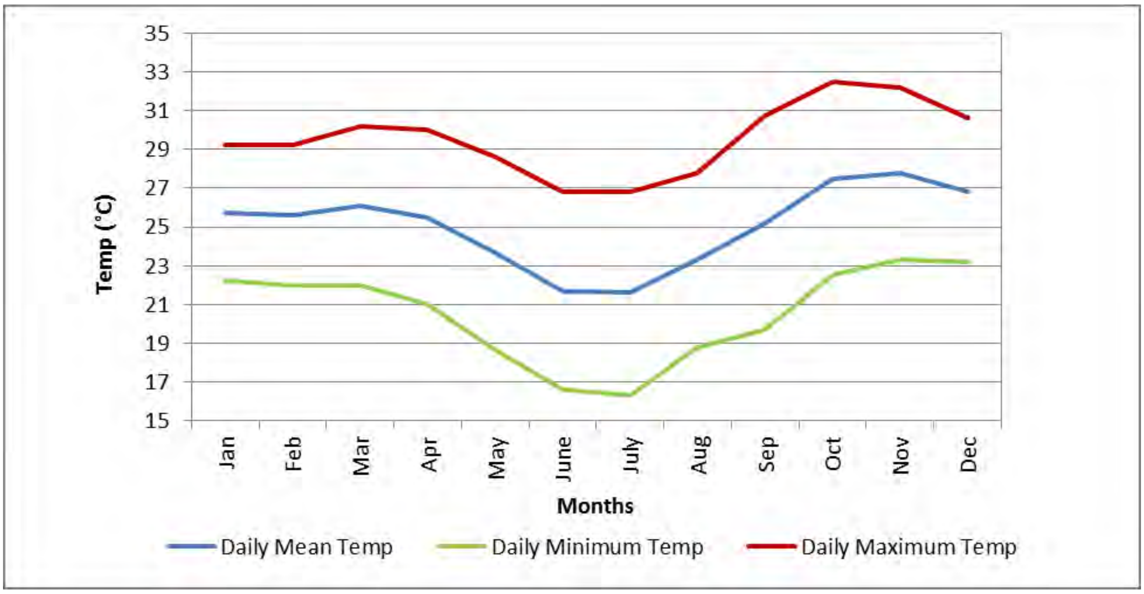
Figure 5-3
Average monthly temperature derived from the Songwe Hill site specific data (2014-2015)



Based on the LocClim data, daily temperature minima ranges from 17.1 °C in July to 25.9 °C in January. Thus the LocClim data is comparable to site specific meteorological data measurements, with slight variations.

Daily mean, minimum and maximum temperature signatures for Study Area, extracted from the LocClim database, are summarised in Figure 5-4 and show a similar pattern to the modelled data.

Figure 5-4
Daily Mean, Minimum and Maximum temperature extracted from the LocClim database for Study Area

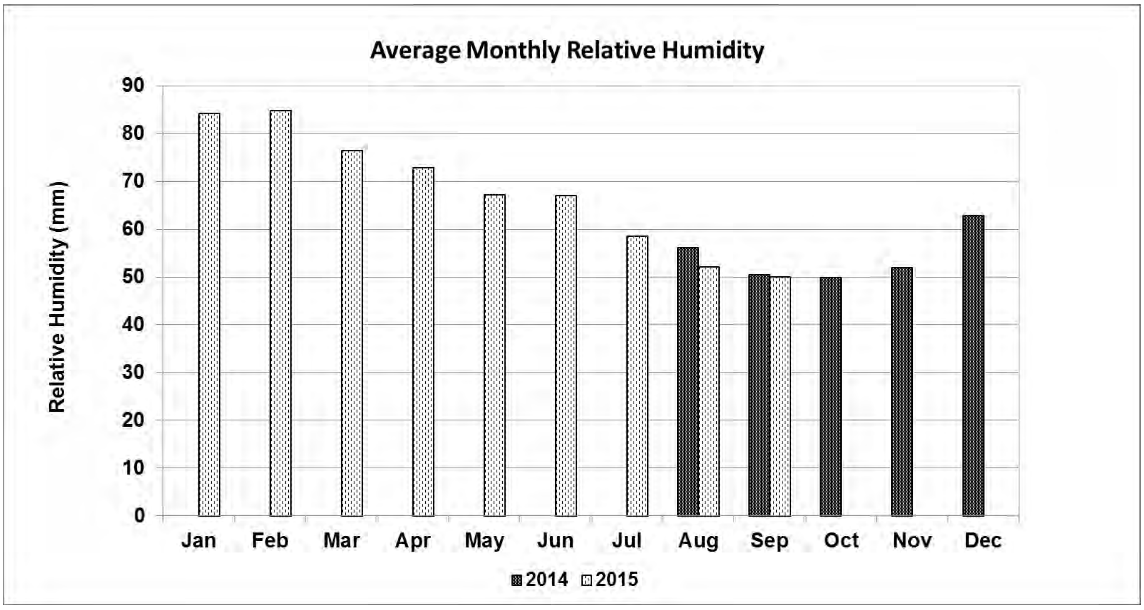


5.2.1.3 *Relative Humidity*

The monthly average relative humidity (Figure 5-5) remains above 50 % for the whole year and ranges from 50.1 % in September to 84.7 % in February. The monthly minimum relative humidity on the other hand dropped to 10.9 % in August, and reached a high of 43.5 % in February.

Figure 5-5

Average Monthly Relative Humidity derived from the Songwe Hill site specific data (2014-2015)



5.2.1.4 *Precipitation*

The rainy season is from November to April, with the highest monthly rainfall in February with a maximum of 399 mm recorded. Much of the Study Area receives little to no rainfall from May to September (Figure 5-6). Heavy rainfall occurred in January and February 2015 which resulted in flooding in the area. The annual total rainfall maximum and average for the Songwe Hill site are 821 mm and 68 mm respectively.

Figure 5-6

Average Monthly Precipitation derived from the Songwe Hill site specific data (2014-2015)

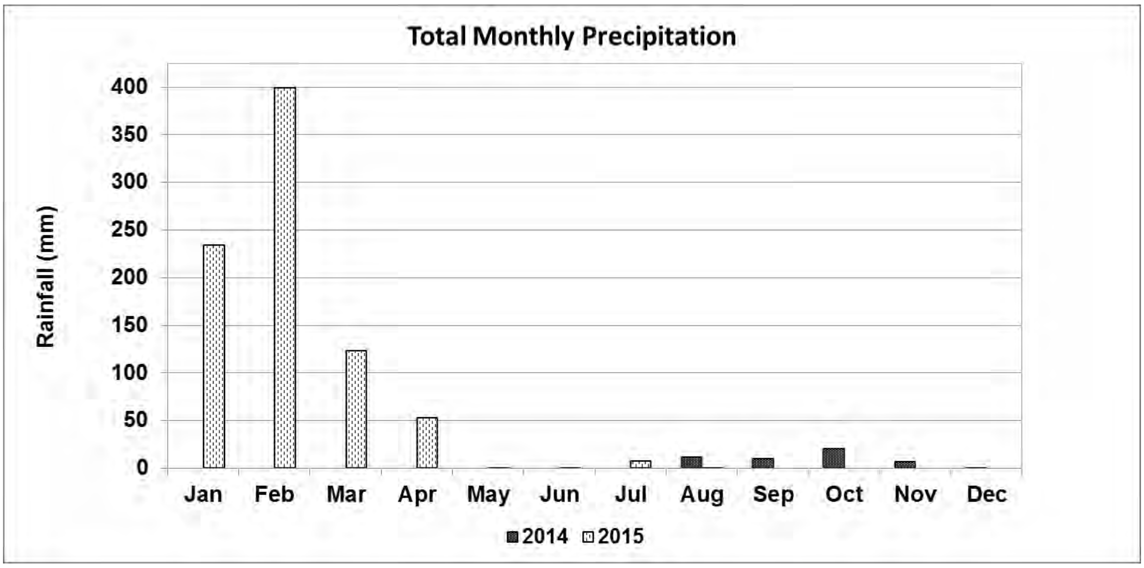


Figure 5-7 gives the monthly average precipitation (blue line) and average estimated evapotranspiration (red line) extracted from the LocClim database. This shows that the potential evapotranspiration is higher than precipitation for the months April to October (the dry season). The opposite is true for November to March.

Figure 5-8 shows average monthly sunshine hours and day-length hours extracted from the LocClim database.

Figure 5-7
Monthly precipitation and Potential Evapotranspiration extracted from the LocClim database for Study Area

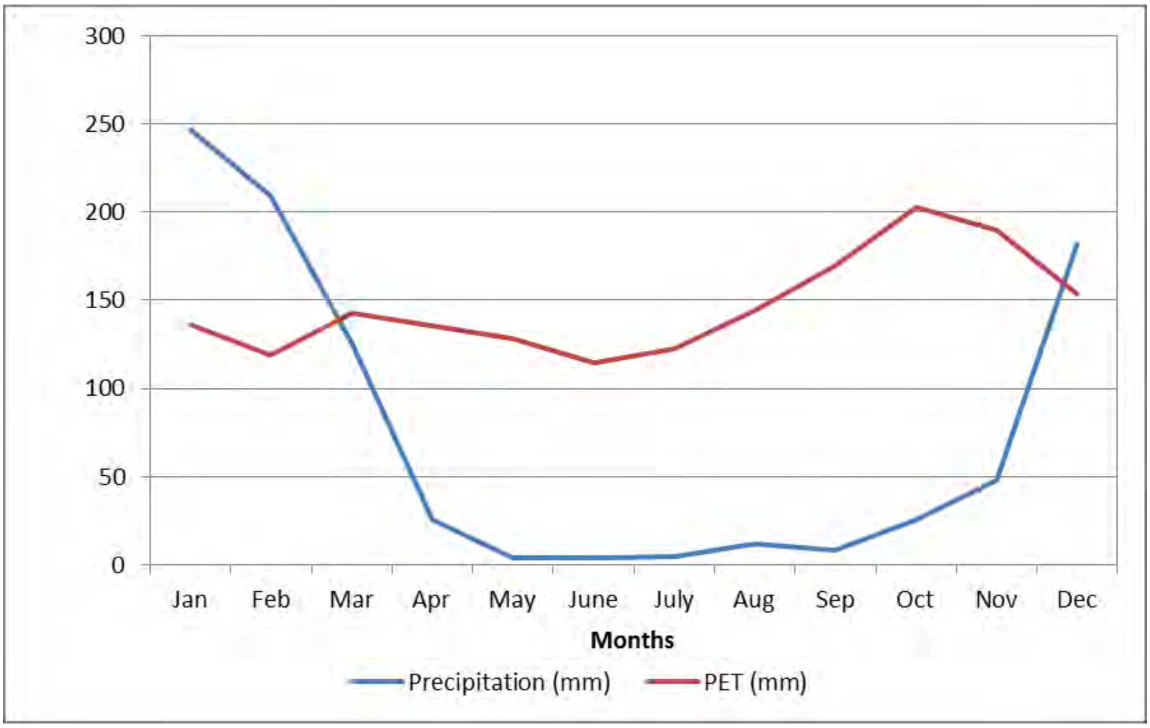
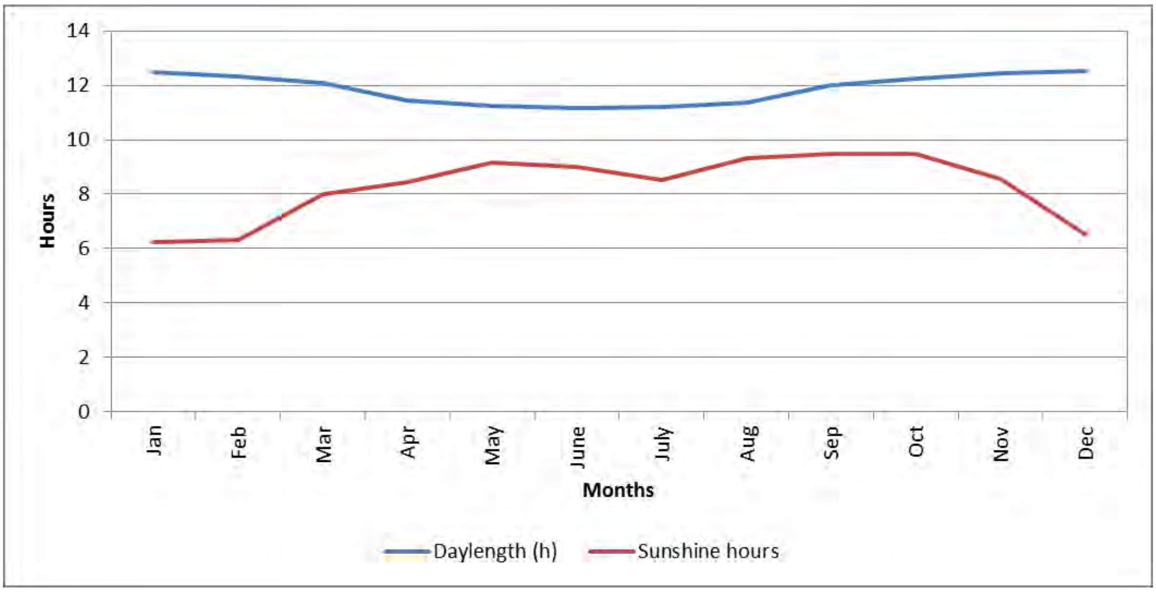


Figure 5-8
Monthly Sunshine Hours, Day-length and Sunshine Fraction extracted from the LocClim database for Study Area

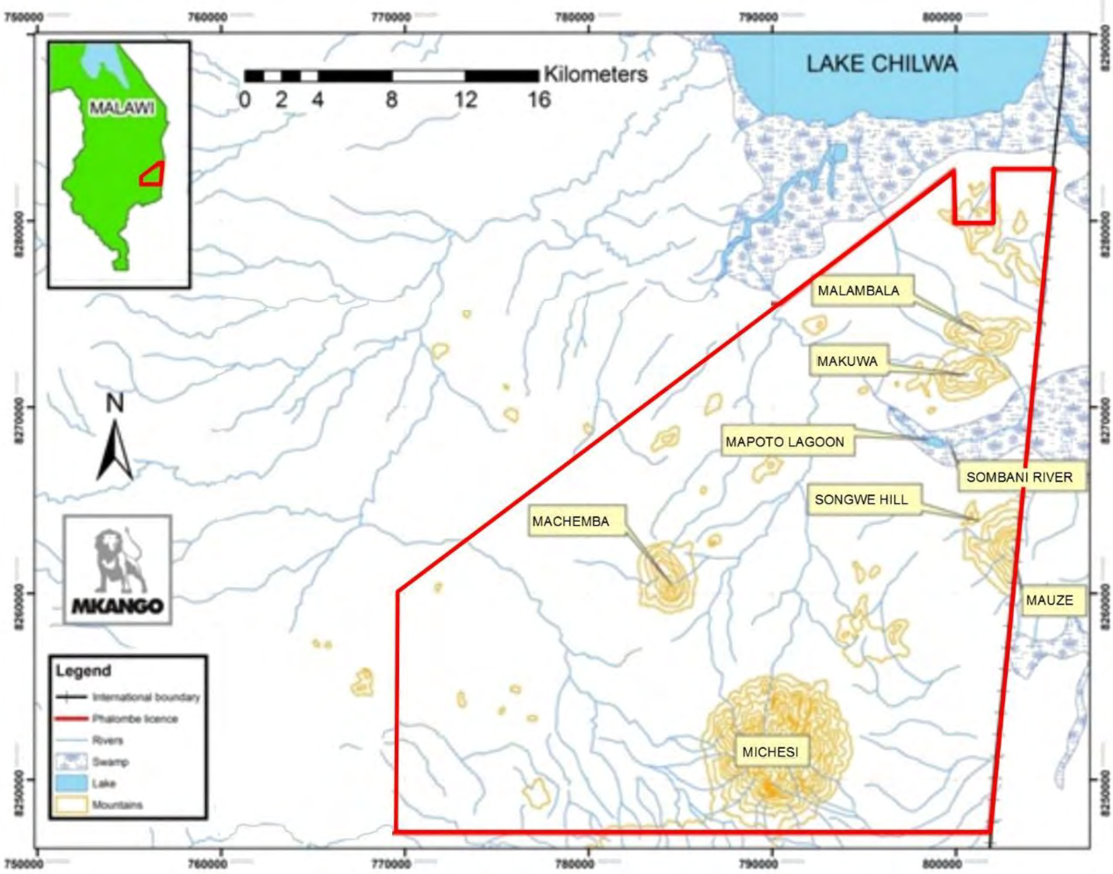


5.2.2 Physiography

To the north of Songwe Hill the physiography comprises an alluvial plain immediately south of Lake Chilwa, which passes southwards into a more elevated region characterized by numerous hills and mountains (Figure 5-9). Some mountains are marked by steep cliffs and areas of bare rock, while other hills are completely wooded, varying from dense tropical forest to a more open acacia forest.

The vegetation changes significantly between the rainy and dry seasons. Following the rainy season the higher ground is covered by a dense growth of elephant grass which can reach three metres in height in open areas. In the dry season the grass cover withers and is commonly burnt back to expose bare ground and rock. The lower lying areas, apart from a zone adjacent to Lake Chilwa, are prone to flooding in the rainy season and support occasional villages with the land intensively farmed for tobacco, maize, cassava and sweet potatoes.

Figure 5-9
Physio-geographical map of the Phalombe district



Source: *Mkango (2012); background base map supplied by the Department of Surveys, Blantyre, Malawi (1991) and modified by Mkango in 2012.*

The Songwe carbonatite forms a moderate- to steep-sided conical hill with a diameter of about 800 m and a summit elevation of 990 m which is approximately 230 m above the plain. On the south-eastern side, Songwe Hill abuts against the higher Mauze Mountain (Figure 5-10) which rises to an elevation of 1,592 m.

Figure 5-10
Songwe Hill carbonatite abutting against Mauze Hill

Source: *Brady (2012)*

5.3 Local Resources and Infrastructure

Exploration activities are conducted from a semi-permanent camp (Figure 5-11) situated at the base of Songwe Hill. Migowi, the nearest town (approximately 15 km from the Project area), is connected to the national electricity grid. The district administration centre is currently being relocated from Phalombe to Migowi. A large surface water resource is located at Mpoto Lagoon, approximately 5 km from the Project site. There is an on-site water borehole, established in 2011, which currently supplies water for all Project operations. Cellular/digital telephone coverage is available at the Project through the telecommunication service providers TNM and Airtel Malawi.

Figure 5-11

View from Songwe Hill onto Mkango's exploration camp

Source: *Photograph courtesy of Dr F. Reichhardt (taken 2012)*

There is a moderately dense population in the Project area with the majority of the people living in small villages and relying on subsistence farming for their livelihoods, with limited production of cash crops. The residents of the area provide a relatively large but generally unskilled labour force.

Fuel and some food supplies could be obtained from the nearest town, Migowi. All other materials and equipment are obtained from the cities of Zomba or Blantyre.

6 HISTORY

6.1 Ownership History

There are no public records documenting the history of mineral tenure in the Project area. The Geological Survey Department of Malawi (GSDM) has no record of any exploration being carried out in the Project area since the late 1980s.

6.2 Historical Exploration

Historical work, referenced below to Dixey *et al.* (1937), Garson (1962, 1965), Garson and Wooley (1969), and Hunting Geology and Geophysics Limited (1985), was regional in nature and included work outside the boundaries of the current Phalombe license. Work referenced to Lewis (1958) and the Japan International Cooperation Agency and Metal Mining Agency of Japan (1989) was conducted within the boundaries of the current Phalombe license.

6.2.1 Pre-1981 Programmes

The geological sequence in the southern Chilwa Province was originally defined and referred to as 'The Chilwa Series' by Dixey *et al.* (1937) in a monograph which is notably important for identifying and describing carbonatites in Africa for the first time. Dixey *et al.* (1937) recognized 11 occurrences of carbonatite in Malawi which at that time more than doubled the global total of known carbonatites. Two localities within the License area, Songwe and Tundulu, were investigated by Dixey *et al.* (1937) who described the Songwe occurrence as a volcanic vent comprising limestone, feldspar rock and agglomerate. The authors produced a simple sketch map along with photographs of hand specimens of agglomerate and feldspathic breccia and concluded that the limestone found at Songwe and other localities in the Chilwa Province is of magmatic origin and comparable to the carbonatites of the Fen complex in Norway.

The Songwe Ring structure was the subject of a brief unpublished report for the Nyasaland Mining Corporation Ltd. in 1953 (Lewis, 1953).

Significant new work on the carbonatites of Malawi was conducted in the early 1950s. Of particular interest is Garson's work with the Nyasaland Geological Survey. Building on earlier descriptions of specific occurrences in the area (e.g. Garson, 1962), he provided a comprehensive account of the carbonatites of Malawi including a detailed description of Songwe (Garson, 1965) with a geological map indicating a volcanic vent filled with feldspathic breccia and agglomerate and cut by arcuate sheets of carbonatite. He showed that rocks of the Precambrian basement are fenitised in the vicinity of the vent and interpreted the calcite-silicate rocks on the eastern margin to be the product of the reaction between carbonatite and nepheline syenite. Garson (1965) also noted that the agglomeritic rocks at Songwe resemble feldspathic fenites of the Nkalonje vent and the Tundulu carbonatite complex. He provided mineralogical descriptions of the latter occurrences and noted the presence of accessory minerals including apatite, pyrochlore, synchysite, bastnäsite and fluorite.

In a later publication, Garson and Walshaw (1969) outlined the geology of the Mulanje area, including a description of the "Songwe Carbonatite Vent". The authors noted the presence of REE-bearing minerals at Tundulu but did not describe them from Songwe.

6.2.2 Post-1981 Programmes

6.2.2.1 Aeromagnetic survey

The GSDM compiled and published total field aeromagnetic survey data at 1:250,000, 1:100,000 and 1:50,000 scales. The data, covering the whole of Malawi, were acquired in 1984 by Hunting Geology and Geophysics Ltd (Hunting) under contract to the United Nations (Project MLW/ 80/030) (Hunting Geology and Geophysics Limited, 1985).

The data were obtained, dependent on the terrain, from fixed wing and helicopter aeromagnetic surveys flown with a flight line spacing of 1,000 m at mean sensor elevations of 120 m and 50 m, respectively. The data were corrected for diurnal variations and gridded at a cell size of 250 m prior to contouring for the paper-based maps. Topographic information was reproduced from the 1:50,000 scale map series published by the Government of Malawi using a Universal Transverse Mercator (UTM) coordinate grid.

6.2.2.2 Gravity survey

Gravity data were acquired during 1984 together with the aeromagnetic data. The gravity survey covered the entire country and maps with scales of 1:250,000, 1:100,000 and 1:50,000 were compiled and published by the GSDM.

6.2.2.3 Radiometric survey

Country-wide radiometric data was also acquired during 1984 (Hunting Geology and Geophysics Limited, 1985) and published by the GSDM as a series of 1:250,000, 1:100,000 and 1:50,000 scale maps. The maps show total counts, uranium, potassium and thorium counts and ternary colour plots are available at scales of 1:100,000 and 1:250,000.

6.2.2.4 Airborne electromagnetic survey

The GSDM compiled 1:100,000 map sheets of the interpreted anomaly coverage from electromagnetic (EM) survey data acquired during 1984 and 1985 by Hunting Geology and Geophysics Ltd. The data were obtained using a Geonics EM33-3 helicopter-based EM system with a nominal sensor elevation of 30 m and a flight line spacing of 1,000 m. The anomalies were selected from the analogue profiles in the field and interpreted using either vertical thin dyke or uniform half-space models, as appropriate. The data were presented on 1:100,000 scale base maps with topographic detail reproduced from the 1:50,000 scale topographic maps.

6.2.3 Japan International Cooperation Agency and Metal Mining Agency of Japan, 1986 - 1988

In response to a request from the Government of the Republic of Malawi, the Government of Japan conducted a mineral exploration programme in the Chilwa Alkaline Province from 1986 to 1988. The work was overseen by the Japan International Cooperation Agency (JICA) and operated by the Metal Mining Agency of Japan (MMAJ) working together with the GSDM. JICA and MMAJ completed a detailed investigation of the potential for REE mineralization in southern Malawi including the Songwe Hill deposit. Following the first phase of the programme, which comprised geological and geochemical surveys, JICA and MMAJ concluded that Songwe Hill, as well as other occurrences within and adjacent to the present License area, had 'high potentiality' for a "carbonatite deposit"'.

The programme was divided into three phases corresponding to the work carried out from 1986 to 1988 and the results have been compiled in the "JICA and MMAJ Report on the Cooperative Mineral Exploration in the Chilwa Alkaline Area, Republic of Malawi, Phases I, II and III; Consolidated Report, 1989".

The first Phase involved a "Route Survey" (geological field survey) of 13 km, the collection of 89 geochemical samples (Table 6-1), the completion of a single whole-rock chemical analysis and a single thin section for mineralogical purposes. The sampling programme largely focused on carbonatite and related rocks with analysis for REE comprising lanthanum, cerium, neodymium, samarium, europium, terbium, dysprosium, ytterbium and yttrium as well as strontium, niobium and thorium. The reports contain no information on the method of REE analysis or any QA/QC protocols that may have been implemented.

Table 6-1
Ranges and averages of REE, Sr, Nb and Th for 89 geochemical samples from Songwe collected during Phase 1

Element	Range of concentration	Average concentration
La_2O_3 (ppm)	87 – 8,102	3,036
Ce_2O_3 (ppm)	330 – 14,688	5,774
Nd_2O_3 (ppm)	412 – 4,609	2,162
Sm_2O_3 (ppm)	75 – 4,664	325
Eu_2O_3 (ppm)	7 – 931	80
Tb_2O_3 (ppm)	0 – 64	26
Dy_2O_3 (ppm)	2 – 261	88
Yb_2O_3 (ppm)	2 – 82	33
Y_2O_3 (ppm)	55 – 1,411	508
Sr (ppm)	516 – 21,207	7,467
Nb (ppm)	21 – 1,307	381
Th (ppm)	0 – 813	257
TREO (%)	**0.3 - 2.9**	**1.2**

Note: *TREO includes oxides of lanthanum, cerium, neodymium, samarium, europium, terbium, dysprosium, ytterbium and yttrium*
Source: *JICA and MMAJ (1989)*

Following the positive Phase 1 results, the work programme proceeded to Phases 2 and 3 in 1987 and 1988, respectively. As outlined in Table 6-2, Phases 2 and 3 were much more comprehensive and included the drawing of a detailed geological map (Figure 6-1), further collection of surface geochemical samples (Figure 6-2) and two drilling programmes.

The geological map distinguishes carbonatite and agglomerate/feldspathic breccia and in this respect does not differ from Garson's 1965 map. However, it does show a much more complex distribution for the carbonatite and notably indicates the presence of two large, continuous areas of carbonatite on the northern slope and a somewhat smaller occurrence on the lower northeastern side of the hill. The location of the 19 drill holes completed during Phases 2 and 3 and some of the trenches are also shown superimposed on the geological map (Figure 6-1) which was digitized by Mkango from the original map by JICA and MMAJ (1989).

Table 6-2

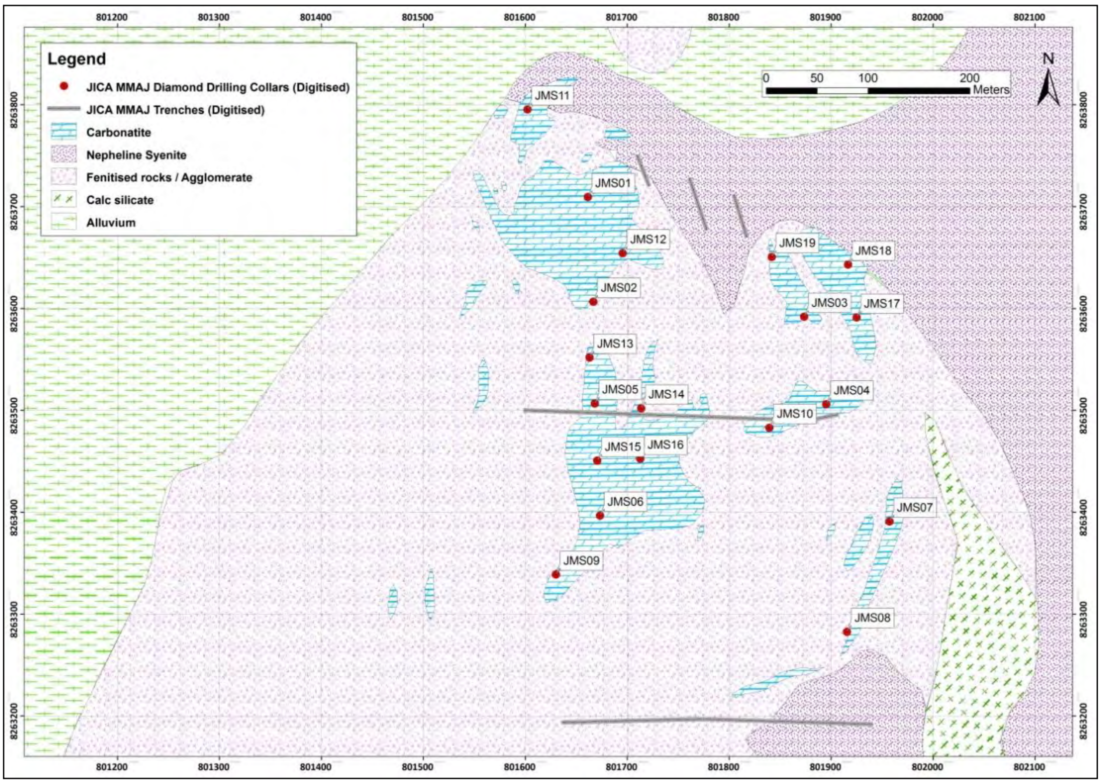
Phase 2 and 3 investigations on Songwe Hill

Type of survey	Unit	Drilling	Unit
Area mapped (km^2)	3.2	Number of drill holes	19
Route survey (km)	9	Total length of drill holes	960.15 m
Trench survey (m)	600	Inclination	Vertical
Rock samples collected and assayed	151	Drillcore samples assayed	191
Microscope thin sections	13	Elements assayed for	La, Ce, Nd, Sm, Eu, Tb, Y, Nb, Sr, P
Microscope polished sections	20	Elements assayed for	La, Ce, Nd, Sm, Eu, Tb, Y, Nb, Sr, P
X-ray diffraction analyses	14	Elements assayed for	La, Ce, Nd, Sm, Eu, Tb, Y, Nb, Sr, P
EPMA	1	Elements assayed for	La, Ce, Nd, Sm, Eu, Tb, Y, Nb, Sr, P

Source: *JICA and MMAJ (1989)*

Figure 6-1

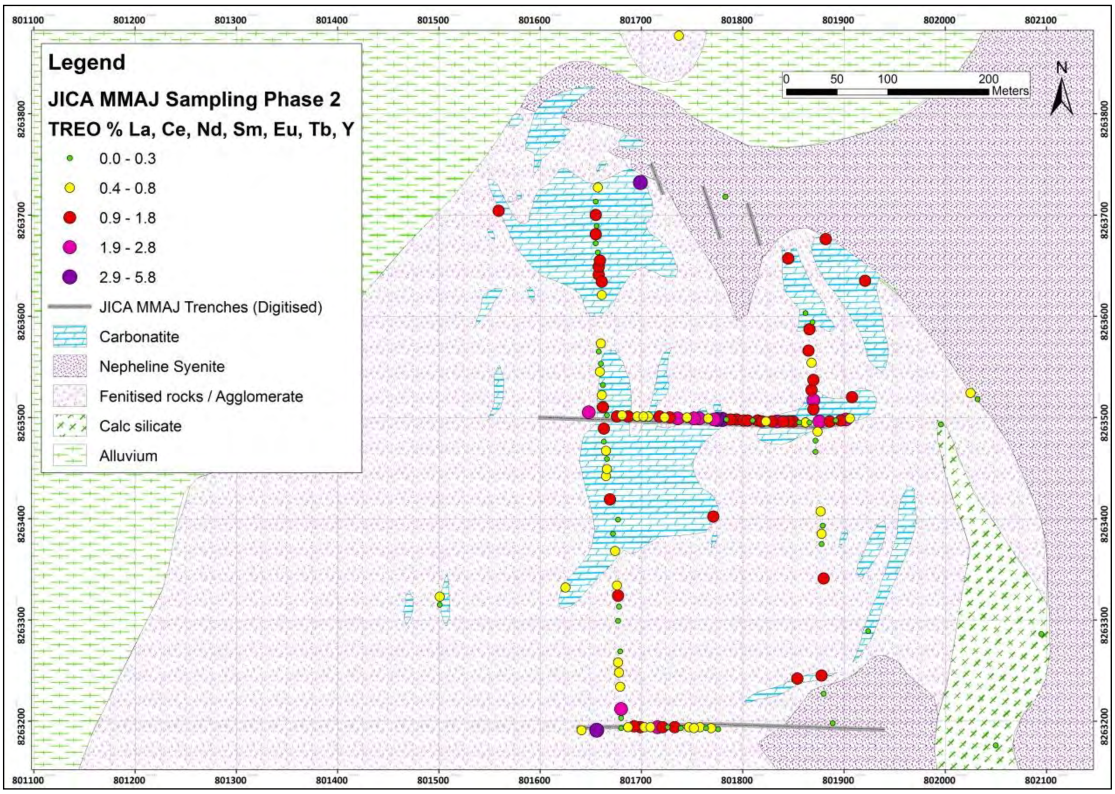
Geological map with borehole and trench locations



Note: *UTM Zone 36S and WGS84 Datum*

Source: *Mkango after JICA and MMAJ (1989)*

Figure 6-2
Geological map with geochemical sample locations



Note: *UTM Zone 36S and WGS84 Datum*
Source: *Mkango after JICA and MMAJ (1989)*

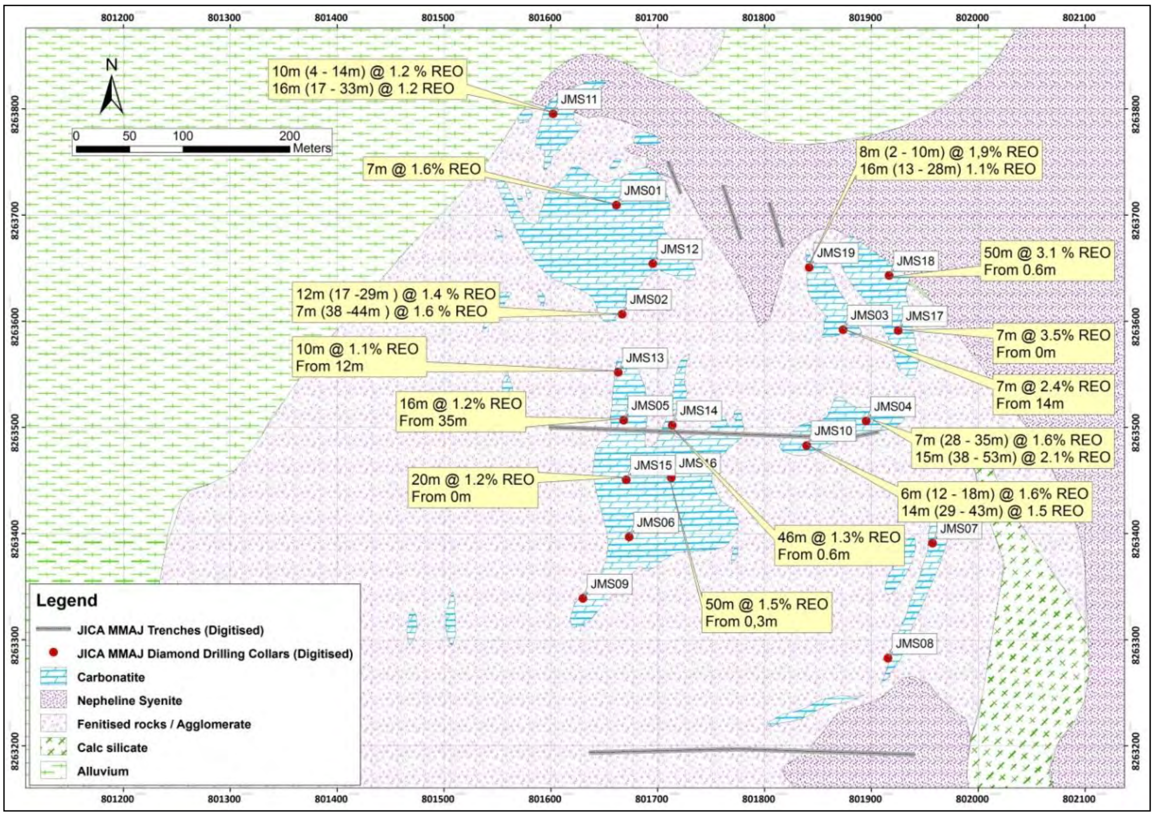
The 1987 Phase 2 drilling programme comprised 11 diamond drill holes totalling 558 m and defined a number of mineralized zones (Figure 6-3). Drilling was performed with a YBM-05DA drill rig using a 73 mm diameter drill bit and BW casing through unconsolidated surface material followed by a 56 mm diameter diamond bit to the bottom of the hole. Average core recovery, excluding the unconsolidated soils, was 94 %.

The subsequent Phase 3 drilling programme in 1988 was aimed to better define the extent and grade of the mineralized zone on the northern side of Songwe Hill which was intersected during Phase 2. Two rigs were used to drill eight holes totalling 401.2 m with a maximum vertical borehole depth of 55 m. The drilling followed the same procedures as in Phase 2 and the average core recovery (excluding soils) was 95 % during Phase 3.

There is no information on the sampling methods used in the JICA and MMAJ drilling programmes, other than that the drillcore was halved prior to chemical analyses of 191 core samples. A total of 109 core samples with an average length of 2.3 m were analysed from the first phase of drilling, while the samples from the second phase had an average length of 4.6 m. The reports do not detail the analytical methods or any QA/QC protocols that JICA and MMAJ may have adopted for the sample preparation or chemical analyses. It has not proved possible to identify the locations of any of these drill collars in the field.

Figure 6-3

Drill holes with drill intersections exceeding 1 % REO



Note: *UTM Zone 36S and WGS84 Datum; REO (Rare Earth Oxides) includes the oxides of La, Ce, Nd, Sm, Eu, Tb and Y*

Source: *Mkango, after JICA and MMAJ (1989)*

The Phase 2 and 3 drill core samples were assayed for seven REE namely lanthanum, cerium, neodymium, samarium, europium, terbium and yttrium as well as strontium, niobium and phosphorous. The geological logs of the drillcore indicate broad intersections of carbonatite in a number of boreholes, including JMS 14 (46 m at 1.3 % REO), JMS 16 (50 m at 1.5 % REO) and JMS 18 (50 m at 3.1 % REO) and were used to assess the three-dimensional distribution of the individual carbonatite bodies to a vertical borehole depth of 50 m. The holes were drilled with a nominal length of 50 m but the collars were positioned at various elevations near the top of Songwe Hill and northwards down the slope with the result that only the outer "shell" of the deposit was drill-tested.

The principal REE-bearing minerals identified by JICA and MMAJ, using thin section, polished section, XRF and EMPA analysis, included synchysite, bastnäsite, parisite, strontianite, monazite, pyrochlore and apatite.

JICA and MMAJ noted (Phase 3 Report, page 53, 1989) that "samples from Songwe sector are more enriched in medium REE than those from Tundulu, Kangankunde and Chilwa Island sectors [in Malawi]". JICA and MMAJ defined the medium REE as samarium, europium and terbium.

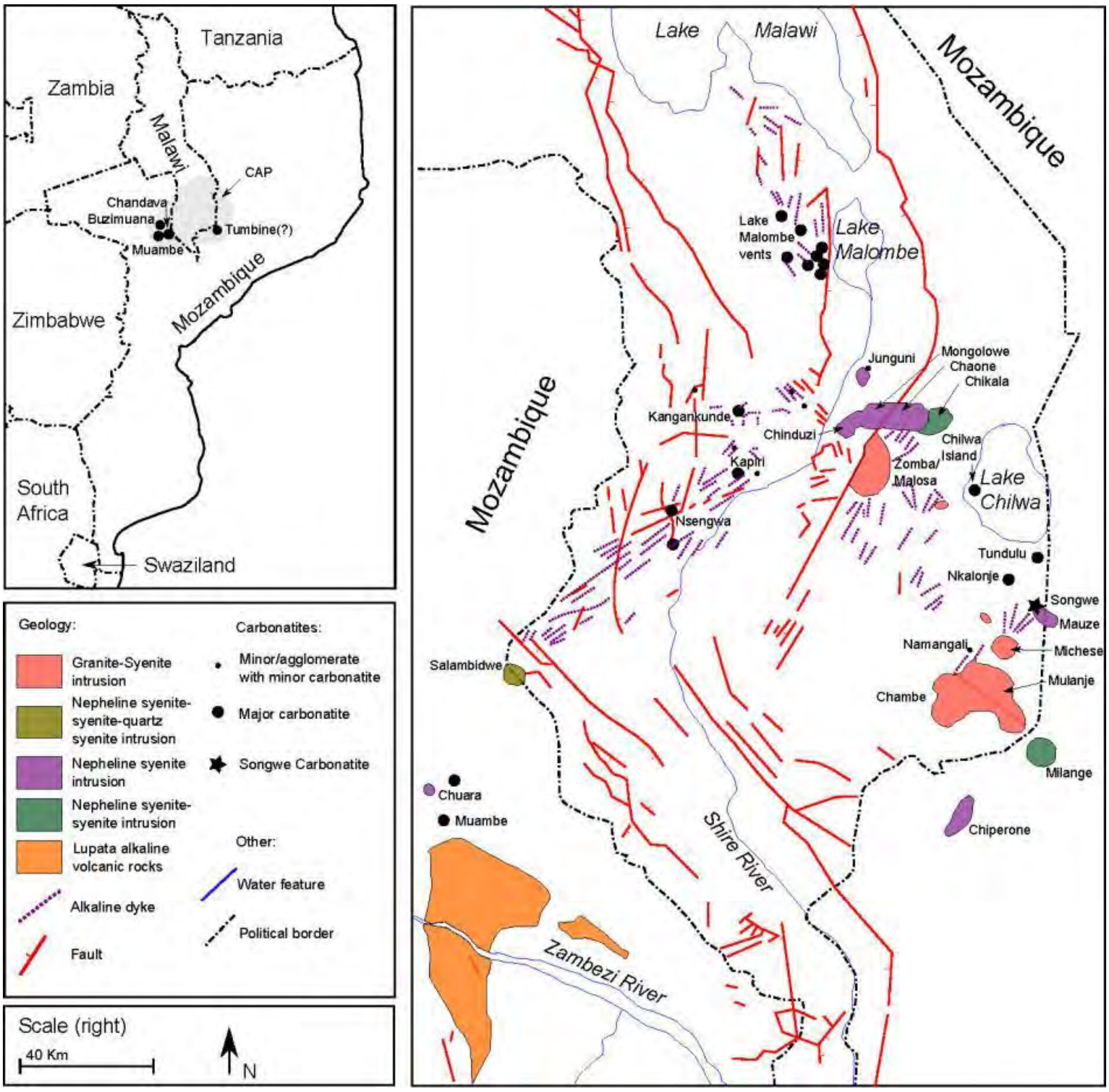
7 GEOLOGICAL SETTING AND MINERALIZATION

7.1 Regional Geology

The Songwe Hill Project is located within the Chilwa Alkaline Province (CAP), which is centred in southern Malawi and extends into adjacent areas of Mozambique (Figure 7-1).

Figure 7-1

Distribution of Chilwa Province alkaline intrusions in southern Malawi and Mozambique



Source: *Modified from Woolley (2001)*

Rocks in southern Malawi range in age from Precambrian to Cretaceous and are in many areas covered by Tertiary to Recent lacustrine sediments. A comprehensive description of all rock units can be found in Garson and Walshaw (1969). The oldest rocks in the area are assigned to a Precambrian Basement Complex that consists of charnockitic granulites and gneiss. The gneiss around the Songwe Hill area is typically paragneiss but orthogneiss is found elsewhere in the region. The Basement Complex was intruded during the Jurassic by a dolerite dyke swarm of the

Stormberg Series. The latter are genetically linked to the basaltic lavas of the Karoo Supergroup which occur throughout southern Africa.

The geological units of significance with respect to REE mineralization in the Songwe Hill area are intrusions and lavas of the Jurassic/Cretaceous Chilwa Alkaline Province. The Chilwa Alkaline Province is comprised of large alkaline intrusions ranging from Mulanje, which is a massif that covers approximately 640 km^2 and rises some 3,000 m above the Phalombe Plain (750 m), to the Michese intrusion with a diameter of 8 km, to the smaller Machemba intrusions and minor plugs and dykes measuring only a few tens of metres in length. These intrusive centres, mainly early Jurassic in age, comprise a variety of alkaline silica-saturated and silica under-saturated lithologies locally associated with carbonatites and are unrelated to the modern rift system. A general account of the tectonic setting has been given by Woolley and Garson (1970).

Although the Chilwa Province is dominantly intrusive at the present level of exposure, there are locally minor remnants of extrusive rocks. A comparison with alkaline provinces along the East African Rift to the north suggests that volcanic rocks at Chilwa Island may have originally been very extensive. The Chilwa Province is remarkable for the diversity of rock types which include granites, quartz syenites, syenites and trachytes, nepheline syenites and phonolites, ijolites and nephelinites, and a plethora of dykes and carbonatites with associated fenites. Three principal lithological associations have been identified on the basis of field relationships (Woolley, 1987), geochemistry (Woolley and Jones, 1987), and K-Ar age dating (Eby *et al.*, 1995):

- nephelinitic lavas and nepheline syenite coeval with carbonatite (133 Ma);
- nepheline syenite and syenite (126 Ma); and
- syenite and peralkaline granite (123 Ma).

Carbonatites are widely present throughout the Chilwa Alkaline Province. There are 17 documented carbonatites in southern Malawi and adjacent Mozambique at the junction of the north-south-trending fault system of the East African Rift and east-west-trending fault system of the Zambezi Rift (Garson, 1965, 1966). In addition to the large carbonatitic vent at Songwe Hill, there are three other substantial carbonatite complexes within the Province: Chilwa Island, Kangankunde and Tundulu. Numerous smaller carbonatites occur throughout the Province and include dykes, sheets, small plugs and a carbonatitic volcanic vent at Nkalonje. Igneous silicate rocks comprise only a few small dykes and sheets of nephelinite, ijolite, trachyte and alnöite at the Chilwa Island carbonatite centre whilst there are no igneous silicate rocks associated with the Kangankunde carbonatites. However, there are significant intrusions of nepheline syenite, ijolite and feldspathoid-bearing carbonate-silicate rocks associated with the carbonatite at Tundulu. The four large carbonatite complexes have metasomatic aureoles characterized by the presence of fenites, which extend up to 2 km from the margins of the carbonatite. The fenites are mostly sodium-rich and comprised essentially of sodic pyroxenes and amphiboles. In addition, there are domains of potassic fenite which are intimately associated with the carbonatite, consisting mainly of K-feldspar reflecting a potassium rather than sodium metasomatism.

The largest intrusions of the Chilwa Province in Malawi, notably Mulanje and Zomba, are comprised of peralkaline granite and quartz syenite similar to the large intrusion of Michese which occurs immediately north of Mulanje. Some of the nepheline syenite and syenite intrusions have a considerable size. For instance the four overlapping nepheline syenites north of Zomba extend nearly 40 km in an east-west line. Most of the igneous centres include swarms of dykes and there are a number of volcanic vents including the six that make up the Malombe vents in the north of the Chilwa Province (Figure 7-1). In the Phalombe license area, the vent in the Nkalonje complex is filled with breccia and agglomerate while the Namangale occurrence contains feldspathic and phonolitic breccias. The Songwe centre comprises a large volcanic vent choked with fragmental rocks.

Intrusions in the northern part of the Chilwa Province span ages from about 98 Ma to 137 Ma, making it the oldest igneous province associated with the eastern branch of the East African Rift. This relatively old age, in terms of the general rift volcanism, explains the typically intrusive nature of the province and paucity of extrusive rocks. Reviews of the general geology are provided by Woolley and Garson (1970) and Woolley (1991), while Woolley (2001) presents brief accounts of all the individual carbonatite occurrences.

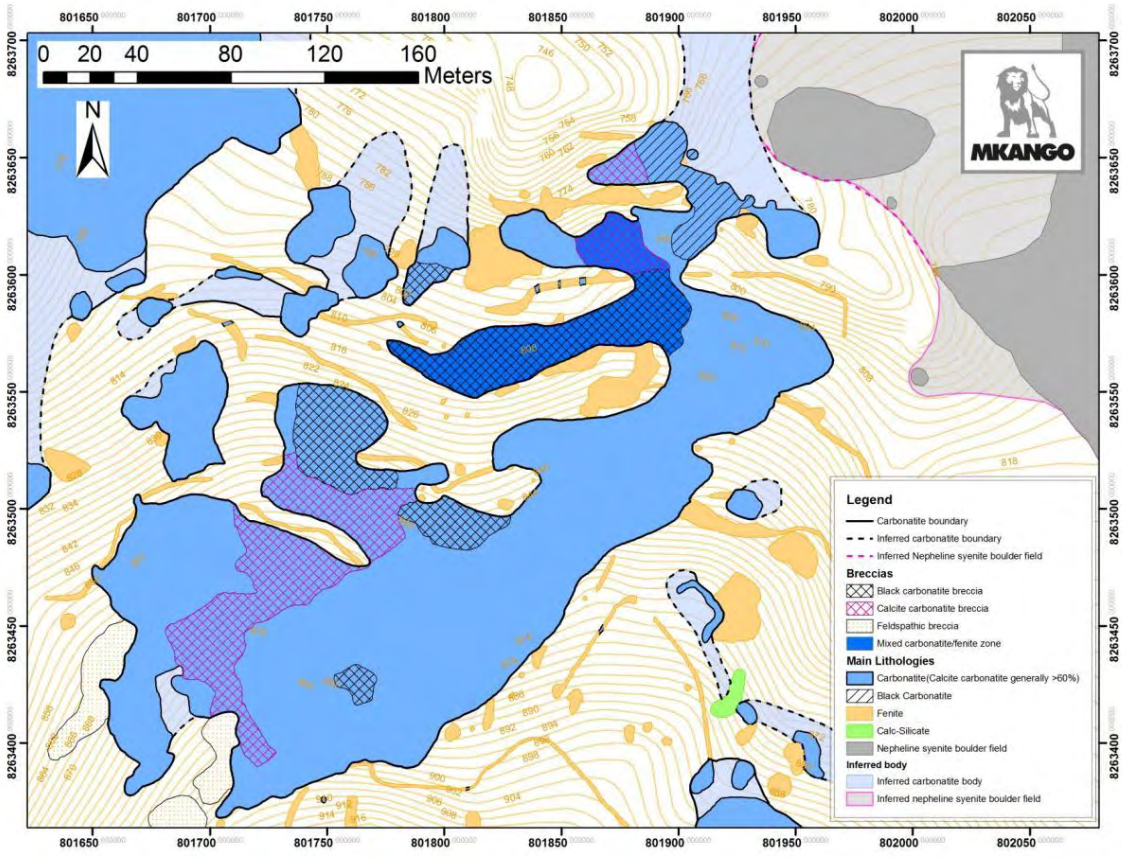
7.2 Geology of the Songwe Carbonatite Vent

Songwe Hill is interpreted as a volcanic vent that is expressed as a steep-sided hill (see Figure 5-11) with a diameter of approximately 800 m. Information from recent surface mapping and drill core indicates that the vent complex consists of a multi-phase intrusion characterized by diverse carbonatites and breccias exhibiting a range of alteration from potassic fenitisation to low temperature hydrothermal/ carbohydrothermal overprinting. The vent abuts against the western slope of the large Mauze nepheline syenite intrusion, but the outer contacts on the western and north- western sides of the vent are hidden beneath recent surficial deposits. It is possible that the carbonatite complex is in contact with Precambrian gneisses in this area because Chenga Hill, which is located less than 200 m west of the probable western margin of the Songwe vent, includes fenitised gneisses and breccias. A nearby remnant of Precambrian gneiss north and northwest of the vent complex is also fenitised, although a screen of nepheline syenite intervenes between the gneiss and the vent lithologies. The fenitisation is interpreted to be the result of carbonatite intrusion in the Songwe vent, although it is also possible that the Mauze nepheline syenite had some role in the fenitisation process. The occurrence of carbonate-silicate rocks along the eastern margin of the vent was interpreted by Garson (1965) to be the product of metamorphism of the nepheline syenite by the Songwe carbonatite.

7.2.1 Carbonatite

The carbonatite is best exposed along the north-eastern slope of Songwe Hill and, together with a somewhat smaller area along its north western edge, is tentatively interpreted to form a ring structure (Figure 7-2). There are essentially two REE- mineralized carbonatite end members, namely a light-grey, fine-grained, relatively homogenous calcite carbonatite and a darker, fine-grained, heterogeneous Fe-rich carbonatite.

Figure 7-2
Surface Geological Map of Songwe Hill



Note: *UTM Zone 36S and WGS84 Datum; Contour lines at 2 m intervals*
Source: *Modified from Mkango (2012)*

7.2.1.1 Calcite carbonatite

The calcite carbonatite (Figure 7-3) constitutes by far the largest proportion of exposed carbonatite and forms irregular, massive bodies that appear to have been emplaced in several phases. The grey carbonatite probably represents the closest composition to the primary carbonatite liquid. Petrographic studies have shown that calcite carbonatite consists predominantly of Fe- and Mn-rich calcite, with varying proportions of Mn-bearing ankerite, apatite, Fe-Mn-oxides, pyrite, fluorite and alkali (K-) feldspar.

Figure 7-3

Examples of the three major rock types at Songwe Hill

Source: *Brady (2012)*

7.2.1.2 Fe-rich carbonatite

The Fe-rich carbonatite is dominated by Fe- and Mn-rich carbonates and Fe- and Mn-oxides with apatite and minor amounts of alkali (K-) feldspar. Typically, carbonatites are multi-phase intrusions evolving from early magmatic calcite compositions to late magmatic and/or metasomatic Fe-rich compositions, and petrographic and field evidence at Songwe suggest that the more Fe-rich carbonatite varieties may have intruded and partially replaced/overprinted some of the earlier calcite carbonatite.

Subordinate ferrocarbonatite, ranging from late-stage breccias and thin dykes to pervasive, cross-cutting veins, represents the final stages of carbonatite activity at Songwe Hill. Examination of drill core reveals that veining is extensive throughout the carbonatite, cross-cutting all lithologies including fenite and breccias. The veining can broadly be divided into two types: Fe-rich carbonatite veins and black Fe- Mn-rich 'wad' veins which are porous, highly weathered, poorly consolidated intrusions that have undergone extensive alteration (supergene?) and replacement by a range of Mn and Fe oxides. The two types are easily distinguished in the field: the carbonate bearing veins react with hydrochloric acid (HCl), while there is no reaction with the 'wad' type veins.

7.2.2 Fenite

Fenites appear to form an aureole around the carbonatite intrusion and in plan view surround the carbonatite outcrop area on Songwe Hill. The fenites are characteristically light red in colour (Figure 7-3) and mineralogical work has shown that they are composed essentially of alkali (K-) feldspar. Surface mapping and drill core assays show that the fenites in the immediate area of Songwe Hill are potassic (up to 14.99 wt. % K_2O) confirming Garson's (1965) observation that the feldspar is potassic and that these rocks resemble feldspathic fenites elsewhere in Malawi. Breccias in the more easterly parts of the vent commonly contain pseudomorphs after large prismatic feldspars which would seem to substantiate a nepheline syenite parentage. However, textures observed elsewhere on surface outcrops and particularly in drill core suggest that at least some of the potassic fenites were formed by metasomatism of earlier phonolitic intrusions and Precambrian basement rocks.

No vertical zonation of fenitisation has been observed in the drill core at Songwe with potassic fenites extending from surface to deeper levels. However, the fenites that occur on Chenga Hill, north of Songwe Hill, are sodic in nature. Garson (1965) described them as containing aegirine, aegirine-augite, a blue sodic amphibole and albite. This is consistent with the fenitisation pattern at other carbonatite complexes in Malawi (see Section 7.1), where potassic fenites are intimately associated with carbonatite while sodic fenites occur at some distance from the carbonatite margin.

The fenite on Songwe Hill appears to be generally in situ, although some blocks and small fragments are highly abraded and indicate some degree of movement during the emplacement history. On the upper reaches of the hill fenite appears to roof the carbonatite with black Fe- and Mn-rich carbonate veins, which appear to originate in the carbonatite, penetrating upwards through the fenite. The Songwe vent complex is interpreted to represent the preserved roof zone of the intrusion and many of the fenite blocks seem to have been stoped into the former magma chamber. This model is further supported by the pervasive occurrence of highly mixed carbonatite and fenite material.

7.2.3 Breccia

The Songwe vent complex includes a considerable variety of breccias that range from clearly abraded pebble-sized fragments (pebble dykes) to metre-sized angular blocks as well as significant volumes of breccias in which the fragments appear to have undergone little or no movement. The breccias can essentially be divided into two types: feldspathic-rich breccias and carbonatite-rich breccias.

7.2.3.1 Feldspar-rich breccia

The feldspathic-rich breccias consist mainly of light red alkali-feldspar rich (orthoclase or sanidine; Garson, 1965) fenite clasts and fragments, partially fenitised nepheline syenite and minor clasts of calcite carbonatite. The matrix is fine-grained, carbonatitic in nature and composed of abundant Fe- and Mn-oxides, Fe-rich carbonates and alkali feldspar with occasional pyrochlore. In some cases the matrix can have a relatively high silica content reflecting the comminution of fenite during formation of the breccias.

7.2.3.2 Carbonatite-rich breccia

Carbonatite-rich breccias contain an abundance of light grey, fine-grained calcite carbonatite clasts, with subordinate fenite clasts in a similarly fine-grained carbonate-rich matrix. Gradational relationships can be observed from one variety of breccia into another indicating a complex process of intrusion, fragmentation and continuous movement of a carbonatite-breccia mixture. The breccias, regardless of type are invariably cross cut by numerous late-stage black Fe- and Mn-rich carbonate veins.

7.2.4 Silicate-rich dykes

Late-stage silicate-rich dykes have been identified in drillcore but rarely outcrop at surface. The dykes are mainly phonolitic in composition, aphanitic or porphyritic in texture and exhibit a wide degree of alteration ranging from minimal modification to extensive alteration and fenitisation. Syn-intrusion and post-intrusion faulting is evident across Songwe Hill although displacements appear to be relatively small.

7.3 Mineralization

7.3.1 Geological domains

The principal zone of REE mineralization outcrops along the north eastern slope of Songwe Hill. REE mineralization is present in carbonatite, fenite and breccias, which are exposed intermittently over a surface area of approximately 350 m by 100 m. The REE mineralization is untested to the northeast and southwest beyond the limits of the present drilling and below the deepest vertical intersection of approximately 350 m below the surface of the hill.

The mineralized body at Songwe Hill is dominantly a carbonatite intrusion that has incorporated variable amounts of potassic fenite and diverse vent breccias. Lithology appears to be the main control on the REE mineralization which occurs dominantly in the carbonatite but is also found in both fenites and breccias. Carbonatite and fenite form separate geological domains and are easily distinguished visually in core and geochemically. However in some areas, carbonatite and fenite occur together in breccias, or are intimately mixed which complicates the spatial correlation on maps and cross sections.

For the purposes of resource definition, three geological domains have been identified namely a carbonatite domain, a fenite domain, and a 'mixed' domain consisting of breccia and/or finely intermixed carbonatite and fenite. In their respective domains, carbonatite and fenite form the dominant rock type and usually contain small and variable proportions of the other rock types. Each domain has specific geological characteristics which are described in the following Sections.

7.3.1.1 Carbonatite Domain

Calcite carbonatite is the most abundant carbonatite type by volume and surface area and is the principal host of REE mineralization.

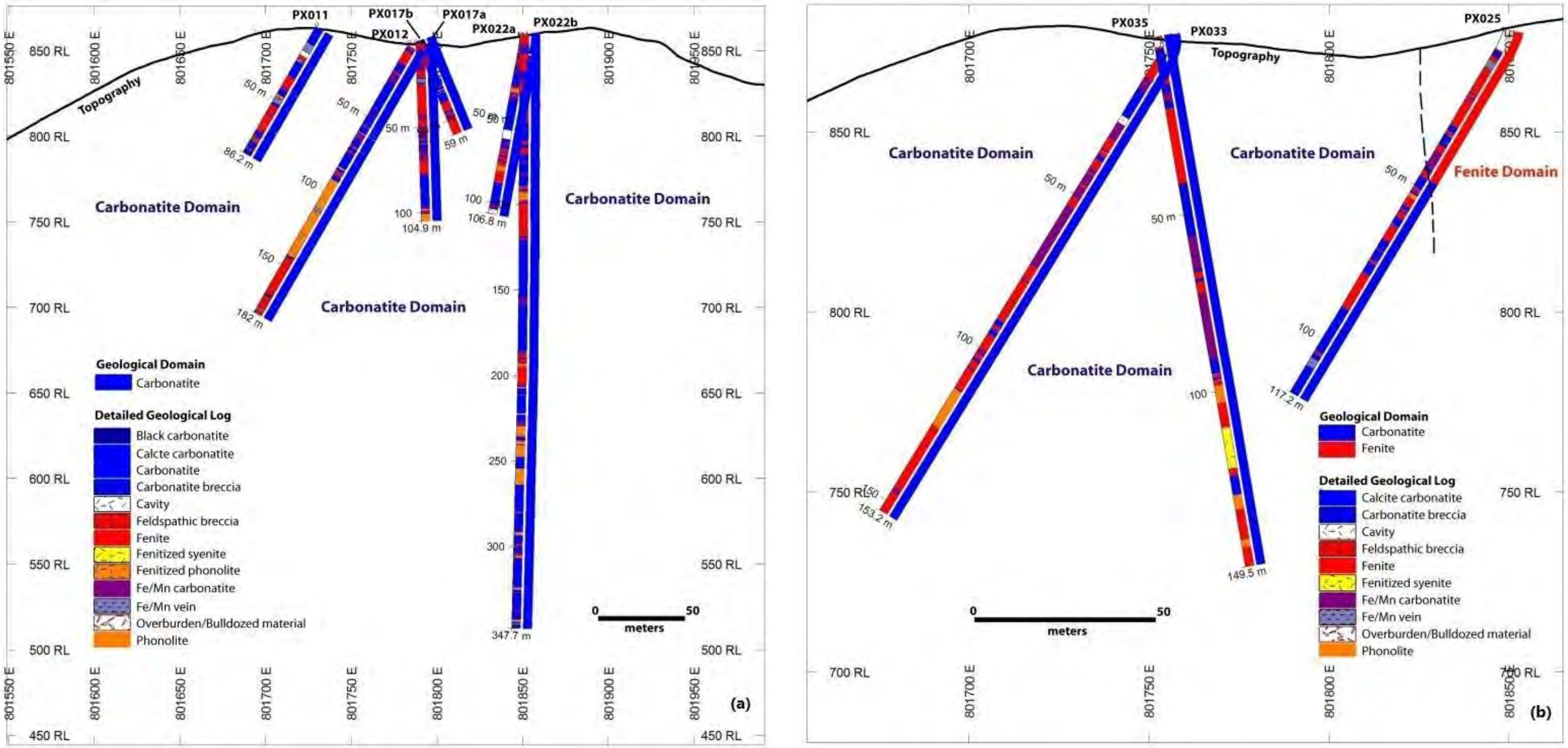
Carbonatite contacts with the adjacent fenite are typically sharp and are characterized geochemically by an abrupt increase in potassium, silica and aluminium and a coinciding decrease in calcium. Calcite carbonatite outcrops at various elevations of Songwe Hill and has been traced in drill holes to depths of approximately 350 m below the surface of the hill (Figure 7-4 (a)). The carbonatite can generally be correlated from section to section particularly in the south of the complex (Figure 7-4 (a) and (b)).

Carbonatite is typically fine-grained and light grey to pinkish white in colour (Figure 7-5 (a) and (b)). Sulphides, mainly pyrite, are abundant and occur as disseminations, patches and veins. Fluorite is present as locally abundant patches or blebs and can impart a purple hue to the rock. REE mineralization in the calcite carbonatite is not readily identifiable by texture and the similarities in colour of carbonatite and mineralization. Several phases of narrow ferro-carbonatite veins are common along with occasional late-stage calcite veining.

The calcite carbonatite unit includes zones of Fe- and Mn-rich carbonatite (Mn/Fe carbonatite in Figure 7-4 (a) and (b). The contact between the two types of carbonatite is typically irregular and can range from sharp to gradational. This Fe- and Mn-rich carbonatite is typically dark brown-black in colour and visibly oxidized. It is often vuggy in nature and characterized by a range of late-stage low temperature (supergene?) patchy or brown striped textures. Mineralization is easily recognized in the dark Fe-Mn- rich carbonatite by the pervasive streaks of orange pink to white rare earth fluorocarbonate minerals and apatite.

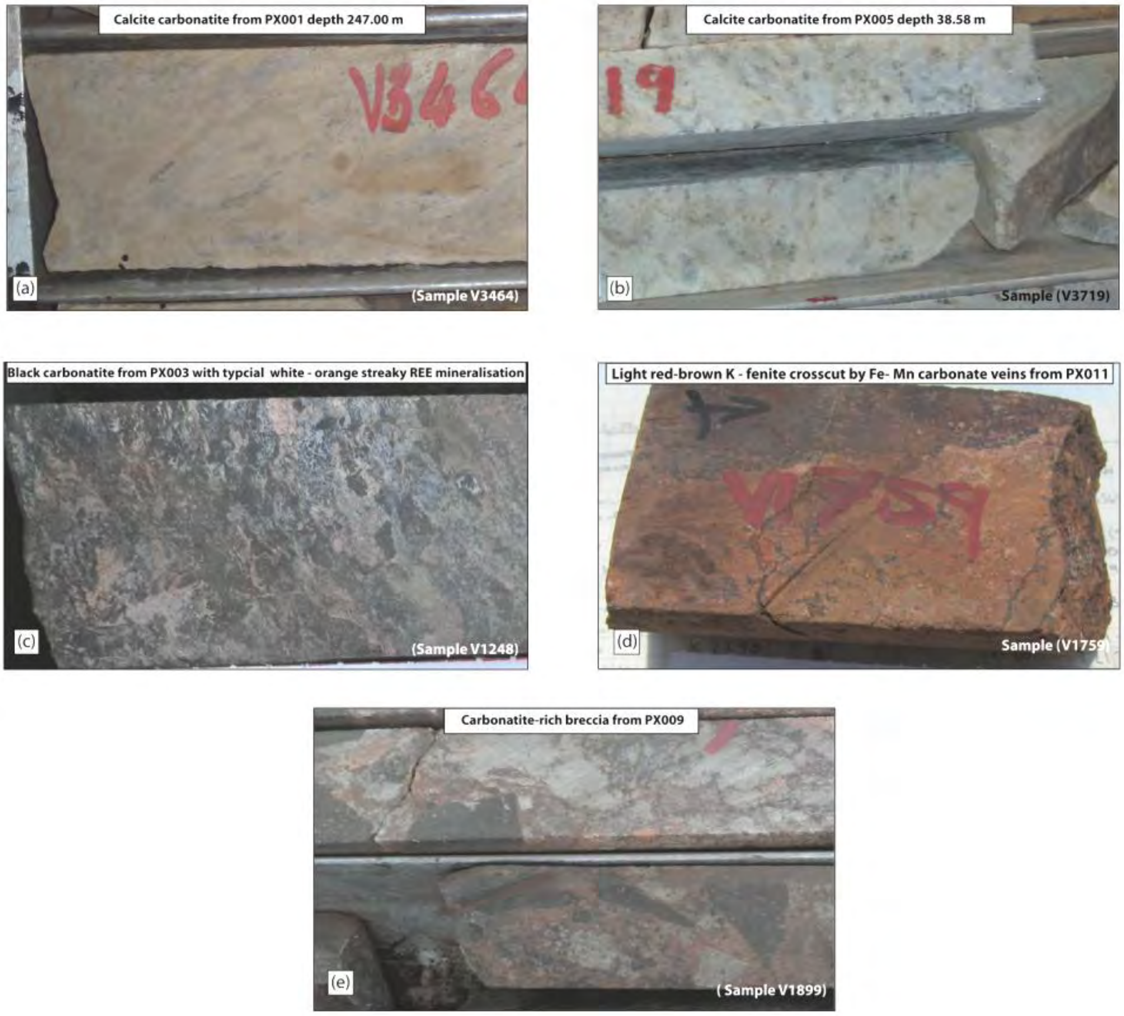
Figure 7-4

Examples of geological domains in two southern cross section



Note: *(a) illustrates the continuity of carbonatite to depth at Songwe Hill in Section 8263457 (b) illustrates the geometry of carbonatite and fenite domains in Section 8263423N. Detailed geological logs are illustrated in the centre colour bar together with geological domains in the colour bar on the right*

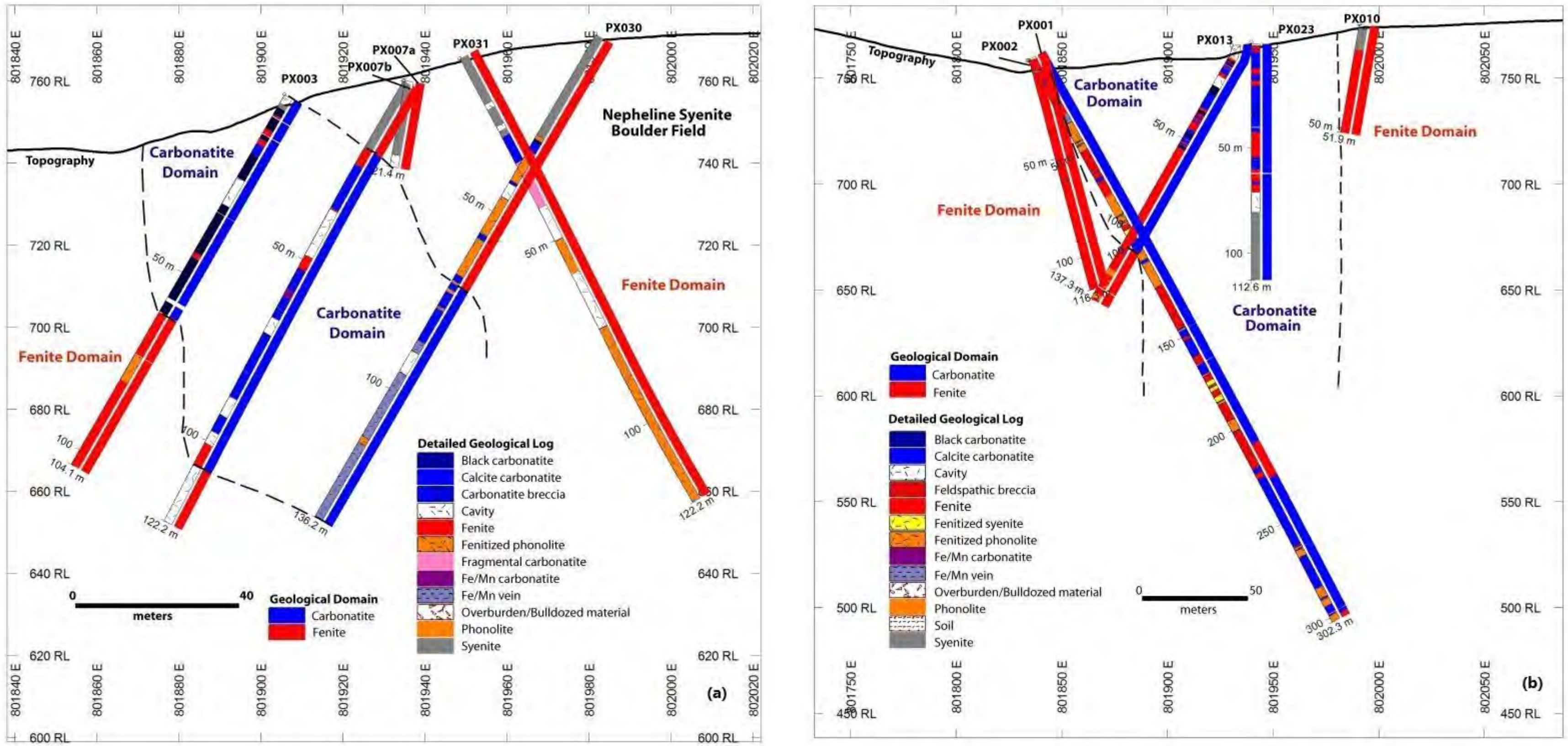
Figure 7-5
Examples of mineralized rock types



Black carbonatite contains the highest REE grades (average 3.8 % TREO) and occurs as a distinct zone located in the north eastern part of Songwe Hill (Figure 7-2). It can be traced at surface for approximately 50 m in a north-south direction and to a depth of approximately 40 m beneath the surface of the hill (Figure 7-6 (a) and (b)). The black carbonatite is texturally more complex than the calcite carbonatite. The rocks are heterogeneous on the local scale ranging in colour from black to light grey with a highly variable fabric comprising various late-stage cross-cutting Fe-carbonatite veins. The carbonatite is characterized at surface and at depth by a distinctive white to orange and pink-coloured, streaky mineralization which comprises fluorocarbonates, apatite and carbonates (Figure 7-5 (c)). The higher TREO content in the black carbonatite does not reflect differences in REE mineralogy compared to the calcite carbonatite but a greater abundance of the REE-bearing minerals.

Figure 7-6

Examples of geological domains in two northern cross section



Note: *Section 8263667N (a) and Section 8263646N (b) illustrate the sharp contact between fenite and carbonatite domains in the north east (PX003 and PX013) and intersections of carbonatite (PX031 and PX001) dipping towards and underneath the boulder field*

Source: *Brady (2012)*

7.3.1.2 Fenite Domain

Potassium fenite, comprising variably carbonatized potassium feldspars which are visible in the core, surrounds the mineralized carbonatite body in plan view and is present in virtually all drill holes. Fenite is typically light orange to red in colour (Figure 7-5 (d)) and is interpreted to roof and partially surround the carbonatite at the present level of erosion. In drill holes fenite occupies the areas marginal to the carbonatite and also occurs as discrete bodies within the carbonatite that are presently interpreted as stoped blocks.

Fenite is variably mineralized and the degree of mineralization is a function of the degree of carbonatization of the fenite. Along the north-western and eastern side of Songwe Hill, the fenite is relatively uncarbonatized, geochemically characterized by consistently low CaO (~ 7 wt. %) and high SiO_2 and K_2O concentrations (averages of 17 wt. % and 7 wt. %, respectively), and can be traced in drill holes from surface to depth with consistent values of less than 0.5 % TREO (Figure 7-6 (a) and (b)).

Well-defined lithological and geochemical contacts are observed between the fenite and carbonatite at the north-western side of Songwe Hill (Figure 7-6 (a) and (b)). Further south the fenite becomes more intimately associated with the carbonatite and is variably carbonatized and cross-cut by multiple generations of late-stage ferro-carbonatite. In these areas, the fenite contains lower concentrations of SiO_2 and K_2O but higher concentrations of CaO and consequently REE concentrations exceed 1 % TREO (Figure 7-7 (a) and (b)).

7.3.1.3 Mixed Domain

The geologically mixed domain in drill core consists of intimately intermixed carbonatite and fenite, often on a centimetre scale, such that the lithologies cannot be easily separated or correlated across sections. In many areas, this intimate intermixing reflects the presence of vent breccias with variable proportions of carbonatite and fenite clasts on centimetre and metre scale in a predominantly carbonate matrix. In other areas, the mixed domain may include small stoped blocks of fenite occasionally intruded by carbonatite. The domain is characterized by highly variable concentrations of CaO, SiO_2 and K_2O reflecting the high level of intermixing between carbonatite and fenite. The mixed domain is variably mineralized and the degree of mineralization is a function of the proportion of carbonatite.

Broad zones of mineralized breccias have been recognized in several drill holes interspersed with the carbonatite. Locally the breccia and carbonatite appear to grade in and out of each other in drill core. The breccias are widely exposed at surface along the western side of Songwe Hill but are highly irregular in shape and difficult to correlate in drill holes. The surface breccia exposures are represented in drill core by zones of highly mixed carbonatite and fenite (e.g. PX008 and PX016) (Figure 7-7 (a) and (b)). The calcite carbonatite breccias are light grey to orange-red in colour depending on the proportions of calcite carbonatite and fenite fragments. Typically, carbonatite breccias contain abundant angular to sub-angular calcite carbonatite fragments in a fine-grained grey carbonatitic to feldspathic matrix (Figure 7-5 (e)). Similar to the main calcite carbonatite lithology, fluorite and sulphides are abundant and occur as disseminations, patches and veins.

Black carbonatite breccias consist of a mixture of fenite and carbonatite fragments with varying shapes from rounded to angular and typically have spotted, striped and patchy late-stage low temperature (supergene?) textures. The level of rare earth mineralization in the breccias is more variable than in the carbonatites and directly related to the proportion of carbonatite to fenite fragments and the amount of carbonatitic matrix.

7.3.2 Geometry of the Mineralization

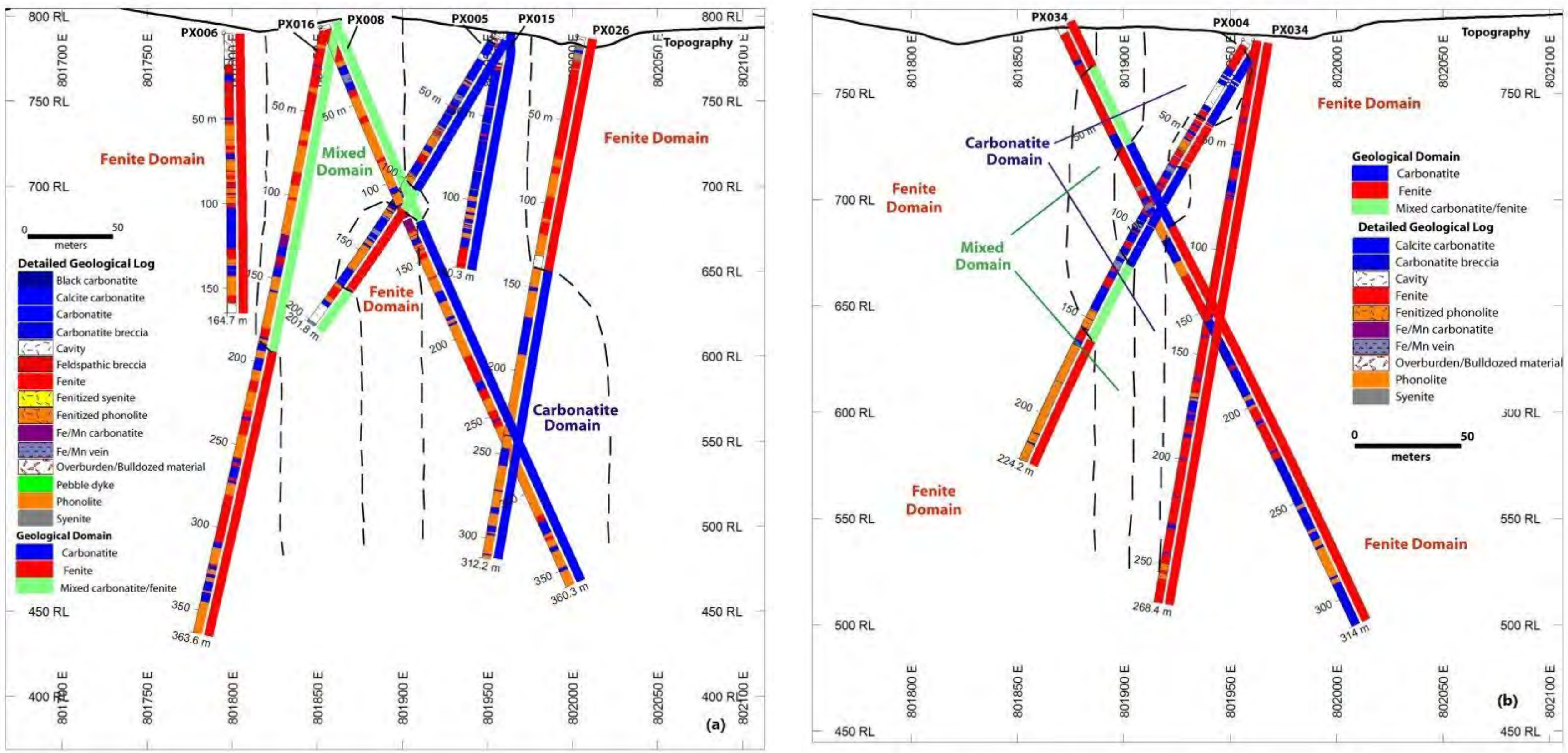
The orientation of the mineralized body within the Songwe carbonatite vent system is not well constrained due to the fact that only a few drill holes have penetrated the intrusive contacts of the carbonatite which appears to extend beyond the limits of drilling to the northeast, southwest, and at depth.

Lithological contacts and structural features are generally at shallow angles to the core axis (Figure 7-8) and suggest that the intrusion has sub-vertical to vertical margins and flow patterns. However, the body as a whole has an irregular shape which can be expected from an intrusive plug. In plan view, the body has an elongate shape in a northeast-southwest direction and borehole evidence from the eastern portion is interpreted to suggest an overall dip to the east. Along the eastern side of Songwe Hill, the calcite carbonatite appears to dip steeply underneath the fenite and nepheline syenite boulder field. Intersections of mineralized calcite carbonatite have been encountered in drillholes which extended to depths below the boulder field (e.g. PX001; Figure 7-6 (b)) and also in drill-holes collared in the boulder field (e.g. PX031; Figure 7-6 (a)). To date no major off-setting structures have been identified within the main carbonatite bodies

The internal geometric relationships of the different mineralized geological domains are not yet well defined. While the carbonatite domains can typically be correlated between drillhole sections, the fenite and mixed domains occur as isolated blocks within the carbonatite and cannot readily be correlated between sections. The boundaries between the carbonatite and fenite domains are relatively sharp but contacts with the mixed domains tend to be gradational (see PX016; Figure 7-7) and not well defined.

Figure 7-7

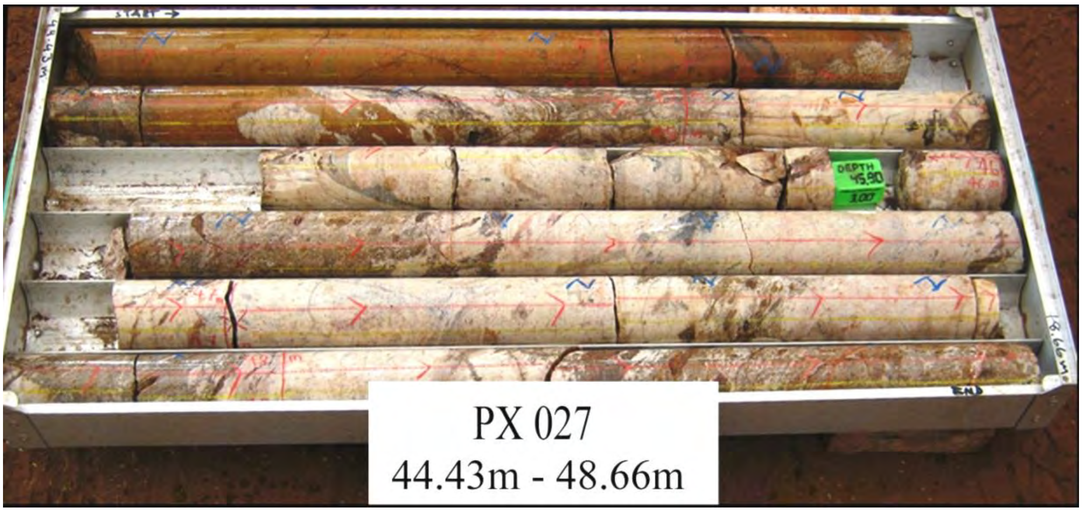
Examples of the various domains in two cross section



Note: *Section 8263568N (a) and 8263600N (b) highlight the mixed domains of Songwe Hill and the complex relationships between the three domains*

Source: *Brady (2012)*

Figure 7-8
Example of contact between fenite and calcite carbonatite



Source: *Brady (2012)*

7.3.3 Thorium

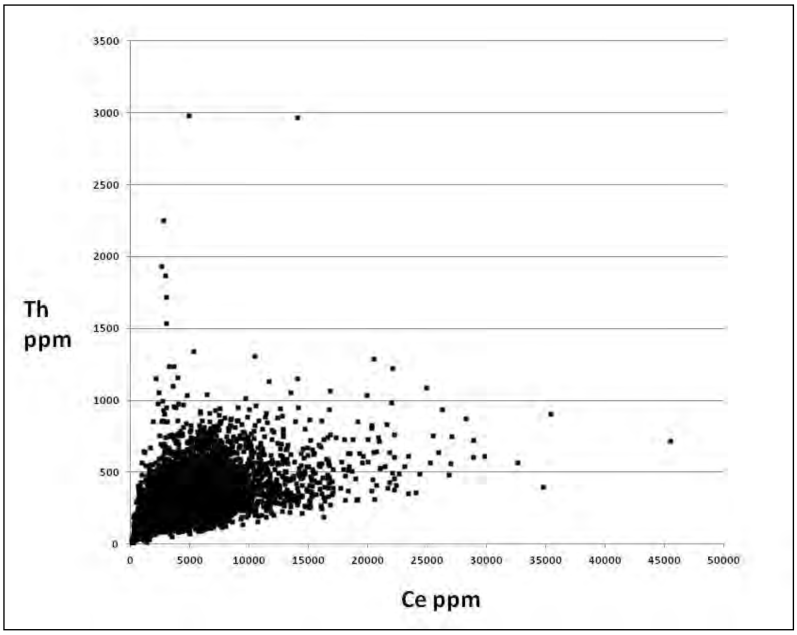
The occurrence of thorium can be problematic for some carbonatite-associated REE deposits. Songwe Hill carbonatite is marked by a radiometric anomaly in thorium and this feature provided an important prospecting tool. The concentration levels in individual REE minerals have not been fully quantified and will be addressed as part of further metallurgical test work.

Examination of the assay data from drillcore samples reveals that thorium concentrations in the Songwe Hill deposit are typically relatively low (Figure 7-9). Almost 90 % of the samples contained less than 500 ppm Th. The overall values calculated for the Mineral Resource at various cut-off grades typically range between 240 ppm and 430 ppm (Table 14-7 to Table 14-12).

Electron microprobe analyses carried out by SGS Lakefield, Canada indicate that between 84 % and 97 % of the Th is carried by REE-bearing fluorocarbonates. As illustrated in Figure 7-9 there is a diffuse positive geochemical relationship between Ce and Th that probably reflects the presence of Th in synchysite.

Figure 7-9

Thorium versus Cerium from 2011-2012 drill programme samples



Source: *Swinden (2012)*

7.3.4 Mineralogy

Mineralogical studies were initially carried out on six rock samples from the 2010 field sampling campaign using x-ray diffraction (XRD), Quantitative Evaluation of Minerals by Scanning Electron Microscopy (QEMSCAN) and electron microprobe ("EMP") analyses at the mineralogy department of SGS Inc. in Lakefield, Canada (SGS), previously described in detail by Scott and Wells (2010).

All samples are dominated by calcite with minor to trace amounts of iron and manganese oxides and carbonates, K-feldspar, strontianite and barite. REE-bearing phases are dominated by synchysite and apatite, with minor to trace amounts of parisite, monazite and ancylite. The abundance of the principal minerals in the 6 rock samples from QEMSCAN whole rock analysis for sub-samples (80 % powderized to less than 150 micron) is given in Table 7-1.

Table 7-1

Mineral abundances of six samples by QEMSCAN

Mineral	Range of abundance (%)
Calcite ($CaCO_3$)	32.6 - 81.6
Ankerite ($CaFe(CO_3)_2$)	3.9 - 41.9
Strontianite ($SrCO_3$)	0.1 - 5.9
Barite ($BaSO_4$)	1.1 - 5.2
Apatite ($Ca_5(PO_4)_3(F,Cl,OH)$)	0 - 8.3
Parisite ($CaCe_{1.1}La0_{.9}(CO_3)_3F_2$) [1]	2.5 - 6.7

[1] = *parisite, for the purposes of QEMSCAN analyses, includes bastnäsite, synchysite, and parisite*

A comprehensive mineralogical study of REE-enriched lithologies was carried out on core material from the 2011-2012 drill campaign by Dr. Aoife Brady, Mkango senior geologist, using scanning electron microscopy (SEM), EMP and laser ablation inductively coupled mass spectrometry (LA-ICP-MS). For this purpose a total of 33 samples were selected from drillcore material of nine boreholes and different depths from the three main carbonatite lithologies, namely calcite carbonatite, black carbonatite and carbonatite breccia (Table 7-2).

Table 7-2
Summary of samples for mineralogical studies

Borehole	Depth (m)	Sample ID	Lab ID	Lithological description
PX001	191.00 - 192.00	V3383	P17593	Calcite carbonatite/fenite mixture
PX001	239.00 - 240.00	V3452	P17835	Calcite carbonatite
PX001	247.00 - 248.00	V3464	P17836	Calcite carbonatite
PX001	255.00 - 256.00	V3474	P17837	Calcite carbonatite
PX001	257.00 - 257.49	V3476	P17592	Calcite carbonatite
PX001	294.26 - 295.00	V3532	P17595	Calcite carbonatite
PX003	3.49 - 4.00	V1206	P17598	Stripy black carbonatite
PX003	8.00 - 9.00	V1212	P17586	Very dark carbonatite
PX003	16.39 - 17.00	V1226	P17585	Mixed stripy black-to-grey carbonatite
PX003	31.00 - 32.00	V1237	P17584	Brown/grey/black stripy carbonatite
PX003	34.00 - 35.00	V1240	P17826	Black carbonatite
PX003	37.00 - 38.00	V1246	P17583	Calcite carbonatite
PX003	39.00 - 40.00	V1248	P17827	Black carbonatite
PX004	53.00 - 53.9	V3984	P17600	Calcite carbonatite
PX004	81.00 - 82.00	V1025	P17601	Calcite carbonatite crosscut by black carbonatite veining
PX004	163.24 - 164.00	V1138	P17602	Black carbonatitic vein? with late-stage brown stripy/spotted textures
PX005	7.00 - 8.00	V3682	P17599	Calcite carbonatite crosscut by black carbonatitic veins
PX005	27.00 - 27.72	V3702	P17834	Calcite carbonatite
PX005	38.58 - 39.00	V3719	P17833	Calcite carbonatite
PX005	59.00 - 60.00	V3747	P17596	Calcite carbonatite
PX005	64.0 - 65.00	V3753	P17597	Weathered black carbonatite
PX009	40.00 - 41.00	V1825	P17828	Carbonatite breccia
PX009	98.00 - 99.00	V1889	P17829	Carbonatite breccia
PX011	4.00 - 5 .00	V1673	P17589	Mixed carbonatite and fenite
PX011	51.00 - 52.00	V1729	P17587	Mn- Fe-rich black carbonatitic vein
PX011	23.00 - 24.00	V1692	P17588	Mn- Fe-rich carbonatitic vein containing fine-grained light red fenite
PX012	37.72 - 38.00	V1465	P17830	Calcite carbonatite
PX012	61.00 - 62.00	V1501	P17831	Mn/Fe carbonatite
PX012	81.70 - 82.00	V1532	P17832	Calcite carbonatite
PX018	190.36 - 191.00	X3982	P18140	Carbonatite
PX018	308.00 - 308.56	Y4139	P18139	Carbonatite
PX020	313.00 - 314.00	Y2189	P17990	Calcite-rich breccia
PX020	313.00 - 314.00	Y2189	P17991	Calcite-rich breccia

Source: *Mkango (2012)*

REE analyses and imaging of the samples were performed using a Cameca SX100 electron microprobe and a JEOL 5900LV scanning electron microscope, equipped with an Oxford Instruments INCA energy dispersive X-ray microanalysis system and a Gatan cathodoluminescence detector at the Natural History Museum (NHM) London, England. Quantitative analyses of apatite were carried out on selected samples at the Institute of Geography and Earth Sciences, Aberystwyth University (AU), Wales, using a Laser Ablation Inductively Coupled Plasma Mass Spectrometer (LA-ICP-MS).

The SEM, EMP and LA-ICP-MS analytical work shows that the REE mineral assemblage at Songwe, regardless of lithology, is dominated by fluorocarbonates, principally synchysite with very minor parisite, apatite and occasional florencite. Average rare earth oxide (REO) concentrations in synchysites from several drillholes are presented in Table 7-3. The synchysite crystals are homogeneous, typically occurring as randomly oriented laths or tabular crystals and/or fibro-radial to plumose aggregates (Figure 7-10 (a) and (b)). Crystal size varies but laths typically range in length from 10 µm to 60 µm and crystal aggregates can reach up to 400 µm.

Synchysite is invariably associated with strontianite and/or baryte either as inclusions and/or intergrowths and together they form distinctive vein-like aggregates or segregations (Figure 7-10 and Figure 7-11). In addition to these two phases, synchysite is locally associated with calcite, fluorite, alkali (K) feldspar, pyrochlore and titanite. The mineral association of synchysite with strontianite and baryte in the Songwe carbonatites and their textural relationships is typical of sub-solidus hydrothermal REE mineralization and has been reported from other carbonatites e.g. Amba Dongar Carbonatite Complex, India (Doroshkevich *et al.*, 2009).

Apatite in the Songwe carbonatites is anomalously enriched in yttrium and heavy rare earth oxides (HREO). The HREO enrichment factor of Songwe apatite, defined here as the sum of all HREO from Eu_2O_3 to Lu_2O_3 and Y_2O_3/TREO (Table 7-4), ranges from 40 % to 85 % compared to 2 % to 11 % in apatite from other carbonatites (Hornig-Kjarsgaard, 1998). It is rare for apatite in carbonatite deposits to display heavy rare earth enrichment. At Songwe however, apatite formed at a late stage and does not have the characteristic 'lozenge' shape which is typical of early crystallized apatite in carbonatites.

Apatite in the Songwe carbonatite lithologies is often visibly recrystallized and occurs as stringers and groundmass anhedral crystals, or as large bands (Figure 7-11 (a)) and veins which frequently contain entrained groundmass material, typically carbonate. In samples from the black carbonatite apatite invariably forms large bands and veins (PX003 sample V1206; Figure 7-11 (b)) and is closely associated with the Fe carbonate.

Chondrite normalized REE patterns for apatite (Figure 7-12) illustrate the anomalous enrichment of HREE+Y. Figure 7-13 compares representative analyses of the Songwe late-stage apatite to typical LREE-enriched unaltered magmatic carbonatite from other carbonatite complexes, Oka in Canada and Jacupiranga in Brazil (Hornig-Kjarsgaard, 1998).

Florencite is particularly abundant in the groundmass of the carbonatite breccias forming narrow acicular crystals (< 20 µm in width) and is associated with various Fe- and Mn-bearing oxides (Figure 7-14). Occasionally, florencite is also found as small anhedral crystals along the edges of entrained carbonate crystals in apatite veins and most likely formed as a replacement/alteration product of apatite.

Xenotime in association with apatite was identified in a calcite- and apatite-rich breccia in bore hole PX020 but this is to date the only xenotime occurrence at Songwe Hill.

Table 7-3
Average REO distribution of Synchysite, analysed by EMP, in Songwe carbonatites (excluding outliers)

Borehole	La_2O_3 wt. %	Ce_2O_3 wt. %	Pr_2O_3 wt. %	Nd_2O_3 wt. %	Sm_2O_3 wt. %	Eu_2O_3 wt. %	Gd_2O_3 wt. %	Dy_2O_3 wt. %	Y_2O_3 wt. %	REO[1] wt. %
PX001										
Median	14.50	23.39	2.16	7.45	1.04	0.26	0.63	0.21	0.54	50.18
Average	14.39	23.11	2.13	7.38	1.03	0.25	0.60	0.22	0.55	49.66
PX003										
Median	15.84	26.52	2.39	7.45	0.58	0.04	0.00	0.06	0.24	53.12
Average	16.13	26.78	2.40	7.17	0.55	0.05	0.01	0.07	0.27	53.43
PX005										
Median	11.42	24.70	2.72	9.42	0.99	0.10	0.17	0.14	0.50	50.16
Average	10.98	24.19	2.55	8.94	0.98	0.12	0.20	0.14	0.61	48.71
PX011										
Median	13.65	24.43	2.38	6.63	0.65	0.11	0.16	0.21	0.84	49.06
Average	13.73	23.99	2.31	6.57	0.64	0.11	0.17	0.24	0.92	48.68
Borehole	**La_2O_3 %**	**Ce_2O_3 %**	**Pr_2O_3 %**	**Nd_2O_3 %**	**Sm_2O_3 %**	**Eu_2O_3 %**	**Gd_2O_3 %**	**Dy_2O_3 %**	**Y_2O_3 %**	**REO[1] %**
PX001										
Median	28.92	46.44	4.32	15.10	2.11	0.51	1.23	0.43	1.07	100.0
Average	28.97	46.53	4.29	14.86	2.08	0.50	1.21	0.44	1.12	100.0
PX003										
Median	29.88	49.65	4.58	13.81	1.09	0.08	0.00	0.11	0.45	100.0
Average	30.23	50.12	4.50	13.39	1.02	0.09	0.01	0.13	0.51	100.0
PX005										
Median	22.75	49.21	5.36	18.65	1.93	0.24	0.38	0.28	1.17	100.0
Average	22.45	49.80	5.21	18.33	2.00	0.25	0.41	0.29	1.26	100.0
PX011										
Median	28.66	49.09	4.78	13.55	1.30	0.23	0.32	0.45	1.78	100.0
Average	28.20	49.30	4.75	13.50	1.31	0.23	0.33	0.48	1.87	100.0

[1] *REO = La_2O_3, Ce_2O_3, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Dy_2O_3 and Y_2O_3*
Source: *NHM and Brady*

Table 7-4

Average REO distribution of Apatite, analysed by LA-ICP-MS, in Songwe carbonatites (excluding outliers)

Borehole	La_2O_3 ppm	Ce_2O_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Ho_2O_3 ppm	Er_2O_3 ppm	Tm_2O_3 ppm	Yb_2O_3 ppm	Lu_2O_3 ppm	Y_2O_3 ppm	TREO ppm	HREO $+Y_2O_3$/TREO %
PX001																	
Median	1,195	3,521	555	2,809	859	303	991	161	1,034	185	465	60	314	37	5,304	17,793	49.76
Average	1,124	3,242	513	2,695	799	284	917	150	944	168	420	55	291	33	4,792	16,427	49.03
PX003																	
Median	1,419	3,956	688	3,233	1,006	359	1,157	194	1,237	211	482	48	211	21	5,680	19,902	48.24
Average	1,638	5,700	631	3,058	914	325	1,071	183	1,151	203	458	47	201	20	5,276	20,876	42.80
PX005																	
Median	270	922	170	949	429	199	806	177	1,323	259	619	66	305	28	8,101	14,623	81.26
Average	258	929	168	950	420	199	843	187	1,407	281	680	71	321	31	8,649	15,394	82.30
PX012																	
Median	423	1,414	275	1,561	668	305	1,214	231	1,601	296	703	76	303	28	9,364	18,462	76.49
Average	479	1,463	263	1,493	650	290	1,106	211	1,443	270	632	67	288	27	8,150	16,832	74.17

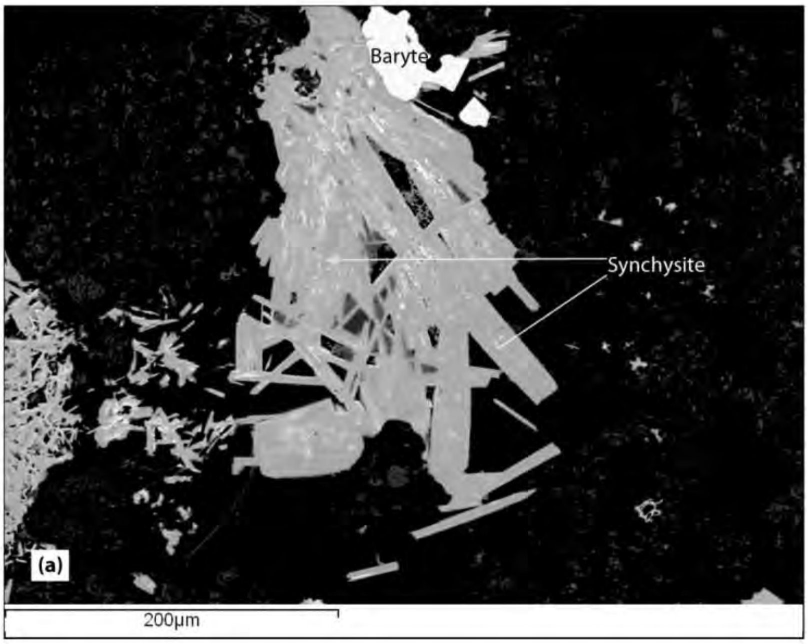
Borehole	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	TREO %
PX001																
Median	6.7%	19.8%	3.1%	15.8%	4.8%	1.7%	5.6%	0.9%	5.8%	1.0%	2.6%	0.3%	1.8%	0.2%	29.8%	100%
Average	6.8%	19.7%	3.1%	16.4%	4.9%	1.7%	5.6%	0.9%	5.7%	1.0%	2.6%	0.3%	1.8%	0.2%	29.2%	100%
PX003																
Median	7.1%	19.9%	3.5%	16.2%	5.1%	1.8%	5.8%	1.0%	6.2%	1.1%	2.4%	0.2%	1.1%	0.1%	28.5%	100%
Average	7.8%	27.3%	3.0%	14.6%	4.4%	1.6%	5.1%	0.9%	5.5%	1.0%	2.2%	0.2%	1.0%	0.1%	25.3%	100%
PX005																
Median	1.8%	6.3%	1.2%	6.5%	2.9%	1.4%	5.5%	1.2%	9.0%	1.8%	4.2%	0.5%	2.1%	0.2%	55.4%	100%
Average	1.7%	6.0%	1.1%	6.2%	2.7%	1.3%	5.5%	1.2%	9.1%	1.8%	4.4%	0.5%	2.1%	0.2%	56.2%	100%
PX012																
Median	2.3%	7.7%	1.5%	8.5%	3.6%	1.6%	6.6%	1.3%	8.7%	1.6%	3.8%	0.4%	1.6%	0.1%	50.7%	100%
Average	2.8%	8.7%	1.6%	8.9%	3.9%	1.7%	6.6%	1.3%	8.6%	1.6%	3.8%	0.4%	1.7%	0.2%	48.4%	100%

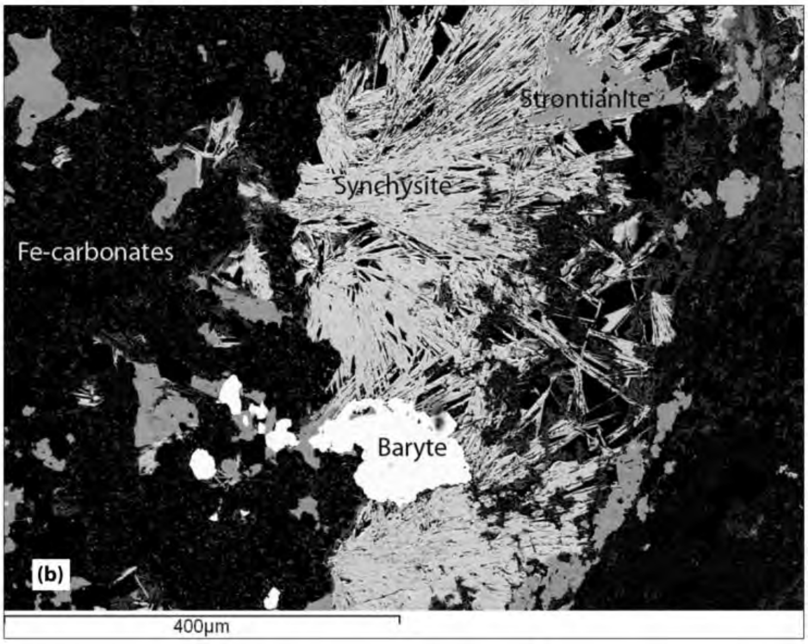
[1] *REO = La_2O_3, Ce_2O_3, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Dy_2O_3 and Y_2O_3*

Source: *AU and Brady*

Figure 7-10

SEM images of synchysite in the Songwe carbonatite





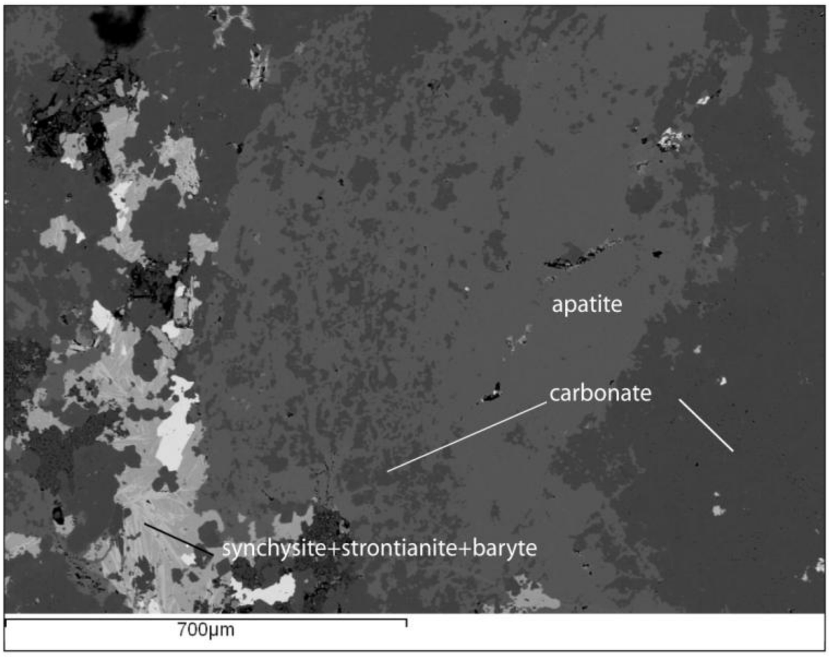
Note: *(a): Sample V3702 from borehole PX005 (V3702) with tabular/lath-shaped synchysite crystals;*

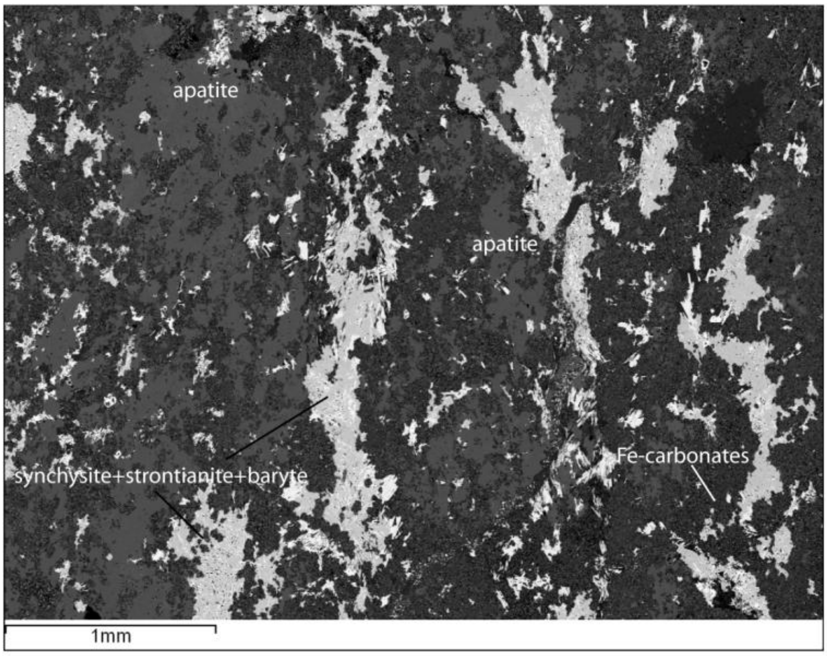
(b): Sample V3532 from borehole PX001 showing fibro-radial aggregates of synchysite in strontianite

Source: *NHM and Brady (2012)*

Figure 7-11

SEM images of apatite in the Songwe carbonatite





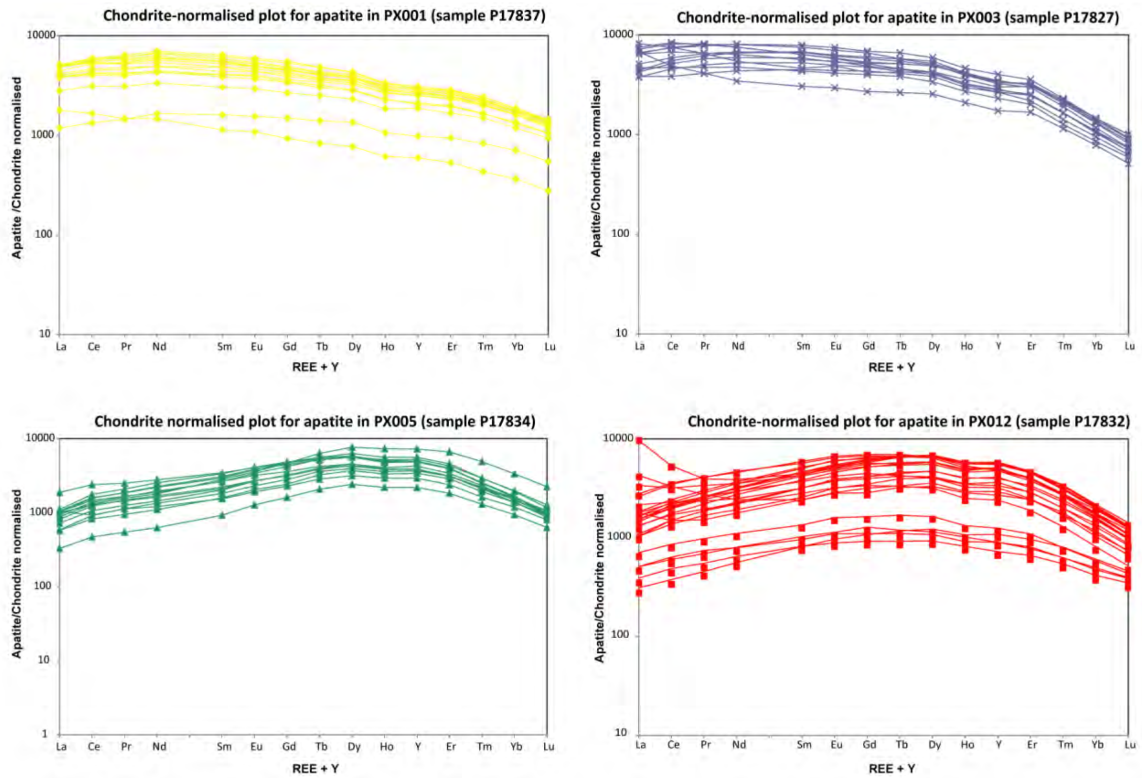
Note: *(a): Sample V364 from borehole PX001showing band of apatite containing entrained carbonate with aggregates of synchysite, strontianite and baryte along its edge and*

(b): Sample V1240 from borehole PX003 with apatite and Fe-rich carbonate bands with large vein-like aggregate of synchysite, strontianite and baryte

Source: *NHM and Brady (2012)*

Figure 7-12

Chondrite-normalized REE pattern for apatite in Songwe carbonatite

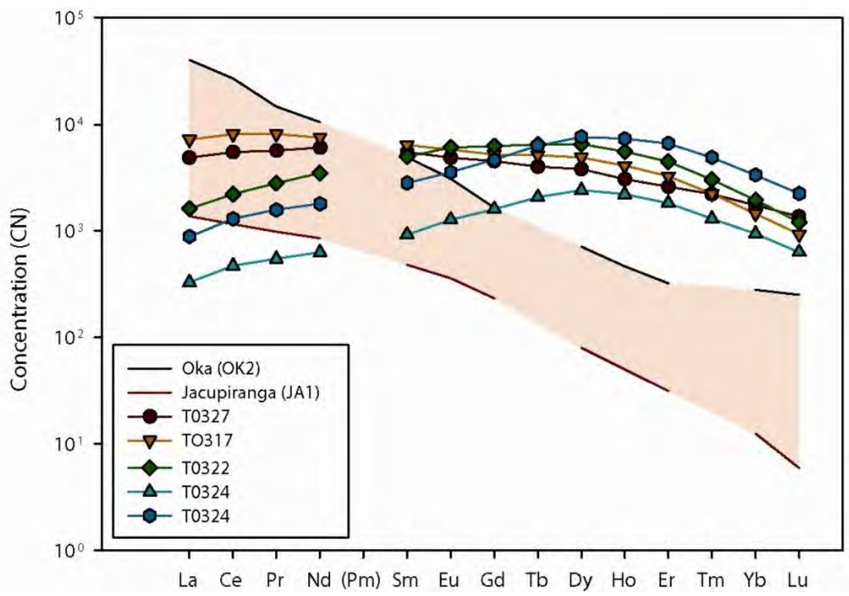


Note: *Chondrite normalization after Sun and McDonough (1989)*

Source: *Brady (2012)*

Figure 7-13

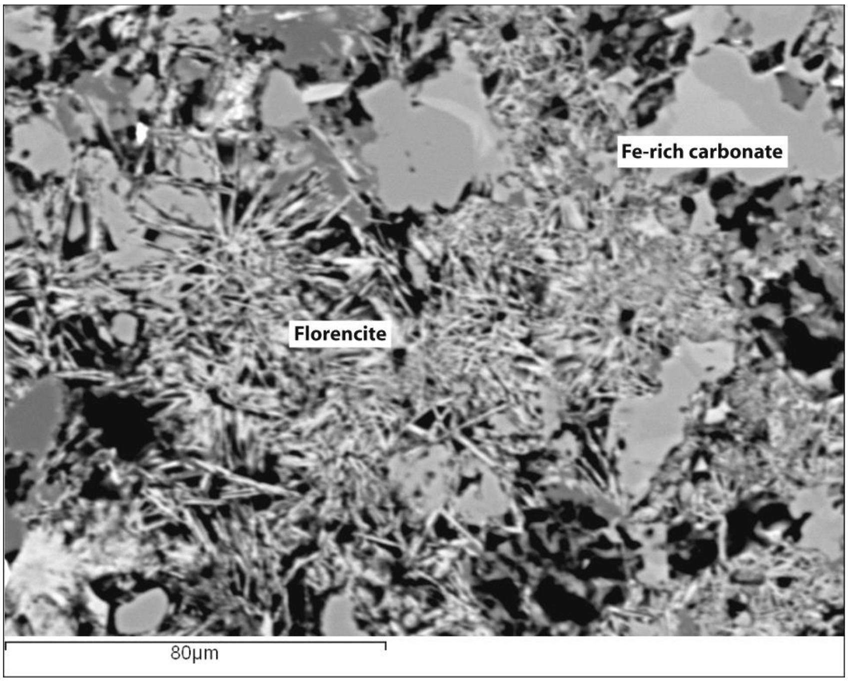
Chondrite-normalized late-stage apatite from Songwe carbonatites



Note: *Chondrite-normalized HREE pattern of Songwe apatite compared to typical LREE-enriched unaltered magmatic carbonatite from the Oka and Jacupiranga carbonatites. Chondrite normalization after Sun and McDonough (1989)*

Source: *Broom (2012)*

Figure 7-14
Florencite-rich groundmass of carbonatite breccia



Source: *NHM and Brady (2012)*

7.3.4.1 Genetic Model for REE Mineralization

The mineralogical work to date indicates that the light and heavy rare earth mineralization in the Songwe Hill vent system is late- to post-magmatic hydrothermal in origin and, regardless of lithology, is hosted primarily by fluorocarbonates (principally synchysite) and apatite with minor florencite.

The complex, multi-phase geological evolution of the Songwe carbonatite complex is tentatively interpreted as follows: 1) intrusion of the Mauze nepheline syenites and phonolites, 2) fenitisation of the host nepheline syenites, 3) intrusion(s) of REE-bearing calcite carbonatite in a ring type structure and concomitant incorporation/stoping of fenite blocks, 4) pulses of Fe-bearing carbonatite magma emplacement and replacement of calcite carbonatite, 5) intrusion of thin Fe-rich carbonatite dykes/veins in the calcite and Fe-bearing carbonatites, 6) multiple later stage episodes of brecciation, and finally 7) extensive hydrothermal/carbohydrothermal activity resulting in REE enrichment of the various carbonatite and related lithologies.

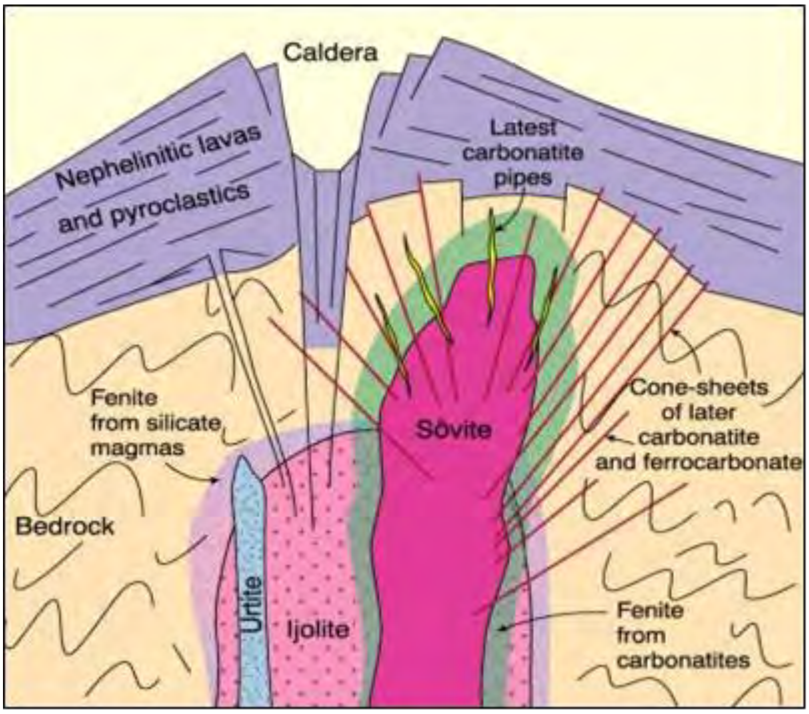
The mineral association of REE-rich fluorocarbonates and apatite, with strontianite, baryte, ankerite and fluorite at Songwe strongly suggests that the REE mineralization formed by re-equilibration and recrystallisation of primary (early-crystallized) minerals (e.g. calcite) in the various carbonatite lithologies. REEs are known to concentrate into the late-stage carbonatite-related (deuteric) fluids (e.g. Doroshkevich *et al.*, 2009) and it is therefore most likely that certain elements were introduced and/or re-distributed by hydrothermal/carbohydrothermal solutions. The presence of REE in the fenites demonstrates the mobility of the REE in the hydrothermal/carbohydrothermal fluids at Songwe Hill.

8 DEPOSIT TYPES

The target deposit type at Songwe Hill is a REE-enriched carbonatite. Carbonatites are traditionally defined as intrusive and extrusive igneous rocks that contain in excess of 50% modal carbonate minerals (Woolley and Kempe, 1989). The most recent classification by Mitchell (2005) defines carbonatites as “containing greater than an arbitrary 30 vol. % primary igneous carbonate regardless of silica content”. Carbonatites can be named according to their carbonate mineralogy (e.g. calcite carbonatite, dolomite carbonatite and ankerite carbonatite) and chemically they can be divided into the three main varieties: calcio-, magnesio- and ferro-carbonatite. Figure 8-1 is a generalized and widely accepted schematic illustration of the intrusion of a carbonatite complex.

Figure 8-1

General model for an alkali silicate-carbonate intrusive complex



Source: *after Le Bas (1987)*

Carbonatites usually occur as plugs or pipe-like bodies within zoned alkalic intrusive complexes, or as dykes, sills, breccias, and veins, and are almost exclusively associated with continental rift-related tectonic settings. They are characterized by an aureole of metasomatically altered country rocks which are usually referred to as fenites. Carbonatites are typically associated with silicate rocks of which the seven key carbonatite-silicate rock associations are in decreasing order of abundance: 1) nephelinite-ijolite, 2) phonolite-feldspathoidal syenite, 3) trachyte-syenite, 4) melilitite-melilitolite, 5) lamprophyre, 6) kimberlite, and 7) basanite-alkali gabbro (Woolley & Kjarsgaard, 2008). The carbonatite deposit at Songwe Hill is spatially associated with the large nepheline syenite intrusion of Mauze and is therefore interpreted to belong to the phonolite-feldspathoidal syenite association.

Carbonatites can be generated by:

- a low degree of partial melting in the mantle (e.g. Wallace & Green, 1988);
- extreme crystal fractionation (e.g. Watkinson and Wyllie, 1971); or
- liquid immiscibility (e.g. Kjarsgaard and Hamilton, 1989) from carbonated silicate magma.

It is possible that all three mechanisms may play a part in carbonate magma evolution. Carbonatites typically consist of multiple phases of intrusions and characteristically evolve, by crystal fractionation within the intrusion, from early magmatic calcite-rich carbonatite to magnesium-rich dolomite carbonatites and finally with decreasing temperature to late-stage iron-rich carbonatite phases. As a result of their petrogenesis, carbonatites tend to be anomalously enriched in the highly incompatible REE and high field strength elements (HFSE) and such enrichment can lead to economic concentrations of REE (Chakhmouradian and Zaitsev, 2012).

The REE profile of carbonatite-associated mineralization is typically LREE-dominated. Concentrations of REE tend to increase with fractionation from calcio- to magnesio- to ferro-carbonatites and the REE distribution and profile in carbonatites is typically modified by late stage hydrothermal activity (Mariano, 1989; Giere, 1996; Wall and Mariano, 1996; Doroshkevich *et. al.*, 2009). Carbonatite deposits may also contain economic or anomalous concentrations of magnetite, apatite, baryte, sulphides and vermiculite and are characterized by elevated concentrations of some or all of phosphorous, niobium, tantalum, uranium, thorium, copper, iron, titanium, vanadium, barium, fluorine, zirconium, and other rare or incompatible elements.

REE-enriched carbonatite hosted deposits may be divided in to three types: magmatic, hydrothermal, and residual / supergene (Mariano, 1989). Rare earth mineral deposits produced by primary crystallization from carbonatite magma are very rare and at the present time, the Mountain Pass deposit in the USA is the only well documented example. Late-stage rare earth mineralization produced by magmatic hydrothermal fluids is much more common, resulting in the precipitation of rare earth minerals, such as bastnäsite-(Ce), parisite-(Ce), synchysite-(Ce) and monazite-(Ce) in fractures or voids in the host carbonatite rock. Alternatively, hydrothermal mineralization may be present as disseminated, fine grained, polycrystalline aggregates of rare earth minerals overprinting or replacing earlier-formed minerals. Examples of hydrothermal deposits include Bayan Obo in China (Chao *et al.*, 1992; Smith and Henderson, 2000) and Karonge/Gakara in Burundi (Lehmann *et al.*, 1994).

Laterites, overlying deeply weathered carbonatites and alkaline rocks, are also an important source of REE enrichment and examples of supergene mineralization include the Mount Weld deposit in Western Australia. However, the rare earth deposit at Songwe Hill is not a laterite and is best described as a magmatic/hydrothermal REE deposit.

The target at Songwe Hill is a large body of intrusive calcic carbonatite with related breccias and fenites that appears to be part of a ring complex in a high level vent system. The REE mineralization is lithologically-controlled and the highest concentrations and greatest volumes of mineralization occur specifically within the carbonatite bodies. The carbonatites are believed to have been REE-enriched when they were intruded and the REE have apparently been redistributed and enhanced by late-stage hydrothermal/carbohydrothermal activity and are now principally residing in synchysite and apatite.

Vent breccias are also variably mineralized, locally to potentially economic values, and the level of REE concentrations is a function of the relative abundance of carbonatite fragments.

Adjacent fenites are also variably mineralized, although typically at lower volumes and concentrations than carbonatites, and the intensity of mineralization is related to the degree of carbonate alteration overprinting the fenite suggesting that these rocks have also been mineralized by late-stage hydrothermal activity.

9 EXPLORATION

Mkango has been exploring and evaluating the Songwe Hill rare earth deposit since January 2010. Following confirmation of the enriched zones, previously investigated by JICA and MMAJ (see Section 6), exploration focused on identifying the nature and extent of the REE-mineralized carbonatites and related rocks. Mkango's exploration activities consisted of litho-geochemical sampling, soil sampling, channel sampling, geological mapping, ground magnetic, density and radiometric surveys, and petrographic/ mineralogical analyses and culminated in two diamond drilling campaigns in 2011 and 2012, the results of which are described in Section 10. Geological observations and interpretations and procedures related to exploration methodology were implemented and overseen by the Mkango geological team in Malawi led by Dr. Aoife Brady.

9.1 Litho-geochemical Sampling

Fieldwork undertaken by Mkango on Songwe Hill during March 2010 and May 2010 consisted primarily of litho-geochemical sampling to confirm the nature and extent of the mineralization identified by JICA and MMAJ. Outcrops were systematically scanned with a Thermo-Scientific Niton® XLP handheld X-ray fluorescence analyzer calibrated for the semi-quantitative analysis of REE. This work indicated that all lithologies on Songwe Hill contain anomalous amounts of REE and that there are variations between the different lithologies. In general, the contents of total REE in the fenites were lower than the carbonatites.

Two principal types of carbonatite were identified: a relatively homogeneous, medium grey rock, which appeared flow banded in places and a much blacker type which was characteristically heterogeneous. The black carbonatite appeared to form zones of various widths that cut or replace the grey homogeneous carbonatite. A total of 88 representative grab samples were taken from outcrop (62 carbonatites, 14 fenites, 11 Fe-rich and related rocks) and assayed for a full suite of rare earth and related elements. The sample locations are shown on Figure 9-1 and the assay results for the various rock types are presented in Table 9-1 and Figure 9-2. The samples were considered to be representative of the outcrop distribution of the mineralization. Care was taken to sample fresh rock and no sample biases were identified beyond the fact that there may have been minor modification of the concentration of REE in some samples by weathering effects.

The new results generally compared well with the data from JICA and MMAJ and confirmed broad zones of carbonatite at surface. The 62 carbonatite grab samples produced TREO concentrations between 0.4% and 5.3% TREO with an average of 1.5 % TREO. The proportion of HREO, defined as the sum of oxides of Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu and Y, for these samples averaged 8 % of TREO. The average TREO concentration of samples exceeding 1 % TREO is 1.84 % TREO.

The results of this work confirmed the REE enrichment, initially identified by JICA and MMAJ and suggested that the mineralized carbonatites are more widespread than originally identified. This led to a broadening of the exploration focus to include most of the north-facing slopes of Songwe Hill.

Table 9-1

Average REO distribution of Apatite, analysed by LA-ICP-MS, in Songwe carbonatites (excluding outliers)

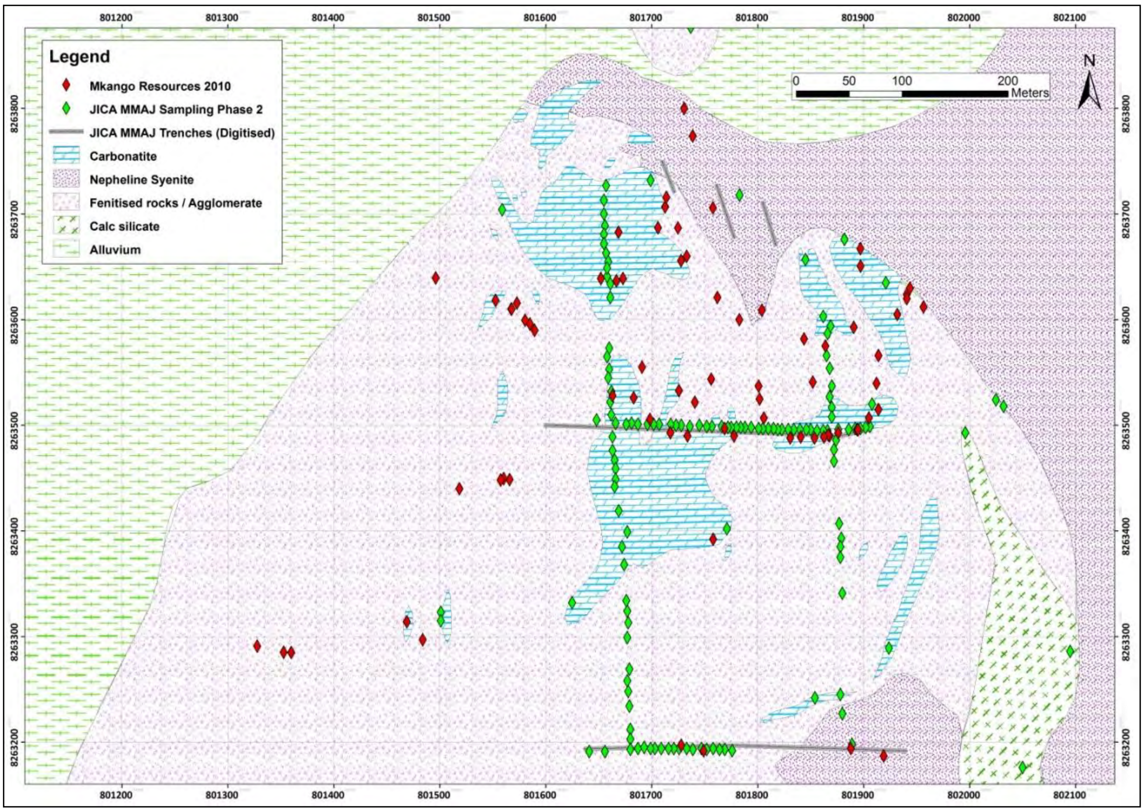
Borehole	Rock Type	La_2O_3 ppm	Ce_2O_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Y_2O_3 ppm	Other[1] ppm	TREO[2] %
H0101	Carbonatite	8,704	13,232	1,126	3,218	343	85	238	23	102	385	66	2.75
H0102	Carbonatite	2,100	4,661	569	1,866	269	75	183	24	116	547	104	1.05
H0103	Carbonatite	10,135	15,691	1,310	3,626	326	77	228	20	88	370	76	3.19
H0117	Carbonatite	2,721	6,277	715	2,600	364	95	225	24	103	428	112	1.37
H0118	Carbonatite	10,979	16,043	1,369	3,999	448	108	309	30	142	749	155	3.43
H0119	Carbonatite	4,481	9,309	1,013	3,696	592	160	380	41	171	635	128	2.06
H0125	Carbonatite	2,064	4,754	517	1,842	261	68	166	22	118	655	130	1.06
H0126	Carbonatite	2,933	6,663	766	2,775	416	117	292	34	135	466	91	1.47
H0127	Carbonatite	11,343	16,511	1,369	3,731	458	122	326	39	180	720	131	3.49
H0917	Carbonatite	5,396	10,047	1,062	3,964	686	167	395	47	200	711	131	2.28
H0003	Fenite	1,408	3,244	314	1,259	264	68	146	13	46	183	41	0.70
H0004	Fenite	1,021	1,792	185	749	152	38	75	6	22	112	26	0.42
H0901	Fenite	903	1,265	228	1,056	220	62	137	15	63	271	57	0.43
H0902	Fenite	1,325	1,405	298	1,178	182	48	105	12	56	262	57	0.49
H0134	Fenite	745	1,522	199	802	200	61	156	19	88	395	68	0.43
H0909	Fe-rich rock	2,018	4,625	524	2,110	281	63	130	11	35	121	23	0.99
H0911	Fe-rich rock	1,279	2,916	339	1,411	213	52	118	13	49	179	30	0.66
H0913	Fe-rich rock	3,202	7,834	940	3,790	488	103	211	15	51	174	26	1.68
H0109	Fe-rich rock	5,501	8,115	741	1,912	216	66	203	27	119	538	95	1.75
H0002	Fe-rich rock	555	2,764	496	3,090	1,070	299	641	67	228	598	102	0.99

Note: [1] *Other comprises Ho2O3, Er2O3, Tm2O3, Yb2O3 and Lu2O3;*
[2] *TREO = Total Rare Earth Oxides including yttrium*

Source: *Mkango (2010)*

Figure 9-1

Geological map of Songwe Hill with sample localities of JICA (1988) and Mkango (2010) samples

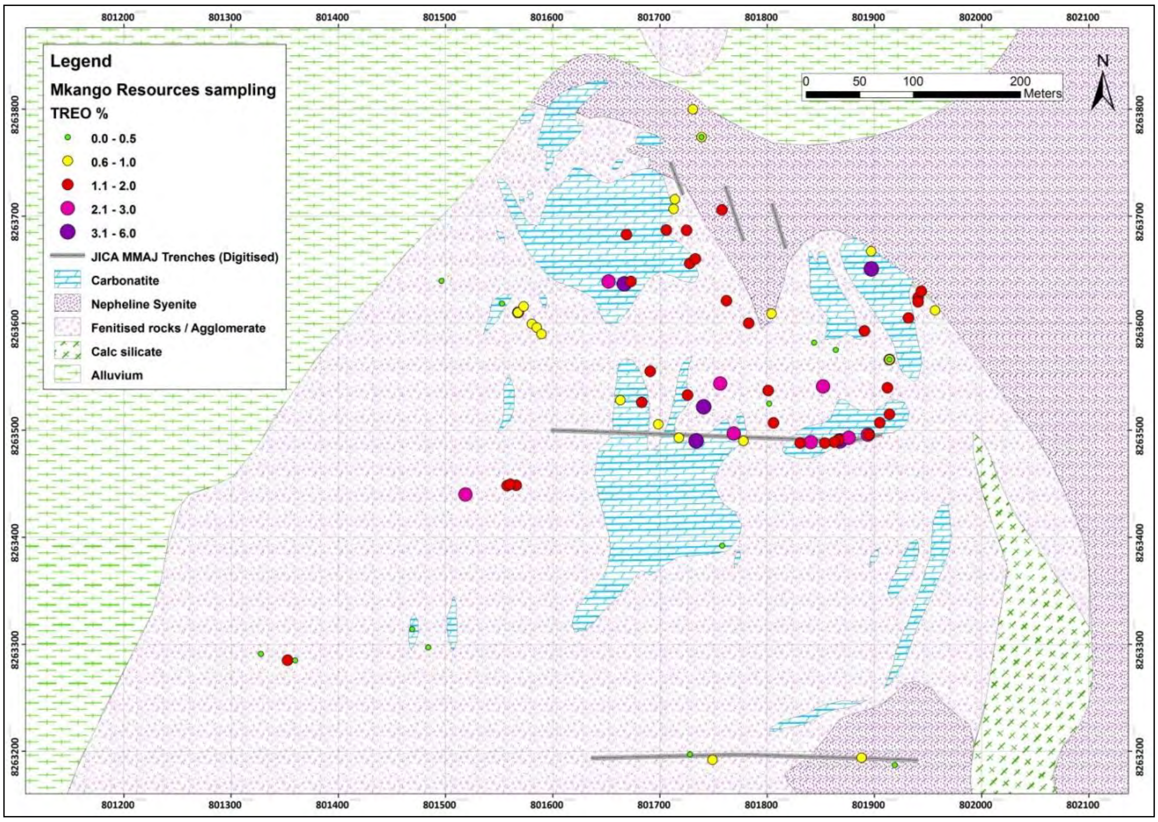


Note: *UTM Zone 36S and WGS84 Datum*

Source: *Mkango after JICA / MMAJ (1989)*

Figure 9-2

Geological map of Songwe Hill with assay results for Mkango samples



Note: *Assay results are shown for various rock types sampled; UTM Zone 36S and WGS84 Datum*
Source: *Mkango (2010)*

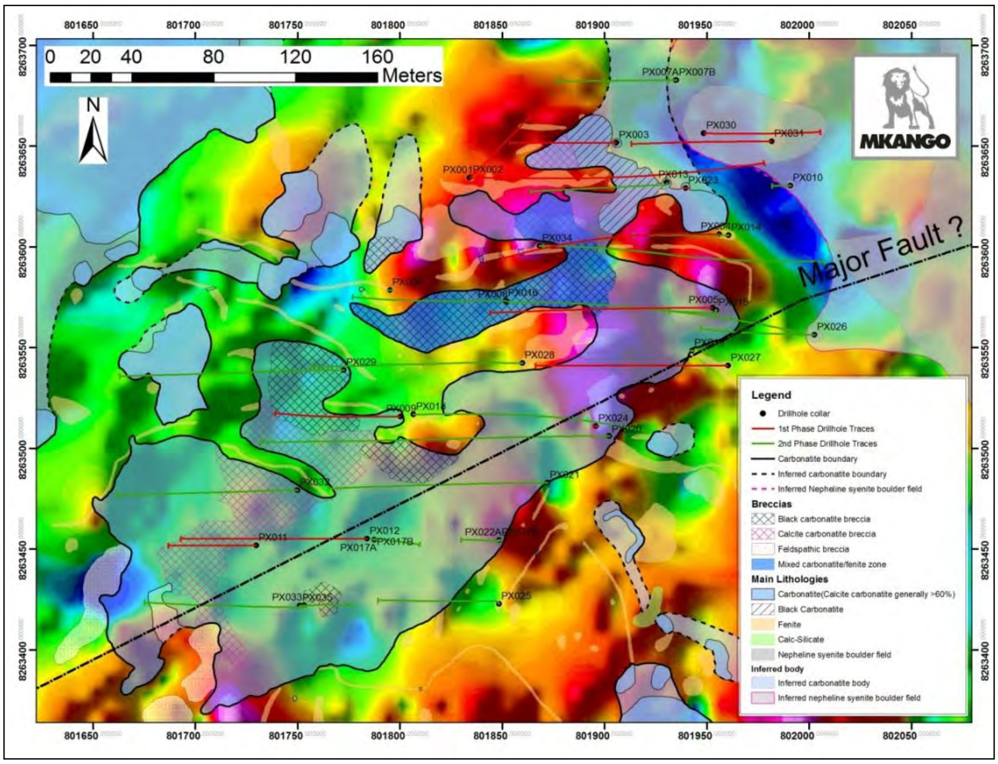
9.2 Ground Geophysical Programme

In October 2010 and January 2011, Remote Exploration Services (Pty) Ltd. ("RES") from South Africa, conducted magnetic, radiometric and gravity surveys over Songwe Hill. The objective of the geophysical programme was to determine the geophysical characteristics of the geological units as an aid to mapping the extent of the carbonatite over Songwe Hill (Remote Exploration Services Ltd., 2010). A digital terrain model (DTM) was prepared as part of the geophysical programme. All data was processed by RES.

9.2.1 Magnetic survey

The ground-magnetic survey was conducted using GEM Overhauser Magnetometers. Magnetic data was collected in "Walk Mode" at one second intervals along 1 km long lines spaced 50 m apart, while a fixed GEM base magnetometer enabled each day's magnetic data to be corrected for diurnal variations by recording magnetic field readings at 10 second intervals. Field data spatial positioning was accomplished with the use of a Garmin handheld GPS. The magnetic data define the vent aureole as a zone of demagnetization around the mapped fenite and depicts the vent as magnetically zoned. A NE-trending major fault cross-cutting the centre of the vent could be the cause for this magnetic zoning. The data showed no clear correlation between magnetic anomalies and the mapped carbonatite outcrops. The magnetic survey also identified several faults/lineaments which could have played an important role in carbonatite emplacement as well as radioelement mobility (Figure 9-3).

Figure 9-3
Modified analytical signal of TMI over Songwe Hill

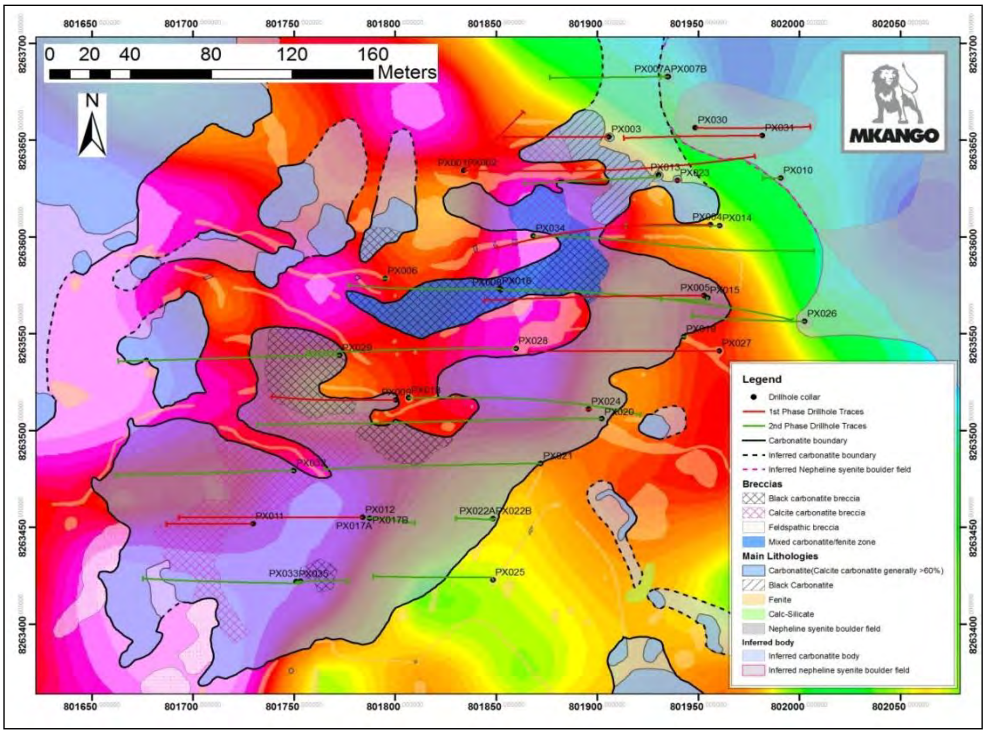


Note: *Analytical signal showing magnetic zone and structures; geological map, drill collars and traces superimposed*
Source: *RES and Mkango (2011)*

9.2.2 Radiometric survey

A calibrated 4-channel spectrometer was used for the radiometric survey. Total count, potassium (K), thorium (Th) and uranium (U) counts were recorded for 60 s at 50 m station intervals along 1 km long lines spaced 50 m apart. An additional infill survey was conducted over part of the survey area with a known carbonatite occurrence. The radiometric survey data showed the existence of significant thorium and potassium anomalies and demonstrated a good correlation between the Th response and the mapped carbonatite (Figure 9-4).

Figure 9-4
Thorium radiometric survey over Songwe Hill



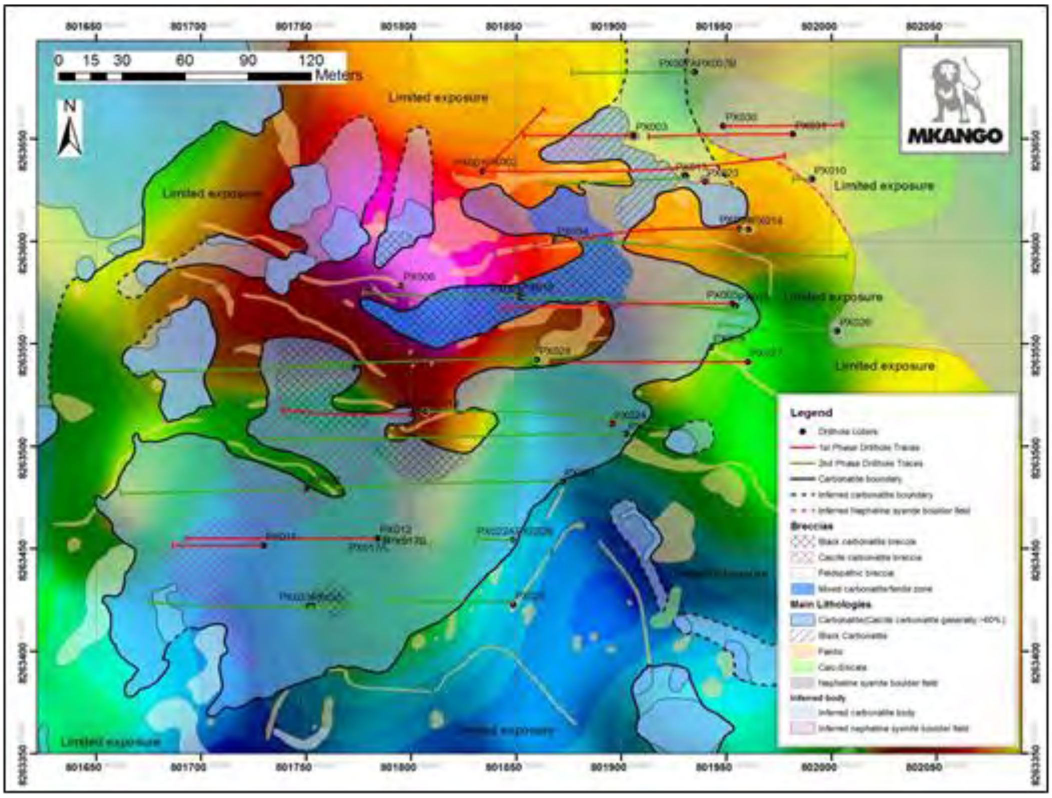
Note: *Thorium radiometric survey; geological map, drill collars and borehole traces superimposed*
Source: *RES and Mkango (2011)*

9.2.3 Gravity survey

The ground gravity survey was conducted using a Scintrex CG3 micro-gravimeter, capable of taking readings with an accuracy of +/- 0.001 mGal. Gravimetric measurements were made at 50 m station intervals along 1 km long lines spaced 50 m apart. Readings were stacked for 60 s and averaged at each station so as to minimize random noise and were also kept within a standard deviation of +/- 0.050 mGal. Base readings were taken at the "gravity base" at the beginning and end of each survey day in order to correct field measurements for instrument drift. Elevation and positional control was accomplished initially with the use of a Trimble Differential GPS (DGPS) unit. This had to be abandoned due to a technical fault within the DGPS system and a Garmin 60CSX handheld GPS unit was adopted for the remainder of the survey. The hill was resurveyed in January, 2011 (Remote Exploration Services Ltd., 2011) in order to better constrain the digital terrain model and the gravity survey data was reinterpreted on the basis of the revised DTM. Interpretation of the gravity data, based on in-field observations undertaken on hand specimen grab samples, assumed a high density contrast between the carbonatites and the surrounding rocks.

Due to inherent errors in the gravity data emanating from imprecise elevation measurements using a handheld GPS as well as the coarse nature of the data, it is likely that an accurate assessment of the density distribution within the vent has not been achieved. A central gravity high was identified (Figure 9-5) but it is inconclusive as to whether it relates to carbonatite or basement geology.

Figure 9-5
Ground gravity survey over Songwe Hill



Note: *Ground gravity survey over Songwe Hill showing a central gravity high; geological map, drill collars and borehole traces superimposed*
Source: *RES and Mkango (2011)*

9.3 Geological Mapping

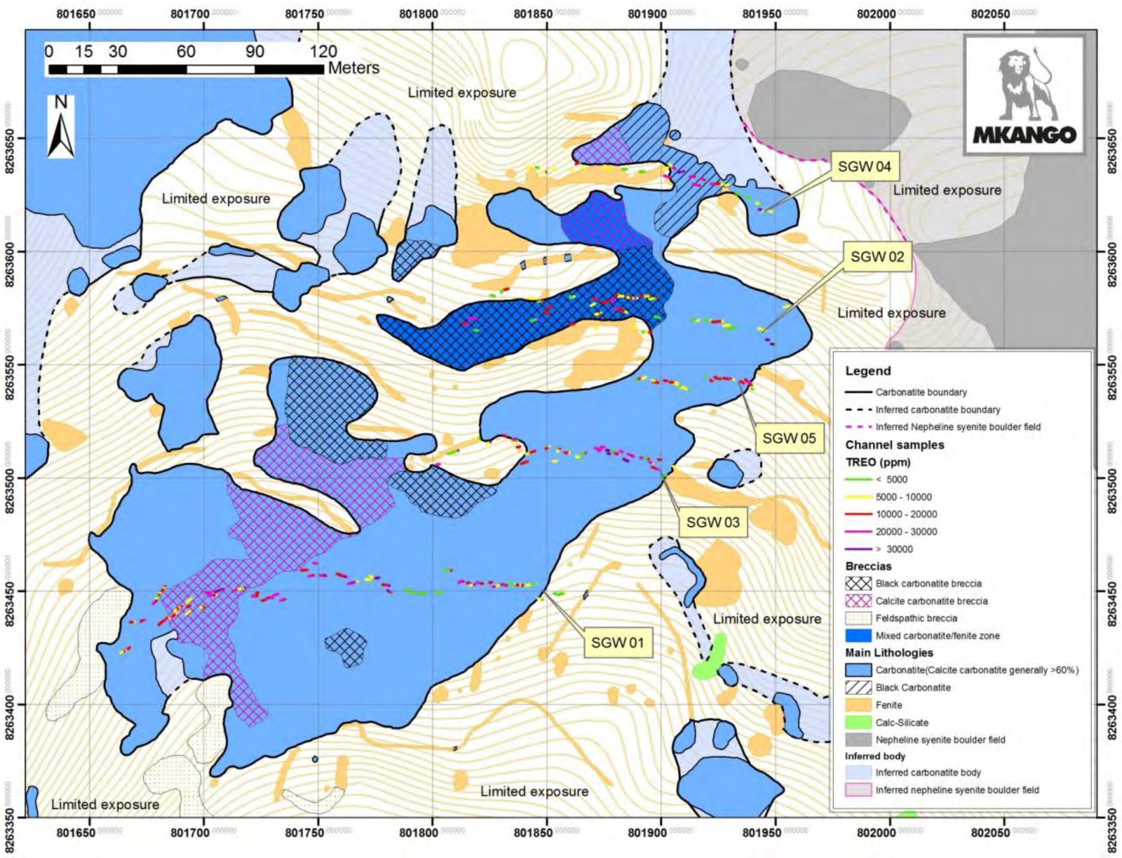
Detailed geological mapping of Songwe Hill was carried out during March, 2010 in conjunction with the surface litho-geochemical sampling program and between May and July, 2011. All outcrops on the north-facing slopes of Songwe Hill were systematically recorded and their locations determined with a handheld GPS (Garmin 60CSX). Mapping was aimed to provide better detail on the distribution of carbonatite, fenite and breccia across Songwe Hill and to delineate the zones of rare earth mineralization (see Figure 7-2). The mapping programme demonstrated that carbonatite outcrops over a significantly larger area than had previously been recognized by JICA and MMAJ. Mapping further achieved a more precise delineation of the distribution of breccia and fenite. The mapping broadened the surface area of known rare earth mineralization significantly beyond the areas identified in previous exploration and identified new areas of rare-earth enriched carbonatite on the western slope of the hill.

9.4 Surface Channel Sampling

A channel sampling programme was undertaken during November and December 2011 following the Stage 1 drill campaign. The objective was to help constrain the geological model and provide continuous surface sampling along the drill section lines in order to constrain the Mineral Resource Estimation. Outcrops were exposed by cleaning off overburden and soil as continuously as possible along 5 lines with an east-west orientation that followed the approximate surface projections of existing and planned boreholes. In detail, the location of the channel sampling lines was dictated by the availability of outcrop along each E-W line. Where outcrop could not be exposed directly on the line, sampling was offset to the outcrop nearest to the line, irrespective of lithology (Figure 9-6). To the extent possible, continuous channel samples were cut along each of these lines.

Figure 9-6

Geological map with location and TREO of the 5 channel sample lines



Source: *Mkango (2012)*

Channels were cut in the exposed outcrop using a Stihl TS 700 saw fitted with a diamond saw blade (Figure 9-7) and connected to a Stihl 10L pressurized water tank. All channels were cut to an approximate width of 4 cm to 5 cm and a depth of 10 cm to 12 cm. A single channel was defined by the start and end of a continuous cut. There were many breaks in the cutting due to the uneven topography and distribution of outcrop and overburden. As a result, although the channels follow the planned surface lines as closely as possible, they are not continuous and locally deviate from the line.

Figure 9-7

Example of Channel sampling programme on Songwe Hill

***Note:** Left: a single channel cut through carbonatite; Right: Channel cutting with a Stihl TS 700 saw*
***Source:** Armitage (2012)*

On completion of cutting, the channels and an area approximately 50 cm to either side of the channels were cleaned of sludge using water and a stiff brush if necessary. When the rock surface had dried after cleaning, metre marks across the channels were painted together with unique sample numbers (sample ticket book number) adjacent to the metre marks on the left side of the channel viewed in the direction of sequential sampling.

Samples were broken and chipped out of the channels using a tapered masonry chisel and a club hammer. As slabs and chips of rock were liberated, they were placed immediately into pre-prepared sampling bags containing sample tickets and marked with sample numbers on the outside. Before sampling each metre, the geologist checked that the sample number of the bag corresponded to the number spray-painted alongside the channel. Channels were sampled at 1 m intervals and if there was a change of lithology within the sampling interval, then each lithology was sampled separately, using a minimum of 20 cm channel length and a maximum of 130 cm.

On completion of sampling, all channels were photographed, viewed in the direction of sequential sample numbering, and clearly showing the sample numbers.

The channel sampling logging and sampling technique employed during the channel sampling programme followed strict internal quality assurance and quality control (QA/QC) procedures. Each channel sample line was geologically logged and sampled observing the same procedures used during the drilling programmes. Sample preparation and analytical work was carried out by

Intertek-Genalysis Laboratory Services (Johannesburg, South Africa and Perth, Australia) employing ICP-MS analytical procedures and following strict internal QA/QC procedures including the insertion of duplicates, blanks and certified standards. Detailed information on logging, sampling and geochemical analysis is presented in Section 11.

A summary of the channel sampling programme, as illustrated in Figure 9-6, is presented in Table 9-2. The results were broadly consistent with the current geological mapping, litho-geochemical sampling and portable XRF sampling results and further confirm the continuity of rare earth mineralization at surface in carbonatite, carbonatite breccia and fenite on Songwe Hill. Representative assay data for the channel samples are given in Table 9-3.

Table 9-2
Summary of assay results for the 5 channel sample lines

E-W line (approximate length)	Aggregated length of channel samples	Aggregated length of carbonatite[1] in channel samples	Weighted average TREO in carbonatite[1]	Aggregated length of fenite in channel samples	Weighted average TREO in fenite
m	m	m	% TREO[2]	m	% TREO[2]
SGW-01 (200 m)	152	119	1.75	33	0.73
SGW-02 (150 m)	106	79	1.44	27	1.20
SGW-03 (110 m)	66	53	1.70	14	0.67
SGW-04 (120 m)	63	33	2.83	31	0.94
SGW-05 (55 m)	37	31	1.37	6	1.28

Note: [1] *Includes both carbonatite and carbonatite breccia;*
[2] *TREO = Total Rare Earth Oxides including yttrium*

Source: *Mkango (2012)*

9.5 Research Programmes

Post-graduate studies on the middle and heavy REE mineralization at Songwe Hill have been completed at Camborne School Mines (CSM), University of Exeter, UK in conjunction with the British Geological Survey (BGS). This Project investigated HREE concentration levels in alkaline and carbonatite complexes which are typically light rare earth dominated.

This research was focused on two principle questions: (1) under what conditions are the HREE preferentially removed from a carbonatite and deposited in hydrothermal veins and (2) how does the REE distribution evolve through the carbonatite intrusion phases and into late stage hydrothermal remobilization. This work was carried out at the mineralogical labs at CSM using cathodoluminescence, electron microscopy and an electron microprobe and at the BGS utilizing laser-ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) and a fluid inclusion heating and cooling stage.

The study has been completed and the results are expected to aid in targeting and exploring REE-enriched carbonatites elsewhere in the license area.

Two further research projects are underway at CSM in collaboration with Mkango. The research projects, in relation to Songwe, are focused on mineralogy, geochemistry and mineral processing.

Table 9-3

Representative assay results for carbonatite, fenite and breccia from the 5 channel sample lines

Profile	Channel No	Sample No	Rock Type	La_2O_3 ppm	Ce_2O_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Y_2O_3 ppm	Other[1] ppm	TREO[2] %
SGW-01	5	U4017	Carbonatite	2,851	6,223	726	2,621	397	112	275	32	153	636	117	1.41
SGW-01	5	U4018	Carbonatite	2,389	4,999	576	2,049	292	78	186	21	109	559	98	1.14
SGW-02	6	U4213	Carbonatite	2,456	5,358	621	2,155	315	88	222	29	145	623	115	1.21
SGW-02	6	U4214	Carbonatite	2,308	4,988	568	1,960	294	86	225	32	174	843	150	1.16
SGW-03	8	U4415	Carbonatite	3,784	9,053	1,099	4,346	709	211	528	70	363	1,982	315	2.25
SGW-03	8	U4416	Carbonatite	4,135	9,940	1,179	4,708	924	280	772	98	497	2,212	399	2.51
SGW-04	10	U4521	Carbonatite	10,571	16,306	1,536	5,172	524	134	296	35	170	711	127	3.56
SGW-01	17	U4051	Fenite	1,371	3,029	405	1,599	283	76	183	20	96	497	87	0.76
SGW-01	17	U4052	Fenite	348	670	78	302	68	22	58	8	43	246	45	0.19
SGW-02	31	U4289	Fenite	496	897	119	481	115	34	85	11	52	246	42	0.26
SGW-02	31	U4290	Fenite	762	1,460	193	771	165	45	104	12	58	280	48	0.39
SGW-05	22	U4635	Carbonatite breccia	3,399	5,677	573	1,698	242	66	164	20	101	463	84	1.25
SGW-05	22	U4636	Carbonatite breccia	2,947	5,049	517	1,580	259	82	223	31	155	680	131	1.17
SGW-01	36	U4114	Carbonatite breccia	5,610	8,491	801	2,425	336	96	250	27	128	638	119	1.89
SGW-01	36	U4115	Carbonatite breccia	5,694	8,626	825	2,501	334	91	228	25	114	537	103	1.91

Note: [1] *Other comprises Ho2O3, Er2O3, Tm2O3, Yb2O3 and Lu2O3;*
[2] *TREO = Total Rare Earth Oxides including yttrium*

Source: *Mkango (2012)*

10 DRILLING

10.1 Historical Diamond Drilling (1988)

Historic drilling from the JICA and MMAJ programme is described in Section 6 and Figure 6-1 shows the location of the historic drill holes on the property. The historic drilling does not have adequate geodetic or procedural information to be incorporated in the evaluation of the Songwe Hill deposit and does not form part of the database for the current Mineral Resource Estimate.

10.2 Stage 1 and Stage 2 Diamond Drilling (2011 – 2012)

Mkango undertook two diamond drill campaigns totalling 38 drill holes at Songwe Hill during 2011 (Stage 1) and 2012 (Stage 2) to evaluate the REE potential of the Songwe Hill deposit and develop a Mineral Resource Estimate. The drilling programmes were undertaken following strict, industry standard QA/QC protocols which were part of a comprehensive set of standard operating procedures ("SOP"). The implementation of all protocols was independently monitored by MSA.

The Stage 1 drilling programme, from April 2011 to June 2011 was conducted by OX Drilling of Zambia using HQ/NQ (63.55 mm / 47.6 mm) core barrels on a track mounted Boart Longyear drill rig. The objectives were to confirm the extent and tenor of mineralization that had previously been identified during the JICA and MMAJ drill campaigns and to test whether the mineralization extends beyond the boundaries of the previously established mineralized areas.

The programme totalled 13 drill holes, two vertical holes and 11 inclined holes drilled on 90° and 270° azimuths at inclinations of -60° and -70°, and one hole (PX002) drilled at 045° azimuth at -70° inclination. Borehole depths ranged from a minimum of 86 m to a maximum of 302.2 m. Table 10-1 provides the location and attitude information for each drill hole. A total of 1,987.38 m were drilled, and 2118 samples were collected for geochemical analyses.

The Stage 2 diamond core drilling programme was carried out between January, 2012 and May, 2012. The drill contractor was Cartwright Drilling Inc. of Goose Bay, Canada, and the core diameter for all boreholes was HQ (63.5 mm) for the upper part and NQ (47.6 mm) to the end of hole. The core diameter of one drillhole (PX022a) was further reduced from NQ to BTW (41.7 mm) size. The track-mounted rig (Figure 10-1) was moved into place on each drill pad using a Caterpillar 329D hydraulic excavator.

The Stage 2 programme focused on infill drilling and expanding the area of known mineralization identified during Stage 1, particularly at depth. A total of 25 holes comprising four vertical holes and 21 inclined holes drilled on 90° and 270° azimuths at inclinations of -60°, -65°, -70°, or -80° (Table 10-1 and Figure 10-2). Borehole depths ranged from a minimum of 21 m to a maximum of 363 m. Table 10-1 shows location and attitude information for each drill hole. A total of 4,864.90 m were drilled and 5,116 samples for assays were collected. Drilling was conducted during day and night shifts.

Table 10-1 Details of 38 diamond drillholes on Songwe Hill						
Borehole ID	**Easting**	**Northing**	**Elevation (m)**	**Depth (m)**	**Azimuth (°)**	**Inclination (°)**
PX001	801833.79	8263634.21	773.46	302.35	90	-60
PX002	801834.45	8263634.44	773.44	116.30	45	-70
PX003	801905.75	8263651.56	773.81	104.10	270	-60
PX004	801956.00	8263606.21	792.13	224.20	270	-60
PX005	801952.80	8263569.65	807.51	201.78	270	-60
PX006	801795.09	8263578.51	805.18	164.70	0	-90
PX007a	801934.71	8263682.65	776.31	122.00	270	-60
PX007b	801935.09	8263682.61	776.33	21.35	270	-80
PX008	801852.13	8263572.57	810.02	360.31	90	-70
PX009	801800.18	8263515.75	833.78	122.20	270	-60
PX010	801990.79	8263630.30	792.44	51.85	270	-80
PX011	801729.74	8263451.70	883.05	86.20	270	-60
PX012	801783.93	8263455.08	870.55	182.00	270	-60
PX013	801930.41	8263631.93	782.55	137.25	270	-60
PX014	801960.58	8263605.78	792.28	268.40	270	-80
PX015	801954.53	8263568.45	807.49	140.30	270	-80
PX016	801851.58	8263573.22	809.88	363.58	270	-80
PX017a	801787.50	8263454.54	870.60	57.95	90	-70
PX017b	801787.50	8263454.54	870.60	106.75	0	-90
PX018	801806.66	8263516.77	834.92	341.60	90	-70
PX019	801942.77	8263548.44	817.38	76.25	0	-90
PX020	801902.24	8263506.05	849.49	350.75	270	-60
PX021	801871.97	8263482.77	869.18	216.55	270	-80
PX022a	801848.42	8263454.36	879.78	106.75	270	-80
PX022b	801848.42	8263454.36	879.78	347.70	0	-90
PX023	801939.70	8263629.14	783.53	112.55	0	-90
PX024	801895.77	8263510.96	849.69	91.00	0	-90
PX025	801848.40	8263422.79	899.65	117.00	270	-60
PX026	802002.65	8263556.25	803.43	312.19	270	-80
PX027	801960.36	8263541.10	818.05	188.30	270	-60
PX028	801859.78	8263542.26	828.09	201.30	270	-60
PX029	801772.54	8263538.77	828.65	210.45	270	-60
PX030	801948.48	8263656.25	781.33	122.20	90	-60
PX031	801981.63	8263652.24	788.53	136.20	270	-60
PX032	801749.86	8263479.11	866.41	170.80	270	-60
PX033	801753.10	8263422.12	895.30	153.22	270	-60
PX034	801868.31	8263600.37	795.25	314.45	90	-65
PX035	801751.08	8263421.82	895.55	149.45	90	-80

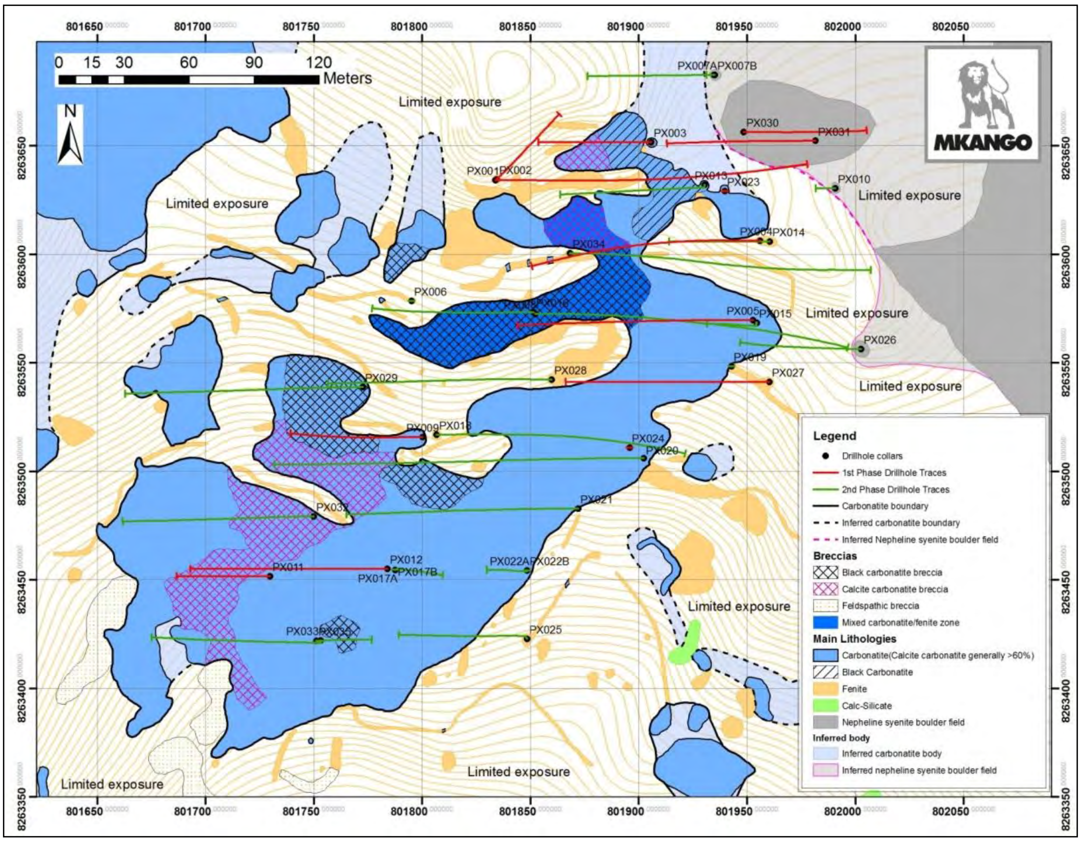
Note: *Coordinates are in UTM Zone 36S and WGS84 Datum; PX018a is excluded from the Table because the hole was terminated after 9.15 m*

Source: *Mkango (2012)*

Figure 10-1
Diamond core drill rig on Songwe Hill

Source: *Mkango (2012)*

Figure 10-2
Geological map with Stage 1 and Stage 2 drill collars and traces



Source: *Brady (2012)*

10.3 Core Recovery

Core recovery was determined prior to logging and sampling and standard core recovery forms, prepared by MSA, were completed for each hole by the geologist at the drill. Core recovery was typically very good, usually >90 % within the carbonatite, carbonatite breccia and fenite lithologies. However, in zones that contained significant void space/cavities, recoveries were locally very poor (<50 %) and in a few cases, very little material (<10 %) was returned to the surface. The cavities/void spaces are the likely result from karst-type dissolution of matrix carbonate in the host carbonatite.

Large cavity/void areas were not included in assay intervals, but were tabulated as voids. Poor recoveries were also encountered close to and within the boulder field on the north eastern side of the hill. This area is a palaeo-drainage system and interaction with flowing water has resulted in the formation of a zone of highly weathered, friable and void-filled fenite and carbonatite that tends to fracture and disaggregate easily during drilling. Consequently, recoveries were poor in this zone.

10.4 Collar Surveys

The 2011 Stage 1 borehole collars were surveyed by Digital Surveying based in South Africa. The 2012 Stage 2 channel sample lines and borehole collars were surveyed by a licensed land surveyor, Land Management Consultants, of Blantyre, Malawi using a Real Time Kinematics (RTK) Differential GPS system with sub-centimetre accuracy. The Stage 1 drill-collars were also re-surveyed by Land Management Consultants for verification purposes and all collar locations are reported using the Land Management Consultants survey data. The UTM Zone 36 South and WSG84 Datum were used for all survey measurements.

10.5 Downhole Surveys

The 2011 Stage 1 drill-holes were surveyed by Digital Surveying based in South Africa using a Reflex GYRO tool with station readings every 5 m. The surveys were carried out using a winch inside plastic casing placed down the hole to ensure hole integrity.

During the Stage 2 programme 14 holes (PX007a, PX008, PX014, PX015, PX016, PX018, PX020, PX021, PX026, PX028, PX029, PX032, PX034, and PX035) were surveyed using a Reflex GYRO tool, with station readings every 5 m. The Reflex GYRO tool has an integrated Azimuth Pointing System (APS) that indicates True North azimuth, a GPS position and degree of inclination. The APS is not affected by magnetic interference and thus during the Stage 2 programme the surveys were carried out inside the drill rods. The Reflex GYRO was set up and controlled by the site geologist using the Toughbook field PC supplied with the system. Several parameters, including temperature, were continuously recorded in the on-board memory throughout the survey to track the path of the drill-hole. Once the survey was finished and the instrument brought to the surface, the data was transferred from the Reflex GYRO's on-board memory to the field PC.

The remaining 10 holes of the Stage 2 programme were surveyed using a Reflex EZ-AQ instrument with station readings every 5 m. The EZ-AQ surveys were carried out using a hand winch inside plastic casing placed down the hole to ensure hole integrity. The EZ-AQ instrument, which is sensitive to magnetic interference, measured the inclination and direction of the drill-hole, together with magnetic and gravity field components. A handheld device was used to communicate with the instrument which allowed the site geologist to view the orientation of the borehole path immediately. The survey data was transferred from the EZ-AQ instrument via an infra-red data link. Both the Reflex GYRO and the EZ-AQ tools worked effectively.

In general, very minor dip deflections were recorded in both the Stage 1 and Stage 2 drillholes. Azimuth deviation was typically less than 5 degrees for all holes, but for a number of deep holes deviation could range up to 10 degrees over 300 m.

10.6 Drilling Logistics and Procedures

Drill access on Songwe Hill was via a network of roads constructed for that purpose. Water for drilling was supplied from a borehole at the Songwe Hill exploration camp site. Water was pumped from the borehole into a 30,000 litre aqua-dam at the base of Songwe Hill and then pumped through heavy-duty pipes to a second 30,000 litre aqua-dam at the top of the Hill and then gravity fed to the drill rig.

All boreholes were sited by a geologist from Mkango's exploration team with a handheld GARMIN GPS unit using UTM Zone 36S projection and WGS84 Datum. The planned collar positions were marked with wooden pegs and the azimuth outlined using spray paint. Prior to drilling, the alignment of the rig was checked by the site geologist to ensure correct rig setup. The inclination was measured on the derrick using a Brunton compass. Azimuths were checked by the geologist using a compass clinometer corrected for local magnetic declination. After the completion of each drilling programme all holes were re-surveyed using DGPS equipment.

Drilling was monitored on a continuous basis by Mkango geologists to ensure maximum recovery. Core was obtained using wire-line methods and was washed by a member of the drill crew prior to placement in a steel core tray. Core trays were labelled in advance with the borehole name and box number and placed near the drill rig, Drill core was consistently packed left to right, pointing down hole, in each tray. Plastic depth marker blocks were inserted at the end of every run and the actual drill depth, according to the number of rods in the ground, and the length of the recovered core were recorded on the depth blocks. Detailed core recovery measurements were completed by the site geologist before the trays were transferred to the exploration camp.

Filled core trays were removed from the drill site twice a day under the supervision of the site geologist. Trays were covered with blankets and then secured by straps with ratchets in Mkango's pick-up truck and transported to the exploration camp site.

Following completion of the holes, drill collars were capped and marked with a concrete slab with the relevant information recorded on a metal plate (Figure 10 3Figure 10 3).

Figure 10-3
Examples of borehole beacon

Source: *Swinden and Reichardt (2012)*

10.7 Results of Drilling

10.7.1 Drill Objectives

The Stage 1 drill programme was successful in confirming the presence of REE mineralization first outlined by the JICA and MMAJ work. Eleven of the thirteen holes intersected significant zones of rare earth mineralization. Having confirmed the presence of the mineralization, the Stage 1 drilling was expanded to areas not previously tested and demonstrated the extension of rare earth mineralization both laterally and vertically.

The Stage 2 drilling focused on expanding the area of known mineralization, infilling between existing holes and testing the mineralization at depth. All boreholes intersected REE mineralization and the maximum depth at which REE mineralization was encountered was 350 m below the surface of the hill.

Table 10 2Table 10 2 and Table 10 3Table 10 3 summarize significant intersections from the Stage 1 and Stage 2 drilling campaigns.

10.7.2 Mineralized Lithologies

The drilling demonstrated that the mineralized body at Songwe Hill is geologically complex. It is best interpreted as a carbonatite plug that has intruded and partially assimilated a carapace of fenite. The explosive nature of the intrusion is demonstrated by the widespread occurrence of carbonatite and fenite breccias. The following 3 lithological domains were used to guide the Mineral Resource Estimate.

10.7.2.1 Carbonatite

Carbonatite is the dominant lithology, ranges from grey to black in colour and hosts the bulk of the mineralization. Assay data show that the carbonatite is widely and uniformly mineralized. Mineralogical observations suggest that the mineralization is dominantly hosted by synchysite and apatite. The latter is generally anomalously rich in heavy rare earths compared to apatites in many other carbonatite complexes. This feature is interpreted to be the result of sub-solidus hydrothermal redistribution of the REE during the final stages of the evolution of the carbonatite body.

10.7.2.2 Fenite

Fenite is present throughout the carbonatite body and is intimately intermixed with the carbonatite. The fenites comprise dominantly potassium feldspar and are interpreted to have formed through metasomatism related to the intrusion of the carbonatite, although fenitization related to intrusion of the earlier nepheline syenites cannot be ruled out. At least some of the fenites are interpreted to be blocks stoped into the carbonatite magma. The fenites are variably carbonatized and mineralization in the fenite appears to be related to the degree of carbonatization, In other words, relatively pure fenites typically do not contain significant REE concentrations, while increasingly carbonatized fenites carry anomalous quantities of REE.

10.7.2.3 Mixed Lithologies

The mixed lithologies form a relatively small part of the Songwe Hill Mineral Resource. They include breccias with carbonatite and fenite components, as well as finely intermixed carbonatite and fenite that cannot be separated into distinct units and correlated at the scale of mapping. The mixed geological domain tends to carry similar amounts of TREO to the carbonatite and fenite, but tends to be lower in overall HREO.

10.7.3 Orientation and Spatial Distribution of Mineralization

The orientation of mineralization at Songwe Hill is not yet well constrained because of the limited understanding of the geometry of the carbonatite intrusion and related lithologies. The mineralized body is a carbonatite plug which is part of a larger volcanic vent system and has incorporated variable amounts of surrounding lithologies. The mineralization appears to be the result of hydrothermal processes that acted within the carbonatite as well as in the related lithologies (fenite, breccia) and produced a relatively uniformly mineralized body. As such, the mineralization does not have a well-defined strike or geometric shape although the drilling suggests that in plan view, it is elongate in a NE-SW direction. Mineralization remains untested by drilling beyond the NE and SW extent of the current drill sections (Figure 10 2Figure 10 2) as well as at depth (e.g. Figure 7 4Figure 7 4). Structural observations in the drill core suggest that contacts and other fabrics are very steep and this supports the interpretation that the overall contacts of the body may be sub-vertical and the carbonatite body may, therefore, extend to considerable depths below the surface. However, the overall geometry is not well enough constrained to allow a determination of the extent to which intersections represent true width.

Table 10-2

Summary of Significant Mineralized Intersections from Stage 1 drilling campaign

Drill Hole	From	To	Interval	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Y_2O_3	Other[1]	TREO[2]	% HREO[3]
	m	m	m	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	+ Y_2O_3
Carbonatite Domain																
PX001	2.4	302.2	299.8	2,464	4,539	474	1,593	237	71	172	22	100	460	85	1.0	8.9
including	184.83	302.2	117.4	3,743	7,037	736	2,478	355	102	241	31	143	710	128	1.6	8.6
	225.6	262.1	36.5	4,287	8,515	911	3,145	449	128	298	38	176	893	179	1.9	8.9
	268.0	290.7	22.7	3,481	7,581	849	2,960	452	130	293	41	192	1,066	215	1.7	11.1
PX003	3.5	61.2	57.7[(i)]	11,773	17,145	1,727	5,179	606	152	357	44	198	844	161	3.8	4.6
including	3.5	23.2	19.7	10,987	16,016	1,607	4,803	543	134	309	38	173	751	145	3.6	4.4
	23.2	30.6	7.4[(ii)]	20,290	29,449	2,945	8,761	1,058	272	650	82	383	1,717	333	6.6	5.2
	30.6	50.0	19.4	9,735	14,375	1,472	4,475	527	131	303	36	158	645	120	3.2	4.4
	50.0	58.0	8.0[(iii)]	12,851	17,948	1,751	5,162	606	153	366	46	203	823	156	4.0	4.4
	58.0	61.2	3.2	6,777	10,466	1,115	3,466	428	110	269	35	157	646	119	2.4	5.7
PX004	14.6	42.0	27.2[(iv)]	4,630	8,988	1,033	3,562	513	149	381	51	249	1,117	324	2.1	10.4
	78.0	117.8	39.8	7,438	10,953	1,065	3,261	389	103	249	30	133	585	122	2.4	5.0
PX005	2.5	102	99.53[(v)]	2,393	4,399	476	1,609	230	62	157	21	104	484	97	1.0	9.2
including	2.5	30.9	28.5[(v)]	2,695	5,231	581	2,000	285	78	206	29	163	804	164	1.2	11.8
	34.4	70.0	35.6	2,670	5,069	566	1,953	285	75	192	24	118	522	104	1.2	8.9
PX009	2.3	116.2	113.9[(vii)]	4,762	8,320	847	2,860	399	108	246	28	125	590	107	1.8	6.5
including	37.0	51.9	14.9	5,881	9,938	982	3,236	417	113	261	31	154	754	134	2.2	6.6
	68.3	110.2	41.9 [(viii)]	5,775	9,997	1,015	3,380	465	120	254	23	81	246	56	2.1	3.6
PX011	1.32	86.2	84.9[(ix)]	2,081	4,359	524	1,894	314	89	224	27	130	631	110	1.0	11.7
including	1.3	29.0	27.7 [(x)]	3,068	6,219	726	2,555	386	106	262	32	151	738	129	1.4	9.9
PX012	2.1	91.8	89.7	3,764	7,273	811	2,771	394	103	245	30	142	697	123	1.6	8.2
including	22.0	79.0	57.0	4,538	8,537	934	3,127	422	110	260	32	153	731	129	1.9	7.5
PX023	2.0	11.0	9.0	2,346	4,632	485	1,660	250	71	180	25	126	604	107	1.0	10.6
	29.0	41.0	12.0	2,058	4,477	493	1,724	249	68	166	21	103	463	85	1.0	9.1
	54.4	60.4	6.0	2,772	5,717	608	2,069	286	78	188	24	120	585	105	1.3	8.8
PX024	2.0	91.0	89.0 (xi)	3,412	6,576	724	2,442	386	103	237	29	141	722	123	1.5	9.1
including	13.0	23.0	10.0	7,381	11,465	1,132	3,516	590	167	390	48	224	1,072	185	2.6	8.0
PX027	43	101.8	58.75	3,397	7,078	784	2,712	374	99	231	28	136	606	112	1.6	7.8
	80.0	98.7	18.7	4,575	9,723	1,090	3,842	516	130	295	34	155	689	125	2.1	6.7
	170.0	188.3	18.3	3,811	6,778	725	2,478	359	92	202	22	95	390	69	1.5	5.8
PX031	68.0	81.0	13.00	2,828	6,009	665	2,414	338	96	230	29	151	705	126	1.4	9.8
Fenite Domain																
PX004	42.0	66.0	24.0 [(xiii)]	1,805	3,653	424	1,469	218	64	165	22	112	533	109	0.9	11.7
PX005	116.0	173.0	57.0	4,340	7,553	747	2,335	311	83	185	22	90	426	90	1.6	5.5

Note: ***P.T.O.***

(i) Includes 1m cavity not sampled in addition to a cumulative 14.4 m with core returns < 90 %. If the latter is excluded average grade is 3.3 %

(ii) Poor core returns. Peak value 11.5 % TREO

(iii) Poor core returns. Includes 1 m cavity not sampled

(iv) Includes 4.5 m cavity not sampled in addition to a cumulative 13 m with core returns <90 %. If the latter is excluded average grade is 1.6 %

(v) Includes 5m cavity not sampled

(vi) Poor core returns. Borehole ends in solid core grading 3.3 % TREO

(vii) Includes a cumulative 26 m with core returns < 90 %. If this is excluded there is no major impact on the grade

(viii) Includes a cumulative 11 m with core returns < 90 %. If this is excluded there is no major impact on the grade

(ix) Includes 3 m cavity not sampled in addition to a cumulative 9 m with core returns < 90 %. If this is excluded there is no major impact on the grade

(x) Includes 3 m cavity not sampled in addition to a cumulative 8 m with core returns < 90 %

(xi) Includes 0.9m cavity not sampled in addition to a cumulative 18 m with core returns < 90 %. If this is excluded average grade is 1.4 %

(xiii) Includes 0.50 m cavity not sampled

[1] *Other comprises Ho2O3, Er2O3, Tm2O3, Yb2O3 and Lu2O3*

[2] *TREO: Total Rare Earth Oxides including yttrium*

[3] *HREO defined here as oxides of Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu*

Note: *Drill intercepts do not necessarily represent true widths*

Source: *Mkango (2011)*

Table 10-3

Summary of Significant Mineralized Intersections from Stage 2 drilling campaign

				Carbonatite Domain											
Drill Hole	**From m**	**To m**	**Interval m**	**La_2O_3 ppm**	**Ce_2O_3 ppm**	**Pr_2O_3 ppm**	**Nd_2O_3 ppm**	**Sm_2O_3 ppm**	**Eu_2O_3 ppm**	**Gd_2O_3 ppm**	**Tb_2O_3 ppm**	**Dy_2O_3 ppm**	**Y_2O_3 ppm**	**Other[1] ppm**	**TREO[2] %**	**% HREO[3] + Y_2O_3**
PX007a	51.9	97.3	45.5[(i)]	3,615	7,916	930	3,392	475	133	312	39	194	847	163	1.8	9.4
PX008	257.0	291.0	34.0	4,108	8,137	900	3,208	457	108	223	22	93	452	77	1.8	5.5
	318.9	339.0	20.1	6,002	9,220	912	2,944	378	99	230	29	152	807	152	2.1	7.0
PX013	5.7	72.2	66.5[(ii)]	6,924	10,801	1,005	2,978	319	85	196	24	117	514	93	2.3	4.5
including	21.1	39.2	18.1	9,950	15,126	1,375	3,980	404	106	236	28	133	593	109	3.2	3.8
	44.6	54.8	10.2	12,157	17,333	1,491	4,132	395	102	225	26	114	466	83	3.7	2.8
PX015	20.1	97.8	77.8	2,687	5,048	522	1,793	248	71	183	25	135	652	131	1.1	10.4
including	82.0	92.0	10.0	5,957	8,954	803	2,557	309	88	211	28	136	611	123	2.0	6.1
PX017a	0.00	39.1	39.1	5,353	8,445	846	2,676	373	107	249	32	147	659	134	1.9	7.0
including	0.00	13.5	13.5	11,170	16,233	1,536	4,562	594	165	379	44	190	804	155	3.6	4.8
PX017b	10.4	25.6	15.3	4,825	8,378	903	3,310	507	129	288	29	137	701	129	1.9	7.3
	42.3	100.8	58.4	3,780	6,895	746	2,697	379	97	215	23	110	551	109	1.6	7.1
including	77.3	97.8	20.5	5,213	8,973	927	3,246	424	113	261	31	155	752	149	2.0	7.2
PX018	9.0	56.3	47.3	6,290	10,224	1,028	3,209	420	118	278	31	146	540	98	2.2	5.4
	102.8	116.4	13.6	5,608	9,136	941	3,208	487	141	318	37	160	611	111	2.1	6.6
	125.6	225.4	99.8	2,745	5,378	603	2,137	303	79	169	18	75	328	63	1.2	6.2
including	125.6	164.3	38.7	3,444	6,490	718	2,569	382	105	228	25	106	442	86	1.5	6.8
	236.0	260.2	24.2	2,928	5,421	586	2,032	291	75	163	16	71	343	68	1.2	6.1
PX020	4.2	100.0	95.8	3,918	7,432	795	2,800	409	110	248	28	127	556	107	1.7	7.1
	147.2	195.2	48.0	4,127	6,883	686	2,318	330	89	215	23	101	389	70	1.5	5.8
	215.0	347.0	132.0	2,984	5,845	656	2,327	371	103	245	28	124	575	121	1.3	8.9
PX021	5.7	106.5	100.8	3,742	7,295	804	2,894	436	120	274	35	165	792	149	1.7	9.2
	117.0	171.0	54.0	3,935	7,380	788	2,726	392	104	220	24	116	508	92	1.6	6.5
	184.9	211.5	26.5	2,861	5,817	688	2,551	385	111	254	29	144	703	124	1.4	10.0
PX022a	11.6	73.2	61.7[(iii)]	2,671	5,933	700	2,700	419	116	258	32	162	774	143	1.4	10.7
including	37.0	68.0	31.0[(iii)]	3,362	7,274	825	3,068	441	123	281	37	193	930	175	1.7	10.4
	88.0	103.7	15.7	3,576	7,919	904	3,394	514	135	296	34	161	731	142	1.8	8.4
PX022b	15.0	347.7	332.7	3,224	6,190	690	2,510	357	96	219	26	124	590	122	1.4	8.3
including	49.1	89.5	40.4	2,776	6,069	719	2,652	381	109	258	34	172	831	162	1.4	11.1
	112.5	195.0	82.5	3,901	7,133	768	2,745	385	102	223	25	119	566	122	1.6	7.2
	202.0	229.0	27.0	4,363	8,148	856	3,096	414	110	259	32	142	659	135	1.8	7.3
	235.5	347.7	112.2	3,627	6,710	741	2,665	370	100	229	27	124	572	124	1.5	7.7
PX025	89.4	117.0	27.6	3,724	7,801	895	3,308	455	124	280	33	159	692	127	1.8	8.0
PX026	163.6	190.1	26.5	2,409	4,702	537	1,919	341	101	249	28	132	544	95	1.1	10.4
	243.0	271.9	28.9	3,071	5,753	610	2,140	309	79	171	17	74	316	59	1.3	5.7

Carbonatite Domain

Drill Hole	From m	To m	Interval m	La_2O_3 ppm	Ce_2O_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Y_2O_3 ppm	Other[1] ppm	TREO[2] %	% HREO[3] + Y_2O_3
PX028	21.35	145.0	123.7	5,191	8,309	823	2,711	365	99	234	27	116	475	86	1.8	5.6
	40.3	108.0	67.7	6,668	10,344	1,018	3,337	437	116	265	30	130	531	94	2.3	5.1
	159.0	188.0	29.0	2,621	5,290	604	2,189	363	106	256	29	138	686	137	1.2	10.9
PX029	4.6	117.3	112.7	4,568	7,728	791	2,621	357	94	212	25	124	548	114	1.7	6.5
including	5.6	30.2	24.6	7,052	10,968	1,054	3,265	398	100	226	26	128	541	114	2.4	4.8
PX032	2.54	167	164.5	2,567	5,021	576	2,024	311	85	205	26	125	630	130	1.2	10.3
including	2.5	48.6	46.1	3,548	6,809	781	2,715	398	108	267	37	188	1,015	217	1.6	11.4
PX033	4.2	101.0	96.8(iv)	4,005	7,004	731	2,539	379	103	247	30	136	596	114	1.6	7.7
including	42.0	84.3	42.3	5,920	9,323	914	2,968	411	110	258	30	132	552	102	2.1	5.7
PX034	89.0	102.2	13.2	9,108	13,724	1,256	3,861	451	120	282	38	192	945	181	3.0	5.8
PX035	0.00	96.3	96.3(v)	3,390	6,589	731	2,570	373	107	254	32	156	741	158	1.5	9.6
including	41.5	66.5	25.0	3,940	7,877	890	3,165	465	130	303	37	176	810	162	1.8	9.0
	72.3	95.0	22.7	4,204	8,368	930	3,222	428	121	285	35	160	611	130	1.8	7.3

Mixed Domain

Drill Hole	From m	To m	Interval m	La_2O_3 ppm	Ce_2O_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Y_2O_3 ppm	Other[1] ppm	TREO[2] %	% HREO[3] + Y_2O_3
PX008	26.13	128.1	102.0	3,708	5,949	591	1,839	240	63	148	17	77	380	77	1.3	5.8
PX034	24.0	64.0	40.0	3,312	5,446	521	1,674	223	63	154	20	96	420	80	1.2	6.9

Fenite Domain

Drill Hole	From m	To m	Interval m	La_2O_3 ppm	Ce_2O_3 ppm	Pr_2O_3 ppm	Nd_2O_3 ppm	Sm_2O_3 ppm	Eu_2O_3 ppm	Gd_2O_3 ppm	Tb_2O_3 ppm	Dy_2O_3 ppm	Y_2O_3 ppm	Other[1] ppm	TREO[2] %	% HREO[3] + Y_2O_3
PX006	100.0	130.4	30.4	3,255	7,318	859	3,096	531	154	382	47	217	883	159	1.7	10.9
PX014	142.0	181.1	39.1	4,481	7,605	770	2,535	336	92	222	27	128	534	103	1.7	6.6
PX019	6.1	76.3	70.2	2,457	4,878	533	1,853	269	81	206	30	162	784	156	1.1	12.4
PX016	322.7	363.6	40.9	3,681	7,705	874	3,125	435	121	281	37	191	1,001	223	1.8	10.5
PX034	13.0	24.0	11	5,603	9,145	880	2,837	373	107	272	36	165	638	117	2.0	6.6
	155.0	199.9	44.9	4,024	6,669	697	2,354	311	85	210	26	132	580	116	1.5	7.6
	241.4	269.0	27.6	2,356	4,603	479	1,663	251	73	186	27	142	663	130	1.1	11.5

Note: *(i) Includes two cavities totaling 9.4 m not sampled;*

(ii) Includes 5.3 m cavity not sampled;

(iii) Includes 5.7 m cavity not sampled;

(iv) Includes 2.2 m cavity not sampled;

(v) Includes 2.6m cavity not sampled.

1 *Other comprises Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3 and Lu_2O_3;*

2 *TREO: Total Rare Earth Oxides including yttrium;*

3 *HREO defined here as oxides of Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu. Drill intercepts do not necessarily represent true widths*

Source: *Mkango (2012)*

11 SAMPLE PREPARATION, ANALYSES AND SECURITY

Channel sampling and core drilling programmes were carried out in accord with written Standard Operating Procedures (SOP) developed by MSA and reviewed during site visits. Logging and sampling procedures described for the drill core were also applied to the channel sampling program. All core cutting, sampling, bagging and dispatch procedures were undertaken at the Songwe exploration camp by Mkango personnel.

SOP for geological and geotechnical logging, core splitting and sampling were compiled by MSA to ensure that the various activities are carried out in a consistent, transparent, auditable and appropriate manner in accordance with industry standards.

11.1 Sample Preparation

11.1.1 Core Handling

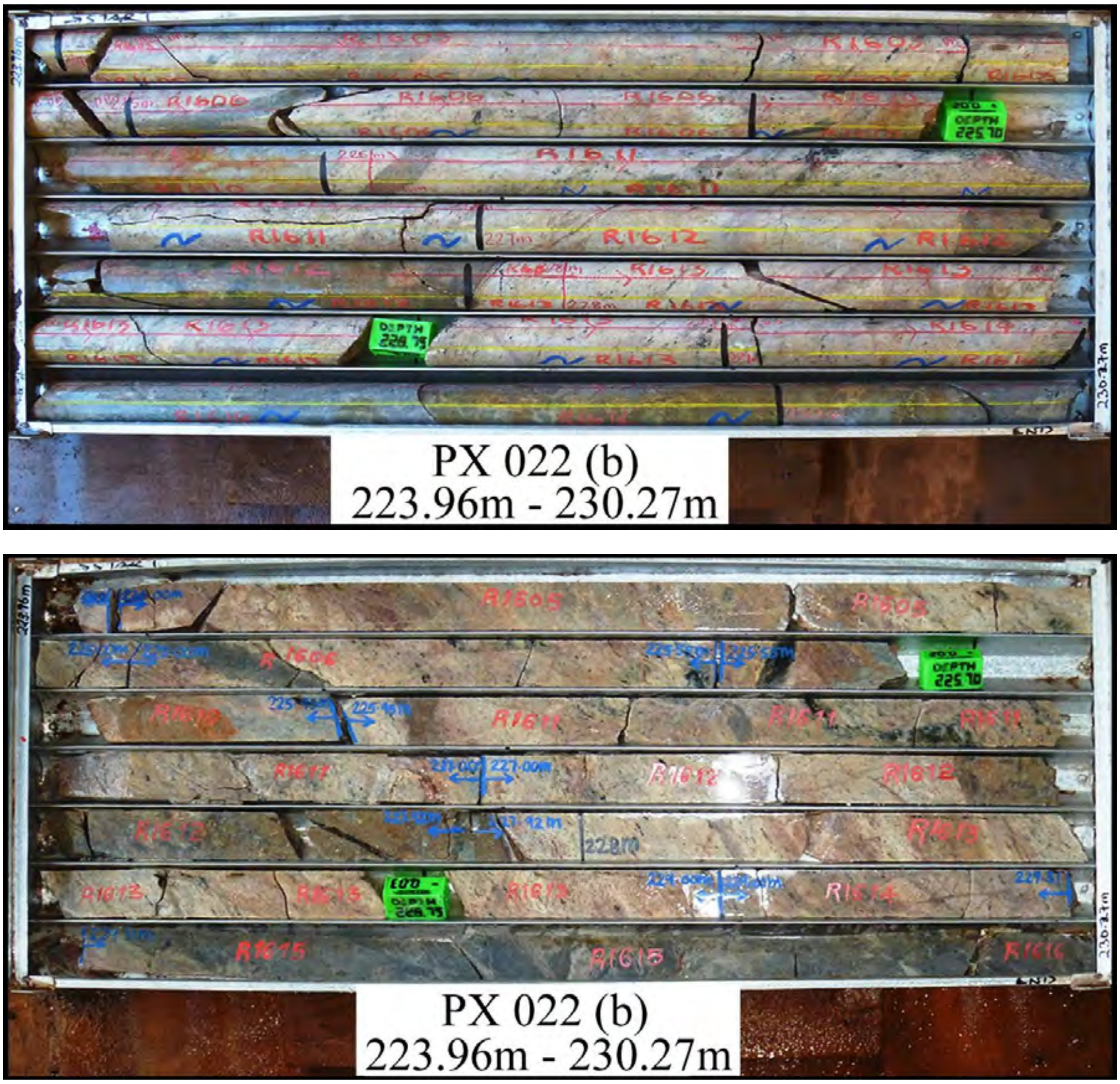
- drillcore was placed by the drill crew in pre-labelled steel core trays together with plastic depth blocks indicating the start and end of each run. A down hole orientation line was then marked on the core immediately with a red china marker by the site geologist;
- geotechnical logging was carried out at the drill site by a geologist who measured the core from each run to determine the accuracy of the drillers' recoveries. The core was marked incrementally every metre with a red china marker perpendicular to the core axis;
- core trays were transported twice daily under the supervision of the site geologist to the core logging and sampling facility at the exploration camp; and
- the core trays were laid out at the camp and the tray labels and the metre markings checked for accuracy by a geologist.

11.1.2 Core Logging

- geological logging of the core was carried out using customized logging sheets designed by MSA. The logging sheets captured the borehole number, collar position, date drilled, 'from-to' data, weathering, grain size, colour, dominant rock type, subordinate rock type and quantity, mineralization, reaction with acid, rock type description and lithological codes;
- the core was logged on paper forms and the logs were subsequently captured in project specific MS Excel spreadsheets. All original paper drill logs are kept on file;
- semi-quantitative geochemical analyses were undertaken by the logging geologist using a handheld Thermo-Scientific Niton® XLP analyzer. This was used as a guide to areas of mineralization which are not always easily identified visually;
- the magnetic susceptibility and gamma radiation (average reading over 30 seconds) for each metre of core were measured using a handheld magnetic susceptibility meter (SM30) and a RadEye Personal Radiation Detector (PRD); and

- after core observations and measurements were completed, and prior to splitting, the core was photographed wet (Figure 11-1) using a hand-held digital camera. The borehole number and interval of each core tray are clearly marked and each tray was photographed separately

Figure 11-1
Examples of drillcore marking before and after core splitting



Source: *Brady (2012)*

11.1.3 Core Sampling

- The entire length of each borehole was sampled for chemical analyses. Core was generally sampled in 1 metre long intervals. Where a change of lithology occurred within the sampling interval, then each lithology was sampled separately, using a minimum and maximum core length of 20 cm and 130 cm, respectively. A black line marked the start and end of each sample interval.

- The sampling interval and a unique, sequential sample number (from sample ticket book) were clearly marked by the logging geologist above the red orientation line and below the core cutting line. The core cutting line (yellow china marker) was marked on the core below and parallel to the red core orientation line. Sample numbers were marked with pink permanent marker on each individual piece of core.
- The sample ticket number for each interval was recorded in the sampling sheet prior to sampling. The borehole number and the sampled interval were also recorded on the stub of the sample ticket book.
- The core was cut in half using a commercial core cutter with a 2.2 mm wide diamond cutting blade. If any part of the core was friable or difficult to handle it was taped with masking tape prior to cutting. Once sawn, both halves of the core were returned to the core tray. After each sample, the saw blade was cleaned with water. The upper half of the core was used for sampling and the lower half of the core retained in the core tray (Figure 11-1) for future reference or additional test work.
- Each sample was double bagged with two sample number tags in extra strength plastic sample bags. The sample and the number tag were first placed in a pre-labeled sample bag and securely sealed a with cable tie. This bag was then placed in a second plastic bag along with the corresponding sample number tag and closed with a stapler.
- Core that had been logged, cut and sampled was stored in locked and secure, company-owned, storage containers at the Songwe Hill exploration camp (Figure 11-2).

Figure 11-2
Core logging and core tray storage facilities

Source: *Brady and Reichhardt (2012)*

11.1.4 Density measurements

Rock density measurements using the Archimedes principle (dry & wet mass and water displacement) were taken for every sample of core, after splitting and sampling. Each sample is approximately 15 to 20 cm long. The density device comprised a 3 kg electronic scale, below which a water container was placed. Attached to the balance was a core sample holder used to immerse core in water in the container. The density method is as follows:

- the balance is always reset to 0.00 g before each reading;
- place a dry length of core in the core holder and record the mass of the core in air;
- fill the container with water to submerge the sample (If the core was weathered it was wrapped in cling wrap). Mark and maintain the same level of water in the container for each reading;
- determine the mass of the sample under water;

- the formula used for calculating the density (specific gravity = SG) is simply:

$$SG = \frac{\text{Mass in Air}}{\text{Mass in Air} - \text{Mass in Water}} = \frac{W}{V}$$

All information was recorded on density measurement sheets for the core samples. No measurements were carried out for the channel samples.

The sampling database was maintained at the camp site and regularly transmitted and backed up at Mkango's office in Zomba and at the head office in the UK.

11.2 Sample Analyses

11.2.1 Primary Laboratory

Intertek-Genalysis Laboratory (Genalysis) Services Pty Ltd. in Johannesburg, South Africa, and Perth, Australia, was the primary laboratory for the sample preparation and analysis of drill core and channel samples. Genalysis is an independent laboratory that performs geochemical analyses on a commercial basis. Genalysis has no relationship with Mkango other than the provision of analytical services for fee.

Samples were prepared at Genalysis in Johannesburg prior to chemical analyses in Perth, using the following procedures:

- samples were weighed, checked and job registered on the laboratory information management system (LIMS). Any discrepancies between the samples received and the sample submission sheets were conveyed to Mkango and resolved immediately;
- after weighing of the samples, if required, the material was dried in a drying oven at 110°C for 8 hours
- the samples were then crushed in a jaw crusher. If a sample was >3 kg it was split through a riffle splitter to provide a 1.5 kg sub-sample. If the material was <3 kg then the entire sample was used;
- the samples were milled and pulverized in a swing mill to 85 % passing 75 micron; and
- a portion of 150 g was split from the pulp material and submitted to Perth for assays.

The samples were analysed in Perth using digestion method FP6 and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) and Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES). The FP6 fusion digest ensures complete dissolution of the sample including the refractory mineral component. Each sample is weighed at 0.25 g, mixed with an alkaline flux ($Na2O2$) and placed in a nickel crucible. This is fused in a muffle with precautions to retain sulphur and the fusion product is dissolved in hydrogen chloride (HCl). Once digestion is accomplished the sample is diluted appropriately and analysed with an ICP-MS, ideally suited to the analysis of trace elements in the ppm or ppb range.

For major element analysis, once digestion is accomplished, the sample is diluted appropriately and read on the ICP-OES. Calibration is effected using standard solutions of known concentration.

Corrections are made, where applicable, for emission line overlaps and scattered light and the overall dilution and catch weights used in the digestion process. Internal standards are used to correct for drift, viscosity effects and plasma fluctuations.

Genalysis is accredited by The National Association of Testing Authorities Australia (NATA) to operate in accordance with ISO/IEC 17025, which includes the management requirements of ISO 9001: 2000. The Perth facility is accredited in the field of Chemical Testing for the tests shown in the Scope of Accreditation issued by NATA (Date of Accreditation: 20 September 1991).

The analytical results were e-mailed to Mkango in MS Excel format followed by the issuing of signed assay certificates in pdf format.

11.2.2 Umpire Laboratory

Activation Laboratories (Actlabs) in Ancaster, Ontario, Canada was selected as the umpire laboratory. Actlabs is an independent laboratory that performs geochemical analyses on a commercial basis. Actlabs has no relationship with Mkango other than the provision of analytical services for fee.

Pulps split from the original samples were provided to Actlabs directly from Genalysis. Actlabs' digestion involved a lithium metaborate / tetraborate fusion with subsequent analysis by ICP and ICP-MS (Code 8-REE Assay Package Major Elements Fusion ICP (WRA) / Trace Elements Fusion ICP-MS (WRA4B2/OE)). Mass balance was required as an additional quality control technique to ensure elemental totals of the oxides between 98 % and 101%. If samples contained > 0.3 % Nb_2O_5 then the ICP-MS technique was replaced by fusion XRF for Nb_2O_5 because ICP-MS results tend to be very low as a result of the Nb falling out of solution.

Actlabs quality system is accredited to international quality standards through the International Organization for Standardization / International Electrotechnical Commission (ISO/IEC) 17025, which includes ISO 9001 and ISO 9002 specifications, with CAN-P-1758 (Forensics), CAN-P-1579 (Mineral Analysis) and CAN-P-1585 (Environmental) for specific registered tests by the Standards Council of Canada (SCC). Actlabs is also accredited by the National Environmental Laboratory Accreditation Conference (NELAC) program and Health Canada.

The analytical results were e-mailed to Mkango in MS Excel format followed by the issuing of signed assay certificates in pdf format.

11.3 Sample Security and Dispatch

Strict security protocols were employed for the handling of samples. All samples were prepared and transported in such a manner that a secure and auditable chain-of-custody from the field to the laboratory was ensured according to the following procedures:

- once an entire hole was sampled, the bagged and securely closed samples were placed in woven PVC bags, approximately 10 samples per bag. The drill-hole number and corresponding sample numbers were recorded on the exterior of each bag. The bags were then stored inside locked and secured, company-owned, storage containers at the exploration camp until dispatchment;

- all samples submitted for analysis were accompanied by standard sample submission documents carrying sample details and analytical instructions;
- the woven bags were transported by road using a contract commercial carrier to the company office in Zomba. Samples were physically accompanied from the exploration camp to Zomba by a senior geologist from Mkango's exploration team;
- upon receipt at Mkango's office in Zomba, samples were inspected, weighed and sealed by a senior geologist of the Malawian Geological Survey Department. A certificate of inspection which was signed by the Director of the Malawian Geological Survey or his representative was prepared and issued. The certificate of inspection contains the name of rocks, EPL certificate number, total number and weight of samples inspected, estimated sample value, port of exit and name and address of the consignee;
- samples were then delivered by a senior Mkango geologist to SDV Malawi Ltd (SDV) in Blantyre for shipment by commercial carrier South African Airlines (SAA) to Genalysis in Johannesburg, South Africa. Samples were weighed by SDV and compared with the weights supplied by the company. In most cases, sample transport was timed so that samples proceeded directly from camp to Zomba and then to the carrier. In rare instances, where SDV was unable to receive the samples the same day, the bags were stored in a secure, locked room at Mkango's offices in Zomba until they could be delivered to SDV;
- SDV was responsible for the shipment and tracking of the samples from Malawi to Genalysis in Johannesburg, South Africa. All shipping paperwork was sent to Mkango personnel and once shipment was confirmed by SDV, notification along with sample submission sheets were emailed to Genalysis; and
- when the sample batches were received by Genalysis, the sample numbers were checked, recorded and a job number assigned on the LIMS. Sample receipt verification was then e-mailed to Mkango staff, including the principal geologist. Following sample preparation, the samples were couriered by Genalysis to their analytical facilities in Perth, Australia

11.4 Quality Assurance and Quality Control

Appropriate quality assurance and quality control (QA/QC) monitoring is a critical aspect of the sampling and assaying process in any exploration programme. Monitoring the quality of laboratory analyses is fundamental to ensuring the highest degree of confidence in the analytical data and providing the necessary confidence to make informed decisions when interpreting all the available information. Quality assurance (QA) may be defined as information collected to demonstrate that the data used further in the Project are valid. Quality control (QC) comprises procedures designed to maintain a desired level of quality in the assay database. Effectively applied, QC leads to identification and corrections of errors or changes in procedures that improve overall data quality. Appropriate documentation of QC measures and regular scrutiny of quality control data are important as a safeguard for project data and form the basis for the quality assurance program implemented during exploration.

In order to ensure quality standards are met and maintained, planning and implementation of a range of external quality control measures is required. Such measures are essential for minimizing uncertainty and improving the integrity of the assay database and are aimed to provide:

- an integrity check on the reliability of the data;
- quantification of accuracy and precision;
- confidence in the sample and assay database; and
- the necessary documentation to support database validation.

Mkango adopted an industry standard QA/QC program and inserted Certified Reference Material (CRM) and blanks each at a frequency of 1 in 20 (5 %) into the batches prior to submission to Genalysis. These control samples were inserted as part of a continuous sample number sequence and the QA/QC samples were not obviously different from routine samples after the pulverization process. In order to create the required 5% duplicate samples, Genalysis were requested in the sample submission sheet to split the pulp of predetermined samples (1 in 20) and insert the material into empty and pre-numbered bags, supplied by Mkango together with the other samples. Genalysis in Perth were unaware which samples were QA/QC samples and what their composition was. This allowed for monitoring of the sample preparation procedure as well as monitoring the accuracy and precision of analyses.

An additional 5 % of the total samples were couriered by Genalysis to the umpire laboratory Actlabs in Canada. Hence the overall number of control samples constituted approximately 20% of the samples analysed which is in line with best practice procedures to ensure integrity of data and is independent from the internal QA/QC methods applied by the laboratory.

Gaps in the sample sequence were left for standards, blanks and duplicates in the course of the sampling and bagging process conducted at the Songwe camp. The standards and blanks were only packed after the main sampling process was completed to minimize the possibility that sample numbers are inadvertently swapped between routine and control samples.

11.4.1 Blanks

To monitor inadvertent contamination of samples, a blank sample containing negligible REE concentrations was included in every batch of 20 samples. The blank sample material used during the Stage 1 drill programme was REE-barren Magaliesberg quartzite chips. During the Stage 2 campaign AMIS0305 from African Mineral Standards (AMIS) and Magaliesberg quartzite were used. The blanks were inserted into the sample stream with a normal, sequential sample number.

Slightly elevated REE concentrations in 4 blank samples from 4 separate batches were queried with Genalysis which re-analysed the samples with acceptable results. No further action was taken or required and the results of the blank analyses are interpreted to indicate that there was no contamination or systematic analytical issues during the period of sample submission and analyses.

11.4.2 Certified Reference Material

For independent assessment of the accuracy of laboratory analyses, certified reference materials were inserted using a frequency of 5 % (1 in 20). Each CRM was assigned a sample number within the normal sample sequence. CRMs comprised AMIS0185 and SARM 40 during the Stage 1 programme and AMIS0185 and Geostats GRE-04 during the Stage 2 campaign. The performance of the CRMs during the two Stages is acceptable and occasional values outside the recommended range have no material effect on the overall data quality. Rare Earth Elements Tb, Dy, Gd and Y show a systematic under-reporting for AMIS185 which is not considered critical due to their very low concentration levels in this light rare earth standard. Representative results from the 2 CRMs are presented in Appendix 3.

11.4.3 Duplicates

Duplicate samples were not used during the Stage 1 drilling programme. However, they were inserted during the channel sampling and Stage 2 drilling programmes at a rate of one in every 20 samples (5 % frequency) to assess the precision of the analyses. Duplicates were placed as an empty numbered bag into the sample stream. Samples were split at the laboratory following pulverization and the pulp of the sub-sample was inserted in the empty sample bag. The instructions on the sample submission sheet to Genalysis specified which samples were to be split for duplicates.

The duplicates indicate a very high level of precision except for 3 duplicate pairs where the problem was traced to a sample number issue at the laboratory. Genalysis re-analysed these samples with acceptable results and no further action was taken or deemed necessary. A summary of duplicate results and representative plots are shown in Appendix 3.

11.4.4 Umpire Laboratory Samples

In order to check the quality of analyses from the primary laboratory, a duplicate of the pulps was sent by Genalysis to Actlabs. Umpire samples were sent at a frequency of approximately 5 % (1 in 20). The results of these analyses were plotted graphically against the original analysis. In 2 cases the umpire results differed substantially from the primary data and this problem was subsequently rectified through re-analysis and attributed to a sample mix-up. The vast majority of samples show a discrepancy between the two laboratories of less than 10% and less than 1 % of the 405 sample pairs exceeded 20 %. Representative plots of the umpire results are presented in Appendix 3.

11.5 Adequacy of Sample Preparation, Security and Analytical Procedures

All aspects of core handling, marking, logging, cutting, bagging, labeling and sample submission to Genalysis preparation facilities at Johannesburg are covered by well-designed protocols to ensure that all routine activities are conducted with maximum consistency and followed industry standards.

Mkango followed an auditable chain-of-custody which ensured greatest security and integrity of the results. MSA believes that there was little or no opportunity for an outside agent to temper with the sample material.

MSA is of the opinion that the sampling and analytical procedures and number of QA/QC samples inserted into the sample stream are appropriate for the current level of the Project, the type of the deposit and for the analytical techniques used. The CRMs and blanks show acceptable performance for the elements analysed over the period of the sampling campaign. The duplicate samples reported acceptable precision for all relevant concentration levels.

The analytical results from the primary and the umpire laboratories show a very good correlation and therefore confirm the element concentrations determined by the primary laboratory. The observed negative bias at generally low concentration levels of certain elements of the CRMs is within acceptable analytical limits and has no effect on the overall adequacy of the data.

The quality control procedures have been effective in demonstrating the quality of the analytical results and any issues that were identified were quickly dealt with and resolved.

Based on these results, it is concluded that the sampling and assay data from the drilling and channel sampling programmes are acceptable for use in a Mineral Resource Estimate.

12 DATA VERIFICATION

Verification activities were conducted by the Qualified Persons during site visits to the Songwe Project and at the MSA office and included:

- the inspection of the drilling and trenching programs;
- the review of core handling and core sampling procedures;
- the review of borehole data collection protocols and QA/QC systems;
- checks of the database against the original borehole logs;
- checks of database against original Assay Certificates; and
- the examination of the database used for the Mineral Resource estimation.

Data from duplicates, internal standards, CRMs and blanks were examined on a batch by batch basis to check for analytical data confidence. Data was examined numerically and graphically to determine the repeatability of the duplicate analyses, the precision of the standard analyses with respect to the accepted values, and the levels of REE present in the blanks. MSA undertook audits on the database and all identified errors were addressed by Mkango's database manager.

The assay data display industry standard levels of precision and accuracy through the adoption of a stringent QA/QC program. The database has therefore been declared in the opinion of MSA and the authors as an accurate representation of the original data collected and to meet the requirements for use in a Mineral Resource estimation.

Overall MSA and the authors are of the opinion that all exploration activities have been conducted and recorded in an appropriate manner and that all analytical issues have been identified and suitable remedial action taken. Industry standard practices have been followed and the quality of the Project database meets or exceeds NI 43-101 standards and CIM best practice guidelines.

13 MINERAL PROCESSING AND METALLURGICAL TESTING

13.1 Introduction

Most rare earth projects follow a three stage metallurgical process of:

- beneficiation – crushing and grinding (comminution) of the run of mine (RoM) ore followed by physical techniques to separate and upgrade the rare earth host minerals by rejecting the gangue minerals. Techniques used include gravity separation, magnetic separation and froth flotation;
- hydrometallurgical recovery – comprising of chemical dissolution of the rare earth host minerals using acidic or alkaline processing steps often at elevated temperatures. This is followed by purification steps in order to remove the unwanted elements that dissolved along with the rare earths during the dissolution step. The resultant solution can either be fed directly to a separation stage if this is located on site or precipitated to give a high purity, mixed rare earth chemical concentrate that will be transported to a remotely located separation facility; and
- separation – the separation of the individual or groups of rare earths into saleable products as determined by the particular end users. Methods typically include selective oxidation and solvent extraction (SX).

The first two stages tend to vary significantly across different projects, largely due to the highly variable mineralogy of rare earth deposits. It is thus essential that appropriate time and resources be devoted to understanding the mineralogy in order to guide the development of the beneficiation and hydrometallurgy phases.

The scope of the PFS encompasses the beneficiation and hydrometallurgical stages.

13.2 Metallurgical Testwork Samples

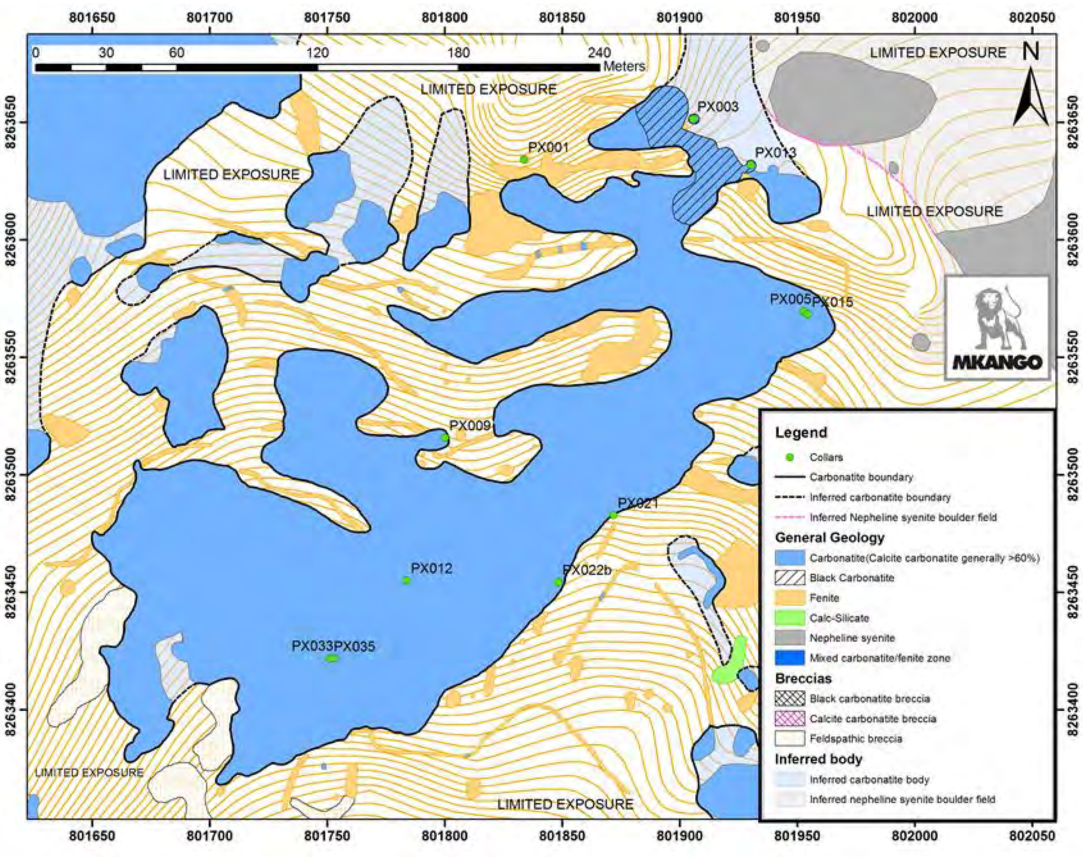
Metallurgical testwork has been undertaken exclusively on diamond drill core samples.

Table 13-1 outlines the drill core samples that were used across the entire testwork program. The locations of the collars are shown on Figure 13-1. Subsample composites were used for specific test programs and these are noted within the descriptions for each program.

Table 13-1
Drill core samples used for testwork

Drill Hole No.	Sampled Interval (m)	Sampled Length (m)
PX001	218.0 - 300.0	82.0
PX003	2.2 – 59.0	56.8
PX005	2.0 – 64.0	62.0
PX009	0.0 – 116.2	116.2
PX012	2.1 – 91.0	88.9
PX013	6.8 – 52.8	46.0
PX015	22.3 – 97.8	75.5
PX021	41.0 – 105.0	64.0
	123.1 – 204.0	80.9
PX022b	119.0 – 186.1	67.1
	200.0 – 295.0	95.0
PX033	4.2 – 95.7	91.5
PX035	0.0 – 95.3	95.3

Figure 13-1
Location of drill holes used for metallurgical testwork



The composites used for metallurgical testwork are considered to be representative and typical of the mineral deposit as a whole.

13.3 Mineralogy

In order to obtain a detailed understanding of the REE host and gangue minerals present at Songwe Hill, a comprehensive mineralogical study was undertaken by Mkango utilizing techniques including X-ray diffraction (XRD), QEMSCAN (quantitative evaluation of materials by scanning electron microscopy), electron microprobe analysis (EMPA), scanning electron microscopy (SEM), and laser ablation – inductively coupled plasma - mass spectrometry (LA-ICP-MS).

The study confirmed that the REE mineral assemblage at Songwe, regardless of rock type, is dominated by the fluorocarbonate mineral synchysite (with very minor parasite occurrences) and the phosphate mineral apatite with minor occurrences of florencite. Overall, the REE host minerals account for around 6 % to 7 % of the mass of the sample. It was also noted that the Heavy Rare Earth Elements (HREE), europium to lutetium, are localised more within the apatite rather than the synchysite. The gangue minerals content consists mainly of the carbonates ankerite and calcite with minor occurrences of iron oxides and K-feldspar. Typical mineral occurrences are given in Table 13-1. For further detailed mineralogical information see Section 7.3.4..

Table 13-2
Typical Mineralogy of Songwe Hill

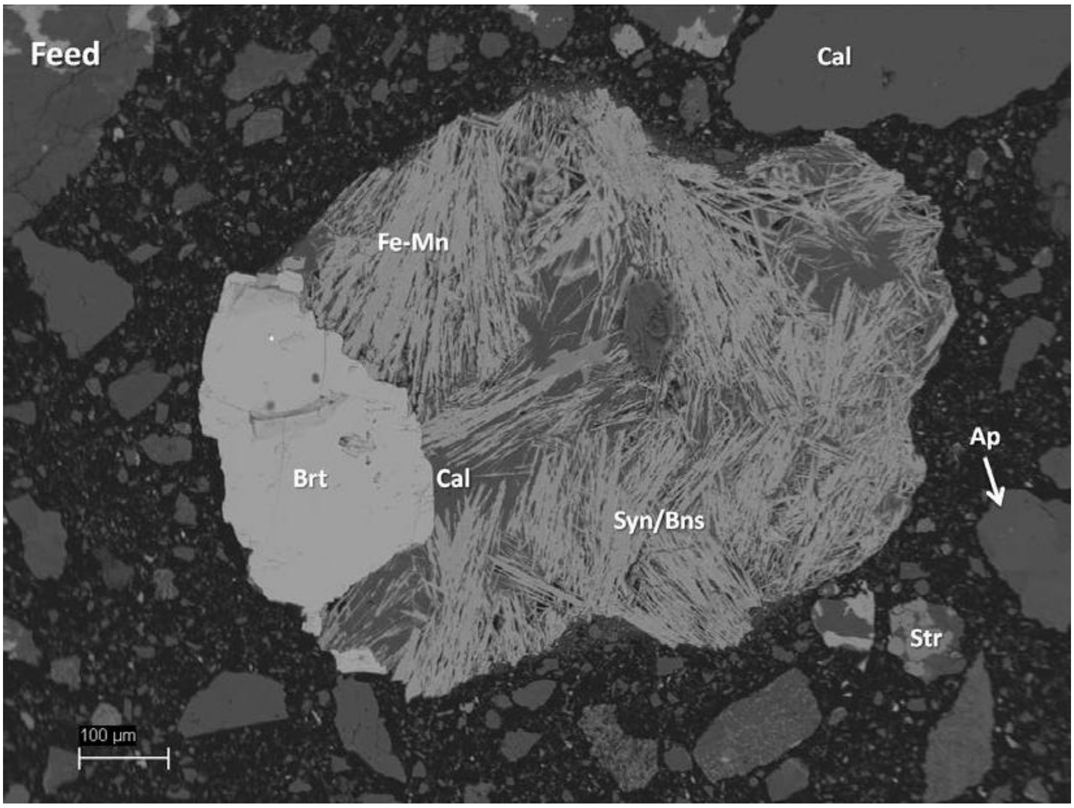
Mineral	Formula	Mass*
Calcite	$CaCO_3$	Major
Ankerite	$Ca(Fe,Mg,Mn)(CO_3)_2$	Intermediate
Apatite	$Ca_5(PO_4)_3(F,Cl,OH)$	Minor
Synchysite	$CaCO_3.CeFCO_3$	Minor
Feldspar	$KAlSi_3O_8$	Minor
Mica	$KAl_2(Si_3Al)O_{10}(OH,F)_2$	Minor

Note: ******* *predominant (>50 mass %), major (25-50 mass %), intermediate (15-25 mass %), minor (5-15 mass %), trace (< 5 mass %). REE host minerals shown in bold.*

13.3.1 Mineral associations

Apatite is mainly associated with ankerite and calcite and to a lesser degree with K-feldspar, iron oxides and strontianite. Synchysite/parisite is mainly associated with calcite followed by ankerite and to a lesser degree with strontianite and barite. Florencite and a mixture of intergrown apatite/florencite, although very poorly liberated, have a strong association with other REE host minerals. Some of these associations are evident in Figure 13-2.

Figure 13-2
BSE image of fine acicular synchysite in a screened -1.7 mm sample



13.4 Metallurgical Testing

13.4.1 Background

Metallurgical testing commenced at Mintek in South Africa in 2012 and at Nagrom in Western Australia in 2013. Both organisations are well regarded as experts in the field of mineral processing, hydrometallurgy and associated testwork with experience in rare earths.

The primary objective of the testwork carried out at Mintek has been to develop a beneficiation flowsheet to concentrate and maximize recovery of the principal rare earth element bearing minerals, synchysite and apatite. Synchysite is a fluorocarbonate mineral in the same mineral group as bastnäsite the principal ore mineral in several REE deposits. Some initial leach testwork on whole of ore was also undertaken by Mintek at this time. Later work by Mintek (2014) included the determination of comminution characteristics of the ore.

Nagrom was engaged to undertake hydrometallurgical testwork under the direction of a specialist rare earth metallurgist, Mr Gavin Beer. The focus was to develop a robust hydrometallurgical flowsheet that maximised rare earth recovery whilst minimising reagent costs.

13.4.2 Comminution

As part of the Pre-Feasibility Study, Mintek was tasked with completing bench scale comminution test work in order to provide, engineering data for the plant design and costing. The tests conducted were SAG mill comminution (SMC), Bond abrasion index (AI), Bond rod work index (BRWI) and Bond ball work index (BBWI).

13.4.2.1 Sample Preparation

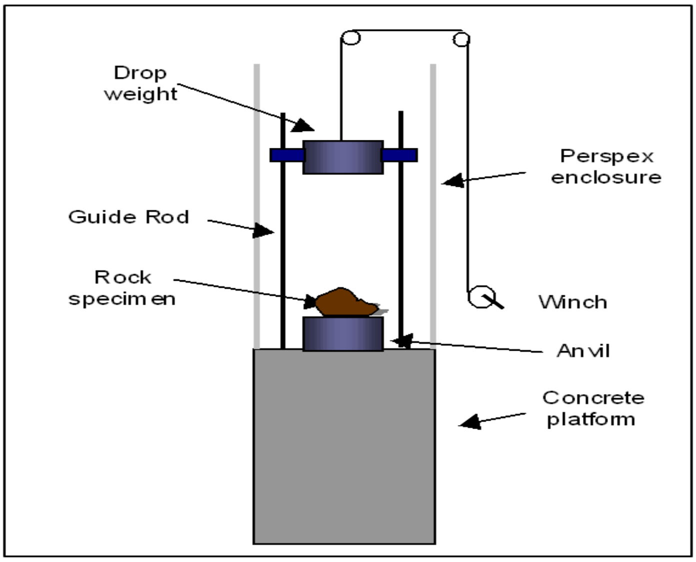
Quarter NQ drill core samples were chosen from diamond drill holes PX015, PX021, PX022b, PX033 and PX035.

After selecting material for SMC testing from the main composite sample, each sub-sample was individually staged crushed to 100 per cent passing 1.7 mm. The first stage involved crushing to 100 per cent passing 20 mm. After individual crushing to 100 per cent passing 20 mm, a single characteristic composite sample of 50 kg was made up from individual 16 sub-samples for bench scale comminution test work. The entire 50 kg composite sub-sample was screened at 12 mm to produce material of -20+12 mm for Bond abrasion index test. Material retained on this size range was blended and a characteristic 10 kg was extracted for Bond abrasion index test. The remaining 40 kg was crushed to 100 per cent passing 13.2 mm. 20 kg of material at 100 per cent passing 13.2 mm was sub-sampled for Bond rod work index test. The remaining 20 kg was further crushed down to 100 per cent passing 3.35 mm for two Bond ball work index tests.

13.4.2.2 SAG Mill Comminution (SMC) Test

The SMC test was developed as a lower cost precision technique to determine the impact breakage characteristics of ores. The SMC test generates a Drop weight index (DWI), which is a measure of the rock strength when broken under impact. The SMC test uses the same device as the JK-Tech drop weight testing.

Figure 13-3
JK Tech Drop weight testing machine



The parameters obtained from the testing are used in the JK SAG mill models to predict throughput, power draw and product size distribution with the aid of their database of information on the performance of continuously fed pilot and production scale mills.

The SMC test was performed at Mintek in accordance with the procedure specified by JK Tech. The cut-core method was utilised as opposed to broken rock method. After completion of the test, the data was submitted to JK Tech for analysis. Test results for the SMC are summarised in Table 13-3. Typical classification of ore hardness on the basis of A*b parameter is presented in Table 13-4.

A useful indicator of the resistance to impact breakage is given by a product of the two parameters (i.e. A*b); the smaller the value of A*b, the higher the resistance to impact breakage.

The A*b value for Songwe REE ore sample was found to be 31.7. This result indicates that in terms of A*b, the ore sample could be classified as being hard ore with high resistance to impact breakage.

Table 13-3
SMC test results

Sample ID	DWi	DWi	M_{ia}	M_{ih}	M_{ic}	A	b	A*b
	kWh/m^3	%	kWh/t	kWh/t	kWh/t			
Songwe REE	9.75	90	23	18.3	9.5	85.7	0.37	31.7

Table 13-4
Classification of ore hardness in terms of A*b parameter

Hardest 10 % (A*b range ~ 0 – 28)	Very Hard
10 % to 30 % (A*b range ~ 28 to 37)	Hard
30 % to 40 % (A*b range ~ 37 to 41)	Moderately Hard
40 % to 60 % (A*b range ~ 41 to 54)	Medium
60 % to 70 % (A*b range ~ 54 to 63)	Moderately Soft
70 % to 90 % (A*b range ~ 63 to 116)	Soft
90 % to 100 % (A*b range ~ 116 and greater)	Very Soft

13.4.2.3 Bond Abrasion Index (Ai) Test

The Bond abrasion index test is used to obtain an indication of the relative abrasiveness of an ore on a standard metal sample. A flat paddle 76 mm x 25 mm x 6 mm of chrome-nickel-molybdenum steel hardened to 500 Brinell is inserted into an impeller or rotor that is 108 mm in diameter, which rotates on a horizontal shaft at 632 rpm through falling ore particles. Part of the paddle surface is exposed to wear or abrasion and the paddle tip has a linear speed of 7.16 m/s, sufficient for good impact blow. The impeller is enclosed by a concentric drum 305 mm in diameter and 108 mm in length, which rotates at 70 rpm (90 % of critical speed), in the same direction as the paddle. The drum is lined with a perforated steel plate to furnish a rough surface for continuously elevating the ore particles and showering them through the path of the rotating paddle. Metal wear is usually the second largest single item of expense in conventional grinding, and in wet grinding installations it may approach or even exceed the power cost.

The Bond abrasion index test was conducted on the ore sample in the -20+12 mm size range. 10 kilograms of material in this size range was prepared and used for testing. Duplicate abrasion index tests were conducted to measure the abrasiveness of the ore. The test results are given in Table 13-5.

Table 13-5
Bond abrasion index test results

Sample ID	Paddle Mass Before Test (g)	Paddle Mass After Test (g)	Abrasion Index Ai
Songwe REE	92.9928	92.9365	0.0563
Songwe REE	92.9365	92.8782	0.0583
Songwe REE		Average	0.0573

Abrasion indices of 0.0563 and 0.0583 were obtained from the two tests conducted with an average value of 0.0573. It can be seen from the typical classification of ore abrasiveness in terms of Bond abrasion index presented in Table 13-6, that this ore could be classified as being of low abrasiveness.

Table 13-6
Typical classification of ore abrasiveness based on Bond abrasion index

Abrasion Index Range	Classification
<0.2	Low
0.2 - 0.5	Medium
0.5 - 0.75	Abrasive
0.75 - 1	Very abrasive
>1	Extremely abrasive

13.4.2.4 Bond Rod Work Index (BRWI) Test

The aim of the test is to provide information that will quantify the energy requirements for open circuit rod milling, it is also used to predict and continually evaluate the performance of commercial rod mills.

A special tilting Bond rod mill is used for this test with an effective length of 610 mm and an internal diameter of 305 mm (Figure 13-4). The mill is fitted with a wave-type liner. Feed for the tests must be prepared by careful stage crushing of ore to produce a feed material with a maximum mesh size of 13.2 mm and a natural size distribution with minimal fines. The same basic locked cycle procedure described for the Bond ball mill test is applied to the ore, but at a circulating load ratio of 100 per cent. A closing screen mesh size should be chosen to yield a product with a similar 80 per cent passing size to that envisaged for the production plant. For this scope of work, the test was conducted with a 1.18 mm limiting screen.

One standard BRWI test was conducted on the ore at a closing screen size of 1.18 mm. The test results are summarised in Table 13-7.

Figure 13-4
Batch rod mill grind-ability test equipment

Table 13-7 ***Results summary for Bond rod work index***					
Sample ID	**Limiting Screen (µm)**	**F80 (µm)**	**P80 (µm)**	**Net Production (g/rev)**	**Work Index (kWh/metric ton)**
Songwe REE	1180	9528.06	809.43	7.49	15.32

Table 13-8 gives the typical classification of ore hardness in terms of BRWI and BBWI.

Table 13-8 ***Typical classificaiton of ore hardness based Bond ball and rod work indices***				
Bond work index (kWh/t)	7 - 9	10 - 14	15 - 20	> 20
Classification	Soft	Medium	Hard	Very hard

The BRWI of the ore was found to be 15.32 kWh/t. This indicates that in terms of the typical classification based on the Bond rod work index, the ore could be characterised as being hard.

13.4.2.5 Bond Ball Work Index (BBWI) Test

The test is aimed at providing useful information for the design of grinding circuits, and in particular, to estimate the energy requirements for closed circuit ball milling. It is also used to predict and continually evaluate the performance of commercial ball mills. The Bond ball work index (BBWI) test involves locked cycle dry milling in a ball mill with an inside diameter and length of 305 x 305 mm, with no lifters, an example of which is shown in Figure 13-5.

A dry locked-cycle standard Bond grind-ability test with several cycles is performed until steady-state conditions or equilibrium is reached which involves up to about seven cycles.

Figure 13-5
Batch ball mill grind-ability test equipment

The tests are conducted to simulate a circulating load ratio of 250 per cent. The mill is operated at 70 rpm and is equipped with a revolution counter. The ball charge consists of 285 steel balls weighing 20.125 kg corresponding to a ball charge filling of 19.2 % by volume. For these tests feed sample must be prepared by careful stage-crushing of ore to produce a feed material with a maximum mesh size of 3.35 mm ensuring that minimal fines are generated during stage crushing. A closing screen mesh size should be chosen to yield a product with a similar 80 per cent passing size to that envisaged for the production plant. For the purpose of this test work two tests were conducted using 75 and 106 microns limiting screens.

Two BBWI tests were conducted at closing screen sizes of 75 and 106 microns. The test results for the two closing screens are summarised in Table 13-9.

Table 13-9 Results summary for Bond ball work index tests					
Sample ID	**Limiting Screen (µm)**	**F80 (µm)**	**P80 (µm)**	**Net Production (g/rev)**	**Work Index (kWh/metric ton)**
Songwe REE	75	2580.70	52.02	1.63	10.26
Songwe REE	106	2580.70	76.32	1.95	10.26

The Bond ball work index was found to be 10.26 kWh/t at both closing screen sizes of 75 and 106 microns. It follows from the typical classification of hardness in terms of Bond ball work index that the ore could be classified as being medium.

13.4.3 Beneficiation

While initial test work tested gravity and magnetic separation, the majority of beneficiation test work comprised numerous flotation tests encompassing differing conditions in order to identify the optimal flotation regime.

13.4.3.1 Sample Preparation

Drill core samples PX001, PX003, PX005, PX009, and PX012 were delivered to Mintek, with the corresponding drill cores weighing 117, 120, 102, 125 and 171 kg, respectively, derived from the sample intervals in Table 13-1.

An initial composite (Composite A) was made up of equal proportions of PX001, PX003, PX005 and PX012 with PX009 excluded, being from an atypical weathered zone in the deposit.

Following completion of further drilling and availability of further drill core, a second composite (Composite B) was made up of equal proportions derived from new drill holes PX013, PX022b, PX021, PX033, PX035, from a combination of PX005 and new drill hole PX015, and from PX012, i.e. seven equal sub-samples, to further support the test work. The relevant sample intervals are shown in Table 13-1.

13.4.3.2 Shaking Table Testwork

Shaking table test work was conducted by Mintek on a Wilfley 8-product shaking table to evaluate the possibility of separating the rare earth minerals from gangue minerals according to density. The separation process of a shaking table is dependent mainly on the difference in specific gravity between the minerals and to a lesser degree on the shape and size of the particles. It was envisaged that the rare earth minerals would separate from the lighter gangue minerals, largely by gravitational and drag forces encountered on a shaking table.

Tests were conducted on individual ground samples of PX001, PX 003, PX 005, PX 009, and PX 012 at a p80 of -300 µm and an additional test on the PX003 sample at the finer grind size of p80 - 150µm.

For all ore types at a coarser grind, the mass pull ranged between 3 % and 6 %, at corresponding average REE recovery of 6 %. The higher recoveries were obtained at a higher mass pull. On average, 1.5 times REE upgrade was obtained for all samples thus it was concluded that shaking table test work was not optimal as an upfront concentration step.

At a finer grind of 80 %-150µm, mass pull, grade and recovery to the shaking table concentrate were similar to coarse grind results, thus there was no benefit in fine grinding.

13.4.3.3 Magnetic Separation

The main rare earth minerals comprise paramagnetic synchysite in a diamagnetic matrix of calcite/dolomite, barite and strontianite, hence magnetic separation was attempted on the premise of differences in magnetic susceptibility. Mintek undertook testwork early on Composite A at grind sizes of P80 -53 and 38µm but no selectivity was obtained at various magnetic strengths.

Mass pulled to the magnetic fraction increased with increasing magnetic strength but the overall REE recovery to this fraction was very poor. This was attributed to poor liberation of synchysite hence sequential WHIMS test work at higher intensities was conducted at a finer grind of 80 % -38 µm. There was poor selectivity between the REE and gangue minerals calcite and ankerite. Iron was seen to upgrade to the magnetic fraction and gave the highest recovery. Recovery trend of Ca and REE was similar overall showing intricate association between synchysite and calcite. The lack of susceptibility to upgrade by magnetic separation was subsequently confirmed at Nagrom.

13.4.3.4 Flotation

An extensive amount of flotation test work has been undertaken at Mintek with later verification work carried out at Nagrom.

Previous mineralogical work had indicated that the main REE carrier was synchysite but it was intergrown with calcite and ankerite and intimately associated with apatite, barite and strontianite. Apatite was demonstrated to be a significant carrier for a large proportion of the heavy REE, Eu and Y.

Mintek's initial work on Composite A targeted the selective flotation of apatite given the heavy rare earth content. Flotation at a coarse grind of 80 % -300 µm using various reagents resulted in a two-fold upgrade of the REE with relatively low REE recoveries. Similar results were obtained at a finer grind of 80 % -150 µm on both "as milled" and de-slimed ore feed. Since the majority of the REE reported to the tails, direct REE flotation was attempted on these tailings using various reagents after further milling to p80 -15 µm to ensure liberation of synchysite. The rare earth minerals did not float and low mass pulls were obtained at REE low recoveries.

Apatite flotation tests on the Composite A sample under a range of reagent and grind conditions showed marginal apatite upgrading with barite, strontianite, calcite and ankerite being major mineral diluents of the concentrate. REE recoveries were lower than the target and were found to be mass pull dependent. As it was apparent that apatite was not upgrading, and consequently the desired REE recovery was not achieved, the mineralogy of the milled (p80 – 150 μm) was characterized. Fine apatite and synchysite grains were found to be intricately inter-grown within calcite, and were associated with barite, strontianite and ankerite. It was concluded that only fine milling would liberate the rare earth minerals.

The next phase of the Mintek test work therefore targeted bulk flotation of both synchysite and apatite, again using Composite A. This was initially to be done at a fine grind of p80 -25μm to liberate the synchysite, however because flotation at fine grinds poses challenges due to high slimes content it was decided that scoping work would be conducted at coarser grinds and only be done at finer grinds if a promising route had been identified. Various reagents such as succinamates, amines, hydroxamic acids and phosphoric acid esters at different dosages were used to float apatite and REE associated with it, at different grinds. The possibility of calcite removal up front using fatty acids while apatite was depressed with phosphoric acid was also evaluated.

Mintek subsequently completed significant further optimisation test work, a large proportion of which was completed within the scope of a Mintek research project entitled "Developing beneficiation procedures for upgrading rare earth minerals from carbonatitic deposits".

This culminated in the results announced by Mkango in July 2013 using a reagent regime and conditions previously utilised at the Mountain Pass rare earth mine. A mineral concentrate grading 4.6 % into a mass pull of 25.7 % was produced, giving an approximate 2.6 times upgrade in rare earth grade was achieved. Individual recoveries for the principal rare earths ranged from 54 % to 70 % as per Table 13-10 below.

Table 13-10
Mintek flotation results on Composite A

Rare Earth	Flotation Recovery (%)
Lanthanum	69.6
Cerium	68.2
Praseodymium	66.8
Neodymium	66.0
Samariam	63.4
Europium	62.4
Gadolinium	59.9
Terbium	58.9
Dysprosium	56.1
Yttrium	53.5

Mintek achieved the above results using soda ash, sodium fluorosilicate and lignin sulphonate as dispersant/depressant system and a fatty acid as a collector. The grind size used was P80 of -53μm with extended conditioning times and elevated temperatures.

Subsequent work at Mintek focused on repeating the results for the second composite (Composite B), improving overall recoveries and in particular heavy rare earth recoveries.

Test work showed that Composite B demonstrated similar flotation behaviour and results to Composite A as summarised in Table 13-11 (Mintek Test 14 – (1)).

Furthermore, Mintek found that by increasing sodium carbonate dosages, it was possible to increase apatite and HREE recoveries to levels similar to LREE recoveries as summarised in Table 13-11 (Mintek Test SV 63). This is potentially due to its role as an apatite activator in the flotation process whereby increased dosages enhance apatite and therefore HREE recovery to the concentrate.

In parallel with continued optimisation work at Mintek, Mkango then commenced a number of confirmatory test work programs at Nagrom in Australia, with a view to demonstrating repeatability in different laboratories, examining further options for optimisation and producing a bulk mineral concentrate for hydrometallurgical test work.

Using the same reagent regime as Mintek, similar results were obtained (Nagrom Bulk Test 5), as summarised in Table 13-11, based on selected results with similar mass pulls.

Table 13-11
Selected flotation results on Composite B

Rare Earth	Mintek Flotation Recovery (%)[1]	Mintek Flotation Recovery (%)[2]	Nagrom Flotation Recovery (%)[3]
Lanthanum	67.8	69.1	67.4
Cerium	67.3	68.0	66.5
Praseodymium	66.6	67.5	66.3
Neodymium	66.1	67.5	66.2
Samarium	65.1	67.2	66.4
Europium	64.6	67.7	66.9
Gadolinium	64.3	68.6	68.0
Terbium	62.3	69.3	68.2
Dysprosium	60.9	69.4	67.8
Yttrium	57.6	68.6	67.5
Mass Pull	23.1	24.8	23.9

Note: *[1]Report 6884 Test 14 (1)*
[2]Report 6884 Test SV63
[3]Report T1636 – Bulk Test 5

In contrast to Mintek, Nagrom consistently achieved HREE recoveries similar to LREE recoveries using the same conditions used at Mintek, with the lower sodium carbonate dosages, indicating that other factors are coming into play, and that base case flotation parameters are not capturing all of the significant variables affecting performance. Similarly, it has been demonstrated at Nagrom, and now subsequently at Mintek, that it is possible to reduce conditioning times significantly without impacting flotation performance.

Variability in test work results has been attributed at this stage to different conditioning devices utilised at different facilities. During future optimisation work, effort will be put into understanding the various parameters affecting flotation process and investigate design of conditioners that can be used in the lab and up-scaled to pilot. This will be a focus of further investigation during the Definitive Feasibility Study and Mintek are continuing refinement and optimisation of the flotation process.

The assumption for the Pre-Feasibility Study and financial model is a recovery of 67 % for both light and heavy rare earths and a mass pull of 23.05 %, based on the results of extensive flotation test work at Mintek and Nagrom, selected results of which are summarised in Table 13-10 and Table 13-11 above and Table 13-18 and Table 13-19 below.

13.4.4 Leaching

Leaching conditions need to take into account the presence of calcium contained within the REE host minerals of apatite and synchysite as well as any residual calcite not rejected by the flotation process. Generally, sulphuric acid is deemed unsuitable for use in leaching high calcium content material as the REE tend to co-precipitate during the formation of gypsum (CaSO4). Alternative routes such as hydrochloric acid (HCl) leaching or nitric acid leaching are generally applied in these cases.

Most of the recent leach test work has been conducted at Nagrom in Western Australia.

13.4.4.1 Whole Rock Leaching

HCl leach test work was undertaken by Nagrom on a ground whole rock composite, comprising equal proportions of material from diamond drill holes PX012, PX001, PX003 and PX005 the results of which were announced in July 2013. Leach tests using HCl were undertaken at varying temperatures and acid strengths. H_2SO_4 leaching at elevated temperature was also trialled to quantify the effect of REE loss to gypsum precipitation. Although optimal dissolution of rare earths occurred at 30 % w/w HCl at elevated temperature, high dissolution values were also achieved using 20 % w/w HCl at ambient temperature. Leaching in H_2SO_4 gave reduced recoveries to solution as expected. The leach conditions and results are summarised in Table 13-12.

Table 13-12 ***Leach recoveries based on a whole rock composite***				
Rare Earth	**Classification**	**Leach Recovery 30 % HCl [1]**	**Leach Recovery 20 % HCl [2]**	**Leach Recovery 25 % H_2SO_4 [3]**
Lanthanum	LREE	84.7 %	78.0 %	65.9 %
Cerium	LREE	87.3 %	82.9 %	64.9 %
Praseodymium	LREE	89.6 %	85.5 %	63.3 %
Neodymium	LREE	91.3 %	87.8 %	63.4 %
Samarium	LREE	93.7 %	91.2 %	66.4 %
Europium	HREE	94.5 %	92.3 %	70.0 %
Gadolinium	HREE	96.2 %	94.4 %	74.9 %
Terbium	HREE	95.8 %	94.5 %	75.5 %
Dysprosium	HREE	94.9 %	94.4 %	77.5 %
Yttrium	HREE	93.4 %	93.0 %	65.9 %

Notes: [1] *30 % w/w pulp density, 30 % w/w HCl, 82 °C, 2 hours leach time*

[2] *20 % w/w pulp density, 20 % w/w HCl, 35 °C, 2 hours leach time*

[3] *10 % w/w pulp density, 25 % w/w H_2SO_4, 89 °C, 4 hours leach time*

The results indicate a clear trend whereby light rare earth recoveries were lower than heavy rare earth recoveries. It is speculated that this is due to preferential leaching of the HREE biased apatite over synchysite.

13.4.4.2 Concentrate Leaching

A flotation concentrate was generated at Mintek and provided to Nagrom to undertake a series of leach optimisation tests the results of which were announced by Mkango in October 2013. A total of 20 leach tests were undertaken at varying conditions. Again, although a slightly better result was achieved at a higher HCl strength of 25%, an almost comparable result at 20% w/w acid strength was obtained. It was determined that a reduced leach time of 30 minutes could be applied without adversely affecting leach results. The leach was carried out on a bulk sample of concentrate at 20% w/w pulp density and ambient temperature. The results are presented for this leach in Table 13-13. As per the whole rock leaching results, there is a notable difference in the leach recoveries between LREE and HREE.

Table 13-13	
Leach recoveries based on a flotation concentrate	
Rare Earth	**Bulk Leach Recovery**
Lanthanum	75.01 %
Cerium	79.48 %
Praseodymium	83.30 %
Neodymium	85.79 %
Samariam	89.42 %
Europium	90.91 %
Gadolinium	92.12 %
Terbium	92.56 %
Dysprosium	92.58 %
Yttrium	89.83 %

13.4.4.3 Multiple Stage Leaching

Gangue Leaching

Mintek evaluated the concept of an initial selective HCl leach targeting the calcite in order to reduce excessive frothing in subsequent processing stages. This was done on a ground composite of drill core samples. By controlling the pH to around 3, a 60 % mass reduction was achieved, mainly due to calcite dissolution. REE "loss" to the solution was less than 1 % for the HREE and less than 5 % for the LREE excluding Ce (12 %) and La (7.6 %).

Mintek repeated this approach on a flotation concentrate controlling the pH to between 3 and 3.5. All REE losses were below 2 % with a mass loss of 63 %, again due mainly to calcite dissolution (Ca extraction was 80.3 %).

Nagrom also leached a flotation concentrate with restricted acid addition, resulting in a minimum pH of 3. Confirmatory results to previous findings were obtained with a 67 % mass loss and a 74 % Ca extraction. REE losses to solution, with the exception of Y, were modest.

Of particular note is how pure the leach solution was, consisting of mainly of Ca (55g/L), Sr (3.7 g/L) and Mn (1.2 g/L) in a chloride solution. All other metals combined were less than 1 g/L. This solution is highly amenable for recycling HCl as discussed in the Acid Recycle section below.

Rare Earth Leaching

The residue from the Nagrom gangue leach was subjected to a second, more intensive HCl leach as per the initial concentrate bulk leach conditions. The recoveries of REE to solution met or exceeded the single stage bulk leach and are reported in Table 13-14 below.

Table 13-14 Bulk leach, gangue leach and RE leach on concentrate				
Rare Earth	**Bulk Leach Dissolution**	**Gangue Leach Dissolution**	**RE Leach Dissolution**	**Combined Dissolution**
Lanthanum	75.01 %	2.93 %	71.09 %	74.02 %
Cerium	79.48 %	2.69 %	75.97 %	78.66 %
Praseodymium	83.30 %	2.91 %	80.76 %	83.67 %
Neodymium	85.79 %	3.03 %	83.46 %	86.49 %
Samarium	89.42 %	2.27 %	87.93 %	90.20 %
Europium	90.91 %	2.87 %	89.52 %	92.39 %
Gadolinium	92.12 %	3.17 %	90.90 %	94.07 %
Terbium	92.56 %	3.49 %	91.19 %	94.68 %
Dysprosium	92.58 %	3.91 %	91.02 %	94.93 %
Yttrium	89.83 %	6.53 %	87.80 %	94.33 %

13.4.4.4 Caustic Conversion of Leach Residue

Mineralogical studies identified the presence of LREE host minerals such as florencite and monazite, albeit in minor quantities, which are known or suspected to be refractory with regards to ambient temperature acid leaching. The presence of fluorine within the mineral composition of synchysite can also provide a mechanism for precipitation of insoluble rare earth fluorides during the leach stage. Either or a combination of these mechanisms may account for the REE remaining in the residue post leaching.

To test this proposition, a caustic conversion was undertaken on the leach residue from the bulk leach reported in Table 13-13 and announced by Mkango in May 2014. The residue was contacted with 50% w/w sodium hydroxide solution at 100 ºC for a 4 hour period. Upon cooling, the solids were filtered, washed and then dissolved in 5 % w/w HCl. The original leach recoveries along with the additional caustic conversion and calculated overall recoveries are reported in Table 13-15.

Table 13-15 Leach, Caustic Conversion and Overall Recoveries on a Flotation Concentrate			
Rare Earth	**Bulk Leach Dissolution**	**Additional Dissolution via Caustic Conversion**	**Overall Dissolution**
Lanthanum	75.01 %	18.51 %	93.52 %
Cerium	79.48 %	12.44 %	91.92 %
Praseodymium	83.30 %	12.68 %	95.98 %
Neodymium	85.79 %	10.8 %	96.68 %
Samarium	89.42 %	7.96 %	97.38 %
Europium	90.91 %	6.72 %	97.63 %
Gadolinium	92.12 %	5.66 %	97.78 %
Terbium	92.56 %	4.68 %	97.24 %
Dysprosium	92.58 %	3.97 %	96.55 %

Yttrium	89.83 %	3.82 %	93.65 %

Of note is that the recoveries not only improved, they were somewhat “normalised” between LREE and HREE deportment.

13.5 Flowsheet Development

As the preceding work was done on limited sample quantities, a dedicated program of flowsheet development was scoped and undertaken at Nagrom in 2014. The sample preparation and flotation concentrate generation is reported in Nagrom report T1636 and the hydrometallurgical flowsheet development is reported in T1737.

13.5.1 Sample Selection

The samples supplied to Nagrom are presented in Table 13-16.

Table 13-16
Sample Composition

Sample	Weight (kg)
Mkango PX013	4.882
Mkango PX012	0.746
Mkango PX05 + PX015	0.746
Mkango PX022b	0.746
Mkango PX021	0.746
Mkango PX033	0.746
Mkango PX035	0.746
M066:M JR003 Master Comp[1]	4.681
M066: Mkango JR003 Master Comp[1]	5.032
Mkango JR003 M066 Master Comp[1]	5.034
Mkango JR003 M066 Master Comp[1]	5.034
Mkango JR003 M066 Master Comp[1]	5.035
Total	**34.014**

Note: *[1] these each comprise equal proportions derived from PX022b, PX021, PX033 and PX035, from a combination of PX005 and PX015, and from PX012, i.e. six equal sub-samples. These were then combined with sufficient quantities of PX013 and other samples such that the overall composite corresponds to the composition of Composite B.*

These samples were stage crushed, wet screened and stage ground to a p80 of 38µm.

The Master Composite was wet screened at 53µm. The oversize fraction then underwent staged grinding to produce a P80 of 53µm. The natural and generated fractions were recombined before the sample was submitted for size by analysis. A summary is presented in Table 13-17.

More than half of the mass (52.11 %) exists in the -25µm size fraction. Most of the mineral species also exist within the fines with 48.44 % of the P_2O_5, 60.48% of the Nd_2O_3, 56.15 % of the Dy_2O_3, 52.85 % of the Fe_2O_3 and 60.64 % of the TREO also reporting to the -25µm size fraction.

13.5.2 Concentrate Generation

A total of twenty seven (27) bulk rougher flotation tests were undertaken on 0.9 kg charges of the ground Master Composite sample. As the objective of the testwork was for sample generation rather than flotation optimisation, only Bulk Float Tests 4, 5 and 6 underwent a full concentrate and tailings analysis, whilst the other tests were analysed for Nd_20_3 and Dy_2O_3 only. As an example, a summary of the mass yields, grades and recoveries achieved from the Bulk Rougher Flotation Test 5 is presented in Table 13-18.

Table 13-17

Ground Master Composite Size by Analysis

	Yield	P_2O_5		Nd_2O_3		Dy_2O_3		Fe_2O_3		TREO	
Size (µm)	%	%	dist.	ppm	dist.	ppm	Size (µm)	%	%	dist.	ppm
+75	7.94%	2.06	9.90%	2228	6.74%	143	+75	7.94%	2.06	9.90%	2228
+63	7.39%	2.01	9.00%	2106	5.93%	135	+63	7.39%	2.01	9.00%	2106
+53	4.82%	1.90	5.54%	2044	3.75%	125	+53	4.82%	1.90	5.54%	2044
+45	9.02%	1.71	9.36%	2161	7.42%	127	+45	9.02%	1.71	9.36%	2161
+38	9.86%	1.64	9.77%	2181	8.20%	123	+38	9.86%	1.64	9.77%	2181
+25	8.87%	1.49	7.99%	2214	7.48%	119	+25	8.87%	1.49	7.99%	2214
-25	52.11%	1.53	48.44%	3046	60.48%	151	-25	52.11%	1.53	48.44%	3046
Calculated Head	100.00%	1.65	100.00%	2624	100.00%	140	100.00%	15.59	100.00%	1.71	100.00%

Table 13-18

Master Composite Bulk Float Product Mix (Test 5)

	Yield	P_2O_5		Nd_2O_3		Dy_2O_3		Fe_2O_3		TREO	
	%	%	dist.	ppm	dist.	ppm	%	%	dist.	ppm	dist.
Rougher Concentrate	23.9	5.16	77.1	6993	66.2	385	67.8	12.3	18.4	4.65	66.7
Rougher Tailing	76.1	0.48	22.9	1123	33.8	57	32.2	17.2	81.6	0.73	33.3
Calculated Head	100.0	1.60	100.0	2526	100.0	136	100.0	16.0	100.0	1.66	100.0

The results show that a total of 66.2 % of the Nd_2O_3, 67.8 % of the Dy_2O_3 and 66.7 % of the TREO reported to the combined Rougher Concentrate which represented 23.9% of the original mass. As expected, a considerable amount (77.1 %) of P_2O_5 floated with significantly less (18.4 %) of the Fe_2O_3 reporting to the combined rougher concentrate. The combined rougher concentrate from Test 5 had an overall TREO upgrade of 2.8 times.

Rougher concentrates were selected from all 27 float tests to form a single combined concentrate composite. Rare earth and P_2O_5 grades were slightly higher than the Test 5 composite whilst the Fe_2O_3 grade was slightly lower as shown in Table 13-21. Overall the composite is deemed typical of what would be expected from an optimised flotation process.

Table 13-19
Comparison of Flotation Test 5 and Combined Concentrates

	P_2O_5	Fe_2O_3	Nd_2O_3	Dy_2O_3	TREO
	%	%	ppm	ppm	%
Test 5	5.2	12.3	6993	385	4.7
Combined (Tests 1-27)	5.7	12.0	7732	426	5.1

This concentrate composite was used for the hydrometallurgical development work.

13.5.3 Calcite Leaching

Sighter calcite leach (calcite being the targeted gangue mineral) testwork was undertaken on subsamples of the concentrate composite to determine optimal leach conditions.

The remainder of the concentrate composite then underwent a bulk calcite leach at the following conditions to produce a leach residue, leach liquor and two leach wash fractions:

- Pulp density: 20 % w/w;
- Target pH: 3.5 (maintained w/ HCl);
- Leach time: 2hr; and
- Temperature: ambient (21 °C)

The results are reported in Table 13-20.

Table 13-20
Calcite Leach

Element	Deportment to Solution
P	0.05 %
Mn	29.47 %
Mg	25.66 %
Ca	56.19 %
La	1.07 %
Ce	0.81 %
Pr	0.88 %
Nd	0.94 %
Sm	0.76 %
Eu	0.00 %
Gd	1.17 %
Tb	1.26 %
Dy	1.29 %
Ho	1.55 %
Er	2.02 %
Tm	0.00 %
Yb	3.10 %
Lu	0.00 %
Y	1.92 %

Source: *Nagrom test T1737 – Bulk Calcite Leach*

56.19 % of the Ca was recovered to the combined liquor and wash fractions with only 0.95% of the REE solubilizing.

13.5.4 Rare Earth Leaching

The bulk calcite leach residue was dried in preparation for bulk rare earth leaching. The bulk rare earth leach was conducted at the following conditions to produce a leach residue, leach liquor and two leach wash fractions:

- Pulp density: 20 % w/w;
- Acid concentration: 20 % w/w HCl;
- Leach time: 0.5hr;
- Temperature: Ambient (31.5 °C); and
- Staged acid addition.

The results of the bulk rare earth leach are presented in Table 13-21.

Table 13-21 Rare Earth Leach on Calcite Leach Residue	
Element	**Deportment to Solution**
P	93.18 %
Ca	88.66 %
La	73.91 %
Ce	79.16 %
Pr	82.99 %
Nd	85.98 %
Sm	91.42 %
Eu	92.94 %
Gd	94.20 %
Tb	94.26 %
Dy	93.41 %
Ho	92.19 %
Er	90.41 %
Tm	88.41 %
Yb	87.46 %
Lu	82.14 %
Y	91.17 %
TREE	80.30 %

Source: *Nagrom test T1737 – Bulk RE Leach*

80.30 % of the TREEs were solubilized along with almost all of the remaining P and Ca indicating the apatite host mineral has been attacked. Of note is the preferential leaching of the heavy rare earths over the light rare earths. This further supports the premise that the apatite host minerals contain a biased proportion on these rare earths.

13.5.5 Caustic Conversion and Redissolution

A subsample of the and bulk rare earth leach residue was subjected to caustic conversion at the following conditions to produce one a residue, liquor and two wash fractions:

- Pulp density: 30 % w/w;
- NaOH concentration: 50 % w/w;
- Leach time: 4 hr; and
- Temperature: 100 °C.

Analysis was conducted on all fractions which reported less than 0.01% Total REE loss to the combined liquor and wash fractions.

A hydrochloric acid redissolution was conducted on the caustic conversion residue at the following conditions to produce a residue, liquor and two wash fractions:

- Pulp Density: 20 % w/w;

- Acid Concentration: 5 % w/w HCl;
- Leach Time: 1 hr; and
- Temperature: Ambient (27 °C).

The results for the hydrochloric acid redissolution are presented in Table 13-22.

Table 13-22
HCl Dissolution of Caustic Conversion Residue

Element	Deportment to Solution
P	38.72 %
Ca	44.25 %
La	71.28 %
Ce	31.31 %
Pr	71.43 %
Nd	71.90 %
Sm	67.84 %
Eu	65.06 %
Gd	63.29 %
Tb	51.99 %
Dy	45.11 %
Ho	40.57 %
Er	36.27 %
Tm	31.17 %
Yb	31.89 %
Lu	30.90 %
Y	34.47 %
TREE	50.58 %

Source*: Nagrom test T1737 – HCl Redissolution*

50.58 % of the REEs reporting to the HCl dissolution stage were recovered to the combined liquor and wash fractions.

13.5.6 Purification

The basis of the purification of the combined leach liquor is to remove the main contaminants from solution being iron and phosphorous via FePO4 precipitation. Thorium is also effectively precipitated at this stage.

The process involves adjusting the stoichiometric ratio of iron to phosphorous and then elevating the pH to precipitate $FePO_4$. Iron chloride ($FeCl_3$) is first added to obtain the required stoichiometry and then limestone ($CaCO_3$) is dosed as a slurry to raise the pH. Air is also sparged to ensure high levels of dissolved oxygen to maintain the iron in the oxidised ferric state in solution.

Tight pH and oxidation/reduction potential (ORP) control is required to ensure good rejection of iron and phosphorous with minimal loss of REs via co-precipitation. Approximately 20 laboratory tests were undertaken to determine the optimal combination of conditions.

The summary results of the contaminant rejection and RE losses are given in Table 13-23.

Table 13-23
Purification of RE Leach Solution

Element	Deportment to Precipitate
P	79.93 %
Fe	64.65 %
Th	98.94 %
La	1.63 %
Ce	1.96 %
Pr	1.81 %
Nd	1.63 %
Sm	2.21 %
Eu	2.09 %
Gd	1.89 %
Tb	1.94 %
Dy	1.48 %
Ho	1.27 %
Er	1.20 %
Tm	1.65 %
Yb	1.51 %
Lu	1.30 %
Y	3.76 %
TREE	**1.88 %**

Source: *Nagrom test T1737 – Bulk Purification (6)*

13.5.7 Raw RE Hydroxide Precipitation

The purified leach solution is dosed with caustic soda (NaOH) to raise the pH to just beyond neutral (pH 7.5) and precipitate a raw, mixed rare earth hydroxide. This process recovers more than 99% of the critical and heavy rare earths to a precipitate which is filtered and washed.

The results are given in Table 13-24.

Table 13-24 ***Raw RE Hydroxide Precipitation***	
Element	**Deportment to Precipitate**
La	94.63 %
Ce	98.57 %
Pr	99.04 %
Nd	98.92 %
Sm	100.00 %
Eu	100.00 %
Gd	100.00 %
Tb	100.00 %
Dy	100.00 %
Ho	100.00 %
Er	100.00 %
Tm	100.00 %
Yb	100.00 %
Lu	100.00 %
Y	99.72 %
Total REE+Y	**97.86 %**

Source: *Nagrom test T1737 – Bulk Hydroxide Precipitate*

13.5.8 Hot Caustic Wash

Experimentation identified that a hot caustic wash (or mild caustic conversion) improved downstream recovery of the rare earths. It is speculated that this converts any insoluble rare earth fluorides present into soluble hydroxides. There is no loss of rare earths to solution at this stage.

Testwork was undertaken using a concentrated caustic soda solution at near boiling point. Further testwork should be undertaken to ascertain if reduced strengths and temperatures are also effective.

13.5.9 Cerium Rejection

Cerium can be rejected by converting it to the +4 oxidation state which makes it much less soluble than the other rare earths that generally only occur in the +3 state. In an alkaline environment (such as a wet rare earth hydroxide precipitate), this can be achieved by hot air drying. The solid from the hot caustic wash was dried at 150^0C with regular turning to ensure good exposure to the air.

13.5.10 Selective Dissolution

With the cerium now oxidised, the mixed RE hydroxide can be leached in a mild strength acid to reject the majority of cerium along with residual iron and thorium.

With limited sample available, only a few tests could be undertaken, however it was determined that an HCl solution at a pH of 1 at ambient temperature and 2 hour leach time gave the best selectivity between cerium and impurity rejection and rare earth dissolution. Further optimisation is expected to give greater selectivity against cerium and other contaminants whilst improving rare earth recovery.

The deportment of elements to the solution is given in Table 13-25.

Table 13-25
Selective dissolution of mixed RE hydroxide

Element	Deportment to Solution
P	0.97 %
Fe	2.19 %
Th	0.00 %
La	83.69 %
Ce	11.09 %
Pr	72.19 %
Nd	71.07 %
Sm	72.44 %
Eu	69.98 %
Gd	71.73 %
Tb	66.43 %
Dy	71.32 %
Ho	70.87 %
Er	72.32 %
Tm	73.88 %
Yb	76.70 %
Lu	76.89 %
Y	85.40 %

Source: *Nagrom test T1737 – Redissolution Sighter 7 Subsample #2*

13.5.11 Residue Leaching

Because of the appreciable amounts (between 15 to 30%) of the desired (non-cerium) rare earth content remaining unleached from above, the solid undergoes another stronger leach in 5% HCl. This “scavenges” approximately 80% of the remaining non-cerium rare earths and a much lesser amount, around 40%, of the remaining cerium. As some iron is solubilized and in order to maximise cerium rejection and non-cerium recoveries, this stream is recycled back to the purification stage.

13.5.12 Product Precipitation

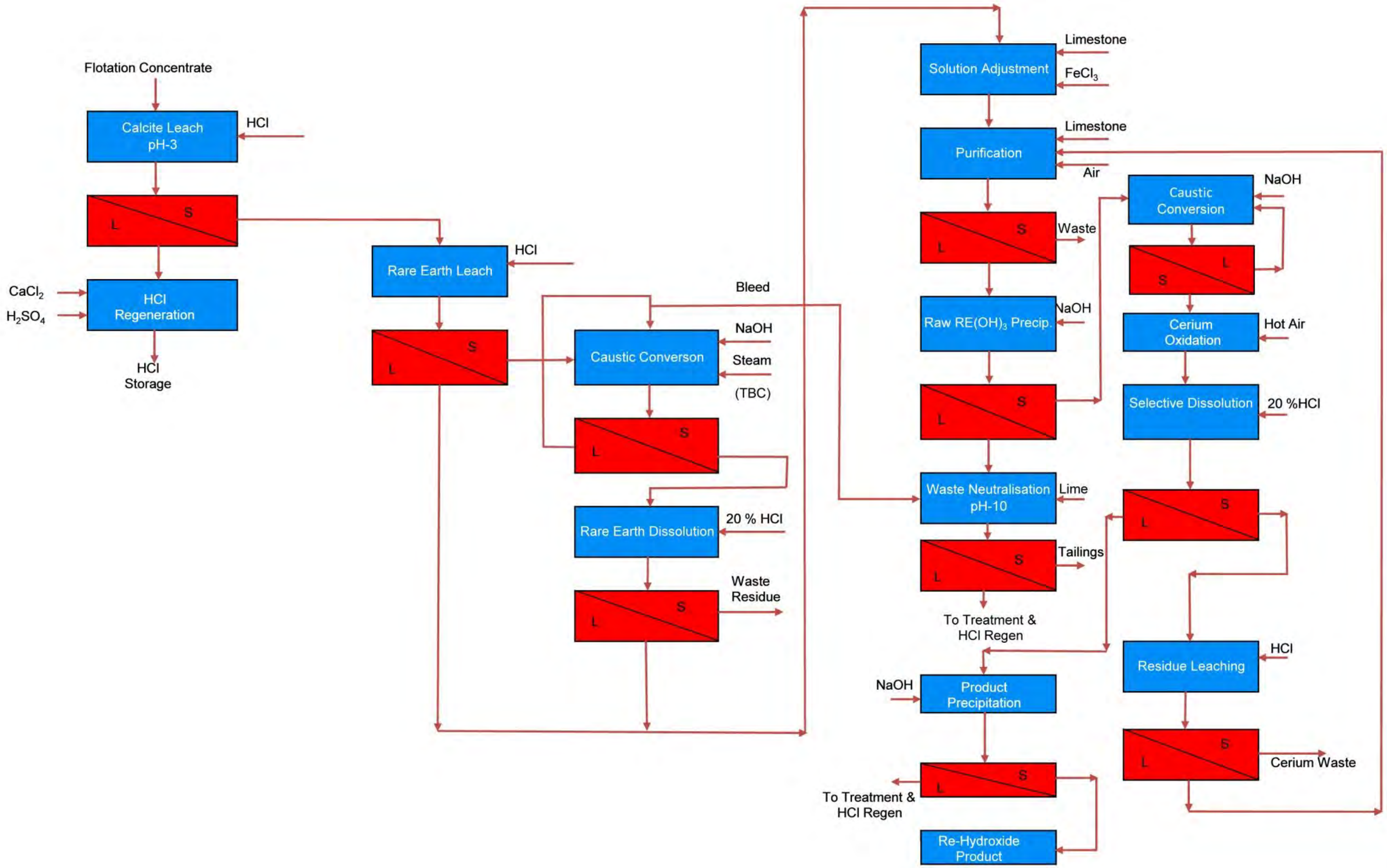
The solution from the selective dissolution stage is treated with caustic soda solution to raise the pH and precipitate all of the rare earths from solution.

13.6 Flowsheet Selection

Based on the preceding test work, a hydrometallurgical flowsheet has been developed. This is presented in Figure 13-6.

Figure 13-6

Hydrometallurgical Flowsheet



13.7 Stage Recoveries for Basis of Design

From the preceding testwork, stage and overall rare earth recoveries through the process have been determined. These are summarised in Table 13-26.

Table 13-26
Rare Earth Recovery by Stage

Rare Earth	Flotation Recovery	Calcite, RE Leach and Residue Leach Recovery	Purification and Precipitation Recovery	Overall Recovery
La	67.0 %	92.3 %	88.2 %	54.5 %
Ce	67.0 %	85.2 %	15.9 %	9.1 %
Pr	67.0 %	94.9 %	90.1 %	57.3 %
Nd	67.0 %	95.8 %	89.3 %	57.3 %
Sm	67.0 %	97.0 %	91.8 %	59.7 %
Eu	67.0 %	97.5 %	90.5 %	59.1 %
Gd	67.0 %	97.5 %	89.2 %	58.2 %
Tb	67.0 %	96.7 %	86.0 %	55.7 %
Dy	67.0 %	95.7 %	90.4 %	58.0 %
Y	67.0 %	93.1 %	93.4 %	58.2 %
Ho	67.0 %	94.5 %	89.9 %	56.9 %
Er	67.0 %	92.7 %	91.0 %	56.5 %
Tm	67.0 %	92.0 %	90.3 %	55.7 %
Yb	67.0 %	89.6 %	92.7 %	55.7 %
Lu	67.0 %	87.7 %	91.0 %	53.4 %

14 MINERAL RESOURCE ESTIMATES

14.1 Previous Mineral Resource Estimates

JICA and MMAJ conducted a core drilling programme on Songwe Hill in the late 1980s but did not produce a code-compliant Mineral Resource.

In 2010 Mkango commenced an extensive exploration programme over Songwe Hill culminating in a maiden Mineral Resource Estimate for the Project, covering an up to 200 m wide north-east trending section of Songwe Hill.

The location of the Phalombe license, including Songwe Hill is shown in Figure 5-10. A geological map of the Songwe Hill area is shown in Figure 7-2.

14.2 Mineral Resource Estimate

The current Mineral Resource estimation exercise is based on a Microsoft Access database compiled by MSA containing borehole and surface channel sampling data (Figure 14-1) supplied by Mkango, from two exploration programmes covering Songwe Hill. Drilling and channel sampling were conducted between April 2011 and May 2012. MSA verified all data received from Mkango upon receipt and requested Mkango to rectify errors where these were identified.

This Technical Report includes TREO, Heavy Rare Earth Oxides (HREO) and Light Rare Earth Oxides (LREO) Mineral Resource Estimates for three domains defined as each of the dominant lithological units identified at Songwe Hill. These are Carbonatite-, Fenite- and a combination roughly of equal proportions of these two, termed the Mixed Domain.

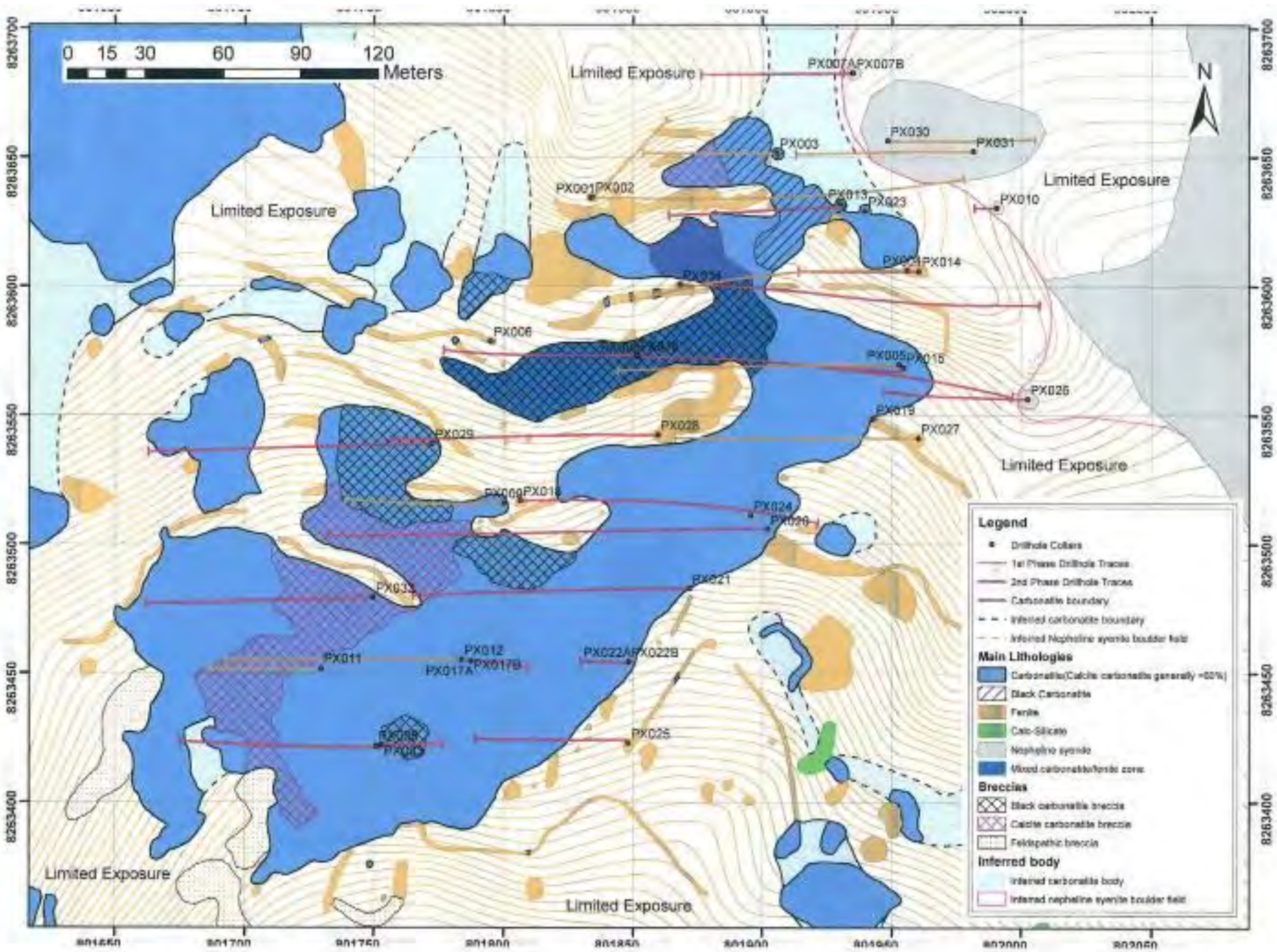
14.3 Known issues that materially affect Mineral Resources

All geological data were acquired in terms of the Standard Operating Procedures (SOP) as supplied by MSA at the Project outset. These SOP were designed to address all aspects of the CIM Exploration Best Practices Guidelines. MSA undertook audits and reviews of the exploration data as and when supplied by Mkango. The Project Access database was evaluated for use in Mineral Resource estimation by the application of an internal checklist for the assessment of data quality and integrity.

MSA exported the Access database into Microsoft Excel spread sheets and applied an internal checklist for the assessment of data quality and integrity. Final data verification was undertaken upon import into Datamine software, this being the selected 3-D modelling software package. Any errors and, or omissions identified at each interrogation stage were communicated to Mkango who then rectified the data accordingly.

No material issues were identified with respect to the finalized Mkango exploration database which would negatively impact on the declaration of the Mineral Resources. No material issues were identified by which the Mineral Resource Estimates could be materially affected by environmental, permitting, legal, title, taxation, socio-economic, marketing economic, marketing, political, or other factors.

Figure 14-1
Drilling plan for Songwe Hill



Source: *Hall (2012)*

14.4 Assumptions, Estimation Methods and Parameters

The methodology, assumptions and process for preparation of the Mineral Resource estimations are discussed under the following sections:

- input database validation and preparation;
- geological modelling;
- block model creation;
- statistical analysis of the input data;
- variogram modelling and grade continuity;
- estimation parameters;
- grade estimation; and
- Mineral Resource classification parameters.

14.4.1 Input Database Validation and Preparation

The input database consisted of borehole sample data including collar, lithology, sampling, assay, density, core recovery, magnetic susceptibility and structural data for boreholes, and lithology and assay data from surface channel samples. These data were derived from the combined 2010-2012 exploration programmes.

Lithology codes were retained as received for the Mkango boreholes. The input data was subjected to checks and validations at MSA and a database error listing was submitted to Mkango for rectification of the identified errors. Original data collection for the Mkango drilling was carried out on site at the time of the drilling by Mkango's appointed geological contractors and was periodically observed by MSA's representatives and associates; Messrs Mike Venter and Pete Siegfried respectively. Additional site inspections and verifications were undertaken by consultants Dr. Scott Swinden and Dr. Frieder Reichhardt and Mike Hall, both of MSA.

Data acquisition during the drilling was undertaken according to the established SOP. The total database consisted of 6,852.28 m of drilling in 38 inclined and vertical diamond boreholes as well as 424.08 m of channel sampling and logging in five channel sampling lines. A sixth channel line was chip sampled across 50 m resulting in 44 composited samples.

The breakdown of the exploration data available for Mineral Resource Estimation is shown in Table 14-1.

Table 14-1
Drilling and Channel input data Songwe Hill: Mineral Resource Estimation

Sample Type	Number[1]	Drill and Channel Metres	Sampled Metres
Boreholes	38	6,852.28	6,696.91
Surface Channels	5	424.08	424.08
Surface Chip sampling[2]	1	50.00	50.00
Total	45	7,326.36	7,170.99

Note: [1] *includes two boreholes at each of sites 7, 17 and 22;*
[2] *comprises 50 m of sampled outcrop comprising chips from only 44 samples.*

14.4.1.1 Collar and Downhole Survey

All borehole collars and all channel sample end points were surveyed using a Differential GPS system by a qualified and certificated Land Surveyor.

Drilling fence lines were aligned in an east to west direction, in order to intersect the depth extension to the mapped carbonatite outcrops. Fence lines were spaced at 25 m apart north to south. The down-dip borehole spacing varies between 50 m and 100 m. All fence lines contain more than one borehole.

All boreholes were surveyed down-the-hole with the exception of eight boreholes (PX003, PX007b, PX010, PX011, PX012, PX023, PX024 and PX027). The collared dip and direction readings for these eight were however accepted as the final borehole dip and direction considering both their relatively shallow depths and the minor deviations exhibited by those boreholes that had been surveyed. The coordinates of all channels were surveyed at the start, end and at each of the sample centre points along their length using a Differential GPS system.

Borehole data is spread evenly across the 400 m strike of the identified Songwe Hill carbonatite mineralization for which Mineral Resource Estimates were undertaken (Figure 14-1).

A total of 7,230 borehole samples and 454 channel samples are contained in the current database, amounting to 7,164.99 m of sample length. The nominal sample interval was 1 m. Average borehole sample length was 0.93 m and average channel sample length was 1.04 m.

A detailed topographic surface was supplied by Mkango for the Project area. The supplied borehole collar elevations were matched to this surface.

14.4.1.2 Density

Density measurements were undertaken at site using the Archimedes principle of weight in water versus weight in air. Density readings for 6,420 core samples, representing 5,690 m or approximately 80 % of the assayed sample length, were taken. Average core length for density determinations was 17 cm, with a maximum of 21 cm and a minimum of 8 cm, covering all lithologies intersected at Songwe. No density data were determined from the channel samples.

14.4.1.3 Core recoveries

Core recoveries for the Mkango diamond drilling were included in the supplied database. The length-weighted average core recovery is 88.2 % in the data set. There is a broad depth-core recovery relationship as shown in Table 14-2, showing increasing core recovery with increasing depth, this being assigned to the decreasing degree of weathering with increasing depth. The average depth of weathering is 20 m below surface at Songwe Hill.

Table 14-2
Core recovery in percent per depth interval below surface

Depth Interval (m)	0-10	0-20	0-30	0-40	0-50	Overall
Songwe Hill	57.5	66.5	72.5	77.4	79.3	88.2 %

Source: *Hall (2012)*

The core recovery data shown in Table 14-2 reflect the effects of a lower recovery rate during Phase 1 drilling. This was subsequently improved upon as documented in boreholes drilled during Phase 2 at the same collars as phase 1 drilling.

Voids or cavities have been intersected in several boreholes at Songwe Hill. These voids may attain lengths of up to 15 m (in borehole PX007a), as intersected in the drilling database. They occur at varying depths (9.15 m in borehole PX015 to 181.93 m in borehole PX008), mostly within carbonatite or carbonatite-dominant intervals. There is a total of 113.13 m in intervals reported as voids in the drilling database, representing 1.7 % of the drilled metres. This figure may be over-stated as it is partially a result of the sub-standard drilling practices in the first phase. An example of a void is shown in Figure 14-2.

Figure 14-3, which represents the complete drillhole database core recovery data, shows that there is no discernible relationship between grade and core recovery. This illustrates that there is no assay bias introduced as a result of core loss or enrichment in the REO concentration associated with cavities, supporting the incorporation of all borehole assay data in the Mineral Resource Estimate. In the disseminated style of mineralization, such as that found at Songwe Hill it is not expected that any relationship should exist between core recovery and grade.

It is recommended that studies of core recovery versus grade, lithology and depth be continued in future drilling programs. Once suitable information is available it is possible that a slight discount on the tonnages in some lithologies in certain depth intervals may be considered as a result of voids.

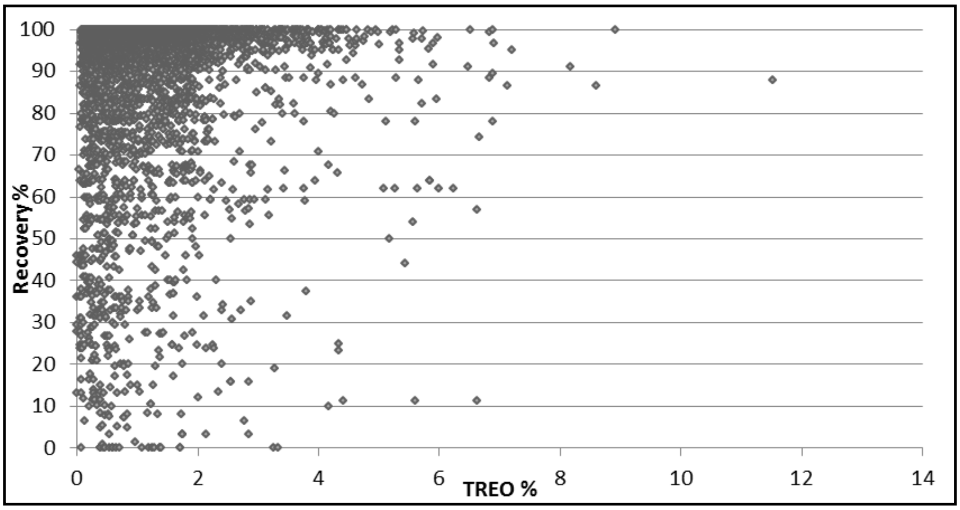
Figure 14-2

Void or cavity in carbonatite: void is 20 cm in diameter rimmed with calcite

Source: *Hall (2012)*

Figure 14-3

Scattergram of core recoveries versus grade for Songwe Hill



Source: *Hall (2012)*

14.4.1.4 Quality Control Quality Assurance

The assay data quality control and quality assurance is described in Section 11. MSA believes the levels of assay precision and assay accuracy are sufficient for use in Mineral Resource Estimations at the current level of confidence.

14.4.1.5 Checklist for Mineral Resource Estimation

Table 14-3 lists the parameters assessed for reporting the Songwe Hill Mineral Resource. These parameters are based on the Canadian Institute for Mining, Metallurgy and Petroleum (CIM) Guidelines for Disclosure of Mineral Resource estimates and are made in accordance with industry standard definitions approved by the CIM, which have been incorporated by reference into NI 43-101.

Table 14-3
Checklist for Mineral Resource Reporting (CIM 2010)

Checklist for Mineral Resource Reporting	
Drilling techniques	Inclined and vertical diamond drilling of both NQ and HQ diameter. Inclined boreholes were drilled at angles between -60 and -80 degrees to the west and east. Channel samples were cut from outcrops using a diamond saw. Two parallel grooves 5 cm apart were cut, from which samples were removed using a chisel.
Logging	All boreholes and channels were geologically logged by qualified geologists. The logging was of an appropriate standard for Mineral Resource Estimation
Drill sample recovery	Core recoveries are documented for the Mkango diamond boreholes and are an average of approximately 88%. Channel sample recoveries were not documented
Sampling methods	Core samples were collected using a nominal sample length of 1 m while making the appropriate adjustments to honour geological variability. Channels were also sampled at 1 m intervals. MSA observed that the routine sampling methods were of a high standard and suitable for Mineral Resource Estimation purposes
Quality of assay data and laboratory tests	The assay database displays industry standard levels of precision and accuracy and meets the requirements for use in Mineral Resource Estimation
Verification of sampling and assaying	Internal data verification is carried out as a standard. This incorporated approximately 5% blanks, 5% certified reference materials and 5% duplicates. An external verification of approximately 5% of the assay data was carried out using an umpire laboratory. Assay QAQC was found to be acceptable
Location of data points	All Mkango borehole collars were surveyed by a qualified surveyor using a differential GPS system. All except eight boreholes were downhole surveyed. Those not downhole surveyed were, with one exception less than 104 m in length and were assumed to have been drilled as collared. One borehole was 182 m in length and was also accepted to have drilled as collared. Channel samples were also surveyed using a differential GPS system, at each sample point and at the channel start and end points
Tonnage factors (*in-situ* bulk densities)	Density determinations were made for approximately 80% of the drilling database' samples using the Archimedes method of weight in air versus weight in water
Data density and distribution	Diamond drilling was carried out along fence lines at 25 m apart north-south and at between 50 m and 100 m east-west along these fences

Checklist for Mineral Resource Reporting	
Drilling techniques	Inclined and vertical diamond drilling of both NQ and HQ diameter. Inclined boreholes were drilled at angles between -60 and -80 degrees to the west and east. Channel samples were cut from outcrops using a diamond saw. Two parallel grooves 5 cm apart were cut, from which samples were removed using a chisel.
Logging	All boreholes and channels were geologically logged by qualified geologists. The logging was of an appropriate standard for Mineral Resource Estimation
Drill sample recovery	Core recoveries are documented for the Mkango diamond boreholes and are an average of approximately 88%. Channel sample recoveries were not documented
Sampling methods	Core samples were collected using a nominal sample length of 1 m while making the appropriate adjustments to honour geological variability. Channels were also sampled at 1 m intervals. MSA observed that the routine sampling methods were of a high standard and suitable for Mineral Resource Estimation purposes
Quality of assay data and laboratory tests	The assay database displays industry standard levels of precision and accuracy and meets the requirements for use in Mineral Resource Estimation
Verification of sampling and assaying	Internal data verification is carried out as a standard. This incorporated approximately 5% blanks, 5% certified reference materials and 5% duplicates. An external verification of approximately 5% of the assay data was carried out using an umpire laboratory. Assay QAQC was found to be acceptable
Location of data points	All Mkango borehole collars were surveyed by a qualified surveyor using a differential GPS system. All except eight boreholes were downhole surveyed. Those not downhole surveyed were, with one exception less than 104 m in length and were assumed to have been drilled as collared. One borehole was 182 m in length and was also accepted to have drilled as collared. Channel samples were also surveyed using a differential GPS system, at each sample point and at the channel start and end points
Tonnage factors (*in-situ* bulk densities)	Density determinations were made for approximately 80% of the drilling database' samples using the Archimedes method of weight in air versus weight in water
Database integrity	Data were supplied to MSA at regular intervals in Excel spreadsheets and were captured into a dedicated Microsoft Access database. These were subsequently exported as separate Microsoft Excel spreadsheets for import into Mineral Resource modelling software. MSA undertook audits on the database and Mkango addressed all identified inconsistencies and errors. The original Access database and the exported Excel spreadsheets have been declared as an accurate representation of the original data collected.
Dimensions	The Mineral Resource at Songwe Hill has been drilled over a length of 250 m in a north easterly direction and across a 100 m width in a westerly direction. The Mineral Resource occurs from surface and has been constrained by the depths of the boreholes. However, in some cases the resource has been extended an additional 25 m to 30 m below the borehole depth after consideration was given to the depths of adjacent boreholes.
Geological interpretation	The current geological model comprises a vertically dipping intrusive plug. The confidence in this interpretation is considered appropriate for Indicated Mineral Resource classification where supported by the data.

Checklist for Mineral Resource Reporting	
Drilling techniques	Inclined and vertical diamond drilling of both NQ and HQ diameter. Inclined boreholes were drilled at angles between -60 and -80 degrees to the west and east. Channel samples were cut from outcrops using a diamond saw. Two parallel grooves 5 cm apart were cut, from which samples were removed using a chisel.
Logging	All boreholes and channels were geologically logged by qualified geologists. The logging was of an appropriate standard for Mineral Resource Estimation
Drill sample recovery	Core recoveries are documented for the Mkango diamond boreholes and are an average of approximately 88%. Channel sample recoveries were not documented
Sampling methods	Core samples were collected using a nominal sample length of 1 m while making the appropriate adjustments to honour geological variability. Channels were also sampled at 1 m intervals. MSA observed that the routine sampling methods were of a high standard and suitable for Mineral Resource Estimation purposes
Quality of assay data and laboratory tests	The assay database displays industry standard levels of precision and accuracy and meets the requirements for use in Mineral Resource Estimation
Verification of sampling and assaying	Internal data verification is carried out as a standard. This incorporated approximately 5% blanks, 5% certified reference materials and 5% duplicates. An external verification of approximately 5% of the assay data was carried out using an umpire laboratory. Assay QAQC was found to be acceptable
Location of data points	All Mkango borehole collars were surveyed by a qualified surveyor using a differential GPS system. All except eight boreholes were downhole surveyed. Those not downhole surveyed were, with one exception less than 104 m in length and were assumed to have been drilled as collared. One borehole was 182 m in length and was also accepted to have drilled as collared. Channel samples were also surveyed using a differential GPS system, at each sample point and at the channel start and end points
Tonnage factors (*in-situ* bulk densities)	Density determinations were made for approximately 80% of the drilling database' samples using the Archimedes method of weight in air versus weight in water
Domains	The deposit has been sub-divided into domains comprising the two dominant lithologies and a domain comprising a mixture of the two lithologies
Compositing	Borehole core sample data were composited into 1 m lengths within the modelled domains.
Statistics and variography	Isotropic variograms were used to model the spatial continuity separately for each domain.
Top or bottom cuts for grades	Statistical analysis of the composited data demonstrated that no capping of the data was necessary, there being no isolated outlier values.
Data clustering	Boreholes were drilled on an approximately regular grid across the Project area. These holes have been drilled to varying depths in some areas, which has resulted in Mineral Resource classifications of lower confidence in those areas informed by fewer drillhole data at varying depths.
Block size	A three dimensional block model composed of 50 m E by 50 m N by 5 m RL cells was constructed for each domain

Checklist for Mineral Resource Reporting	
Drilling techniques	Inclined and vertical diamond drilling of both NQ and HQ diameter. Inclined boreholes were drilled at angles between -60 and -80 degrees to the west and east. Channel samples were cut from outcrops using a diamond saw. Two parallel grooves 5 cm apart were cut, from which samples were removed using a chisel.
Logging	All boreholes and channels were geologically logged by qualified geologists. The logging was of an appropriate standard for Mineral Resource Estimation
Drill sample recovery	Core recoveries are documented for the Mkango diamond boreholes and are an average of approximately 88%. Channel sample recoveries were not documented
Sampling methods	Core samples were collected using a nominal sample length of 1 m while making the appropriate adjustments to honour geological variability. Channels were also sampled at 1 m intervals. MSA observed that the routine sampling methods were of a high standard and suitable for Mineral Resource Estimation purposes
Quality of assay data and laboratory tests	The assay database displays industry standard levels of precision and accuracy and meets the requirements for use in Mineral Resource Estimation
Verification of sampling and assaying	Internal data verification is carried out as a standard. This incorporated approximately 5% blanks, 5% certified reference materials and 5% duplicates. An external verification of approximately 5% of the assay data was carried out using an umpire laboratory. Assay QAQC was found to be acceptable
Location of data points	All Mkango borehole collars were surveyed by a qualified surveyor using a differential GPS system. All except eight boreholes were downhole surveyed. Those not downhole surveyed were, with one exception less than 104 m in length and were assumed to have been drilled as collared. One borehole was 182 m in length and was also accepted to have drilled as collared. Channel samples were also surveyed using a differential GPS system, at each sample point and at the channel start and end points
Tonnage factors (*in-situ* bulk densities)	Density determinations were made for approximately 80% of the drilling database' samples using the Archimedes method of weight in air versus weight in water
Grade estimation	Metal grades were estimated using ordinary kriging. Grades were interpolated within a search ellipse representing the ranges of the isotropic variograms for each domain.
Mineral Resource Classification	The classification incorporated the confidence in the borehole data, the current geological interpretation, data distribution and variogram ranges. Blocks informed within the first search radius were classified as Indicated. The remainder were classified as Inferred Mineral Resources.
Cut-off grades	A series of cut-off grades have been selected for the purposes of Mineral Resource reporting on the Project. These were selected based on bench-marking of similar deposits. A base cut-off grade of 1% TREO was selected for the reported Mineral Resource.
Mining cuts	No mining cuts have been applied
Metallurgical factors or assumptions	No metallurgical test work had been completed at the time of the Mineral Resource Estimation.

Checklist for Mineral Resource Reporting	
Drilling techniques	Inclined and vertical diamond drilling of both NQ and HQ diameter. Inclined boreholes were drilled at angles between -60 and -80 degrees to the west and east. Channel samples were cut from outcrops using a diamond saw. Two parallel grooves 5 cm apart were cut, from which samples were removed using a chisel.
Logging	All boreholes and channels were geologically logged by qualified geologists. The logging was of an appropriate standard for Mineral Resource Estimation
Drill sample recovery	Core recoveries are documented for the Mkango diamond boreholes and are an average of approximately 88%. Channel sample recoveries were not documented
Sampling methods	Core samples were collected using a nominal sample length of 1 m while making the appropriate adjustments to honour geological variability. Channels were also sampled at 1 m intervals. MSA observed that the routine sampling methods were of a high standard and suitable for Mineral Resource Estimation purposes
Quality of assay data and laboratory tests	The assay database displays industry standard levels of precision and accuracy and meets the requirements for use in Mineral Resource Estimation
Verification of sampling and assaying	Internal data verification is carried out as a standard. This incorporated approximately 5% blanks, 5% certified reference materials and 5% duplicates. An external verification of approximately 5% of the assay data was carried out using an umpire laboratory. Assay QAQC was found to be acceptable
Location of data points	All Mkango borehole collars were surveyed by a qualified surveyor using a differential GPS system. All except eight boreholes were downhole surveyed. Those not downhole surveyed were, with one exception less than 104 m in length and were assumed to have been drilled as collared. One borehole was 182 m in length and was also accepted to have drilled as collared. Channel samples were also surveyed using a differential GPS system, at each sample point and at the channel start and end points
Tonnage factors (*in-situ* bulk densities)	Density determinations were made for approximately 80% of the drilling database' samples using the Archimedes method of weight in air versus weight in water
Audits and reviews	The following audit and review work was completed by MSA: • a comparison of the database against the original borehole logs and interpreted geological sections • a review of borehole data collection protocols and QA/QC systems • a site based review of the borehole data. • QA/QC audits by Dr S. Swinden, independent consultant to Mkango and by Dr Frieder Reichhardt of MSA

Source: *CIM (2010)*

14.4.2 Geological Modeling

Datamine Studio 3 was utilized for the three-dimensional modeling. Snowden Supervisor software was used for the univariate and geostatistical analysis.

REE mineralization at Songwe Hill deposit occurs within a vertically intruded carbonatite plug. The drilling to date has investigated only the north eastern portion of the plug. Within this portion, surface exposures show that the carbonatite is the dominant domain, which comprises carbonatite breccias and mixtures of carbonatite and fenite, with carbonatite accounting for >60 % of the rock mass.

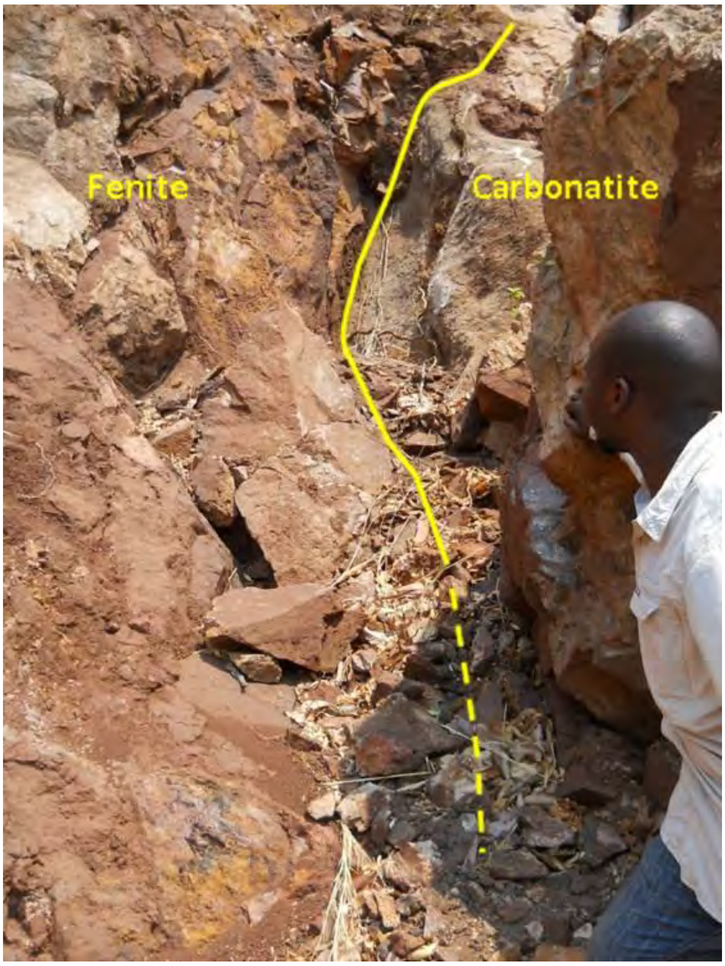
The relationships of the various lithologies and structural features within the carbonatite plug are difficult to establish. Rarely are contacts observed between the major lithologies. A sub-vertical dip was viewed between fenite and carbonatite at a single locality, shown in Figure 14-4. This single data point may however, not represent the overall orientation of the various lithologies with the plug.

Mkango supplied detailed logging section views along drill fence lines. These incorporated lithology and TREO data. An example illustrating the high level of logging detail is shown in the left-hand image in Figure 14-5. Lithological logging and associated assay data is highly variable between one sample and the next, often alternating between fenite and carbonatite on a scale of less than one metre. Such complex relationships are depicted in the insert in Figure 14-5.

In order to carry out mineral resource modeling some simplification of the lithological information was required. Upon request by MSA, Mkango provided geological logs that identified zones of carbonatite or fenite dominant lithologies that were correlated with the broad lithological zones mapped in surface exposures. The simplified equivalent of the section through PX004 and PX014 is shown in the right-hand image in Figure 14-5. Criteria used to create broad zones included potassium and silica contents (as indications of fenitisation) and higher grade TREO and $CaCO_3$ as indications of carbonatite dominance. A number of simplified sections were provided by Mkango, which were used in the generation of the rock type envelopes. Furthermore, the simplified lithological intervals were entered into a separate field in the geological database and these were used to enable broad scale geological modelling.

Figure 14-4

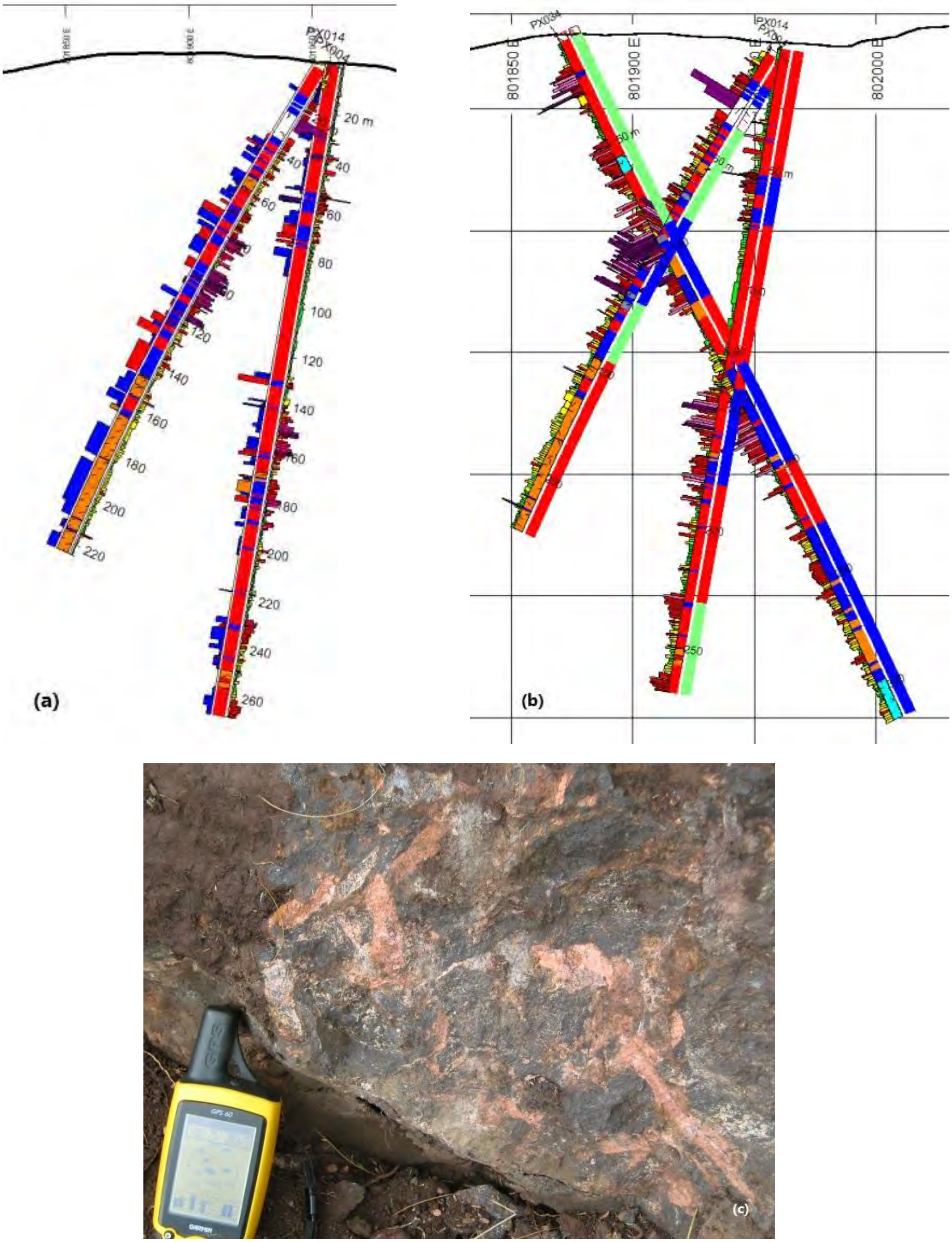
Sub-vertical fenite carbonatite contact at Songwe Hill



Source: *Hall (2012)*

Figure 14-5

Borehole sectional views



Note: *(a): secondary lithology annotated on left hand side of borehole, TREO% on right hand side*

(b): TREO% annotated on left hand side of borehole

(a) and (b): Red: Fenite; Blue: Carbonatite Light green: Mixed; Orange: Fenitized Phonolite Insert: Fenite (pink) in carbonatite at outcrop (detailed borehole legend is shown in Section 7.3.2)

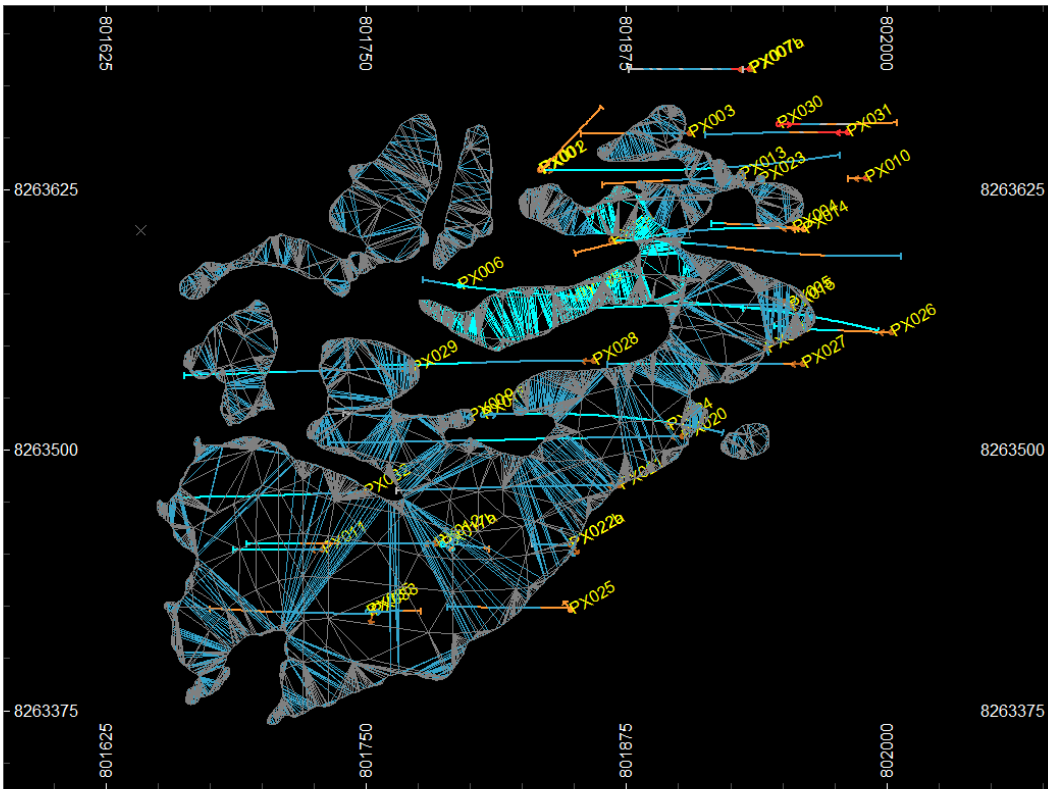
(c) Fenite (pink) in carbonatite at outcrop

Source: *after Brady (2012)*

The surface geological mapping provided the basis for the geological modelling. Consistent with the interpreted emplacement morphology of the plug, the geological contacts from the mapping were translated vertically downwards at 50 m intervals and adjusted with the intersection data in the boreholes. This enabled construction of the Carbonatite and Mixed Domain envelopes. An example of a horizontal sectional view of the wireframes is shown in Figure 14-6.

The modelled envelopes were extended 50 m horizontally away from the extents of the borehole intersections. The entire geological model was extended to 350 m below the topographic surface which resulted in the geological model being approximately 25 m below the deepest borehole intersections.

Figure 14-6
Example of an horizontal sectional interpretation at Songwe Hill: 300 m amsl

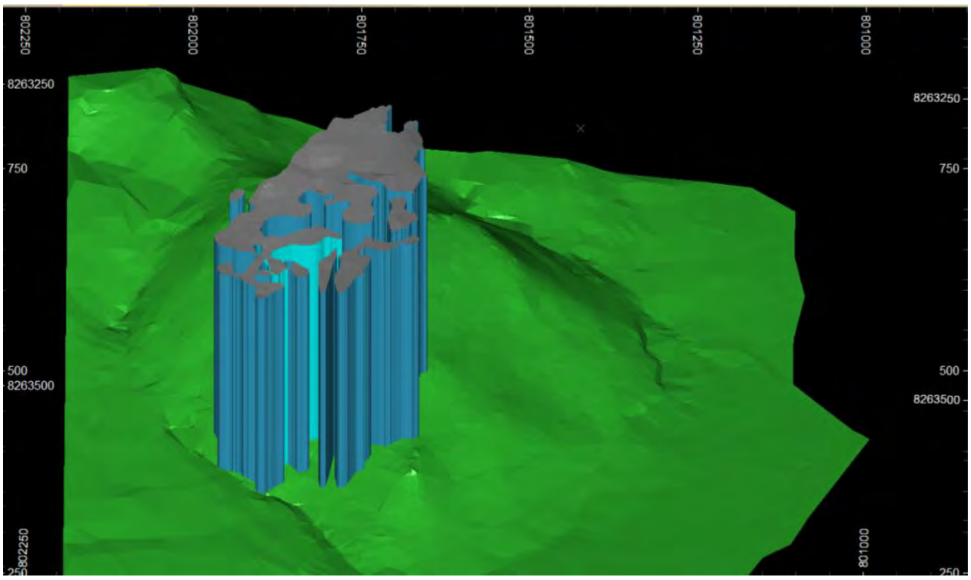


Note: *Light blue = carbonatite envelope and carbonatite intersections in boreholes; turquoise = mixed envelope and mixed intersections in boreholes; grey = planar surface is -300 m above mean sea level (amsl)*
Source: *Hall (2012)*

14.4.2.1 Topographic surface

A topographic survey including DGPS point data was provided by Mkango and the surveyed borehole collars were matched with this surface to produce a combined topographic surface (Figure 14-7). The channel sample data were draped onto the combined topographic surface. The orebody wireframe extents were constrained by the surface topography model. MSA notes that the acquisition of an updated topographic surface is planned for the next phase of exploration.

Figure 14-7
Oblique view of Songwe Hill Carbonatite and Mixed lithology wireframes cut by topographic surface looking south west



Note: *Light blue = carbonatite envelope and carbonatite intersections in boreholes; turquoise = mixed envelop and mixed intersections in boreholes; grey = topography cut-off domains; green surface = 350 m below topography plane*

Source: *Hall (2012)*

14.4.3 Block Model Creation

Block models were generated within the modelled mineralization wireframes for each domain using 50 m by 50 m blocks in the X (easting) and Y (northing) directions with exact wireframe edge fitting in the Z (elevation) direction. Cell splitting was applied to better fit the modelled wireframes, resulting in sub-cells of a minimum of 5 m x 5 m in the X and Y directions.

The common origin for the un-rotated block models is (UTM Zone 36 South, WGS84):

Easting (X): 801 500 m

Northing (Y): 8 263 000 m

Elevation (Z): 300 m above mean sea level (amsl).

14.4.4 Input Data Exploratory Data Analysis

Snowden Supervisor software was used for univariate and geostatistical analyses. These were carried out by domain. The input data for each domain were separated using the wireframe envelopes and then composited to approximately 1 m ensuring that all of the sample lengths were included in composites and that there were no residual lengths omitted. Statistical analysis was carried out on the 1 m composites.

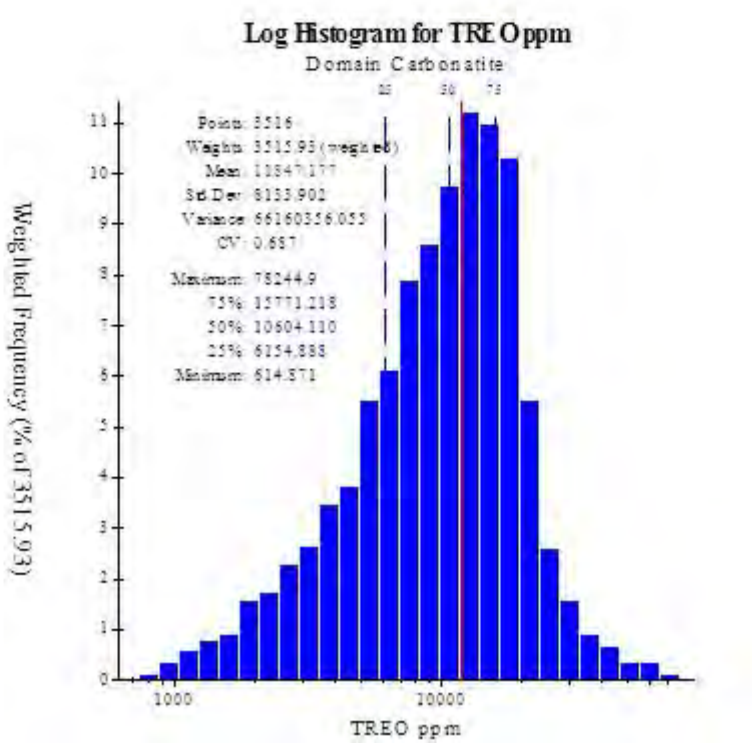
14.4.4.1 Songwe Hill TREO Statistics

Statistics for TREO for the Carbonatite, Fenite and Mixed Domains are depicted in Figure 14-8 to Figure 14-10. The log histograms of the Carbonatite and Fenite Domains are negatively skewed. The number of inflection points in the log probability plots indicate several distributions with each domain (Figure 14-11 to Figure 14-13), which may be a result of the imperfect nature of creating the generalized lithological zones. The histogram of the mixed domain clearly shows the difference between the fenite data and the carbonatite data within this domain.

The HREO proportion of the TREO is less than 9 %. In addition, Th and U contents at Songwe are low. Statistics for other constituents of each domain including HREO, Th, U and density are included in Appendix 4.

The individual domain TREO population coefficients of variation are all low indicating low variability overall and therefore it is acceptable to use Ordinary Kriging (OK) as the estimation technique

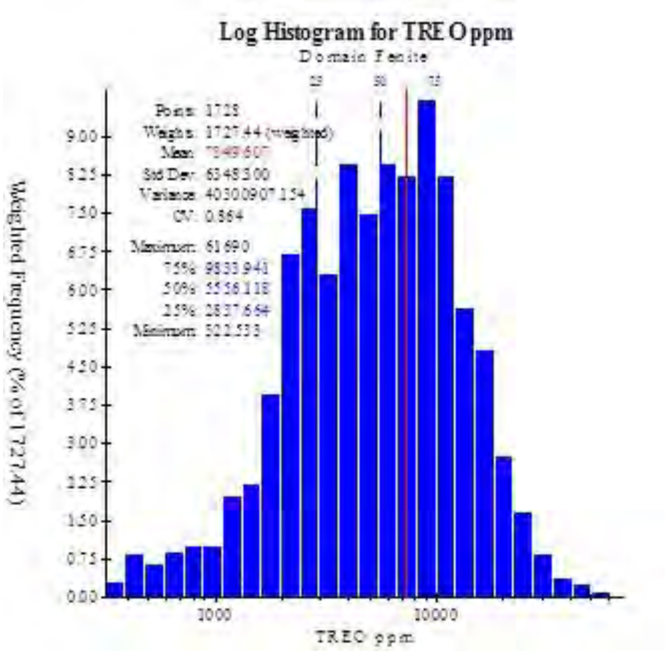
Figure 14-8
Borehole TREO in the Carbonatite Domain at Songwe Hill



Source: *Hall (2012*

Figure 14-9

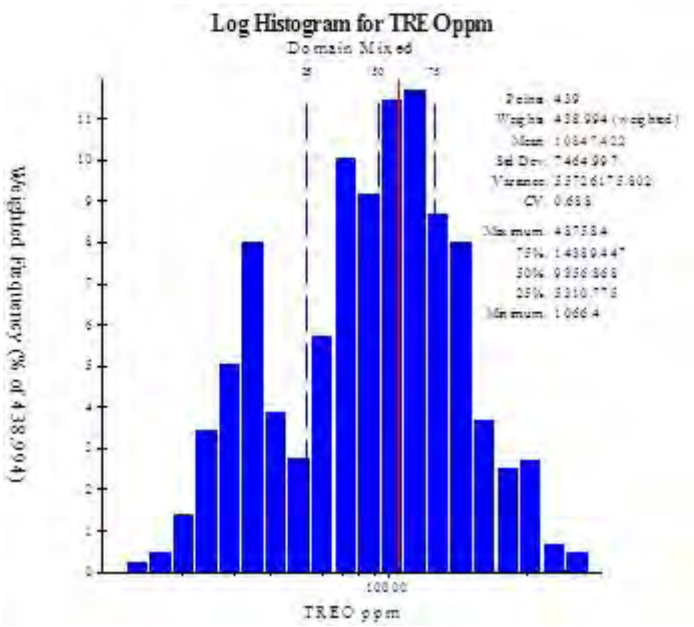
Borehole TREO in the Fenite Domain at Songwe Hill



Source: *Hall (2012*

Figure 14-10

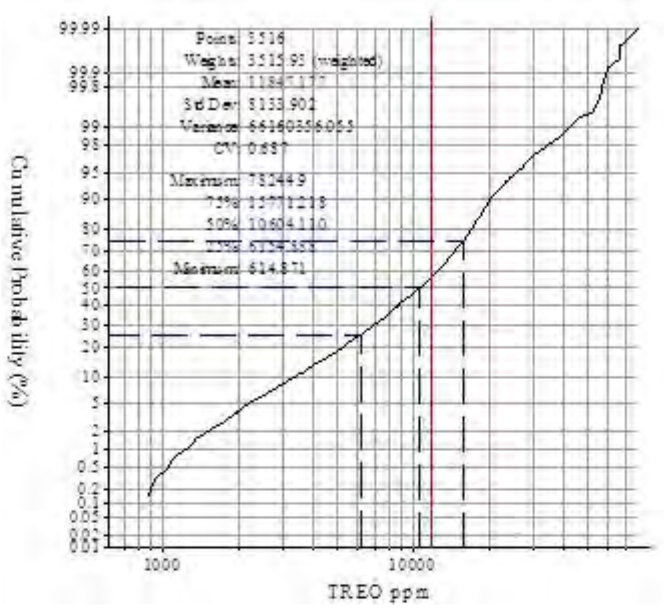
Borehole TREO in the Mixed Domain at Songwe Hill



Source: *Hall (2012*

Figure 14-11

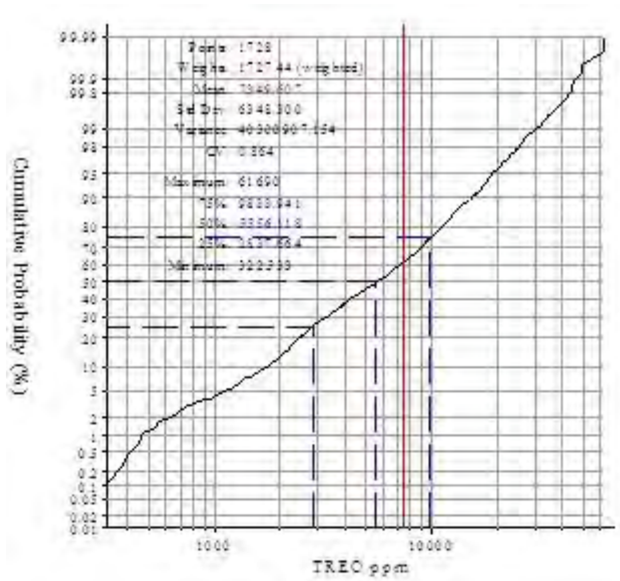
Songwe Hill Carbonatite Borehole TREO Log probability plot



Source: *Hall (2012*

Figure 14-12

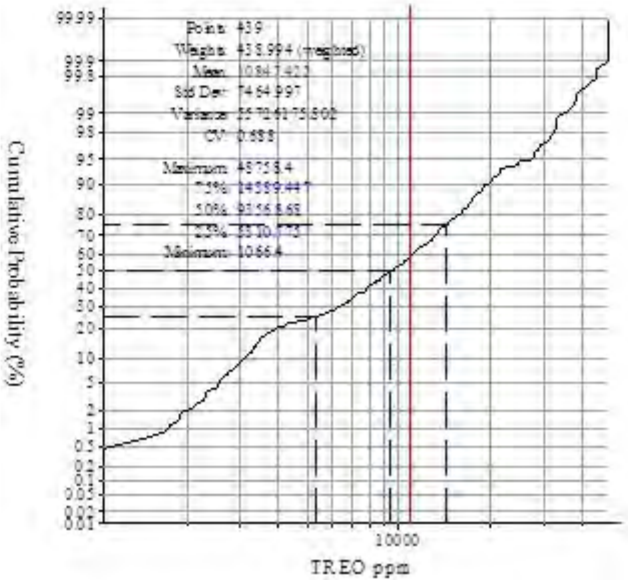
Songwe Hill Fenite Borehole TREO Log probability plot



Source: *Hall (2012*

Figure 14-13

Songwe Hill Mixed Borehole TREO Log probability plot

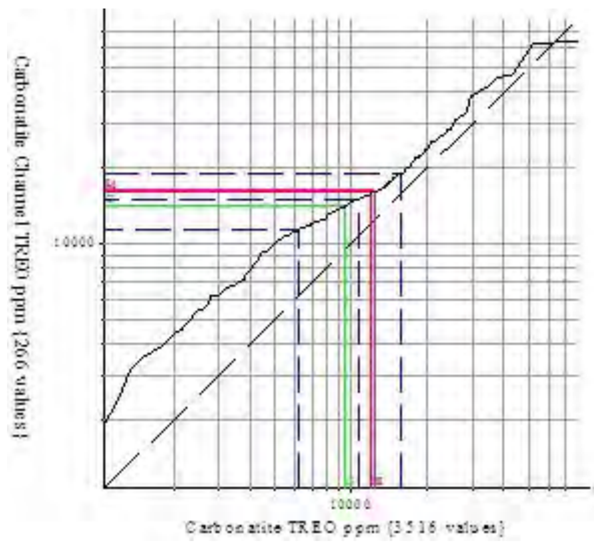


Source: *Hall (2012*

The borehole and channel data were compared for compatibility for use in the mineral resource estimates. Q-Q plots comparing the populations are shown in Figure 14-14 to Figure 14-16. These comparisons show that the channel sample grades for all domains are higher than the boreholes, suggesting they are from a different population, which may be a result of weathering and surface enrichment. As such the channel samples were excluded from the estimation database.

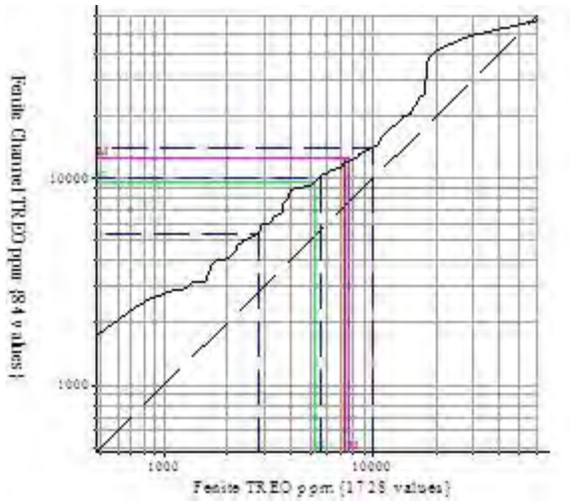
Figure 14-14

Songwe Hill Carbonatite Q-Q Plot: Boreholes versus Channels



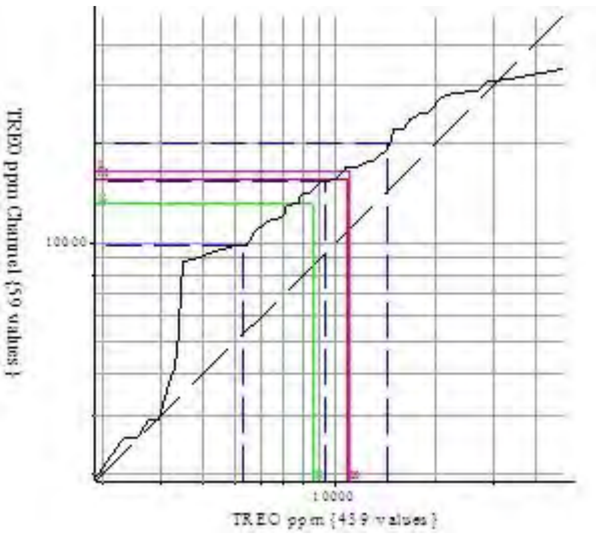
Source: *Hall (2012*

Figure 14-15
Songwe Hill Fenite Q-Q Plot: Boreholes versus Channels



Source: *Hall (2012*

Figure 14-16
Songwe Hill Mixed Q-Q Plot: Boreholes versus Channels



Source: *Hall (2012*

14.4.5 Individual REO Proportions

The drilling database was interrogated to yield proportions of the individual REOs as shown in Table 14-4 which represent the global proportions per domain. These data were subsequently applied per domain to assign proportions at differing cut offs.

Table 14-4 *Individual REO proportions at Songwe Hill*			
REO	**Carbonatite %**	**Fenite %**	**Mixed %**
Light Rare Earth Oxides (LREO)			
La_2O_3	24.23	23.88	26.85
Ce_2O_3	44.21	43.40	45.61
Pr_2O_3	4.75	4.68	4.60
Nd_2O_3	16.41	16.07	14.69
Sm_2O_3	24.23	23.88	26.85
Total LREO	**91.97**	**90.45**	**93.74**
Heavy Rare Earth Oxides (HREO)			
Eu_2O_3	0.65	0.69	0.53
Gd_2O_3	1.52	1.69	1.25
Tb_2O_3	0.18	0.21	0.15
Dy_2O_3	0.86	1.05	0.67
Ho_2O_3	0.14	0.17	0.11
Er_2O_3	0.33	0.42	0.25
Tm_2O_3	0.04	0.05	0.03
Yb_2O_3	0.24	0.29	0.19
Lu_2O_3	0.03	0.04	0.03
Y_2O_3	4.02	4.93	3.06
Total HREO	**8.03**	**9.55**	**6.26**

Source: *Hall (2012)*

14.4.6 Density

Density was interpolated into the block models for each domain similarly to a grade variable. Density values exist for 80 % of the samples used in the grade estimation. Histograms of density data are contained in Appendix 4.

14.4.7 Variogram Modeling and Grade Continuity

Variograms for TREO and HREO borehole data were modeled for each domain.

14.4.7.1 Songwe Hill variography detail

The omni-directional variograms for each domain are shown in Appendix 5. Heavy rare earths, as defined in this Technical Report comprise europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium and yttrium. The poor structure of the variograms models may be a function of the mixed data in the generalized lithological domains.

The omni-directional variogram parameters are tabulated in Table 14-5.

Table 14-5
Variogram parameters

Variable	Nugget	Range structure 1	Variance structure 1	Range structure 2	Variance structure 2
TREO Carbonatite	0.42	29 m	0.58	-	-
HREO Carbonatite	0.41	35.5 m	0.59	-	-
Th Carbonatite	0.38	30 m	0.62	-	-
U Carbonatite	0.33	8.5 m	0.46	50.5 m	0.21
Density Carbonatite	0.48	73.5 m	0.52	-	-
TREO Fenite	0.23	23.5 m	0.77	-	-
HREO Fenite	0.11	10 m	0.57	52 m	0.32
Th Fenite	0.08	7.5 m	0.92	-	-
U Fenite	0.21	24 m	0.79	-	-
Density Fenite	0.29	24.5 m	0.71	-	-
TREO Mixed	0.36	11 m	0.27	26 m	0.37
HREO Mixed	0.10	6 m	0.77	33 m	0.13
Th Mixed	0.21	20.5 m	0.79	-	-
U Mixed	0.32	6.5 m	0.18	34 m	0.50
Density Mixed	0.30	6 m	0.29	25 m	0.41

Source: *Hall (2012*

Grade interpolation was carried out for TREO, HREO, Th and U. The final LREO estimate was derived by deduction of the HREO estimate from the TREO estimate.

14.4.8 Estimation Parameters and Grade Estimation

Ordinary Kriging was used for the grade and density estimation for TREO and HREO. The estimation search parameters are shown in Table 14-6.

Table 14-6
Search parameters

Variable	Direction	Search Distance
TREO Carbonatite	omni-directional	29 m
HREO Carbonatite	omni-directional	35.5 m
Th Carbonatite	omni-directional	30 m
U Carbonatite	omni-directional	50.5 m
Density Carbonatite	omni-directional	73.5 m
TREO Fenite	omni-directional	23.5 m
HREO Fenite	omni-directional	52 m
Th Fenite	omni-directional	7.5 m
U Fenite	omni-directional	24 m
Density Fenite	omni-directional	24.5 m
TREO Mixed	omni-directional	26 m
HREO Mixed	omni-directional	33 m
Th Mixed	omni-directional	20.5 m
U Mixed	omni-directional	34 m
Density Mixed	omni-directional	25 m

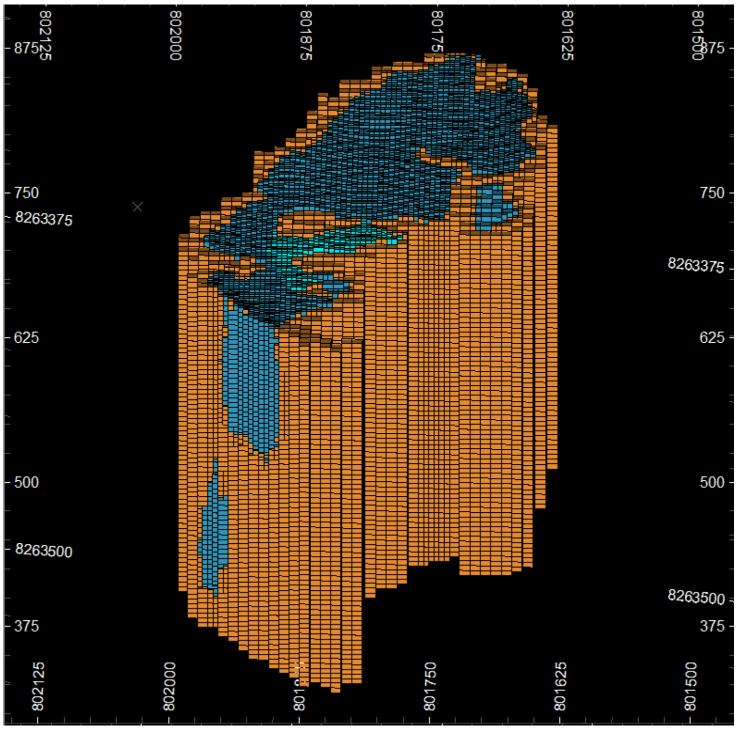
Source: *Hall (2012*

A minimum of 5 and a maximum of 10 samples were selected by the search ellipse in order to estimate a block. The number of samples selected was limited so that local outliers were limited in influence to adjacent areas. The first search selected samples within the variogram range. The search was expanded by up to nine times the variogram range so that all of the model cells were estimated with grade and density. Those blocks that were estimated with the expanded search are considered to be low confidence estimates, they being largely confined to the peripheries of the block model. Parent cell estimation was undertaken.

A view of the combined block model, coloured by domain is presented in Figure 14-17 and the same view is presented in Figure 14-18 coloured by TREO grade.

Figure 14-17

Block model view looking south west: All Domains



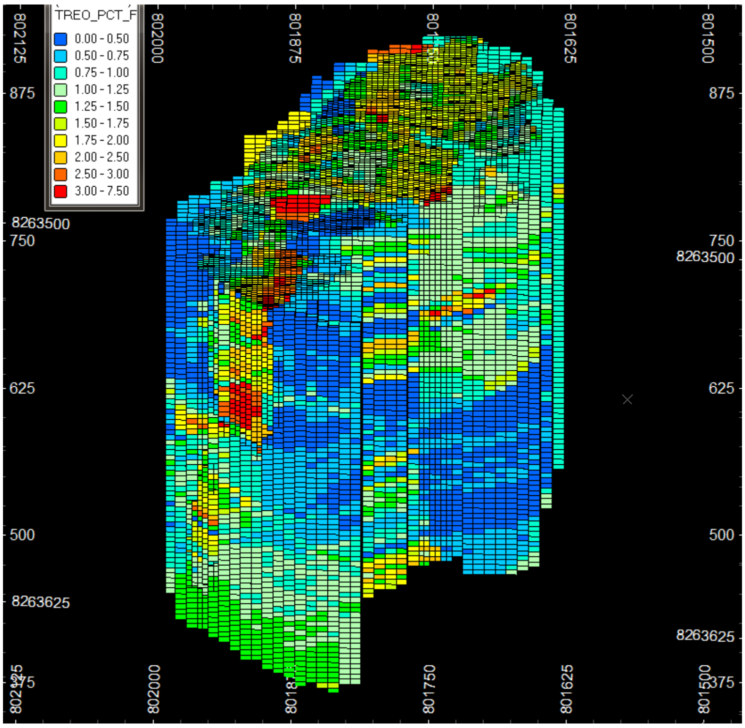
Note: *Blue = Carbonatite Domain Blocks; Brown = Fenite; Turquoise = Mixed*

Source: *Hall (2012)*

The surface expressions of TREO, LREO, HREO and Th grades at Songwe Hill are shown in Figure 14-19 to Figure 14-22. Thorium contents at Songwe are low as depicted in Figure 14-22. HREO constitute approximately 8 % of the TREO content in carbonatite, 9.5 % in the fenite and approximately 6 % in the mixed Domain.

Figure 14-18

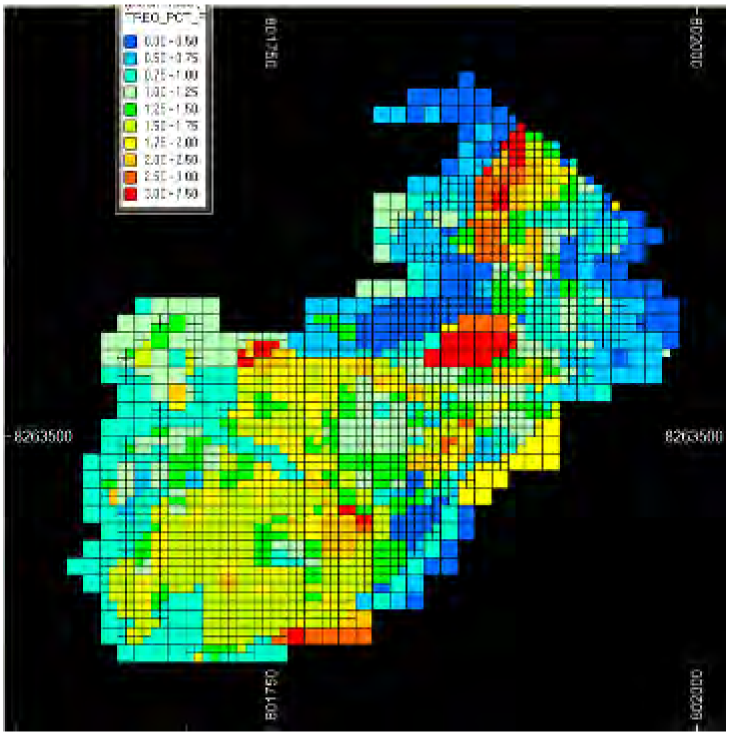
Block model view looking south west: All domains TREO %



Source: *Hall (2012)*

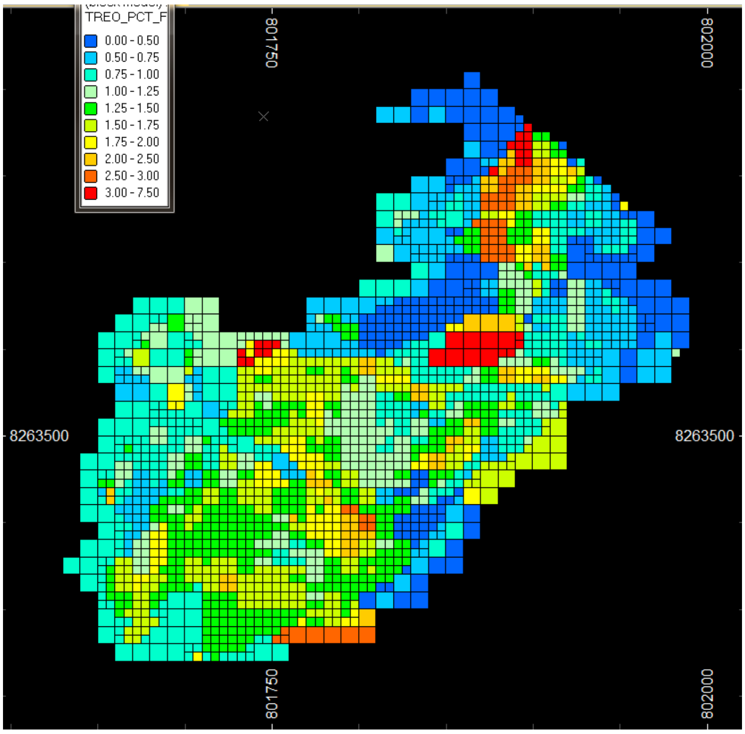
Figure 14-19

Surface expression of TREO grades at Songwe Hill



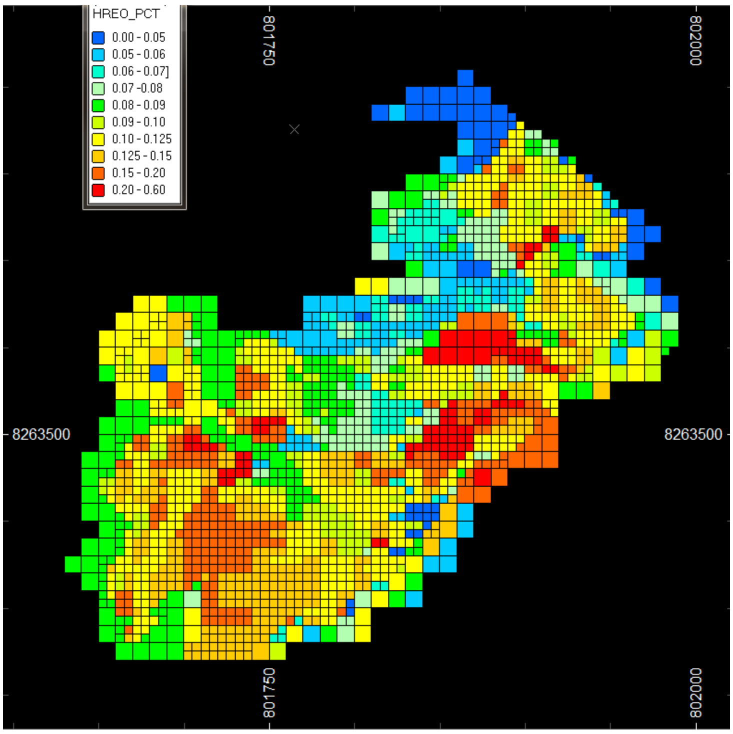
Source: *Hall (2012)*

Figure 14-20
Surface expression of LREO grades at Songwe Hill



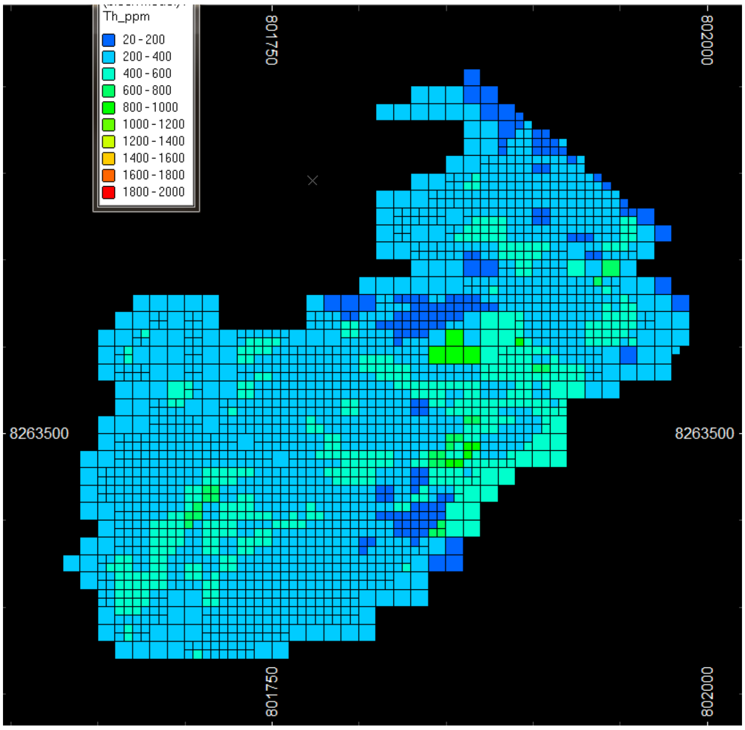
Source: *Hall (2012)*

Figure 14-21
Surface expression of HREO grades at Songwe Hill



Source: *Hall (2012)*

Figure 14-22
Surface expression of Th grades at Songwe Hill



Source: *Hall (2012)*

14.4.9 Geological Losses

No geological losses were applied for the current Mineral Resource Estimates. Geological features such as faults and dykes are not known to occur within the Mineral Resource. The reported voids represent a consideration for discounting the Mineral Resource by 1.7 % but this has not been applied due to a degree of uncertainty regarding the currently documented void data.

14.4.10 Mineral Resource Classification

Blocks that were estimated by samples within the variogram range were classified as Indicated Mineral Resources and the remainder of the block model estimates were classified as Inferred Mineral Resources.

The interpreted geological model at Songwe is of a vertically-intruded plug. Dips of the margins and of the internal lithological contacts have been interpreted as vertical in this model but there is limited data to support this.

Drilling data is considered to be of an appropriate level of detail and reliability and is spread evenly across the study area. It is considered that drilling data adequately covers the Mineral Resource to attain Indicated classification in those areas covered by the regular grid.

The geological breakdown into domains is not currently well enough defined in order to classify the Mineral Resource with more confidence than Indicated. It is noted that the grade continuity is a function of the lithological domains and that more confidence in the estimates may result from better definitions of the domains.

An overall assessment of the above factors limits the current Mineral Resource to the Indicated category.

14.5 Mineral Resource Statement

14.5.1 Songwe Hill Mineral Resources

The Songwe Hill Mineral Resource has been classified as Indicated and Inferred for each of the Carbonatite, Fenite and Mixed domains in accordance with CIM guidelines. These are shown in Table 14-7 to Table 14-12. Comparisons are made at a number of cut off grades for TREO in 0.5 % increments from 0.5 % to 2.0 %, although the base case cut-off grade was assigned as 1.0 % TREO at 30th September 2012, which is highlighted in the various tabulations of the Mineral Resource.

Table 14-7
In-situ Indicated Mineral Resources for Songwe Hill: Carbonatite domain as at 30th September 2012

TREO % Cut Off	Million Tonnes	DENSITY	TREO %	LREO %	HREO %	Th ppm	U ppm	TREO Tonnes	LREO Tonnes	HREO Tonnes
0.5	16.31	2.79	1.35	1.24	0.11	322	12	219,978	202,724	17,255
1.0	**11.10**	**2.80**	**1.62**	**1.50**	**0.12**	**351**	**12**	**179,499**	**166,429**	**13,071**
1.5	5.26	2.79	2.03	1.91	0.13	385	12	106,886	100,185	6,699
2.0	1.85	2.78	2.63	2.50	0.13	429	12	48,572	46,193	2,379

Source: *Hall (2012)*

Table 14-8
In-situ Inferred Mineral Resources for Songwe Hill: Carbonatite domain as at 30th September 2012

TREO % Cut Off	Million Tonnes	DENSITY	TREO %	LREO %	HREO %	Th ppm	U ppm	TREO Tonnes	LREO Tonnes	HREO Tonnes
0.5	17.09	2.82	1.07	0.97	0.09	304	12	182,866	166,637	16,226
1.0	**8.64**	**2.87**	**1.35**	**1.24**	**0.11**	**324**	**11**	**116,967**	**107,335**	**9,629**
1.5	1.90	2.87	1.85	1.72	0.12	349	11	35,045	32,709	2,335
2.0	0.39	2.89	2.50	2.38	0.12	358	11	9,849	9,383	466

Source: *Hall (2012)*

Table 14-9
In-situ Indicated Mineral Resources for Songwe Hill: Fenite domain as at 30th September 2012

TREO % Cut Off	Million Tonnes	DENSITY	TREO %	LREO %	HREO %	Th ppm	U ppm	TREO Tonnes	LREO Tonnes	HREO Tonnes
0.5	2.71	2.81	1.18	1.09	0.09	288	13	31,912	29,504	2,408
1.0	**1.37**	**2.85**	**1.61**	**1.51**	**0.10**	**301**	**11**	**22,145**	**20,704**	**1,441**
1.5	0.59	2.87	2.11	1.98	0.12	334	10	12,460	11,735	726
2.0	0.24	2.84	2.59	2.45	0.14	378	10	6,313	5,972	341

Source: *Hall (2012)*

Table 14-10
In-situ Inferred Mineral Resources for Songwe Hill: Fenite domain as at 30th September 2012

TREO % Cut Off	Million Tonnes	DENSITY	TREO %	LREO %	HREO %	Th ppm	U ppm	TREO Tonnes	LREO Tonnes	HREO Tonnes
0.5	17.47	2.82	1.06	0.97	0.09	271	13	184,819	169,732	15,086
1.0	**8.27**	**2.86**	**1.35**	**1.24**	**0.10**	**295**	**13**	**111,318**	**102,935**	**8,381**
1.5	1.73	2.83	1.88	1.75	0.12	331	11	32,477	30 ,74	2,104
2.0	0.41	2.75	2.41	2.27	0.14	350	11	9,875	9,313	562

Source: *Hall (2012)*

Table 14-11
In-situ Indicated Mineral Resources for Songwe Hill: Mixed domain as at 30th September 2012

TREO % Cut Off	Million Tonnes	DENSITY	TREO %	LREO %	HREO %	Th ppm	U ppm	TREO Tonnes	LREO Tonnes	HREO Tonnes
0.5	1.01	2.79	1.38	1.31	0.07	318	12	13,993	13,266	727
1.0	0.69	2.80	1.65	1.58	0.07	335	12	11,454	10,941	513
1.5	0.31	2.72	2.19	2.11	0.08	387	14	6,719	6,469	250
2.0	0.15	2.65	2.68	2.60	0.08	420	17	3,924	3,806	118

Source: *Hall (2012)*

Table 14-12
In-situ Inferred Mineral Resources for Songwe Hill: Mixed domain as at 30th September 2012

TREO % Cut Off	Million Tonnes	DENSITY	TREO %	LREO %	HREO %	Th ppm	U ppm	TREO Tonnes	LREO Tonnes	HREO Tonnes
0.5	1.90	2.86	1.56	1.50	0.06	251	11	29,614	28,430	1,184
1.0	1.68	2.87	1.65	1.59	0.06	248	11	27,863	26,815	1,049
1.5	1.43	2.87	1.74	1.68	0.06	243	11	24,890	24,005	885
2.0	0.11	2.94	2.36	2.29	0.07	255	11	2,595	2,521	73

Source: *Hall (2012)*

The totals per Mineral Resource category for the combined domains at the base case cut-off grade of 1 % TREO are shown in Table 14-13 and Table 14-14.

The total Indicated Mineral Resource for all domains at Songwe Hill is 13.16 million tonnes at a TREO grade of 1.62 % which equates to 213,098 tonnes of TREO at a 1 % TREO cut-off.

The total Inferred Mineral Resource for all domains at Songwe Hill is 18.59 million tonnes at a TREO grade of 1.3 8 %, which equates to 256,149 tonnes of TREO at a 1 % TREO cut-off.

Table 14-13
In-situ Indicated Mineral Resources for Songwe Hill: All domains at a 1% TREO cut-off as at 30th September 2012

Domain	Million Tonnes	LREO %	HREO %	TREO %	TREO Tonnes	HREO Proportion
Carbonatite	11.10	1.50	0.12	1.62	179,499	7.3 %
Fenite	1.37	1.51	0.10	1.61	22,145	6.5 %
Mixed	0.69	1.58	0.07	1.65	11,454	4.5 %
Totals	13.16	1.50	0.11	1.62	213,098	7.1 %

Source: *Hall (2012)*

Table 14-14
In-situ Inferred Mineral Resources for Songwe Hill: All domains at a 1% TREO cut-off as at 30th September 2012

Domain	Million Tonnes	LREO %	HREO %	TREO %	TREO Tonnes	HREO Proportion
Carbonatite	8.64	1.24	0.11	1.35	116,967	8.2%
Fenite	8.27	1.24	0.10	1.35	111,318	7.5%
Mixed	1.68	1.59	0.06	1.65	27,863	3.8%
Totals	18.59	1.28	0.10	1.38	256,149	7.4%

Source: *Hall (2012)*

The individual REO contents at the 1 % TREO cut off are shown in Table 14-15 (Indicated Mineral Resources) and Table 14-16 (Inferred Mineral Resources).

Table 14-15

In-situ Indicated Mineral Resources: Individual REO contents at Songwe Hill at the 1% TREO cut off as at 30th September 2012

Domain	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
	million	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Carbonate	11.10	3,951	7,208	775	2,676	387	14,997	95	223	27	127	21	48	6	36	5	590	1,178	16,175	351	12
Fenite	1.37	3,980	7,235	779	2,679	404	15,077	76	186	24	116	19	46	6	32	4	542	1,050	16,127	301	11
Mixed	0.69	4,520	7,678	774	2,473	335	15,780	63	148	17	79	13	29	4	22	3	362	739	16,519	335	12

Source: *Hall (2012)*

Table 14-16

In-situ Inferred Mineral Resources: Individual REO contents at Songwe Hill at the 1% TREO cut off as at 30th September 2012

Domain	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
	million	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Carbonate	8.64	3,275	5,974	642	2,218	321	12,430	90	211	25	120	19	46	6	34	5	559	1,115	13,545	324	11
Fenite	8.27	3,286	5,973	643	2,212	333	12,448	73	180	23	112	18	44	5	31	4	523	1,014	13,462	295	12
Mixed	1.68	4,559	7,746	781	2,495	338	15,918	53	125	14	66	11	25	3	19	3	304	622	16,541	248	11

Source: *Hall (2012)*

The tabulations per cut-off grade and per domain are included in Appendix 6

The proportions of the individual REOs at the 1 % TREO cut off are presented in Table 14-17 and Table 14-18.

Table 14-17

In-situ Indicated Mineral Resources: Individual REO proportions at Songwe Hill at the 1% TREO cut off as at 30th September 2012

Domain	Tonnes million	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
Carbonate	11.10	24.43	44.56	4.79	16.54	2.39	0.59	1.38	0.17	0.78	0.13	0.30	0.04	0.22	0.03	3.65	100
Fenite	1.37	24.68	44.86	4.83	16.61	2.50	0.47	1.15	0.15	0.72	0.12	0.28	0.04	0.20	0.03	3.36	100
Mixed	0.69	27.36	46.48	4.69	14.97	2.03	0.38	0.90	0.10	0.48	0.08	0.18	0.02	0.13	0.02	2.19	100

Source: *Hall (2012)*

Table 14-18

In-situ Inferred Mineral Resources: Individual REO proportions at Songwe Hill at the 1% TREO cut off as at 30th September 2012

Domain	Tonnes million	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
Carbonate	8.64	24.18	44.11	4.74	16.37	2.37	0.67	1.56	0.19	0.89	0.14	0.34	0.04	0.25	0.03	4.12	100
Fenite	8.27	24.41	44.37	4.78	16.43	2.48	0.54	1.33	0.17	0.83	0.14	0.33	0.04	0.23	0.03	3.89	100
Mixed	1.68	27.56	46.83	4.72	15.08	2.04	0.32	0.75	0.09	0.40	0.06	0.15	0.02	0.11	0.02	1.84	100

Source: *Hall (2012)*

The individual REO proportions do not vary greatly between the different cut-off grades. The tabulations of individual REO per cut-off grade and per domain are included in Appendix 7.

Indicated Mineral Resources are inclusive of Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability.

14.6 Conclusions

This is the maiden Mineral Resource reported for Songwe Hill.

The combined domain Indicated Mineral Resource for Songwe Hill is 13.16 million tonnes at a TREO grade of 1.62 % which equates to 213,098 tonnes of TREO at a 1 % TREO cut-off.

The combined domain Inferred Mineral Resource for Songwe Hill is 18.59 million tonnes at a TREO grade of 1.38 % equating to 256,149 tonnes of TREO at a 1 % TREO cut-off.

The HREO constitute 8.03 % of the TREO content in the Carbonatite domain, 9.55 % of the TREO in the Fenite and 6.26 % of the TREO in the Mixed domain.

The current Mineral Resource Estimate only covers an area in the north eastern portion of Songwe Hill. There is potential to identify additional mineral resources, both immediately to the northeast and southwest of the drilled area as well as at depth.

The remainder of Songwe Hill may also have additional REO mineral resource potential, the testing of which could involve step-out drilling to the north east and south west on a 25 m fence line spacing. In addition, there is potential to extend the mineralization through shallow depth drilling into other carbonatite outcrop areas at Songwe Hill.

The apparent difference between the borehole and channel sample TREO grades should be investigated in order to understand this bias. Following this, inclusion of the channel sample data into the estimation database could be considered.

15 MINERAL RESERVE ESTIMATES

The Mineral Reserve Estimate reported here is based on the mine design and processing methods discussed in later Sections of this Technical Report. The Mineral Reserves were estimated by applying the modifying factors developed as part of the mine design to the portion of the Indicated Mineral Resources contained in the final pit design. The Mineral Resources are summarised in Table 14-13.

15.1 Mineral Reserve Estimation Process

The process followed in converting the Mineral Resources to Mineral Reserves was as follows:

- a pit optimisation exercise was completed and is discussed in Section 16.2;
- only Indicated Mineral Resources were considered for the pit optimisation and design exercise;
- input criteria were developed for the pit optimisation (See table 16-5);
- a practical pit design was completed using the optimum pit shell generated by the pit optimisation exercise as a base. The practical pit design includes ramps, safety berms and other aspects not considered by the optimisation software and is discussed in Section 16.3;
- a production schedule was generated from the pit design, based on the mine owner's stated production target and is discussed in Section 16.4;
- capital and operating costs were estimated for the construction and operation of the mine (Section 21); and
- the production schedule and cost estimates were used in a discounted cash flow model, together with the expected realised product prices and plant recoveries. The result of the financial modelling was positive showing that, based on the assumptions and estimations made in this PFS, the Mineral Resources can be profitably mined.

15.2 Modifying factors

15.2.1 Cut-off grade

Based on the life of mine average operating cost a breakeven grade was calculated. The calculation of the breakeven grade is shown in Table 15-1.

Table 15-1 Pay limit grade estimate		
Description	**Unit**	**Value**
TREO price	US$/kg	59.76
Plant recovery	%	34
Operating costs	US$/t milled	93.55
Mining	US $/t milled	23.45
Processing	US $/t milled	61.55
G & A	US $/t milled	8.55
Required mill feed grade	%	0.46
Metal loss	%	5
Dilution during mining	%	5
Breakeven in-situ grade	% TREO	0.51

In order to ensure that an operating margin is maintained and that the capital expenditure is recovered, a cut-off grade of 1 % TREO was applied in the pit optimisation and in the pit design and schedule.

15.2.2 Dilution

Mining dilution of 5 % of the *in-situ* tonnes was included in the production schedule. It is assumed that the dilution carries no grade. This is a conservative assumption as this material may well be low grade material. Since the orebody is massive in nature, with overall dimensions of approximately 300 m by 200 m in plan, it is considered that no more than 5 % dilution should be expected.

15.2.3 Ore loss

In the production scheduling an allowance was made for ore loss of 5 %. This is to account for inefficiencies in the mining process. This is tonnage loss and does not affect the RoM grade.

15.2.4 Metallurgical recovery

Based on the work reported in Section 17 of this Technical Report, the overall recovery of TREO is 34 %. This recovery accounts for the portion of Ce which is removed by the metallurgical process and is not sold. This plant recovery was used both in the pit optimisation exercise and in the financial model.

15.2.5 Metal prices

The forecast of the price that will be realised by Mkango Resources for the individual rare earths minerals is discussed in Section 22 of this Technical Report. The application of these prices results in an average basket price of US$ 59.76 per kg of recovered TREO over the life of the mine.

15.2.6 Other factor affecting the Mineral Reserve estimate

In the geotechnical study a range of slope angles for the open pit design are recommended, namely (Table 16-4):

- aggressive design;
- conservative design; and
- moderate design.

The initial pit optimisation and mine design, on which the Mineral Reserve Estimate is based, used the moderate estimate, with a safety factor of 1.3. In order to understand the effect of a change in slope design, should further detailed work show that the slope design needs to be revised, a pit optimisation run was also done using the conservative design slope angles, with a safety factor of 1.5.

15.3 Mineral Reserves summary

The Mineral Reserves for the Songwe Hill Project, estimated as a result of this study, are summarised in Table 15-2 below.

Table 15-2
Mineral Reserve Estimate summary

Category	Tonnes	TREO %	TREO content (t)
Probable Mineral Reserves	8,482,603	1.60	136,139
Proven Mineral Reserves	-	-	-
Total Mineral Reserves	**8,482,603**	**1.60**	**136,139**

Note: *TREO – Total Rare Earth Oxides including yttrium.*

16 MINING METHODS

16.1 Introduction

The Mineral Resource models and grade estimates are considered to be appropriate as a basis for a PFS.

The Songwe Hill Project will be mined using an open pit mining method. An earthmoving contractor will be engaged to carry out the mining operations. Both the deposit and waste mineralization will require drilling and blasting. A standard excavator and haul truck mining fleet will be utilised, together with the requisite auxiliary equipment (graders, water trucks, etc).

16.2 Geotechnical Analysis

The objective of the geotechnical work carried out was to:

- provide geotechnical design elements for the total mine design at an appropriate level of confidence; and
- evaluate and provide open pit slope design and layout.

A two-day site visit was conducted on the 6th and 7th May 2014. A site-walkover survey was carried out to gain an understanding of the geological terrain of the proposed Songwe Hill open pit mine (Figure 16-1). In addition, MSA conducted a review of the borehole cores that were available at the core yard to obtain indicative data on the quality of the weathered, transitional and fresh material.

Figure 16-1
Photograph of proposed area for Songwe Hill open pit mine

Three boreholes were geotechnically logged during the site visit, the details of which are discussed in the following section.

16.2.1 Geotechnical logging

The borehole identity numbers for the core that was logged are listed below with their final logging depths:

- PX013 (132.45m);
- PX018 (341.60m); and
- PX022b (118.95m).

At the time of the field investigation, the core had been stored for an extended period of time, hence the quality of the core had deteriorated. The core had also been split for assay purposes (Figure 16-2).

Figure 16-2
Photograph showing split core from Songwe Hill

The following parameters were indicatively recorded during the logging process:

- depth;
- description (rock type);
- core recovery;
- RQD (rock quality designation);
- strength of intact rock (rock hardness);
- weathering/alteration;
- discontinuity type;
- discontinuity frequency;
- dip angle of structure with respect to core axis; and

- discontinuity condition.

16.2.2 Material properties

The Rock Mass Rating (RMR89) and Geological Strength Index, derived from geotechnical logging for the material are tabulated below (Table 16-1). Based on literature studies, typical material strength properties were derived for the material types and are presented in Table 16-1.

Table 16-1
Summary of geotechnical properties for the material at Songwe Hill REE

Material properties	Nepheline Syenite	Weathered fenite and carbonatite / Breccias?	Fresh Carbonatite	Fresh Fenite	Mixed carbonatite and fenite	Feldspathic breccia
Inferred thickness for a ±200m slope (m)	15.00	20.00	60.00	50.00	60.00	20.00
Average RMR_{89}	58.00	45.00	63.13	63.13	54.50	45.00
Average GSI	58.00	48.00	65.00	65.00	60.38	48.00
UCS (Range)	100 - 300	30 - 100	100 - 300	100 - 300	100 - 300	30 - 100
Disturbance factor (D)	0.70	0.70	0.70	0.70	0.70	0.70
Density ρ (kg/m^3)	2700.00	2000 - 2700	2700 - 3000	2700	2700 - 3000	2000 - 2700
Cohesion (kPa)	5000 - 15000	700 - 5000	5000 - 15000	5000 - 15000	5000 - 15000	700 - 5000
Friction angle φ (°)	25 - 30	20 - 25	25 - 30	25 - 30	25 - 30	20 - 25

It should be noted that due to the high degree of alteration during genesis of the rocks at Songwe Hill, the distinction between the various rock types shown in the table above is highly subjective, hence the thicknesses from one borehole to another are highly variable. Nepheline syenite occurs as a boulder field on the surface of the Songwe Hill and is intersected within boreholes that were drilled along the upper portions of the hill. Similarly, feldspathic breccia was seen to outcrop towards the lower portion of the hill.

The geotechnical properties presented in Table 16-1 are indicative only and further logging and rock testing must be carried out to obtain the rock properties to be used for a Definitive Feasibility Study.

16.2.3 Open pit design and slope geometry

16.2.3.1 Bench height

Mining equipment used to excavate the material determines the bench height. Currently, most large mining operations adopt 10 to 15 metre bench heights, with 15 metres being the most common, with 10 m high benches suggested for weathered material. For the purposes of this Study 10m high benches have been selected.

16.2.3.2 Bench width

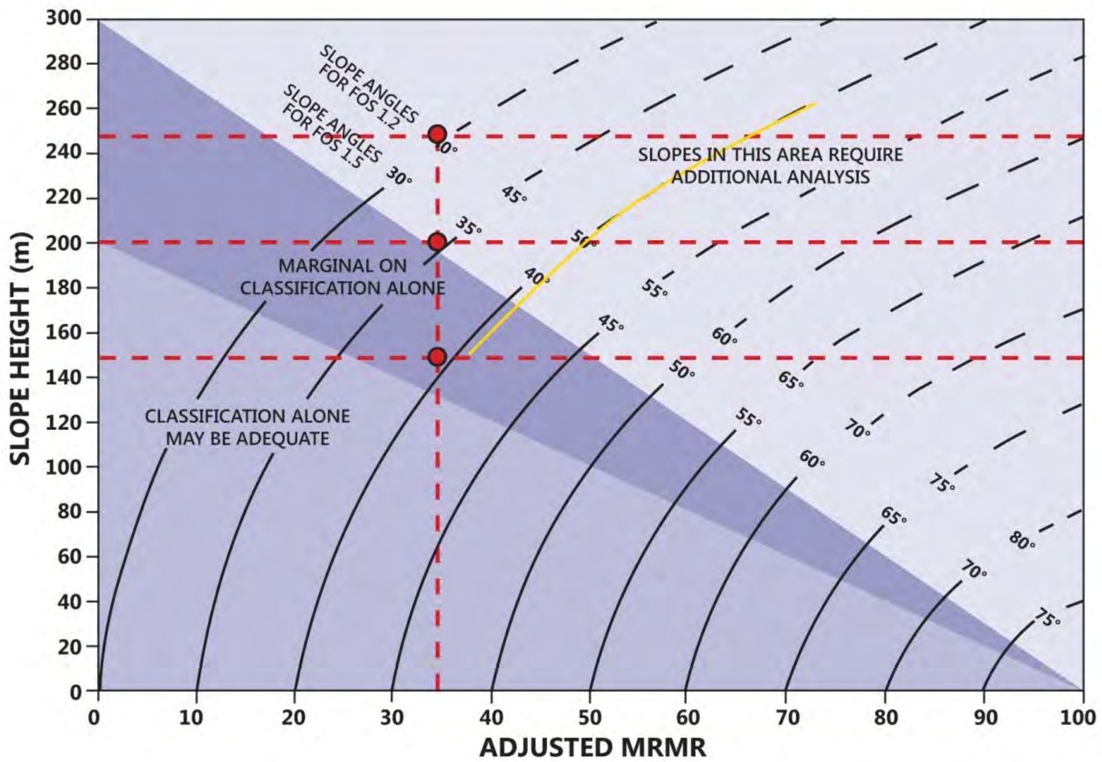
Minimum bench widths of 6.5 to 7.5 m are suggested based on the empirical relationships used to optimise bench width for containment and catching failure volumes: Bench Width (m)=0.2 ×Bench Height+4.5, recommended by the SME Mine Engineering Handbook (1992).

16.2.3.3 Overall slope angle

The overall slope angle (osa) was determined using the empirical slope design chart proposed by Haines and Terbrugge (1991). The design chart relates the height of the slope and the Adjusted Mining Rock Mass Rating (MRMR) value of the material to a stable slope angle (Figure 16-3). Overall slope angles are shown for slope heights of 150 m, 200 m and 250 m.

Figure 16-3

Adjusted MRMR chart showing overall slope angles, Songwe Hill REE



The adjusted MRMR was calculated by multiplying the RMR89 by adjustment factors for blasting, weathering, orientation and mining induced stresses. The adjustment factors used are shown in Table 16-2.

Table 16-2
MRMR adjustment factors, Songwe Hill REE

Domain	RMR_{89}	Adjustments to calculate MRMR				Adjusted MRMR
		Blasting	Weathering	Orientation	Mining-induced stresses	
Nepheline Syenite	58.00	0.85	0.86	0.80	1.00	**33.92**
Weathered fenite and carbonatite	45.00	0.85	0.74	1.00	1.00	**28.31**
Fresh Carbonatite	63.13	0.85	0.94	0.80	1.00	**40.35**
Fresh Fenite	63.13	0.85	0.94	0.80	1.00	**40.35**
Mixed carbonatite and fenite	54.50	0.85	0.82	0.80	1.00	**30.39**
Feldspathic breccia	45.00	0.85	0.74	1.00	1.00	**28.31**
	Average Adjusted MRMR					**33.60**

It is anticipated that regular drilling and blasting will produce poor side walls. An average of three joint sets was recorded during core logging in fresh rock, while circular failure will be dominant within the weathered material and breccia. Mining induced stresses will be negligible. Weathering adjustments were determined using Table 16-3.

Table 16-3
Adjustments for weathering

Domain	Potential weathering and adjustments (%)					
	0.5 years	1 year	2 years	3 years	4 years	4+ years
Fresh	100	100	100	100	100	100
Slight	88	90	92	94	94	96
Moderate	82	84	86	88	88	90
High	70	72	74	76	76	78
Complete	54	56	58	60	60	62
Residual soil	30	32	34	36	36	38

Source: *Laubscher (1990)*

16.2.3.4 Bench face angles

The individual bench face angles (BFA) were calculated mathematically after the stack angles and overall slope angles were determined. Bench face angles for a slope height of 200 m were determined. Further investigations will need to be carried out to determine more accurate domain thicknesses for varying slope heights.

16.2.4 Slope Configuration

Based on the analysis conducted by MSA, MSA's experience on similar types of orebodies and rock types, and adopting a moderate approach, the following slope angles have been assumed for the purposes of this PFS. During the next stage of Study, in order to confirm MSA's assumptions in this regard, more detailed work will need to be carried out.

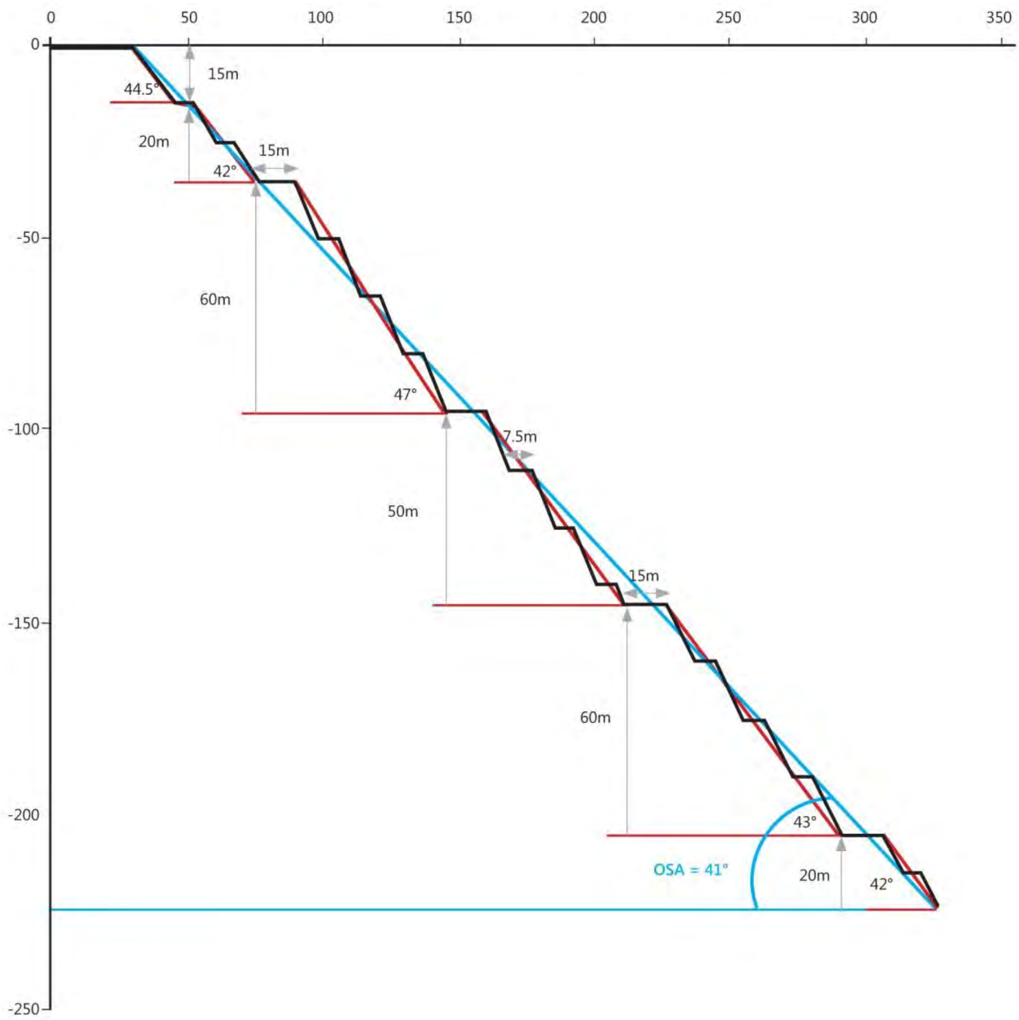
Stack angles and overall slope angles for slope heights of 150 m, 200 m and 250 m were determined using the empirical slope design chart (Figure 16-3). The concept slope geometrical configurations for Songwe Hill are presented in Table 16-4 and illustrated in Figure 16-4.

Table 16-4

Slope configurations for Songwe Hill REE

Domain	Threshold Safety Factor	Stack Angles (degrees)			Bench Face Angles and No. of Benches for 200 m Slope		SME Guidelines		Width of catch bench between stacks (m)
		150 m slope height	200 m slope height	250 m slope height	BFA for 200 m slope (degrees)	No. of benches required	Maximum bench height (m)	Minimum bench width (m)	
Nepheline Syenite	1.20	49.00	44.50	39.50	44.50	1.00	15	7.5	15
Weathered fenite & carbonatite		46.00	42.00	37.50	52.00	2.00	10	6.5	
Fresh Carbonatite		52.00	47.00	42.00	61.00	4.00	15	7.5	
Fresh Fenite		52.00	47.00	42.00	60.00	4.00	15	7.5	
Mixed carbonatite and fenite		47.50	43.00	38.50	55.00	4.00	15	7.5	
Feldspathic breccia		46.00	42.00	37.50	52.00	2.00	10	6.5	
		Overall Slope Angles (degrees)							
Aggressive design	1.20	49.00	44.50	40.00					
Conservative design	1.50	39.00	34.50	30.00					
Moderate design	1.30	45.67	41.17	36.67					

Figure 16-4
Slope configurations, Songwe Hill REE



The material properties derived were based on the geotechnical logging and literature studies. Based on a moderate design using empirical methods, overall slope angles of 45.7°, 41.0° and 36.7° are suggested for slope heights of 150 m, 200 m and 250 m respectively. For the purposes of this PFS an overall pit slope of 41° was selected.

16.3 Pit optimisation study

The pit optimisation study evaluated the geological block model, generated as part of the Mineral Resource estimation work, using the GEOVIA Whittle™(Whittle) optimisation software. The geological block model covers all available Mineral Resources, i.e. Indicated, and Inferred Mineral Resource categories. However for purposes of evaluating the Project no Inferred Mineral Resources were considered in the pit optimisation and were given no value.

The block model contains various fields, including but not limited to fields identifying:

- TREO % (Total Rare Earth Oxide grade);
- HREO % (Heavy Rare Earth Oxide grade);

- LREO % (Light Rare Earth Oxide grade); and
- Mineral Resource category (Measured, Indicated or Inferred).

The TREO grade was used as the primary grade field in the pit optimisation study. The sales price used in the model was stated per kg of TREO produced. A set of techno-economic data was generated against which to evaluate the Mineral Resource model (Table 16-5).

Table 16-5
Techno-economic data set for pit optimisation.

Item	Amount	Units
Operating Costs		
Mining Cost	4.24	US$/t rock mined
Processing Cost	58.20	US$/t milled
General and Administration cost	8.73	US$/t milled
Capital Cost		
Mining Capital	1.657	US$ million
Plant Capital	135.5	US$ million
Infrastructure	41.4	US$ million
Other Project Capital	30.1	US$ million
Sustaining Capital	1.0	US$ million per year
Technical Factors		
Mining Dilution	5	%
Mining Loss	5	%
Metallurgical Recovery	34%	%
Cut-off Grade	1.00	% TREO
Production Rate	500,000	tpa
Geotechnical		
Overall Slope Angle uphill (high) side of pit	41	Degrees
Overall Slope Angle downhill (low) side of pit	46	Degrees
Economic		
Royalties	5	%
Discount Factor	10	%
TREO Price	43,100	US$/tonne TREO

Note: *1) It is specifically noted that data used in this evaluation is preliminary in nature and it may not exactly match the final data used in the Project evaluation later in this document.*
2) The mining costs are quoted as per tonne of rock mined and will be applied to ore and waste.
3) TREO recovery is quoted excluding cerium, i.e. cerium is extracted as a waste product and attracts no value.
4) The TREO price used is the forecast price realised after toll treatment and transport.

Table 16-6 summarises the results from the Whittle optimisation runs, based on the dataset defined above.

Table 16-6
Summary of Whittle pit shells

Pit Shell	NPV at 10%	Ore tonnes	Waste tonnes	Mine Life (Years)	IRR (%)
1	-113,451,152	431,553	514,356	0.86311	0
2	-99,275,166	513,021	661,005	1.02604	0
3	-74,130,736	689,501	847,990	1.379	0
4	-1,143,712	1,378,387	1,443,585	2.75677	9.25
5	52,524,687	2,019,158	2,139,439	4.03832	19.15
6	75,711,522	2,348,164	2,536,834	4.69633	21.21
7	166,277,142	4,054,877	6,140,806	8.10975	25.43
8	201,613,042	4,904,446	8,816,471	9.80889	25.98
9	246,752,239	6,218,360	13,993,607	12.43672	26.55
10	254,905,957	6,581,914	15,324,217	13.16383	26.44
11	268,739,341	7,329,179	19,155,177	14.65836	26.07
12	275,444,010	7,833,928	22,102,544	15.66786	25.78
13	278,052,609	8,225,458	24,468,028	16.45092	25.34
14	278,594,817	8,519,898	26,836,293	17.0398	24.96
15	**278,783,905**	**8,536,295**	**26,930,290**	**17.07259**	**24.96**
16	278,626,978	8,736,128	29,097,118	17.47226	24.67
17	277,639,277	8,874,357	30,624,264	17.74871	24.42
18	275,703,179	9,120,084	33,107,825	18.24017	24.03
19	275,285,852	9,142,020	33,415,473	18.28404	23.96
20	275,148,042	9,157,644	33,520,410	18.31529	23.94
21	275,149,624	9,165,683	33,701,245	18.33137	23.94
22	269,788,442	9,514,857	37,893,421	19.02971	23.35
23	269,539,088	9,547,083	38,126,375	19.09417	23.32
24	269,513,169	9,551,451	38,184,161	19.1029	23.32
25	262,359,211	9,912,900	45,405,113	19.8258	22.64

From Table 16-6 it can be seen that the NPV peaks at pit shell number 15. Consequently pit shell 15 was selected as the optimum pit shell used to develop the detailed pit design.

Table 16-7 is a summary of the material contained in the optimised pit shell.

Table 16-7
Summary of optimised pit shell

Waste	26.930 million tonnes
Ore	8.536 million tonnes
Strip ratio (Waste tonne : ore tonne)	3.15
TREO grade (RoM)	1.616 %
Contained TREO (RoM)	137,989 tonnes

The figures below (Figure 16-5 and Figure 16-6) show the extent of the open pit generated by Whittle and a typical cross section through pit shell number 15.

Figure 16-5
Dimensional view of pit shell number 15

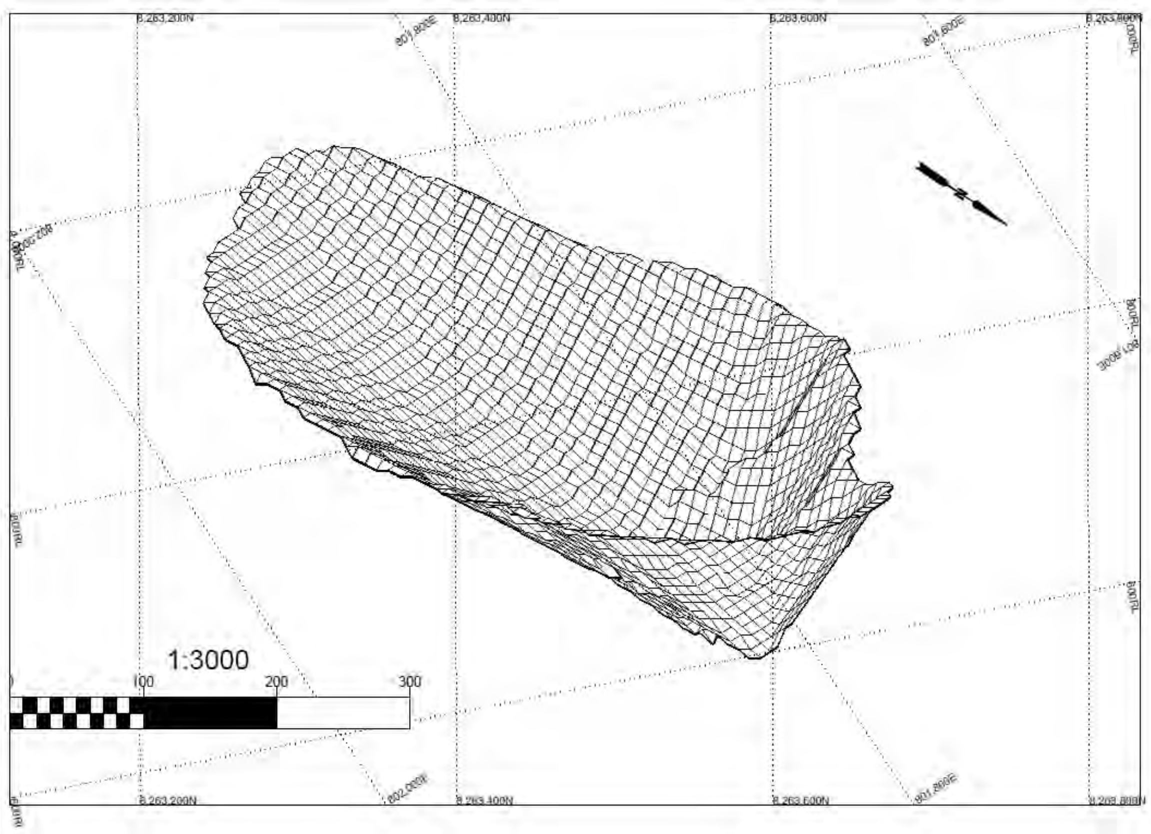
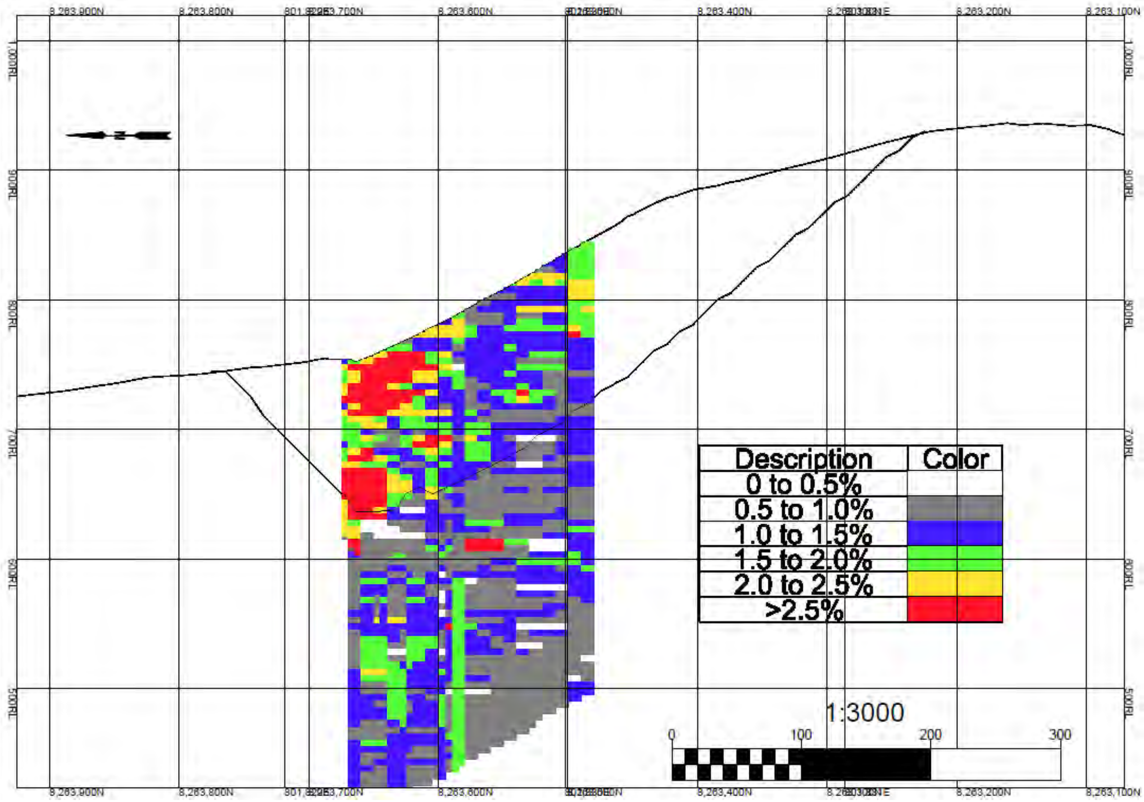


Figure 16-6

Section through open pit shell number 15, showing block model coloured by grade



16.4 Pit Design

The open pit mining method that will be employed is a standard drill, blast, truck and shovel method. Mining will take place in the following manner:

- soft topsoil and overburden will be removed using a dozer and stockpiled separately;
- 10 m benches will be drilled and blasted with a typical blast size of 40 m by 40 m by 10 m bench height;
- controlled blasting will be employed to ensure minimal movement of the blasted muck pile;
- drill hole sampling will be employed to delineate the ore and waste, which will be marked separately by the mine geologist, before loading commences; and
- waste and ore will be loaded into haul trucks with ore being delivered to the RoM stockpile and waste being delivered to a waste dump adjacent to the open pit.

Loading and hauling of waste will be a 24 hour operation. Ore mining will only be carried out during the day shift to ensure effective grade control.

A practical pit design was carried out using the optimum pit shell as a guide. The pit design considers practical mining constraints and requirements such as in-pit ramps, minimum pit room required and practical pit geometry. Consequently the final pit design has a higher strip ratio than the optimised pit shell. The overall dimensions of the final open pit will be approximately 650 m north to South, by 450 m East to West and at its deepest will be 300 m deep when measured from the highest point of the pit on the southern side of the pit. The upper most bench is at an elevation of 945 m and the final pit floor is at 645 m elevation.

The pit will be mined in a series of five push backs, with the mining of pushback 1 commencing on the 775 m elevation with the initial ramp. There is no pre-strip required as the initial mining is in ore with strip ratio of less than 1.5:1 in the first year of mining. The overall strip ratio of the final pit is 4.5:1 (tonne:tonne).

Figure 16-7 below shows the five pushbacks making up the final pit. Figure 16-8 shows a plan view of the final pit design and Figure 16-9 a section through Section Line A-A as indicated on the plan view.

Figure 16-7
Plan view showing pit pushbacks

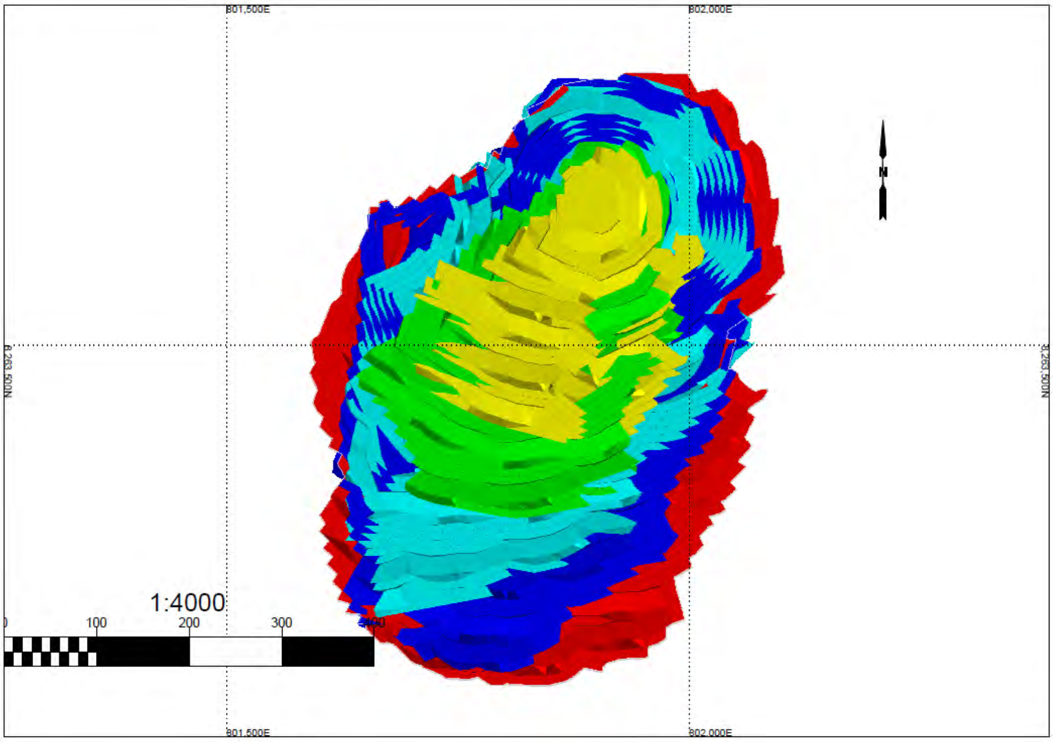


Figure 16-8

Plan view of final pit

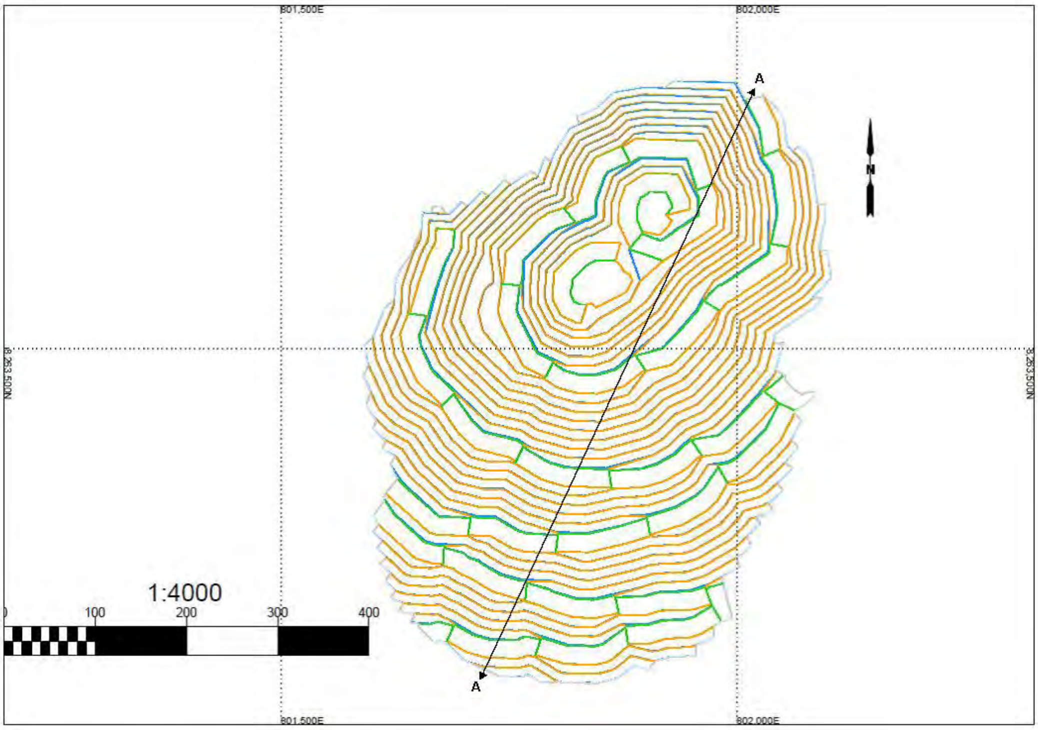
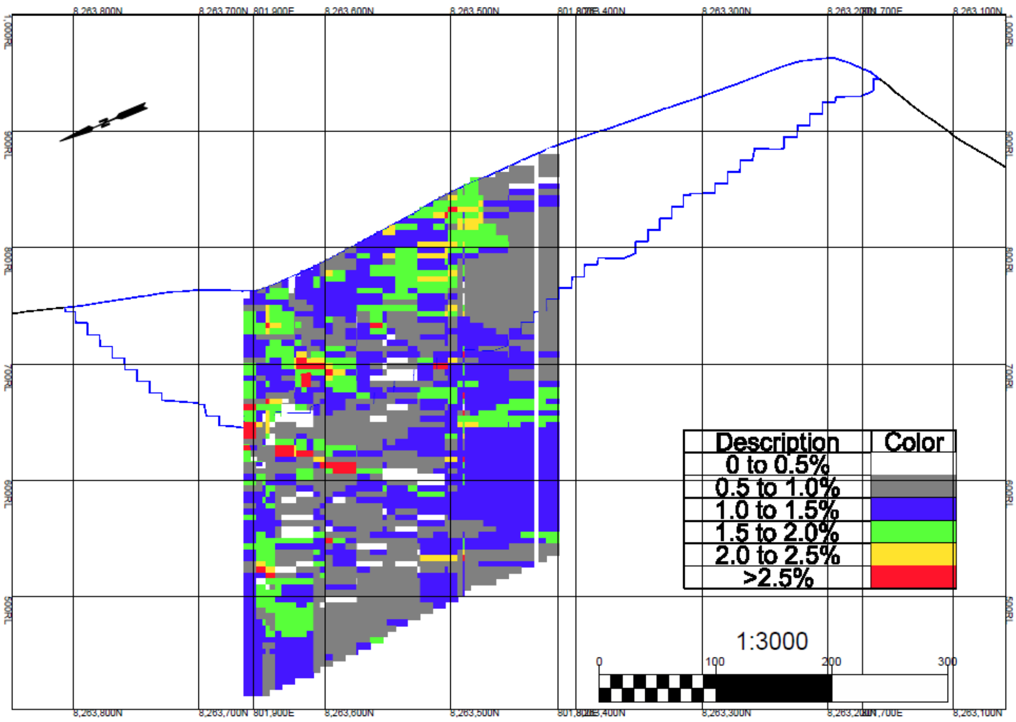


Figure 16-9

Section A-A through final pit, looking East



16.5 Open pit mining equipment

It is envisaged that a mining contractor will be employed to undertake the open pit mining operations. During this study contact was made with a mining contractor who was provided with a preliminary scope of work and bill of quantities. The contractor then provided a budget estimate to undertake the mining operation.

In order to evaluate the contractor's submission basic equipment selection and productivity estimates were completed by the consultant.

Productivity calculations were performed to calculate the size and quantity of the primary equipment (excavator and dump trucks). The requirement for secondary equipment was estimated based on experience from other similar operations. The productivity calculations are based on the following assumptions:

- operating days per year – 312;
- operating shifts per day – two 11 hour shifts; and
- hours operated per shift – 7 (including allowance for shift change, availability and utilisation of equipment).

The fleet requirements estimated are summarised below (Table 16-8). The fleet estimation completed by the consultant and the fleet selection provided by the contractor were very similar and the fleet presented in Table 16-8 is taken from the contractor's submission.

Table 16-8
Mining equipment fleet.

Equipment Item	Productivity per Machine	Production Required	Number Required	Comments
Volvo EC 480D (50 to excavator)	413t/hr	592t/hr	2	Waste and ore mining
Cat 740 ADT	74t/hr	592t/hr	8	Waste and ore hauling
Atlas Copco Rock L8	12m/hr	14m/hr	2	Waste and ore drilling
Volvo L120 Wheel loader			1	In-pit clean up
Cat D8T Dozer			1	Dumps, ramp construction
Diesel Bowser			1	RoM pad, stockpiles
Back hoe loader			1	Roads, pit
Cat 140 K grader			1	Road maintenance
LDVs			5	Supervision
Lighting sets			6	Illumination for night work
250 KvA Gensets			2	Back-up power and pumping
250m^3/hr dewatering pumps			2	Pit dewatering
Bus			2	People transport
Total Mining Fleet			**34**	

16.6 Open pit Mining Schedule

An open pit mining schedule was developed based on the open pit mine design described Section 16.4 above and the optimum pit shell generated in the pit optimisation. The production rate target was set to 500,000 tonnes per year of ore. The production rate was selected by the Mine Owner based on their assessment of the market and their strategic intent. The production rate of 500,000 tpa, which requires total material movement of an average of 2.6 million tonnes per year, is low for a pit of these dimensions. A production rate significantly higher than this could be maintained from this pit, and may be considered as the Project progresses.

The production schedule that was developed provides for the mining and processing of high grade material early in the life of the mine. An overall cut-off grade of 1.00 % TREO was applied to determine if material is treated as ore or waste. In addition to this, ore is categorised as high grade or low grade based on a cut-off of 1.40 % TREO. Material between with an in-situ grade of between 1.00 % and 1.40 % TREO will be marked as low grade and stockpiled in the initial years. The low grade stockpile will grow to a maximum of 4 million tonnes during the mine life. The average grade of the high grade material delivered to the plant is 1.85 % TREO and the low grade 1.14 % TREO.

All waste material will be delivered by truck to the waste dump and no backfilling of the open pit is planned.

No Inferred Mineral Resources were included as ore in the production schedule. Only material sourced from Indicated Mineral Resources was included as ore. There are no Measured Mineral Resources in the current Mineral Resource Estimation. The exclusion of Inferred Mineral Resources also allows for some upside, either in mine life or in the annual production rate, in the future if the Inferred Mineral Resources can be upgraded to Measured or Indicated Mineral Resources. The current pit design includes 3.877 million tonnes of Inferred Mineral Resources at an average grade of 1.50 % TREO (*in situ* grade), which has not been considered as ore in this study.

Table 16-9 shows a summary of the mining schedule.

Table 16-9
Summary of open pit mining schedule

Description	Total / Average	Unit	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18
Waste tonnes mined			1,068,865	1,528,326	1,040,988	2,064,652	1,842,227	1,917,310	1,868,717	1,469,575	1,596,984	2,394,980	3,067,241	2,603,481	3,021,995	3,283,584	3,223,874	2,775,661	2,788,040	885,228
Ore mined			734,831	440,201	1,357,370	333,705	562,700	481,045	529,640	928,782	807,944	3,376	216,344	500,012	268,161	180,092	59,711	507,924	502,116	68,650
Total mined tonnes			1,803,696	1,968,526	2,398,358	2,398,357	2,404,927	2,398,355	2,398,357	2,398,358	2,404,928	2,398,356	3,283,585	3,103,493	3,290,156	3,463,676	3,283,585	3,283,585	3,290,155	953,878
RoM Production																				
High Grade																				
Tonnage	5,245,160	tonnes	539,695	240,554	949,790	189,458	401,232	153,337	294,072	646,556	532,274	2,521	133,550	288,428	188,978	103,885	47,288	233,265	263,073	37,202
TREO %	1.89	%	2.25	2.23	1.85	1.57	2.07	1.71	1.76	1.80	1.74	1.79	2.12	1.76	1.71	1.75	2.79	1.82	1.84	1.53
Content	99,033	tonnes	12,143	5,359	17,571	2,983	8,316	2,625	5,169	11,655	9,238	45	2,827	5,082	3,238	1,822	1,320	4,239	4,831	568
Low Grade																				
Tonnage	3,237,443	tonnes	195,136	199,647	407,580	144,246	161,469	327,707	235,568	282,226	275,670	855	82,793	211,584	79,183	76,207	12,422	274,659	239,042	31,448
TREO %	1.15	%	1.13	1.11	1.15	1.16	1.15	1.12	1.15	1.14	1.15	1.06	1.12	1.15	1.13	1.15	1.08	1.17	1.20	1.12
Content	37 107	tonnes	2,211	2,214	4,693	1,675	1,852	3,660	2,711	3,215	3,161	9	928	2,428	895	874	135	3,221	2,872	352
Total																				
Tonnage	8 ,482,603	tonnes	734,831	440,201	1,357,370	333,705	562,700	481,045	529,640	928,782	807,944	3,376	216,344	500,012	268,161	180,092	59,711	507,924	502,116	68,650
TREO %	1.60	%	1.95	1.72	1.64	1.40	1.81	1.31	1.49	1.60	1.53	1.61	1.74	1.50	1.54	1.50	2.44	1.47	1.53	1.34
Content	136,139	tonnes	14,355	7,573	22,264	4,658	10,168	6,285	7,880	14,870	12,399	54	3,754	7,510	4,133	2,697	1,455	7,460	7,704	920
Stock Pile and Processing																				
High Grade																				
Opening Balance																				
Tonnage	64,624	tonnes	-	339,695	80,249	530,039	219,498	120,729	-	-	146,556	178,830	-	-	-	-	-	-	-	-
TREO %	1.95	%	-	2.25	2.24	1.88	1.80	1.98	-	-	1.80	1.75	-	-	-	-	-	-	-	-
Content	1,261	tonnes	-	7,643	1,798	9,967	3,951	2,386	-	-	2,642	3,130	-	-	-	-	-	-	-	-
Closing Balance																				
Tonnage	64,624	tonnes	339,695	80,249	530,039	219,498	120,729	-	-	146,556	178,830	-	-	-	-	-	-	-	-	-
TREO %	1.95	%	2.25	2.24	1.88	1.80	1.98	-	-	1.80	1.75	-	-	-	-	-	-	-	-	-
Content	1,261	tonnes	7,643	1,798	9,967	3,951	2,386	-	-	2,642	3,130	-	-	-	-	-	-	-	-	0
Processing																				
Tonnage	5,245,160	tonnes	200,000	500,000	500,000	500,000	500,000	274,067	294,072	500,000	500,000	181,351	133,550	288,428	188,978	103,885	47,288	233,265	263,073	37,202
TREO %	1.89	%	2.25	2.24	1.88	1.80	1.98	1.83	1.76	1.80	1.75	1.75	2.12	1.76	1.71	1.75	2.79	1.82	1.84	1.53
Content	99,033	tonnes	4,500	11,204	9,402	8,999	9,881	5,011	5,169	9,013	8,750	3,175	2,827	5,082	3,238	1,822	1,320	4,239	4,831	568
Low Grade																				
Opening Balance																				
Tonnage	612,996		-	195,136	394,783	802,362	946,609	1,108,077	1,209,852	1,239,491	1,521,718	1,797,388	1,479,593	1,195,937	1,195,949	964,110	644,202	203,913	211,837	213,953
TREO%	1.14		-	1.13	1.12	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.16	1.18
Content	6,983		-	2,211	4,425	9,118	10,793	12,645	13,739	14,107	17,321	20,482	16,860	13,616	13,633	10,984	7,343	2,322	2,454	2,527
Closing Balance																				
Tonnage	612,996		195,136	394,783	802,362	946,609	1,108,077	1,209,852	1,239,491	1,521,718	1,797,388	1,479,593	1,195,937	1,195,949	964,110	644,202	203,913	211,837	213,953	-
TREO %	1.14		1.13	1.12	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.16	1.18	-
Content	6,983		2,211	4,425	9,118	10,793	12,645	13,739	14,107	17,321	20,482	16,860	13,616	13,633	10,984	7,343	2,322	2,454	2,527	-
Processing																				
Tonnage	3,237,443		-	-	-	-	-	225,933	205,928	-	-	318,649	366,450	211,572	311,022	396,115	452,712	266,735	236,927	245,401
TREO %	1.15		-	-	-	-	-	1.14	1.14	-	-	1.14	1.14	1.14	1.14	1.14	1.14	1.16	1.18	1.17
Content	37,107		-	-	-	-	-	2,566	2,344	-	-	3,631	4,172	2,412	3,544	4,515	5,156	3,090	2,799	2,880
Total Processing																				
Tonnage	**8,482,603**	**tonnes**	**200,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**500,000**	**282,603**
TREO %	**1.60**	**%**	**2.25**	**2.2**	**1.88**	**1.80**	**1.98**	**1.52**	**1.50**	**1.80**	**1.75**	**1.36**	**1.40**	**1.50**	**1.36**	**1.27**	**1.30**	**1.47**	**1.53**	**1.22**
Content	**136,139**	**tonnes**	**4,500**	**11,204**	**9,402**	**8,999**	**9,881**	**7,577**	**7,513**	**9,013**	**8,750**	**6,806**	**6,999**	**7,494**	**6,781**	**6,338**	**6,476**	**7,329**	**7,630**	**3,447**

17 RECOVERY METHODS

17.1 Process Overview

The process design is based on a comprehensive testwork program which is discussed in more detail in Section 13. Mkango is targeting a high grade critical and heavy rare earth enriched, mixed rare earth hydroxide product that is cerium depleted. The key design parameters for the processing plant are summarised in Table 17-1.

Table 17-1
Key design parameters

Description	Value
Plant feed RoM (t/a)	500,000
Head grade (TREO - %)	1.6
Concentrate grade (TREO - %)	4.7
Concentrate mass pull (% of RoM feed)	23.1
Concentrate recovery (TREO - %)	67
Dry hydrometallurgy plant feed solids (t/a)	115,250
Plant availability (%)	91

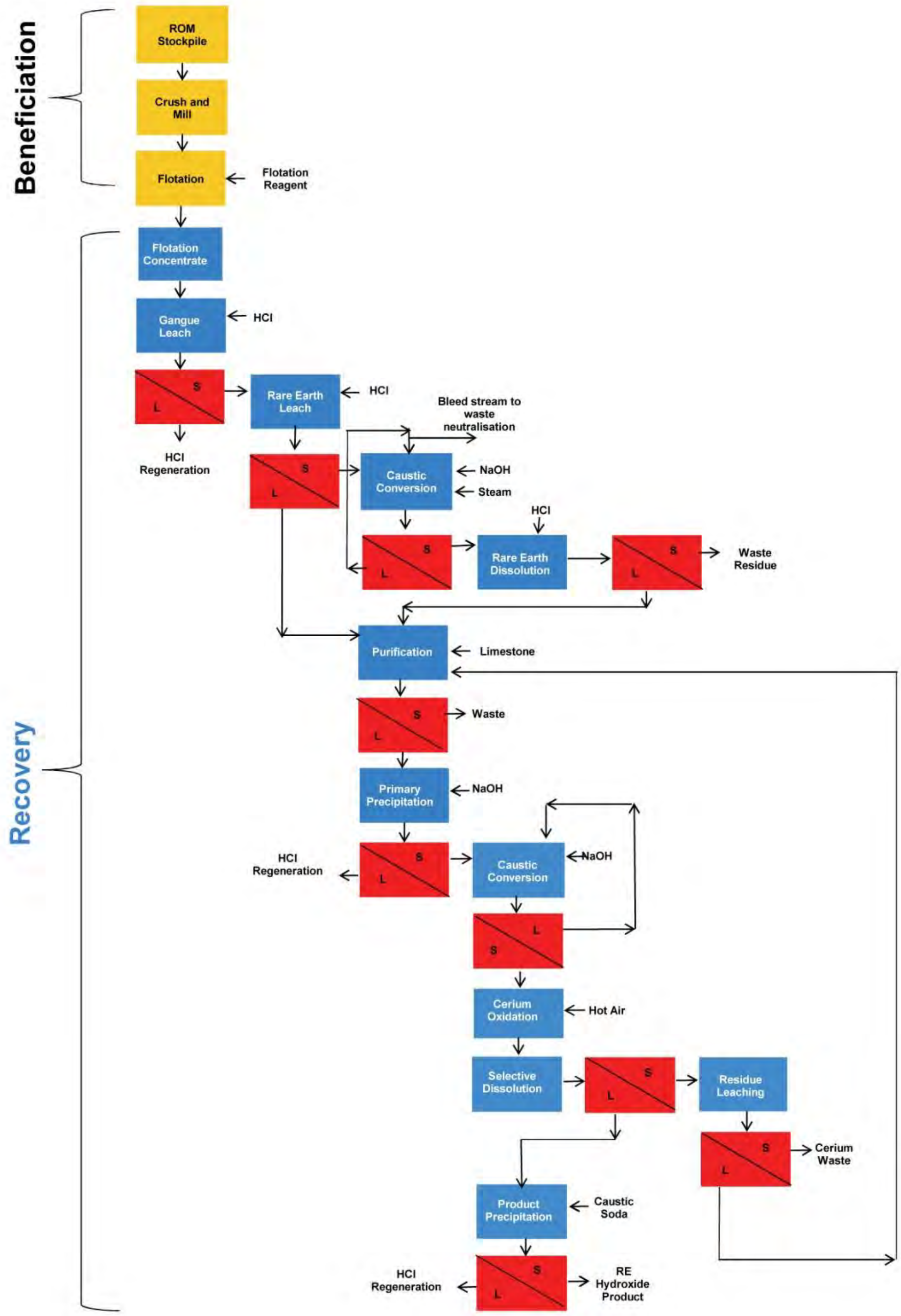
The process flow sheet as illustrated in Figure 17-1 consists of:

- the Beneficiation Plant which functionally includes for the physical concentration of the rare earth host minerals and the rejection of gangue minerals; and
- the Recovery Plant which functionally includes for the chemical recovery, purification and concentration of the rare earths employing a simple hydrochloric acid leach process.

The beneficiation plant comprises the comminution and flotation circuits. The purpose of the comminution circuit is to reduce the size of solid ore particles and thus increase the surface area of solids to enable the liberation of valuable materials that are locked within the gangue minerals. This is achieved by means of crushing and milling.

Flotation is used to upgrade the mineralized material. Flotation is a method of separation, which uses the differing surface properties of the various minerals in the ore. It involves the selective attachment of mineral particles to air bubbles generated in the flotation cell which float to the surface of the slurry and then flow over the lip of the cells into the launders. A selective flotation reagent regime is used to separate rare earths oxide minerals from gangue minerals.

Figure 17-1
Process flow sheet



The beneficiation process plant comprises:

- ore receiving and crushing;
- stockpile;
- milling;
- flotation;
- thickening;
- filtration;
- tailings;
- tailings transfer;
- plant utilities;
- air; and
- flotation reagents.

The recovery process flow sheet comprises a two stage selective hydrochloric acid leach process. The hydrochloric acid is recycled via calcium sulphate precipitation with sulphuric acid. The process flow sheet also includes caustic conversion, rare earth dissolution, purification, cerium rejection and rare earth hydroxide precipitation (Figure 17-1). This approach offers advantages including a significant reduction in acid costs as well as a further concentration of the rare earths thus providing a reduction in downstream capital and operating costs.

The recovery process plant comprises the following:

- calcite leach;
- HCl rare earth leach;
- caustic conversion 1;
- rare earth dissolution;
- waste neutralization;
- HCl Regeneration 1,2, and 3;
- solution adjustment and purification;
- raw rare earth hydroxide precipitation;
- Cerium removal;
- final rare earth hydroxide precipitation;
- reagents;
- emergency power;
- caustic conversion 2; and
- residue leaching.

17.2 Process Facilities

17.2.1 Ore receiving and crushing plant

RoM ore with a maximum particle size of 750 mm will be delivered to the RoM bin via mine haul trucks. The RoM bin is fitted with an inclined static 750 mm aperture grizzly to prevent oversize material entering the RoM bin. The bin discharges through a feed chute onto a vibrating grizzly feeder with an opening of 150 mm. Undersize material discharges via a chute onto the sacrificial conveyor. Oversize material discharges into the primary jaw crusher. The primary crusher is a single toggle with a 110 kW motor installed. Jaw crusher product, discharges and combines with the vibrating grizzly feeder undersize onto a sacrificial conveyor.

The sacrificial conveyor discharges onto the secondary crusher feed conveyor. The secondary crusher feed conveyor discharges onto the double deck crusher feed screen. The screen (bottom deck) undersize material discharges onto the screen undersize conveyor. The material is transferred through a chute onto the stockpile feed tripper conveyor. The top deck screen oversize discharges onto the secondary crusher feed conveyor and the bottom deck screen oversize discharges onto the tertiary crusher feed conveyor.

The secondary crusher is a standard head cone crusher with an installed motor power of 90 kW. Secondary crusher product is recycled to the double deck screen. The tertiary crusher is a short head cone crusher with an installed motor power of 132 kW. Tertiary crusher product is also recycled to the double deck screen.

17.2.2 Stockpile

The mill feed stockpile conveyor discharges onto the mill feed stockpile. The mill feed stockpile has a nominal capacity of 2,283 tonnes, equivalent to 24 hours of milling capacity. Crushed ore is drawn off this stockpile using withdrawal vibrating feeders. Each feeder discharges onto the ball mill feed conveyor. Ball mill feed rate control is achieved using the variable speed vibrating feeders.

17.2.3 Milling

The ball mill operates in a closed circuit with a cyclone cluster to produce a product size P80 of 53 µm in the cyclone overflow which provides the necessary degree of liberation for recovery. The ball mill has an installed power of 1,200 kW. The ball mill discharges into the mill discharge sump then the slurry is transferred into the cyclone cluster. The ball mill re-circulating load is designed at 230 %. The cyclone underflow is designed to operate at a density of 70 % solids and will be recycled to the mill feed hopper via launders. The cyclone overflow with a density of 30 % solids will gravitate into the Conditioning Feed Tank A.

17.2.4 Flotation

The cyclone overflow serves as the feed to the flotation circuit. The conditioning tanks are fed from the bottom and overflow from the top to the next tank to maximise conditioning by the flotation reagents. The flotation feed conditioning consists of three 200 m^3 agitated tanks in series, designed to give the flotation feed slurry an overall staged conditioning residence time of three hours (one hour per stage) prior to flotation. Steam will be injected into the conditioning tanks to raise the slurry temperature to 55 °C for conditioning. The modifier and activator are added into Conditioning Tank A, the depressant is added to Conditioning Tank B and the collector will be added to Conditioning Tank C. Conditioned slurry from the third conditioning tank overflows into conditioning tank overflow sump and is pumped by the variable speed flotation feed pumps to the flotation cells.

The rougher flotation circuit consists of 6x50 m^3 forced draught tank cells in series to give an effective pulp residence time of 20 minutes. Each tank is maintained under independent level and air flow control, with air supplied by flotation blowers. Conditioned slurry from the conditioning tank overflow sump is pumped by one of the pumps to the rougher flotation cells through a rougher feed sampler for metallurgical accounting. Additional collector will also be added as required to the Flotation Cell A. Tailings from Flotation Cell C will gravitate into an agitated Rougher D feed conditioning tank where the collector is added for further conditioning prior to feeding Flotation Cell D.

Tailings from the last rougher tank cell F gravitates into the rougher tailings sump through a tails sampler for metallurgical accounting and control purposes. Tails slurry is pumped by one of the rougher tails pumps into the tailings thickener for thickening prior to disposal to the tails storage facility.

Rougher concentrate gravitates through launders to the common concentrate sump. Concentrate is then pumped by one of the rougher concentrate pumps into the concentrate thickener.

17.2.5 Concentrate thickening

Final concentrate from the flotation circuit is pumped to a single concentrate thickener. Thickener overflow gravitates into the overflow sump and is pumped by one of the overflow pumps to the process water tank, while thickener underflow is withdrawn from the cone by one of the underflow pumps and pumped forward at a density of 55 % solids (m/m – mass fraction) to the concentrate filter feed tank.

17.2.6 Concentrate filtration

Concentrate slurry is pumped from the filter feed tank to the concentrate filter press. The filter has been sized to accommodate a nominal solids feed rate of 14.7 t/h. Filter cake discharges onto the filter product conveyor at 85 % solids (m/m). The filtrate flows into the filtrate sump and is then pumped to the process water tank.

17.2.7 Tailings thickener

Rougher flotation tailings are pumped into a tailings thickener. Thickener overflow gravitates into the overflow sump and is pumped to the process water tank. Thickener underflow is withdrawn from the cone by one of the underflow pumps and pumped forward at design density of 55% solids to the tailings transfer sump ahead of the tailings storage facility.

17.2.8 Tailings transfer

Final tails are pumped to the tailings storage facility by either of the two tailings transfer pumps.

17.2.9 Plant utilities (water)

The water reticulation system is designed to provide the following water services:

- raw water;
- filtered water;
- fire water;
- potable water; and
- process water.

Raw water is pumped from source into the raw water tank. The raw water tank overflows into the process water tank for make-up water. In addition the raw water is pumped through the sand filter plant into the filtered water tank. Filtered water is distributed to the reagents make-up, gland services, potable water treatment plant and fire systems. Process water is stored in a process water tank and is distributed to the plant by process water pumps.

17.2.10 Plant utilities (air)

Plant instrument air is provided by two compressors and the air quality is maintained by filters. Instrument air is dried using a drier. Two receivers are provided namely; plant air receiver and instrument air receiver, to allow for surges in demand. Low pressure air is supplied to the flotation plant by fixed speed blowers. The blower manifold pressure is controlled by a modulating valve on an exhaust line.

17.2.11 Flotation reagents

Make-up and distribution systems have been included for the following flotation reagents:

- sodium fluorosilicate (activator);
- sodium carbonate (pH modifier);
- Pionerra F220 (depressant);
- Betacol CKF30B (collector); and
- flocculant.

17.2.12 Calcite leach

The concentrate filter cake is re-pulped with a portion of the calcite thickener overflow and calcite filtrate. The slurry from the repulp tank is pumped to the first agitated fibreglass reinforced plastic (FRP) tank thereafter the slurry cascades to agitated FRP tanks where calcite leaching occurs using 10 % (v/v – volume concentration) HCl. The purpose of the calcite leach is to remove/solubilise the calcium contained within the rare earth element host minerals of apatite and synchesite as well as residual calcite not rejected by the flotation process.

The leach slurry is thickened and filtered. The majority of the solution (thickener overflow and filtrate) is pumped to the HCl regeneration circuit while a small amount is recycled and used for the flotation concentrate repulp. The calcite leach residue from the filter is repulped with rare earth leach thickener overflow before being pumped to the rare earth leach section. The slurry from tank is pumped to the rare earth leaching circuit.

17.2.13 Rare earth leach

Repulped slurry from the calcite leach circuit is pumped into a series of cascading agitated FRP tanks and leaching is done with 20 % (v/v) HCl. The rare earth leach slurry is fed to the rare earth thickener via pump. Flocculant will be added to assist in the flocculation and settlement of the solids. The thickener overflow and rare earth filtrate gravitates into an overflow tank and is pumped by one of the overflow pumps to the purification circuit.

The thickener underflow at 50 % (m/m) solids is withdrawn via one of the underflow pumps (and pumped forward to the rare earth filter feed tank.

Slurry from the thickener underflow tank is pumped by centrifugal feed pumps to the HCl rare earth filter. The filter cake is re-pulped with sodium hydroxide (NaOH) solution prior to the caustic conversion of the filtered solids.

17.2.14 Caustic conversion 1

The slurry from the rare earth leach is pumped into a series of cascading agitated FRP tanks for caustic conversion with 50 % (v/v) sodium hydroxide (NaOH). The purpose of the caustic conversion step is to decompose the impurities, surrounding the rare earth minerals which were not dissolved during the acid leaching process. Mineralogical studies identified the presence of light rare earth element host minerals such as florencite and monazite which are known or suspected to be refractory with regards to ambient temperature acid leaching.

The caustic conversion slurry is fed to the caustic conversion 1 thickener. The thickener overflow and caustic conversion 1 filtrate are recycled back to the caustic conversion process for repulping and consumption of excess NaOH while the thickener slurry underflow is pumped to the caustic conversion 1 filter. The filter cake is re-pulped with recycled HCl solution from the rare earth dissolution step prior to the rare earth dissolution circuit.

17.2.15 Rare earth dissolution

The slurry from the caustic conversion 1 is pumped into a series of cascading agitated FRP tanks for leaching with 20 % (v/v) HCl. The purpose of the rare earth dissolution circuit is to solubilise the rare earth minerals that had been liberated in the caustic conversion section.

The rare earth dissolution slurry is fed to the rare earth dissolution thickener. The thickener overflow and rare earth dissolution filtrate gravitates into an overflow tank and is pumped by one of the overflow pumps to the Purification circuit while the thickener underflow is pumped to the rare earth dissolution filter. The filter cake is re-pulped with process water then pumped to the tails facility.

17.2.16 Hydrochloric acid regeneration 1, 2 and 3

The HCl regeneration circuits (HCl Regeneration 1, 2 and 3) involves contacting high strength calcium chloride ($CaCl_2$) with 98% concentrated sulphuric acid (H_2SO_4) to produce high strength HCl and insoluble gypsum ($CaSO_4$).

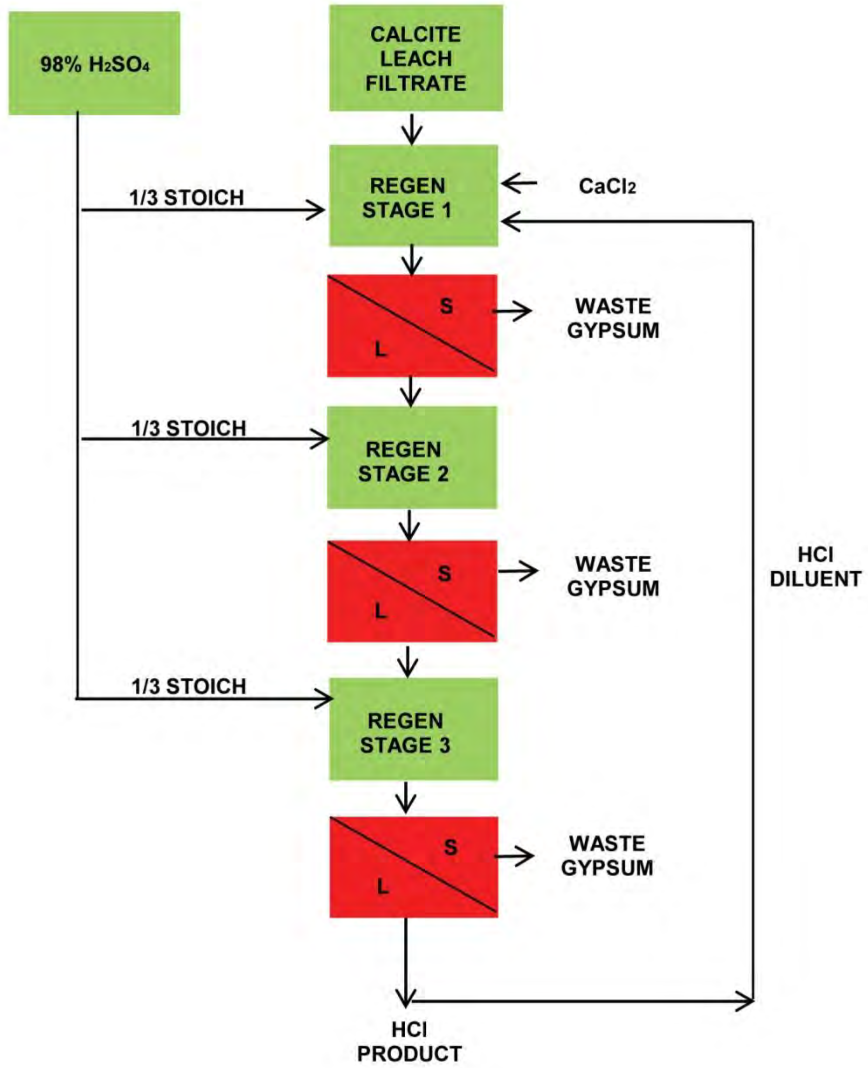
The HCL regeneration process flowsheet developed for the Songwe Hill rare earths Project is shown in Figure 17-2.

The calcite thickener overflow and calcite filtrate solution together with the waste neutralization thickener overflow solution are pumped to the HCl regeneration holding tank. Calcium Chloride ($CaCl_2$) is added to the HCl regeneration circuit. The slurry is pumped to a series of cascading agitated FRP tanks into which 2/3 of the full stoichiometric amount of 98 % H_2SO_4 solution is added. The slurry is pumped to a thickener. The thickener overflow gravitates into an overflow tank and is pumped by the overflow pump to a second set of cascading agitated FRP tanks into which 98 % H_2SO_4 solution is again added. The slurry is pumped to a thickener. The thickener overflow is pumped by to a final set of cascading agitated FRP tanks into which 98 % H_2SO_4 solution is added. The slurry exiting the final set of agitated FRP tanks is pumped to a thickener. The thickener overflow is pumped to a concentrated HCl tank. HCl is then distributed for plant usage.

The thickener underflow for each circuit is withdrawn and pumped to the HCl regeneration filter. The filter cake (predominantly gypsum) is re-pulped with water and pumped to a tailings facility.

Figure 17-2

HCL regeneration process flowsheet



17.2.17 Purification

The pregnant liquor from the rare earth leach thickener overflow, the rare earth dissolution thickener over flow and the residue leaching thickener overflow is pumped to a mixing tank in the purification circuit. The pH in the purification circuit is adjusted to 1.5-2 by the addition of limestone ($CaCO_3$) slurry while the Fe:PO_4 (iron:phosphate) ratio is controlled at 1.2 times the stoichiometric molar ratio by the addition of trisodium phosphate or ferric chloride. Thereafter the slurry and reagents cascade to agitated FRP tanks. The purpose of the purification circuit is to remove residual impurities predominantly iron and phosphate that have passed through the circuit.

The slurry from the last agitated FRP tank is fed to the purification thickener. The thickener overflow and purification filter filtrate is pumped to the raw rare earth precipitation circuit while the thickener underflow is filtered. The filter cake is re-pulped with water and pumped to the waste neutralisation circuit.

17.2.18 Raw rare earth precipitation

The resultant pregnant liquor from the purification thickener overflow is pumped to the raw rare earth precipitation circuit. The solution containing rare earths is subjected to a sequential precipitation step where the pH is increased at a controlled rate by the addition of sodium hydroxide (NaOH) in a series cascading, agitated FRP tanks.

The slurry from the final agitated FRP tank is fed to the raw rare earth precipitation thickener. The thickener overflow and raw rare earth precipitate filtrate is pumped to the waste neutralization circuit. The thickener underflow is pumped to the raw rare earth precipitation filter. The filter cake is repulped with recycled caustic solution then pumped to the caustic conversion #2 circuit.

17.2.19 Caustic conversion 2

The repulped slurry from the raw rare earth precipitation circuit is pumped into a series of cascading, agitated FRP tanks for caustic conversion with 50 % (v/v) sodium hydroxide (NaOH) reagent.

The caustic conversion slurry is fed to the caustic conversion 2 thickener. The thickener overflow and caustic conversion 2 filtrate is recycled while a bleed stream is pumped to the Waste Neutralization circuit. The thickener underflow is filtered and the filter cake is discharged onto a conveyor and conveyed to the cerium Cerium Removal Dryer.

17.2.20 Cerium removal

The filter cake is transferred to the dryer by the filter product conveyor. The cake is then dried at 150 °C where Ce (III) is oxidised to Ce (IV). Ce (IV) is less soluble than the trivalent REO therefore it's possible to remove the Ce (IV) by selective dissolution of the trivalent RE oxides thus allowing for the Ce (IV) oxides to remain in solid form and can then be removed by solid/liquid separation. The dried cake is fed into a series of cascading agitated FRP tanks where selective leaching of the RE oxides (excluding Ce) occurs using 20 % (v/v) HCl.

The slurry from the agitated FRP tanks is fed to the thickener. The thickener overflow and filtrate is pumped to the final rare earth precipitation circuit. The thickener underflow is filtered and the cake is repulped and pumped to the residue leaching circuit.

17.2.21 Residue leaching

Repulped slurry from the selective leaching circuit is pumped into a series of cascading agitated FRP tanks and selective leaching is done again on the residue.

The residue leach slurry is fed to the residue leach thickener. The thickener overflow and residue leach filtrate is recycled to the purification circuit. The thickener underflow is filtered then discharged as a waste cerium product.

17.2.22 Final rare earth precipitation

The resultant liquor solution from the cerium removal thickener overflow is pumped to the final rare earth precipitation circuit. The solution containing rare earth chlorides (minimal Ce) is subjected to a final precipitation step where the pH is increased by the addition of NaOH in a series of cascading, agitated FRP tanks.

The slurry from the agitated FRP tanks is fed to the final rare earth precipitation thickener. The thickener overflow and final rare earth precipitate filtrate is recycled to the raw rare earth precipitation circuit. The thickener underflow is filtered then the filter cake is dried, cooled and bagged for shipping.

17.2.23 Waste neutralization

The raw rare earth precipitation thickener overflow and filtrate from the raw rare earth precipitation filter are pumped to the waste neutralization circuit. The solution is neutralised with hydrated lime in a series of cascading agitated FRP tanks. Solid/liquid separation is accomplished in the waste neutralisation thickener and waste neutralisation filter

The waste neutralization slurry is fed to the waste neutralization thickener. The thickener overflow and waste neutralization filtrate is pumped to the HCl regeneration circuit. The thickener underflow is pumped as waste to the tailings facility.

17.3 Sulphuric Acid Production

Sulphur is recovered from the stockpile by front end loader and fed by conveyor to the sulphur smelter. Molten sulphur overflows to the dirty sulphur pit. Filter aid is added to the dirty sulphur pit before pumping the molten sulphur through a pressure leaf filter. Clean sulphur is stored in the clean sulphur storage tank. Clean molten sulphur is pumped to the furnace.

Molten sulphur is burnt in the furnace producing a hot gas flow containing about 11 % SO_2 (sulphur dioxide). The hot gas passes through a fire tube boiler generating 40 bar steam in the process of cooling the gas. The cooled gas is ducted to and from a multi-pass catalyst reactor where the SO_2 is converted to SO_3 (sulphur trioxide). The gas is passed through absorption towers that absorb the SO_3 to form sulphuric acid. This product acid is cooled and pumped to storage.

Steam from the boiler is passed through a super heater. Part of the steam is sent to drive the main air blower using a steam turbine. The steam is condensed in a turbo-generator producing the power required.

18 PROJECT INFRASTRUCTURE

18.1 Access

Migowi, approximately 15 km from Songwe Hill, is the nearest town to the Project area (Figure 5-1). Access from Migowi to the Project is by an all-weather bitumen road for some 2.5 km. Thereafter a local gravel road of 13 km provides access to the Project area. This road will have to be upgraded in order to service the Project, and a total of 9 culverts will need to be constructed as part of this upgrade.

18.2 Processing Plant Site Infrastructure

Various surface engineering and infrastructure designs for the Songwe Hill mine were undertaken by SNC-Lavalin. The proposed Songwe Hill mine and process plant site plans are presented in Figure 18-1 and Figure 18-2.

The following infrastructure and services will be provided at the processing plant site:

- water reservoir;
- storm water dam;
- tailings disposal facility ;
- explosives bunker;
- mine contractors area including bulk water and electricity supply at the fence and storm water and clean effluent return from the fence;
- contractors camp area;
- laydown area for construction phase;
- electrical incoming power including Electricity Supply Corporation of Malawi (ESCOM) sub-station and internal 11 kV substation;
- fencing around the plant;
- water and waste treatment plants;
- diesel storage tanks;
- the following vehicles will be required at the processing plant:
    - two 4x4 utility truck;
    - three 4x2 utility trucks;
    - two 50-seater buses;
    - one 4x2 Fire truck;
    - one ambulance;
    - one 15 t mobile crane;
    - two forklifts; and
    - one Bobcat;

- buildings:
    - offices including training room and boardroom with 15 offices;
    - paving, parking, landscaping;
    - workshops (mechanical and electrical);
    - wash bay;
    - stores including fenced outside laydown area;
    - ablution / change rooms;
    - Motor Control Centres (MCCs);
    - Medium voltage (MV) / low voltage (LV) conversion room;
    - security office / gatehouse;
    - weighbridge office;
    - mess; and
    - laboratory building;
- accommodation
    - on-site housing facilities are not planned for the mine site. However, it has been assumed that the EPCM camp will be used during the operational phase for senior management;
    - all other staff will be sourced from surrounding towns and villages where they will reside. It is assumed that these staff members will be transported by bus from the towns in the area on a daily basis prior to their shifts; and
- road infrastructure:
    - roads into/out of plant (1.2 km gravel road, plus one culvert);
    - internal service roads, including the roads required to service the open pit operations;
    - access road to tailings disposal facility;
    - weighbridge; and
    - vehicle wash bay.

Figure 18-1
General mine site layout

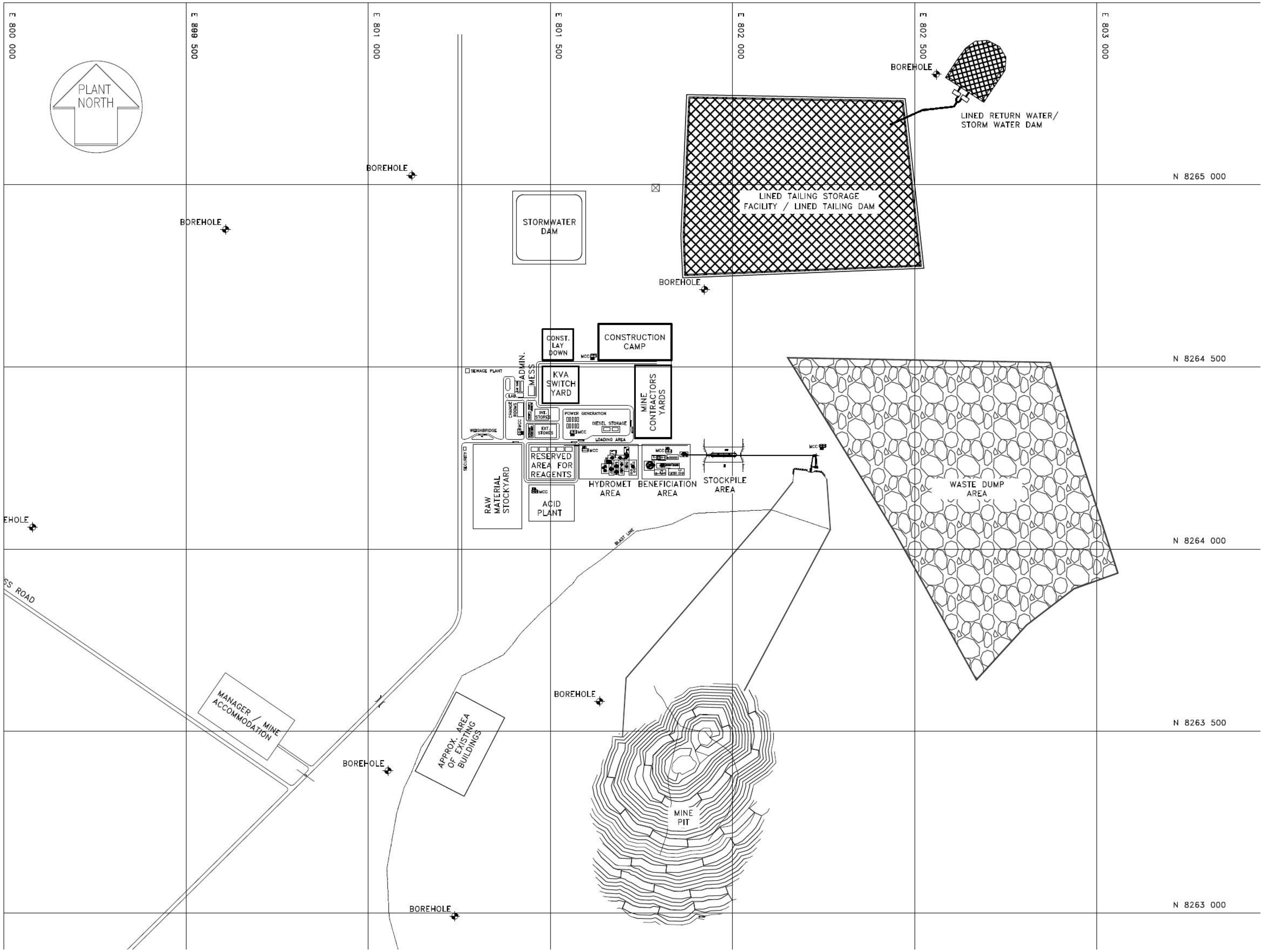
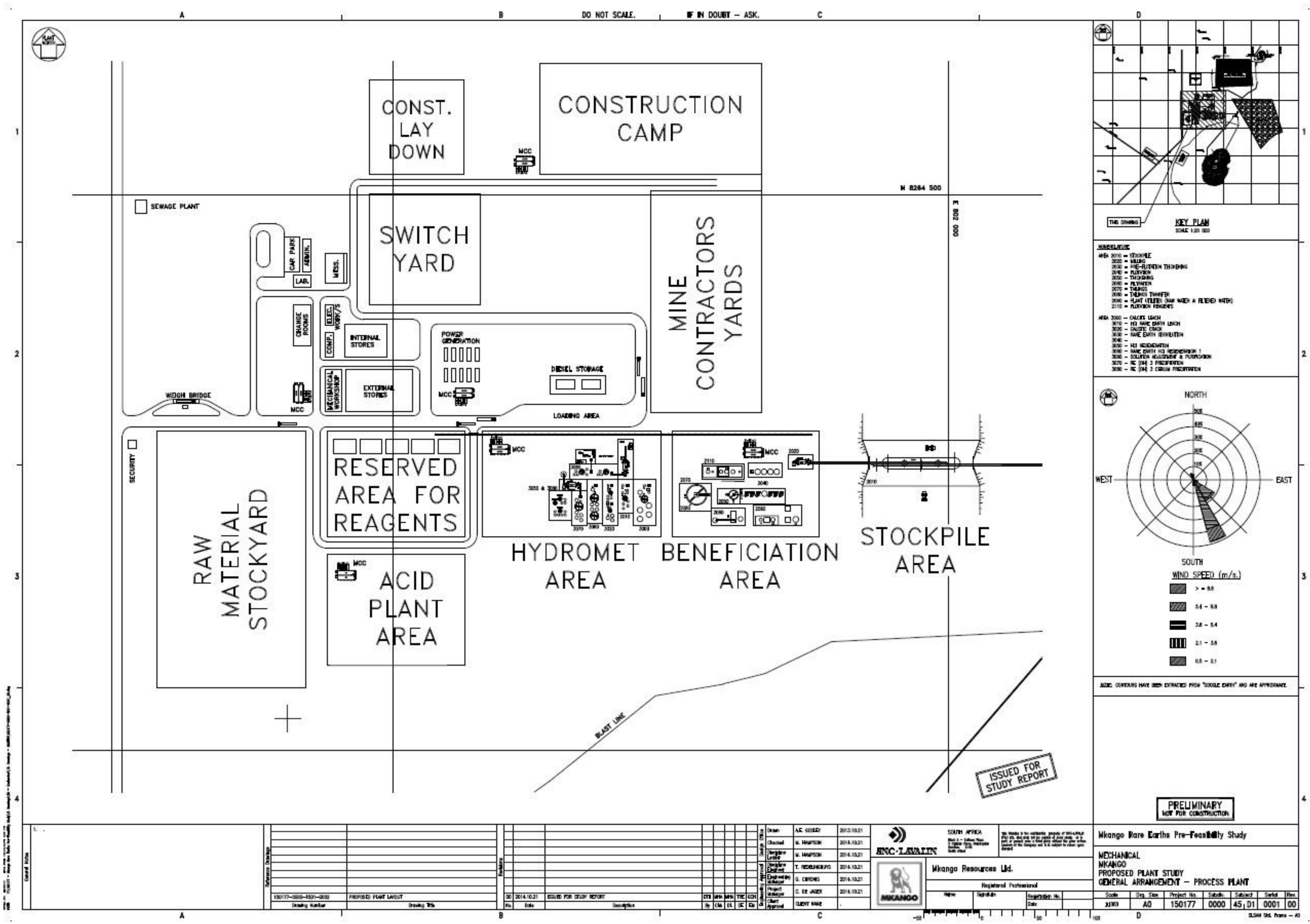


Figure 18-2
General arrangement of the process plant



18.3 Electrical Site Infrastructure

The electrical system allowed for is based on a 10 MVA utility incomer at 132 kV and the electrical power distribution around the site is based on an 11 kV infrastructure system. From the distribution board a 22 kV overhead line (OHL) will feed power to the tailings disposal facility, construction camp and the contractor's yard.

A second overhead line will be used to reticulate to the following areas:

- main office;
- construction mini sub;
- sewage plant;
- raw material MCC;
- stockpile RoM;
- security mini sub;
- storm water MCC; and
- raw water MCC

18.4 Tailings Storage Facility

18.4.1 Design criteria

The criteria for the design of the proposed Musolo TSF are summarised below and includes the following:

- the terms of reference;
- the battery limits;
- the expected production rate of tailings;
- characteristics of the tailings material;
- climatic data; and
- applicable legislation.

18.4.1.1 Terms of reference

The terms of reference for the PFS that Epoch were responsible for, include:

- the design of the TSF and related infrastructure, namely:
    - a self-raising or full containment Tailings Dam that can accommodate 41 667 tpm of tailings for a LoM of 22 years;
    - a Return Water Dam (RWD) and Storm Water Dam (SWD) associated with the TSF; and
    - the associated infrastructure for the TSF (i.e. perimeter slurry deposition pipeline, storm water diversion trenches, access roads etc.);

- an estimate of the capital costs associated with the TSF to an accuracy of ±25 percent; and
- an estimate of the operation costs associated with the TSF to an accuracy of ±25 percent.

18.4.1.2 Battery limits

The battery limits for the TSF PFS are as follows:

- the perimeter fence around the TSF;
- downstream of the point where the slurry delivery pipeline intersects the TSF starter wall; and
- upstream of the first flange exiting the RWD/SWD outlet pipes, prior to the RWD/SWD pump station.

18.4.1.3 Tailings production plan

It is expected that the mining and processing operations shall result in the production of a total of 11 million tons of tailings over a LoM of 22 years, at a rate of 500 dry ktpa as summarised in Table 18-1.

Table 18-1
Summary tailings production plan

Parameter	Units	Musolo TSF
Life Of Mine	years	22
Run Of Mine Feed	ktpa	500
Tailings Deposition Rate	ktpa	500
Total Tailings	kt	11,000

18.4.1.4 Characterisation of tailings

Geochemical and Geotechnical characterisation of the tailings is necessary in order to produce an appropriate TSF design solution. The characteristics of the tailings for the PFS design are unknown, and have thus been based on similar rare earth tailings products from other projects at this stage.

Design criteria for the design of the TSF

The design of the TSF is based on the design criteria shown in Table 18-2.

Table 18-2
Design criteria associated with the TSF

Item No.	Description	Value	Source / Comments
1	Design Life of Facility	22 Years	Mkango (Ref : SIMO2 – 500kTpa schedule)
2	Processed Ore	Rare Earths	Mkango (Ref : SIMO2 – 500kTpa schedule)
3	Total Tailings Deposition	11,000,000 dry tonnes at 500 ktpa (80:20 - Float : Hydromet)	Mkango (Ref : SIMO2 – 500kTpa schedule) SNC
4	Tailings Specific Gravity (SG)	2.85	SNC
5	Particle Size Distribution (PSD)	80 % passing 75 micron	SNC
6	Geochemical Characteristics of Tailings	Worst case scenario assumed to be mitigated by installing a HDPE liner	Epoch – Assumed
7	Placement Dry Density of Tailings	1.36 t/m^3	Epoch – Assumed. Based on an average settlement void ratio of 1.1. Confirmed SG of 2.85 (SNC)
8	Total Waste Rock Production	48,932,309 tonnes	Mkango (Ref : SIMO2 – 500kTpa schedule)
9	Percentage Solids	50 % Solids for Float and 30 – 40 % Solids for Hydromet	SNC
10	Slurry Density	1.48 t/m^3 for Float Stream 1.28 t/ for Hydromet Stream	SNC Confirmed SG and Solid %
11	Return Water Strategy	Closed Circuit	Epoch – Assumed
12	TSF Lining System	HDPE Lined Facility – 1.5 mm HPDE liner and compacted in-situ soil.	Agreed upon by Mkango
13	TSF Decant System	Penstock	Available storage volume on tailings dam would not be adequate to store accumulating water volume during a major storm event.
14	Return Water and Storm Water Facility	Decanting of water to RWD and SWD to maximise water usage.	Epoch – Assumed. Slurry water collected on the TSF to be decanted to the RWD where it will be stored for re-use as process water. Should a major storm event occur, excess decant water in the RWD will overflow into the SWD from where it will be either stored or treated and discharged.
15	Depositional Facility/Philosophy	Self-raising paddock system.	Epoch – Assumed
16	Process Circuits Facility/Philosophy	Water recovered from the TSF shall be stored in a single process water dam.	Epoch – Assumed

Item No.	Description	Value	Source / Comments
17	Climatic Data	Extract from Digby Wells Environmental and Social PFS Report and also sourced from CantyMedia, 2004	Digby Wells input and Epoch – Assumed
18	Survey Data	Lidar data provided by Mkango	Mkango

In addition to the above, it has been assumed, at this stage of the study, that sufficient and suitable construction material, for the preparatory earthworks associated with the TSF, can be sourced from within the RWD/SWD/TSF basins.

Tailings geochemistry and pollution potential

For the purposes of the PFS, it has been assumed that the tailings shall require containment in a HDPE lined TSF with the provision for leakage detection. This is to be investigated further and revised during the next stage of the study work by means of geochemical laboratory testing of the tailings product.

18.4.1.5 Climatic data

The proposed mine is situated in the southern part of Malawi in the Phalombe district 61 km South East of the town of Zomba. It is located approximately 300 km from the Indian Ocean and has an elevation of 700 mamsl. Historical rainfall data for the mine site could not be obtained and alternative data had to be considered. Typical rainfall data for the city of Zomba, Blantyre and Phalombe was considered in order to estimate the typical monthly rainfall and Mean Annual Precipitation (MAP) in the area. The site has an estimated MAP of 1,279 mm, refer to Table 18-3. The mean annual evaporation for the site was sourced from the FAO LocClim database and equates to 1,415 mm, refer to Table 18-3.

Table 18-3
Average rainfall

Month	Average monthly Rainfall (mm)				Evaporation for Lake Chilwa
	City of Zomba	City of Blantyre	City of Phalombe	Average	
Jan	300.0	200.0	308.9	269.6	131.0
Feb	250.0	200.0	294.7	248.2	114.0
Mar	250.0	160.0	286.2	232.1	118.0
Apr	60.0	40.0	153.0	84.3	106.0
May	10.0	0.0	56.8	22.3	96.0
Jun	10.0	0.0	53.6	21.2	79.0
Jul	0.0	0.0	45.2	15.1	87.0
Aug	0.0	0.0	31.9	10.6	109.0
Sep	0.0	0.0	22.1	7.4	131.0
Oct	20.0	20.0	63.5	34.5	163.0
Nov	100.0	80.0	143.3	107.8	148.0
Dec	270.0	130.0	277.6	225.9	133.0
Total	**1,270.0**	**830.0**	**1,736.8**	**1,278.9**	**1,415.0**

Source: *CantyMedia (2004)*

The expected magnitude of rainfall events as a function of duration and recurrence interval was estimated by using data for an area similar to Mkango but situated in South Africa. The main characteristics compared in order to establish a similar site were elevation and distance from the ocean. Various weather stations were compared and the station with storm intensities that tends to be conservatively high was assumed applicable to the Mkango site. The weather station selected is situated in the North Eastern part of South Africa and according to the Surface Water Resources of South Africa, 1990 the station is named The Knoll (SAWS no. 0556143, co-ordinates 25˚23'S latitude, 31˚5'E longitude). The station is located at an elevation 743 mamsl and is approximately 250 km from the ocean. The expected magnitude of rainfall events as a function of event duration and recurrence interval are shown in Table 18-4.

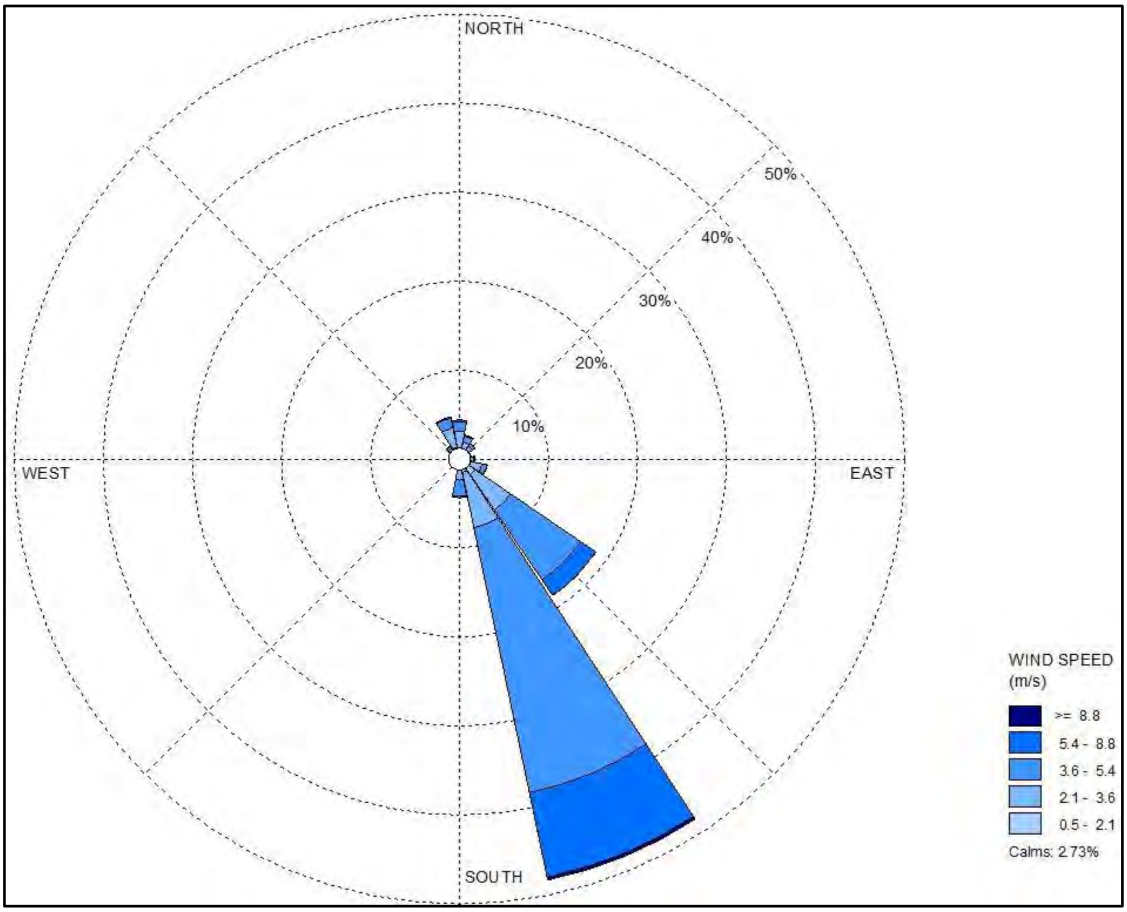
Table 18-4
Rainfall depth as a function of event duration and recurrence interval

Event duration (days)	Recurrence interval (years)					
	2	5	10	20	50	100
	P (occurrence) based on planned Life of Mine					
	100 %	99 %	90 %	68 %	36 %	20 %
1	74.1	103.1	125.1	148.8	183.4	212.7
2	89.8	125.8	153.4	183.4	227.8	265.8
3	103.5	145.4	177.7	212.4	263.8	307.6
4	108.3	151.9	185.1	220.7	272.8	316.9
5	113.3	158.1	191.6	226.8	277.8	320.0
7	118.7	165.3	199.9	236.2	288.2	331.2

During the next phase of the study a hydrological study for the Mkango site would be required from which more applicable storm events may be adopted in the design of the TSF and other infrastructure.

Wind data was obtained from the Environmental and Social Pre-Feasibility Report, September 2013 (prepared by Digby Wells Environmental). The wind rose was determined using data recorded on site over a three year period with the results shown in Figure 18-3. From the Figure, the predominant wind direction is south-southeasterly. Whilst this differs from the on site information now being recorded, for design purposes, information gathered from a period longer than one year is preferred. Should the Project proceed to Feasibility Study stage, then more detailed consideration will be given to the information gathered on site.

Figure 18-3
Wind rose for Songwe: 01 January 2010 to 31 December 2012



Source: *Digby Wells Environmental*

18.4.1.6 Legislation applicable to the mine tailings storage facilities

The TSF design has been based on best design practices, and South African TSF design codes/standard where applicable, e.g. South African National Standards (SANS) code of practice for mine residue (SANS 0286: 1998).

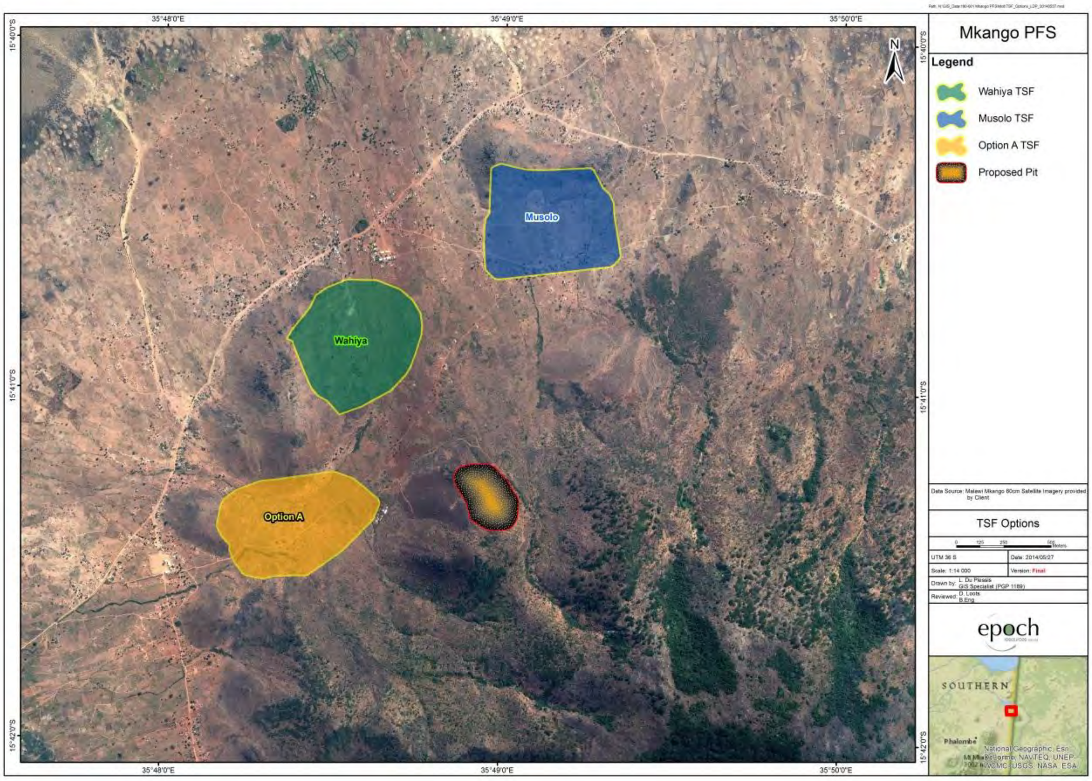
18.4.2 Selection of the preferred site for the establishment of the tailings storage facility

The area available for the development of the proposed Project is shown in Figure 18-4 which also shows three candidate sites for the establishment of the TSF. The preferred TSF area is one defined by:

- reasonable population densities that can be economically relocated;
- the location and extent of the open pit; and
- drainage and flood lines.

Figure 18-4

Candidate sites for the tailings storage facility



18.4.2.1 Summary comparison of candidate sites for the tailings storage facility

Tailings storage facility Option A

The characteristics of TSF Option A are:

- this site has the available storage capacity to store the tailings that shall be produced over the LoM. Potential for expansion is limited due to the surrounding ridges and steep gradient of the mountain to the South;
- it is situated upgrade of a densely populated area which falls inside the Zone of Influence (SANS, 1988) of the TSF. The number of households that fall inside a 500m radius of the TSF amounts to 253;

- large volumes of waste rock/earth is required for the construction of the containment walls; and
- this option is the furthest site from Mpoto lagoon. To a lesser extent the distance from the TSF to the Mpoto lagoon shall also minimise the pollution potential/impact of the TSF on the Mpoto lagoon.

Wahiya tailings storage facility option

The features of Wahiya TSF option are as follows:

- this site has the available storage capacity to store the tailings that shall be produced over the LoM. There is potential for expansion to the North East should the LoM be extended or the deposition rate increased;
- it is situated upgrade of a densely populated area which falls inside the Zone of Influence (SANS, 1988) of the TSF. The number of households that fall inside a 500m radius of the TSF amounts to 422;
- the volume of waste rock required for the construction of the starter walls is minimal, reducing the cost associated with the construction thereof;
- this option is intersected by a primary drainage line; and
- this option is the second furthest site from the Mpoto lagoon.

Musolo tailings storage facility option

The features of Musolo TSF Option are as follows:

- this site has the available storage capacity to store the tailings that shall be produced over the LoM. There is potential for expansion to the East, West and South should the LoM be extended or the deposition rate increased;
- it is situated upgrade of a densely populated area which falls inside the Zone of Influence (SANS, 1988) of the TSF. The number of households that fall inside a 500m radius of the TSF amounts to 356;
- the volume of waste rock required for the construction of the starter walls is minimal, reducing the cost associated with the construction thereof; and
- this option is the closest to the Mpoto lagoon.

18.4.2.2 Selection of preferred site for tailings storage facility

Based on the available information the Musolo TSF Option was selected as the preferred location for the establishment of the TSF. This is based predominantly on the aspects that the available area allows for a safe self-raising rate of rise whilst minimising the cost associated with the construction of the starter walls.

The Wahiya TSF option was not seen as a viable due to the fact that it intersects a main drainage line. In terms of an environmental and social perspective it would also have the biggest impact on the surrounding area due to the dense population within its vicinity.

TSF Option A also intersects a main drainage line and due to the high volume of waste rock/earth material required for the construction of the starter walls this option is not economically viable.

18.4.3 Tailings storage facility design

The Pre-Feasibility design of the TSF is described below in terms of the stage capacity calculations, the proposed TSF development strategy and the works required to ensure the facility performs as required.

The TSF comprises:

- a HDPE lined self-raised TSF;
- a HDPE lined RWD;
- a HDPE lined SWD; and
- associated infrastructure (i.e. slurry delivery infrastructure, storm water diversion trenches etc.).

18.4.3.1 Stage capacity calculations

The TSF has been designed taking cognisance of the following aspects:

- the monthly tonnage rate of 41,667 tpm;
- the average placed dry density of tailings at 1.36 tonnes/m^3; and
- a rate of rise restricted to less than 3 m/year once above the starter wall.

Stage capacity analyses have been carried out in order to provide the basis for the staged development of the TSF and are summarised in Table 18-5. The calculations show that the facility has the capacity to store the expected tailings production. The facility is to be developed to a maximum height of 48 m above datum with the final rate of rise being 2.8 m/yr.

Table 18-5
Summary of stoage capacity calculations for proposed TSF

Parameter	Units	Musolo Option
Life of Mine	years	22
Deposition Rate	Dry ktpa	500
Total Tailings Production	Dry kt	11 000
Tailings Storage Volume Required	10^6 m^3	8.11
Datum Level	mamsl	663
TSF Crest Elevation	mamsl	711
Storage Capacity	kt	11 033
Deposition Area at Final Elevation	ha	13.21
Terminal Rate of Rise (Tailings)	m/a	2.79

18.4.3.2 *Site development strategy and construction of impoundment walls*

Construction of the starter wall to an elevation 672 mamsl shall allow contained storage for the first year of LoM. The datum elevation for the starter wall is 663 mamsl and for the 9 m lift to 672 mamsl 100,000 m^3 of borrow material excavated from the RWD/SWD/TSF basins and within a 2 km haul distance shall be required for its construction. The rate of rise of the facility decreases to 2.5 m/year from the datum to the crest elevation of the starter wall. Thereafter the TSF shall be developed by means of the self-raising depositional methodology to a final elevation of 711 mamsl which is 48 m above datum level. Terminal rate of rise of the TSF is 2.8 m/year.

18.4.3.3 *Tailings storage facility zone of influence*

The Zone of Influence for a TSF is the area likely to be affected by a flow slide emanating from the facility. In terms of the guidelines (SANS 0286:1998) the zone of influence is defined as the area:

- upstream of any point on the perimeter of the TSF, the lesser of a distance of 5h from the toe (where h is the height of the deposit at the point under consideration); and the distance to the point where the ground level exceeds h/2 above the elevation of the toe at the point on the perimeter;
- on sides of the TSF parallel to the ground slope – a distance of 10h from the toe; and
- downstream of the lowest point on the perimeter of the TSF, a distance of 100h

The area most likely to be affected by a flow slide from the TSF could potentially impact on:

- the adjacent drainage lines; and
- Mpoto lagoon.

18.4.3.4 *Water balance for Musolo TSF*

The average monthly deterministic water balance calculation are based on a range of inputs including estimates of the release of slurry water upon deposition, losses to evaporation and runoff associated with monthly average rainfall. The calculation of slurry water return volumes and the contribution of storm water runoff to the water balance are based on:

- the solids : liquid ratio of the slurry (50:50);
- the estimated void ratio of the deposited slurry immediately after deposition;
- the basin areas of the facilities (TSF, SWD and RWD);
- monthly average rainfall for the site;
- a minimum decant pool volume on the tailings dam
- a RWD pool volume based on an assumed retention period for slurry decant water of 7 days;
- a Beach slope of 1V:200H for the TSF basin area;
- estimates of average and storm event runoff coefficients; and

- estimates of evaporation losses based on the RWD/SWD configuration and monthly average evaporation rates.

The inputs to the water balance calculations are summarised in Table 18-6.

Table 18-6
Inputs to water balance calculations for the Musolo TSF

Description	Units	Musolo TSF
Particle SG	t/m^3	2.85
Basin Area	Ha	33
Slurry Deposition	m^3/month	56,287
Solids Volume	m^3/month	14,620
Volume of Water	m^3/month	41,667
% Solids in Slurry (by mass)	%	50
Void Ratio at Initial Settlement		1.4 – 1.5
RWD Normal Operation Capacity	m^3	4,600

Selected results from the water balance calculations are summarised in Table 18-7 and show that:

- between 19,726 m^3 and 21,189 m^3 of slurry water is expected to report to RWD each month;
- the available slurry water return is supplemented by rainfall water falling on the TSF and is also subjected to evaporation losses. It is estimated that between 18,486 m^3 and 71,451 m^3 of return water is available as return water for pumping back to the plant each month;
- during the wet season (December to April) 100 % of the plant water requirement may be supplied by return water from the TSF; and
- during the dry season (May to October) up to 19,164 m^3 of makeup water is required by the plant from sources other than the TSF.

Table 18-7
Selected results from water balance calculations for Musolo TSF

Description	Unit	Musolo TSF	
		Min	Max
Slurry Water Released to Decant Pool	m^3/month	19,726	21,189
Rainfall Contribution to Return Water	m^3/month	394	30,778
Evaporation Losses From Decant Pool	m^3/month	498	3,775
Estimated total Return Water Available	m^3/month	18,486	71,451
Total Plant Slurry Water Requirement	m^3/month	41,667	41,667
Clean Water Make-Up Requirement	m^3/month	4,167	4,167
Required Make-Up Water	m^3/month	0	19,164

Return water generated during a storm event

Estimates of the volumes of runoff expected to report to the TSF for different storm events are presented in Table 8. It is estimated that up to 56,901m3 of storm water may report to the SWD during a 1 in 100 year 7 day storm event. It is expected that there shall be a build-up of return water in the SWD during the wet season which would be absorbed back into the plant during the dry season based on the estimated makeup water requirements.

Table 18-8
Expected runoof to TSF decant pool as a function of event duration and recurrence interval

Event Duration (Days)	Recurrence Interval (years)					
	2	5	10	20	50	100
	Probability (Occurrence) Based on Planned Life of Mine					
	100 %	99 %	90 %	68 %	36 %	20 %
	Catchment Runoff Coefficients					
	0.5	0.5	0.5	0.5	0.5	0.5
1	12,095	16,829	20,420	24,288	29,936	34,719
2	14,658	20,534	25,039	29,936	37,183	43,386
3	16,894	23,733	29,006	34,670	43,060	50,209
4	17,678	24,794	30,214	36,024	44,529	51,727
5	18,494	25,806	31,274	37,020	45,345	52,233
6	19,375	26,982	32,629	38,554	47,042	54,061
7	20,485	28,434	34,359	40,578	49,507	56,901

Operating procedures for the TSF should make provision for managing fluctuations in the decant pool level especially after periods of intense rainfall. The quantities of runoff are not such that they should pose long term problems to the TSF.

18.4.4 Seepage and slope stability analyses

Seepage and slope stability analyses have not been carried out for the Pre-Feasibility design. Detailed analysis of the proposed TSF are to be carried out as part of the next study stage and based on the expected geotechnical characteristics of the tailings and foundation materials. The objectives of these analyses are to determine the seepage regimes and the position of the phreatic surface within the TSF during the various phases of development. The stability of the side slope of the TSF during the different phases is also to be assessed under static and dynamic condition.

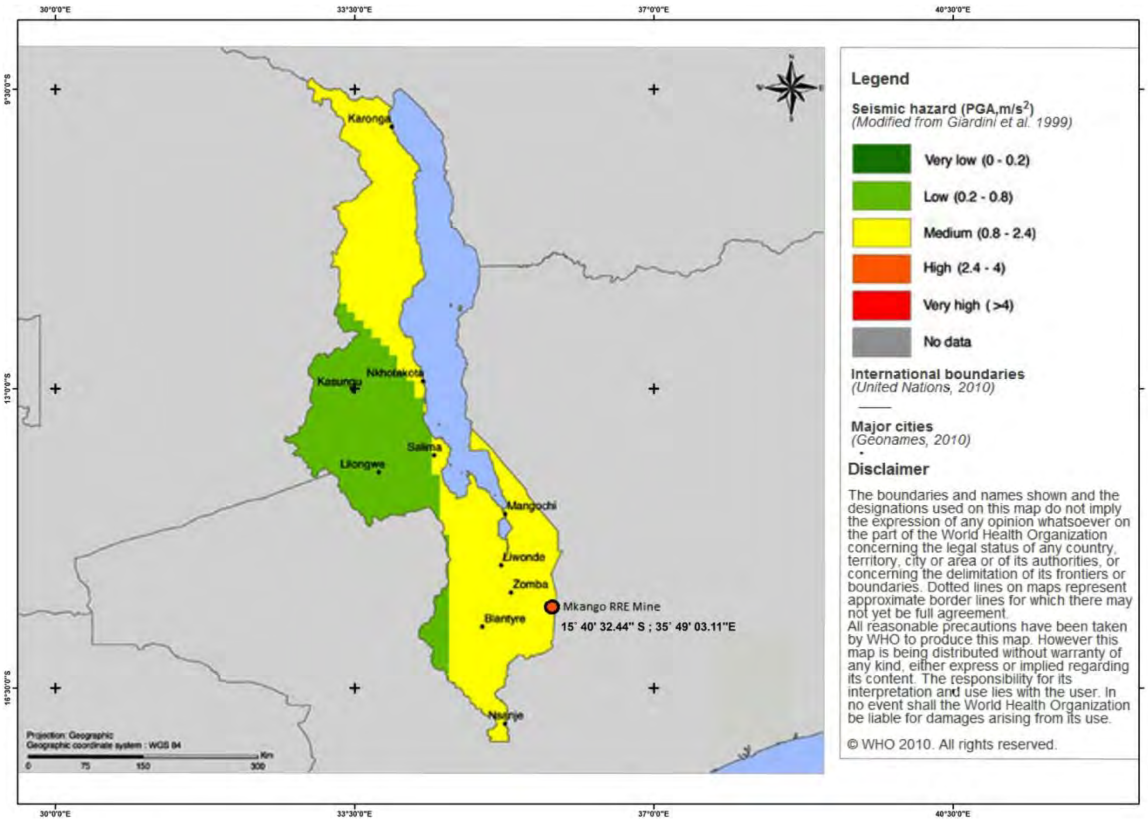
18.4.4.1 Seepage analyses

It has been assumed that the toe drain along the inside toe of the starter embankment is adequate in drawing dawn the phreatic surface within the TSF.

18.4.4.2 Slope stability analysis

For the purposes of the Pre-Feasibility design an overall design slope of 1V:3H has been adopted which is sufficient for a stable outer TSF wall. During static conditions the location of the phreatic surface and material strength parameters (tailings, foundation and embankment) would normally have the biggest influence on the on the Factor of Safety (FOS) against failure. Seismic activity would contribute to instability lowering the FOS against failure. It is therefore recommended that dynamic conditions also be considered during the next stage of the study as the Mkango site falls inside a medium seismic active zone as depicted in Figure 18-5.

Figure 18-5
Earthquake hazard map of Malawi



Source: *WHO (2010)*

18.4.5 Development, operation and closure of the TSF, RWD and SWD

18.4.5.1 Tailings Storage Facility design

This section of the Technical Report explains the preparatory and operational works associated with the construction of the TSF.

Tailings dam preparatory works

The construction of the TSF shall have to be completed to coincide with the commissioning of the metallurgical plant and comprises:

- topsoil stripping to a depth of 300 mm over the entire TSF footprint area;
- a box cut to a depth of 500 mm beneath the starter wall embankment;
- a compacted earth starter embankment wall, constructed with suitably borrow material sourced from within the RWD/SWD/TSF basins, with the following dimensions:
    - 9 m high (i.e. crest elevation of 672 mamsl);

- 6 m wide crest;
- 1V:2H internal side slope; and
- 1V:3H external side slope;

- a compacted bund wall, constructed with suitably borrow material sourced from within the RWD/SWD/TSF basins, with the following dimensions:
  - 1 m high (i.e. from elevation 671 mamsl);
  - 6 m wide crest;
  - 1V:2H internal side slope; and
  - 1V:3H external side slope;
- the supply and installation of a HDPE liner to the tailings dam basin and inside slope of the starter walls comprising (from top to bottom):
  - a 1,500 micron HDPE liner; and
  - A6 Kaymat geotextile;
- the self-rising portion of the TSF is battered at an overall side slope of 1V:3H;
- a 5 m wide elevated toe drain. The toe drain is positioned along the inside toe of the starter wall embankment and comprises:
  - 160ND slotted HDPE drainex pipe;
  - suitably graded filter sand;
  - 6.7 mm stone;
  - 19 mm stone; and
  - non-woven geo-fabric;
- a 3 m wide Natural Ground Level (NGL) toe drain extending the length of the inside perimeter toe of the bund wall above elevation 671 mamsl The toe drain comprises:
  - 160ND slotted HDPE Drainex pipe;
  - suitably graded filter sand;
  - 6.7 mm stone;
  - 19 mm stone; and
  - non-woven geo-fabric;
- a 160 ND non-slotted HDPE Drainex pipe, spaced at 50 m intervals and positioned along the perimeter of the elevated and NGL toe drain. Seepage water emanating from the drains is collected and channelled into the solution trench;
- a 20 m wide toe catchment paddocks extending the perimeter of the tailings dam. The paddock walls have a crest width of 1 m, a height of 1 m and side slopes of 1V:1.5H. The

cross-walls have a crest width of 1 m, a height of 0.75 m and side slopes of 1V:1.5H. The paddocks collect runoff from the tailings dam side slopes;

- a solution trench around the TSF from which seepage and catchment paddock runoff water is directed to the silt traps and subsequently into the RWD. The trapezoidal solution trench has the following dimensions:
  - 1 m deep;
  - 1 m wide base; and
  - 1V:1.5H side slopes;
- an energy dissipater for the collection of supernatant water from the penstock as well as seepage water from the toe drains;
- a two compartment reno-mattress/basket silt trap;
- a clean storm water diversion channel, upstream of the TSF, with its associated cut-to-fill berm wall with the following dimensions:
  - 1 m deep;
  - 4 m wide base; and
  - 1V:1.5H side slopes;
- a seepage cut-off trench downstream of the TSF, on the western and eastern side, to an average depth of 5 m below NGL, from which collected seepage water is pumped into the RWD;
- a 450 ID PE 100 PN 8 reinforced concrete encased penstock outfall pipe compromising double intermediate and final vertical 510 ID precast concrete penstock ring inlets. The penstock pipeline is fully encased in reinforced concrete along its entire length and has an average gradient of 1V:65H;
- wooden catwalks along the penstock pipeline with platforms at the intermediate and final intakes to allow access to the penstocks; and
- a 120 mm ID HDPE slurry distribution pipeline along the perimeter length of the TSF starter wall embankment.

The sands and stones specified in the preparatory works shall be externally sourced.

The specified size of the penstock pipeline and the slurry distribution pipeline has been based on preliminary design calculations and is to be re-evaluated during the next phase of the project.

Tailings dam depositional and operational methodology

Deposition of tailing shall initially take place behind the constructed starter embankment. Once the tailings elevation reaches the top crest elevation of the starter wall the TSF shall be developed as a conventional self-raising day wall / night paddock facility with an overall outer slope of 1V:3H

Routine operational aspects of the facility entail:

- operating of the slurry delivery system to ensure the even distribution of tailings within the TSF so as to enable the lifting of the day wall and control of the decant pond;
- dismantling, relocation and reassembly of the slurry delivery system from time to time as required;
- operating of the decant system, return water dam and pumps; and
- routine inspections and maintenance of the facility and associated infrastructure.

Deposition is to be controlled as to ensure that the day wall being constructed is always 2 m higher than the tailings in the basin of the dam.

Supernatant and storm water collected on the TSF shall be decanted through vertical penstock inlets and the penstock pipeline to the RWD/SWD.

18.4.5.2 Return water dam and storage water dam system

This section of the Technical Report explains the preparatory and operational works associated with the construction of the RWD and SWD.

Return water dam and storm water dam design philosophy

The RWD and SWD associated with the TSF have been designed to contain runoff water arising from the TSF footprint area and to ensure that "dirty water" storage dams are:

- designed, constructed, maintained and operated so that they are not likely to spill into any clean water system more than once in 50 years; and
- designed, constructed, maintained and operated to have a minimum freeboard of 0.8 m above full supply level.

RWDs and SWDs are potential sources of large losses of decant water from a TSF in terms of seepage through the base and evaporation from the surface. In order to minimise these losses, the following measures have been incorporated into the design:

- division of the TSF return water storage into:
  - a HDPE lined, smaller capacity RWD catering for the day-to-day operational decanting of water from the TSF; and
  - an HDPE lined, larger capacity SWD catering for the high rainfall/storm event decant water;
- the RWD/SWD combined capacity caters for the 3 day, 1 in 100 year storm event. Given the site and the desire to optimise the design, an integrated approach has been adopted whereby the RWD is situated inside the SWD. The RWD storage capacity stores 7 days of slurry return water (4 600 m3) for day to day operations, the balance of the storage capacity (50 209 m3) in the SWD is to accommodate the high rainfall storm events. Such a facility reduces:
  - the potential water surface area exposed to evaporation (as half the facility is utilized for the day to day operations) and, thus, evaporation losses;

- the base and side slope area of the RWD/SWD are lined, preventing seepage losses through the footprint area; and
- the potential impact on the ground water arising from the RWD/SWD since the TSF decant water is contained within the HDPE lined facility.

Based on the above the combined storage capacity of the RWD/SWD is in the order of 54 809 m3 and based on a 3 day 1 in 100 year design storm rainfall depth of 307.6 mm.

Return water dam/ storm water dam details and preparatory works

The RWD/SWD embankment is to be constructed using material sourced from within its own basin. A combined RWD/SWD facility has been adopted whereby the RWD is contained within a portion of the SWD basin. Water entering into the system reports to the RWD from where it can be pumped back to the plant for re-use as process water. In the event of high rainfall, the RWD fills up first and thereafter spills over into the remaining SWD basin. An emergency spillway shall be incorporated into the design, on the North Eastern embankment of the SWD. In the event that the RWD/SWD system is unable to accommodate additional storage above full supply level; this additional water may be released into the downstream environment. The key design features are summarised in Table 18-9.

Table 18-9
Key parameters associated with the Musolo RWD / SWD facility

Description	Unit	Value
Footprint area of RWD	ha	0.46
Footprint area of SWD	ha	2.36
Storage Capacity of the RWD	m^3	4,600
Storage Capacity of the SWD	m^3	50,209
Thickness of HDPE Liner	mm	1.5

The preparatory works associated with the RWD/SWD comprise:

- topsoil stripping to a depth 300 mm beneath the entire RWD/SWD footprint area;
- a box cut to a depth of 500 mm beneath the embankment wall;
- a compacted earth embankment wall with the following dimensions:
    - 6 m wide crests;
    - 1V:3H external side slopes; and
    - 1V:2H internal side slopes;
- 800 mm of freeboard at full supply level;
- a maximum excavation to elevation 651 mamsl in the basin of the combined facility, in order to satisfy the storage capacity requirements;
- a spillway on the North Eastern embankment of the SWD, discharging into the downstream environment;

- a 1,500 micron HDPE liner overlying both the basin and the inner side slopes of both the RWD and the SWD;
- a non-woven geotextile placed between the HDPE liner and the in-situ soil to provide a protective layer for the HDPE liner; and
- 4 No 300 ND HDPE, outlet pipes connecting to the RWD/SWD pump station.

The specified size of the spillway has been based on preliminary design calculations and is to be re-evaluated during the next phase of the Project.

18.4.5.3 Rehabilitation, closure and aftercare works

A rehabilitation, closure and aftercare plan for the TSF RWD and SWD has been developed by the environmental consultant to the Project as part of the development of the environmental management plan for the proposed mine. It is envisaged that the rehabilitation and closure of the Musolo TSF would, in concept, comprise:

- ensuring the construction of the final outer slope of the TSF to the specified configuration of a 1 in 3 slope with 8m step-ins every 15m in height of the TSF;
- the placement of a layer of sub-soil and topsoil to the outer face of the TSF in preparation for the establishment of vegetation;
- sealing of the penstock intake and outlet structures;
- dismantling and removal from site of all pipes, pumps, valves and fittings;
- the establishment of a vegetative cover to the outer slopes of the facility;
- the placement of a layer of waste material to the basin of the TSF to create a capillary break layer;
- the covering of the crest area with a layer of sub-soil and topsoil in preparation for vegetation establishment;
- the establishment of a vegetative cover to the crest of the TSF; and
- the establishment and maintenance of vegetation to the final landform cover until such time as it is self-sustaining.

Aftercare and maintenance of the site is expected to comprise the repair of localised erosion gullies and the maintenance of vegetation for a period of 3 to 5 years after completion of the rehabilitation and closure works.

18.4.5.4 Engineering Management

The estimate of costs associated with the development, operation and rehabilitation and closure of the TSF includes provision for quarterly inspections of the facility by a suitably qualified person and the compilation of annual reports on the on gong development and operation of the facility. The focus of the quarterly inspections and annual reporting on the facility is to ensure that the TSF is being constructed and operated in accordance with the design requirements.

18.4.6 Estimates of capital, operating and closure costs

An estimate of costs associated with the construction, development, operating and closure of the Musolo TSF have been compiled based on the proposed TSF development strategy and the LoM design criteria as described earlier in this Technical Report.

18.4.6.1 Capital Costs

The total capital cost associated with the TSF has been estimated at US$ 12.65 million (Table 18-10)

Table 18-10
Summary of estimated capital costs

Item	Description	Amount (US$ millions)
	Tailings Storage Facility	
1	Schedule B: Site clearance and topsoil stripping	1.10
2	Schedule C: TSF starter embankment	1.70
3	Schedule D: drainage system to TSF starter embankment	0.23
4	Schedule E: decant penstock, drainage collection sumps and access platform	0.62
5	Schedule F; Slurry delivery system	0.46
6	Schedule G: Surface water management works	0.17
7	Schedule H: miscellaneous	0.13
8	Schedule I: liner	2.64
	Total Measured Works	**7.06**
	Storm Water and Return Water Dam	
9	Schedule B: site clearance and topsoil stripping	0.06
10	Schedule C: TSF starter embankment	0.48
11	Schedule D: miscellaneous	0.03
12	Schedule I: liner	0.16
	Total Measured Works	0.73
	Total Cost Calculation	
	Unmeasured Items @ 25 %	1.95
	P & Gs @ 30 %	2.92
	TOTAL COST	**12.65**

The following qualifications are made with regards to the above mentioned capital costs associated with the TSF:

- unmeasured items are estimated at 25 % of the measured works; and
- P & Gs have been allowed for, accounting for 30 % of the total works.

The above cost estimate excludes:

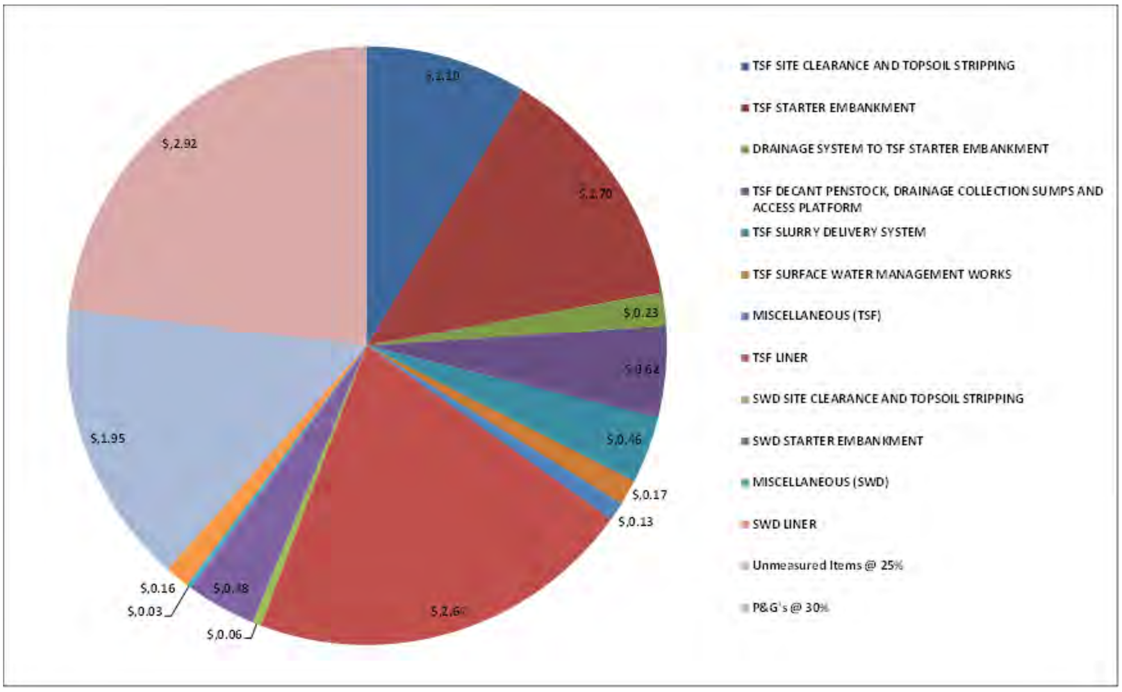
- pumps;
- mechanical and electrical components;

- access roads between the TSF and process plants;
- the return water pipelines from the RWD and SWD to the process plant;
- all electrical, mechanical and instrumentation equipment;
- moving of existing infrastructure; and
- escalation.

A graphical representation of the breakdown of the capital costs associated with the TSF shown in Figure 18-6.

Figure 18-6

Capital cost breakdown in US$ millions



18.4.6.2 Operating costs

The TSF operational cost has been estimated based on current prices for similar TSF operations elsewhere within Africa and operated by specialist contractors. In the case of low tailings depositional rates the operating costs are dictated by the costs associated with establishing and maintaining the staff and equipment necessary to manage the facility and is estimated at US$ 1/tonne of tailing deposition (@ 500 ktpa the cost shall be US$ 0.5m/year). The total operational cost associated with the TSF is estimated at US$ 0.59m/year and comprises:

- US$ 1/tonne of tailing deposition management (500 ktpa amounts to US$ 0.5 million per annum);
- US$ 45,700 per annum for pipe and valve replacements per annum; and
- quarterly inspections and annual reviews of the facility, US$ 40 k/annum.

18.4.6.3 Engineering design

In addition to the capital costs associated with the construction of the TSF provision has been made for engineering design and construction site supervision. The total cost up to the completion of the construction of the TSF is estimated at US$ 13.29 million and comprises:

- construction of the TSF US$ 12.65 million;
- engineering Definitive Feasibility Study at US$ 160,000;
- engineering detailed design at US$ 180,000; and
- engineering construction supervision at US$ 300,000.

18.4.6.4 Rehabilitation and closure costs

The cost for rehabilitation and closure of the TSF has been compiled by the appointed environmental consultant and is thus not included in the above LoM expenditure estimate, but included in elsewhere within the overall Technical Report.

19 MARKET STUDIES AND CONTRACTS

This market review is based on an independent study completed by Adamas Intelligence.

19.1 Rare Earth Elements Overview

Compared to similarly-abundant elements in nature, such as copper, lead, and tin, the annual market for REE is small. Nevertheless, REE have become integral to technologies at the heart of clean energy initiatives worldwide, and have become the critical enablers of ubiquitous gadgetry and electronics that have pervaded society. REE are used in small, but necessary, amounts in hundreds of different technologies, materials, and processes worldwide in commercial, industrial, medical, defence, and environmental applications.

Rare Earth Elements are the critical enablers of modern energy-efficient lamps, are at the heart of low-maintenance wind power generation turbines, and play a 'driving' role in most hybrid electric, plugin hybrid electric, and electric vehicles produced to-date. As a vital ingredient of the three aforementioned technologies, Rare Earth Elements have become a cornerstone of global government macro-initiatives aimed at improving energy efficiency, increasing renewable power generation capacity, and reducing greenhouse gas emissions.

Rare Earth Elements enable more efficient production of hydrocarbon distillates from crude oil and are used in the fuel cracking process to trap toxic-when-volatile metals and gases that would otherwise be emitted into the environment during refining and subsequent combustion of the fuels produced. Rare Earth Elements are used in catalytic converters for internal combustion engine vehicles to convert harmful pollutants in the exhaust stream into less harmful varieties, and are integral to fuel-borne catalyst systems used to manage the accumulation of exhaust particulate in diesel vehicles' catalytic converters.

Rare Earth Elements are used in rechargeable batteries for everything from hybrid electric vehicles to rechargeable toothbrushes, and are at the heart of magnets used in hard disk drives, optical disk drives, headphones, speakers, and cellphone vibration motors, among hundreds of other applications. Rare Earth Elements are used to produce camera lenses, container glass, paint thinner, water treatment agents, fertilizers, and ceramic coatings that protect jet engines from melting during operation. Rare Earth Elements are used in medical and defense applications, and are used in alloys, electronics, lighting, and display screens for applications in aerospace. In just a period of decades, REE have seeped deeply into the fabric of modern life and have proven exceptionally challenging to duplicate or replace.

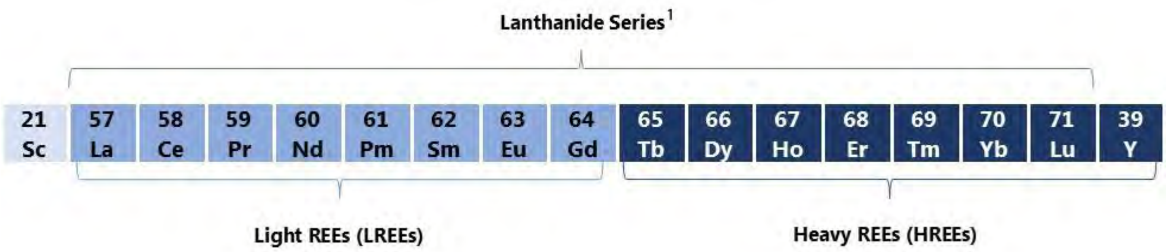
19.1.1 Rare Earths

Despite the misleading moniker, REE are not remarkably rare in nature, but are instead rarely concentrated into economically significant amounts for extraction owing to certain physical and chemical characteristics that promote their broad dissipation in most rock types. In fact, lanthanum, cerium, neodymium, yttrium, and scandium are more abundant than lead in Earth's crust, and praseodymium, dysprosium, samarium, gadolinium, erbium, and ytterbium are more abundant than tin (Khan Academy, 2015). Despite this, there were only 143,300 tonnes of all REOs combined produced globally in 2014 versus approximately 5,460,000 tonnes of primary lead production and approximately 296,000 tonnes of primary tin production globally in the same year (Guberman, 2015; Anderson, 2015).

On the periodic table of elements, REE comprise the lanthanide series plus yttrium and scandium (Figure 19-1). Yttrium is classified as a rare earth element because of its similar ionic radius to the lanthanides, as well as its similar chemical properties, whereas scandium is classified as a rare earth element because of its tendency to concentrate into many of the same minerals.

Figure 19-1

Rare Earth Elements include the lanthanide series plus scandium and yttrium



Note: [1] *Some industry participants (including Mkango) classify europium and gadolinium as heavy rare earths as opposed to light rare earths*

Rare Earth Elements are arbitrarily classified as light REE or oxides (LREEs or LREOs) or heavy REE or oxides (HREEs or HREOs) based on their electron configurations. Simply put, LREEs have an increasing number of unpaired electrons in their 4f shells, starting at lanthanum, which has zero unpaired electrons, through to gadolinium, which has seven unpaired electrons. On the contrary, HREEs have paired electrons - a clockwise and counter-clockwise spinning electron (REE Handbook, 2015) (Figure 19-2). Yttrium's physical properties and chemical reactivity resemble those of HREEs, thus it is categorized as such by industry (Molycorp Inc., 1993).

Figure 19-2

In their 4f shells, LREEs have unpaired electrons whereas HREEs have only paired electrons

19.2 Production and Supply

Rare Earth Elements were first discovered at Ytterby, Sweden in 1787 by Swedish Army Lieutenant and amateur mineralogist, Carl Axel Arrhenius, who collected samples of gadolinite from a small feldspar and quartz mine (Weeks, 1933). Bearing similar physical and chemical properties, REE, or compounds of, proved nearly impossible to separate until 1794, when Finnish chemist Johann Gadolin liberated the first impure yttrium oxide from the mineral ytterbite (Encyclopaedia Britannica, 2015).

Nearly a century later, in 1884, REE were first commercialised with the establishment of the lamp mantle industry, which in parallel spurred the first commercial mining production of REE in Sweden and Norway (Hedrick, 2010). By 1887 both Brazil and the U.S. were commercially mining monazite (Hedrick, 2010), followed by India, which started mining the mineral in 1911 (Hedrick, 2010). Until 1945, the primary method of liberating REE from their oxide hosts was through the slow and costly process of fractional crystallization (about.com, 2015). Beyond 1945, ion exchange and solvent extraction processes were developed, greatly improving access to high-purity, low-cost REEs and spurring global production from hundreds of tonnes to thousands of tonnes annually in the decades to follow (about.com, 2015).

19.2.1 World Mine Production of TREO by Region from 1960 to 2014

According to U.S. Geological Survey (USGS) data, from 1960 through 1965 global annual REO production tripled from a mere 2,300 tonnes to 7,000 tonnes (Figure 19-3) (U.S. Geological Survey, 2015). Production was a global affair in the early 1960s, led by a handful of countries, including South Africa, Australia, the U.S., Brazil, India, and others (U.S. Bureau of Mines Minerals Yearbook, 1932-1993). A number of other nations also yielded small quantities of rare earth minerals and concentrates as by-products of uranium, thorium, tin, and heavy mineral mining operations.

From 1965 through 1980 however the U.S. dominated global REO production, producing an average of 13,700 tonnes of REO and REO equivalent per annum over the period. During that 15-year span, China's REO production was negligible and production from all other nations combined averaged approximately 7,100 tonnes per annum (U.S. Bureau of Mines Minerals Yearbook, 1932-1993) (Figure 19-3).

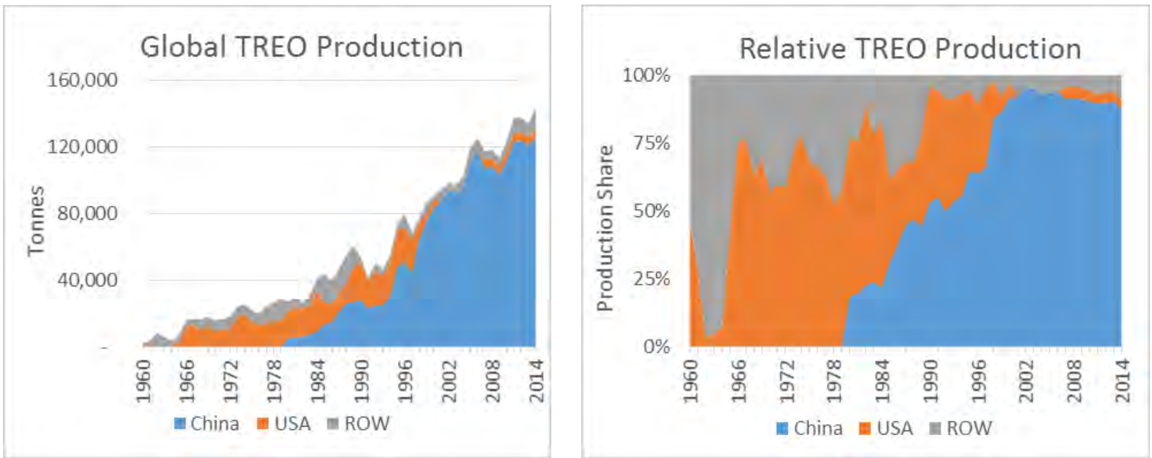
By 1980, however, by means of climbing up the technological latter, China's REO production grew to an encroaching 5,000 tonnes per annum and tripled by 1986 to 15,000 tonnes per annum. From 1987 through the year 2000, China's REO output grew steadily, reaching approximately 28,100 tonnes in 1992, 48,000 tonnes in 1995, and 83,500 tonnes in 2000 (U.S. Bureau of Miners Minerals Yearbook, 1932-1993; U.S. Geological Survey Mineral Commodity Summaries, 1997-2015) (Figure 19-3).

In the wake of China's explosive production growth, U.S. REO production remained steady, averaging approximately 18,000 tonnes per annum from 1980 through the end of 1997 while production from most other nations collapsed in the early-90s due to increased availability of cheaper Chinese REOs (U.S. Geological Survey Mineral Commodity Summaries, 1997-2015).

Throughout the 1990s, prior to joining the World Trade Organization (WTO), China dramatically undercut world prices for REOs, leading the eventual discontinuance of production from most other nations by the end of the decade; namely the U.S., Russia, Malaysia, and India. Despite bearing only 30 % to 40 % of the world's estimated REO reserves (Bradsher, 2010), China has since assumed a near-monopoly on global production (Figure 19-3).

Figure 19-3

World mine production of TREO by region from 1960 through to 2014



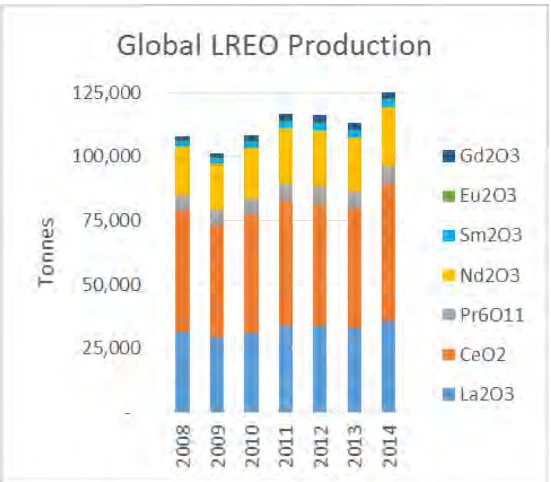
***Source:** US Geological Survey (2015), U.S. Bureau of Mines Minerals Yearbook (1932-1993), Adamas Intelligence estimates*

19.2.2 World Mine Production by Oxide and Country from 2008 to 2014

In a recent market research report titled "Rare Earth Market Outlook" (Adamas Intelligence, 2014), independent research firm Adamas Intelligence (Adamas) estimated global mine production by rare earth oxide and country from 2008 through 2014 based on a bottom-up analysis of production by mine and producer (Adamas Intelligence, 2014).

The research firm estimates that from 2008 through 2014 global mine production of TREO increased at a compound annual growth rate (CAGR) of 3.3 %, from 118,200 tonnes in 2008 to 143,300 tonnes in 2014 (Figure 19-4). Over the same period Adamas estimates that global LREO production grew from 107,700 tonnes to 125,100 at a CAGR of 2.5 %, and global HREO production grew from 10,500 tonnes to 18,200 tonnes at a CAGR of 9.6 % (Figure 19-4).

Figure 19-4
World mine production per rare earth oxide from 2008 through 2014

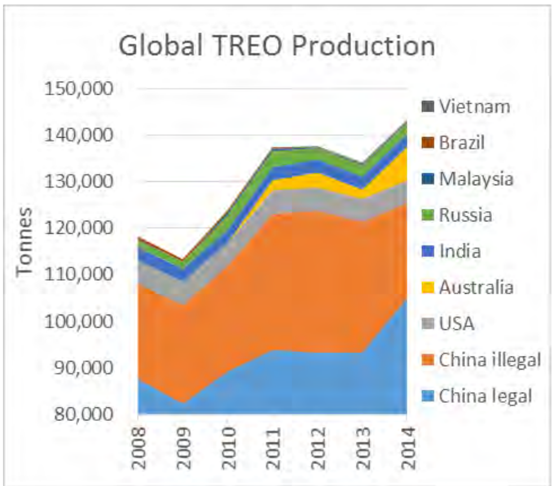


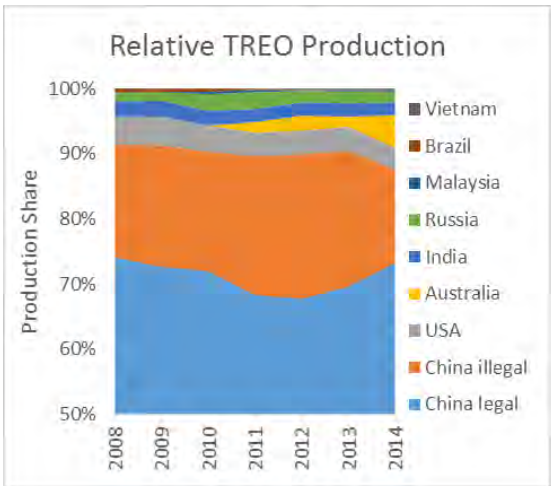
Source: *Adamas Intelligence (2014)*

Adamas estimates that global HREO production increased very sharply between 2008 and 2012 owing to a surge of illegal mining in China brought on by a rise in global REO prices and a boost in domestic resource taxes that made illegal production in the nation more lucrative than ever. It is believed that illegal production from China's HREO-rich ion-adsorption clay deposits was particularly rampant given that such ores can often be exploited in-situ, offering a low technical hurdle for the nation's unregulated producers.

As shown in Figure 19-5, Adamas estimates that illegal TREO production in China peaked in 2012 and has since declined year-over-year on the back of increased efforts by Chinese officials to crackdown on illegal producers. However, Adamas estimates that illegal REO production in China is still very substantial at present, serving to undermine global prices for REOs, but forecasts a continued reduction in illegal production going forward, strengthening the pricing power of China's legitimate producers.

Figure 19-5
World mine production of TREO by country from 2008 through 2014





Source: *Adamas Intelligence (2014)*

Adamas estimates that U.S. production of TREO averaged approximately 5,000 tonnes per annum from 2008 through 2014 with material initially derived from ore stockpiles and later from new production at Molycorp's Mountain Pass mine in California. Adamas estimates that Australian TREO production grew from 2,200 tonnes in 2008 to 7,191 tonnes in 2014 as Lynas Corp. commenced production at its Mt. Weld mine, from which it continues to ramp-up output (Figure 19-5).

India produced approximately 2,800 tonnes of TREO annually from 2008 through 2014, primarily in the form of REO-containing mineral concentrates produced as by-products of heavy mineral mining operations, and Russia produced an average of 2,400 tonnes of TREO per annum in the form of mineral concentrates from the Murmansk region (Figure 19-5).

Lastly, Adamas estimates that production from all other regions combined, namely Malaysia, Brazil, and Vietnam, averaged 690 tonnes per annum from 2008 through 2014 stemming from primary REO mines in Brazil and Vietnam, and by-product production of mineral concentrates in Malaysia (Figure 19-5). From 2008 through 2014 China's total share of global TREO production decreased slightly from 91 % to 88 %, however, with the discontinuance of TREO production from Molycorp's Mountain Pass mine in the U.S. in mid-2015, this trend is poised to reverse should new sources of production not emerge in the near-term.

19.3 Consumption and Demand

19.3.1 World Consumption of Rare Earth Oxides from 2008 through 2014

In the aforementioned "Rare Earth Market Outlook" report, Adamas estimated historic annual consumption of REOs by region for hundreds of key end-uses and applications from 2008 through 2014 – applications and end-uses that can be classified into one of nine distinct categories (Figure 19-6):

- Battery Alloys;
- Catalytic Converters & Fuel-Borne Catalysts;
- Ceramics, Pigments and Glazes;
- Fuel Cracking Catalysts & Additives;
- Glass Polishing Powders & Additives;
- Metallurgy and Alloys;
- Permanent Magnets;
- Phosphors; and
- 'Other' End-Uses and Applications.

Figure 19-6

Nine major rare earth end-use categories and examples of end-uses from each

REE End-Use Categories

Category	End-uses
Battery Alloys	HEVs, PHEVs, E-Bikes, E-Scooters, E-Motorcycles, Single-Cells, etc.
Catalytic Converters & Fuel-borne Catalysts	Cars, Light Trucks, Light Commercial, Heavy Trucks, Buses, Motorcycles, etc.
Ceramics, Glazes, and Pigments	Functional Ceramics, Structural Ceramics, Conductive Ceramics, etc.
Fuel Cracking Catalysts & Additives	Fuel Cracking Catalysts, Co-Catalysts, Fuel Cracking Catalyst Additives
Glass Polishing Powders & Additives	Low-Ce, High-Ce, and Ultra-High-Ce Polishing Powders, Optical Glass, etc.
Metallurgy and Alloys	Steel and Ductile Iron Production, RE-Mg Alloys, Fe-Gd Alloys, Fe-Ho Alloys, etc
Permanent Magnets	HEVs, PHEVs, EVs, HDDs, ODDs, E-Bikes, E-Scooters, Wind Turbines, etc.
Phosphors	LFL Lamps, CFL Lamps, White LED Lamps, Headlamps, TV Backlighting, etc.
Other End-Uses and Applications	Agriculture, Optical Fiber, Laser Crystals, Paint Thinner, Adsorbents, Defense, etc.

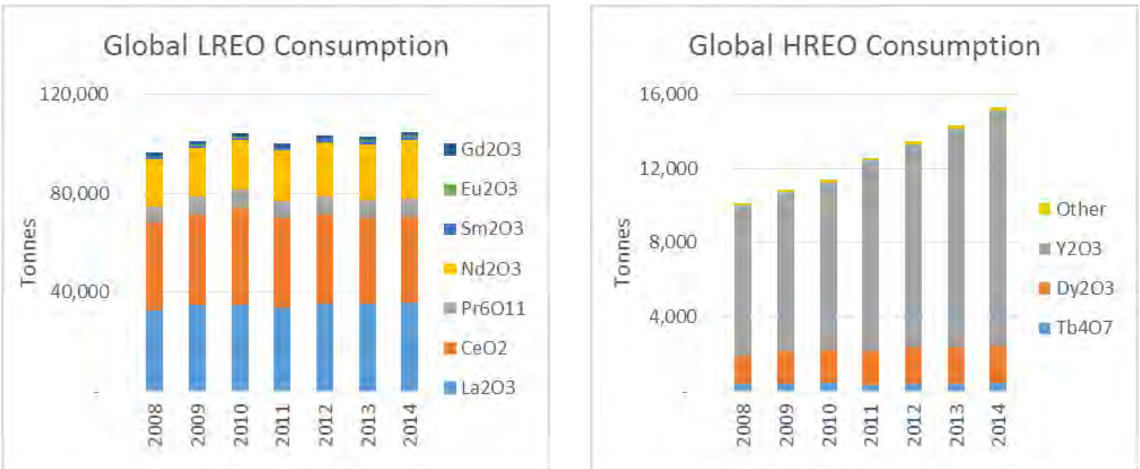
Source: *Adamas Intelligence (2014)*

From this bottom-up analysis, Adamas estimated global annual consumption per rare earth oxide for each individual end-use and application, as well as for each of the aforementioned nine categories, for the period spanning 2008 through 2014. Adamas estimates that global TREO consumption amounted to 106,540 tonnes in 2008 and increased to 120,150 tonnes in 2014 at a CAGR of 2.0 %. Over the same period, Adamas estimates that global consumption of LREOs grew from 96,430 tonnes to 104,830 at a CAGR of 1.4 %, and global consumption of HREOs grew from 10,110 tonnes to 15,320 tonnes at a CAGR of 7.2 % (Figure 19-7).

From 2008 through 2014 Adamas estimates that global consumption of neodymium oxide and praseodymium oxide, combined, increased at a CAGR of 3.0 % from 25,890 tonnes to 30,990 tonnes (Figure 19-7). This growth was driven by strong demand for neodymium-iron-boron (NdFeB) permanent magnets used in a wide array of high-growth applications, ranging from hybrid electric vehicle powertrain motors, to hard disk drive spindle and voice coil motors, wind turbine generators, air conditioner compressor motors, and many others.

Figure 19-7

Estimated world consumption of rare earth oxides from 2008 through 2014



Source: *Adamas Intelligence (2014)*

Similarly, Adamas estimates that global consumption of dysprosium oxide and terbium oxide, combined, increased at a CAGR of 4.0 % from 1,940 tonnes in 2008 to 2,450 tonnes in 2014 (Figure 19-7). Over this period, dysprosium oxide saw increasing demand growth for use in high-grade NdFeB permanent magnets used in high-temperature applications, such as wind turbine generators, and applications involving strong demagnetization fields, such as hybrid electric vehicle powertrain motors. Terbium oxide experienced moderate demand growth over the period from applications involving phosphor, such as production of linear fluorescent lamps and compact fluorescent lamps, as well as for use in specialty NdFeB magnets.

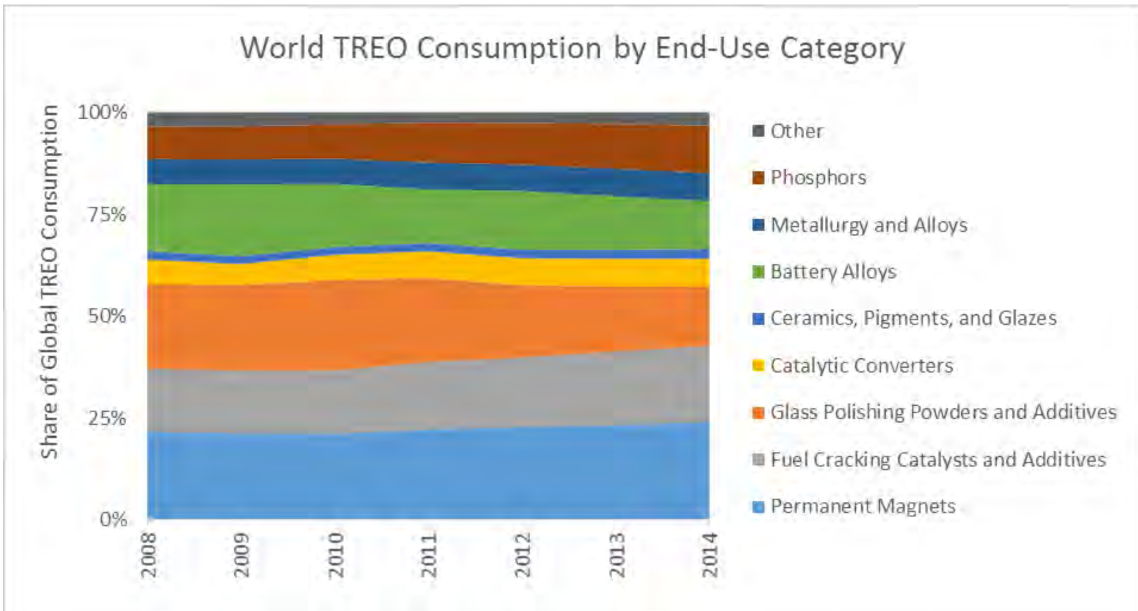
Adamas estimates that global consumption of lanthanum oxide increased modestly at a CAGR of 1.6 % from 2008 through 2014, driven primarily by demand for the oxide in fuel cracking catalysts and nickel metal hydride (NiMH) battery alloys, while global consumption of cerium oxide decreased at a CAGR of -0.3 % over the same period owing to decreased demand for cerium-based polishing powders. Adamas estimates that global consumption of all other REOs increased from 2008 through 2014 at CAGRs of 1.3 % to 7.9 % on the back of wide-ranging demand for the materials in a host of different end-uses.

19.3.2 World Rare Earth Oxide Consumption by End-Use Category 2008 through 2014

In 2008, Adamas estimates that 22 % of all REOs consumed globally went into the manufacture of rare earth permanent magnets and this proportion increased to 24 % in 2014 on the back of above average demand growth versus all end-use categories combined Figure 19-8). From 2008 through 2014 Adamas estimates that demand for REOs used in NdFeB magnets for hybrid electric vehicle powertrain motors increased at a CAGR of 13.7 %, demand for use in wind turbine generators increased at a CAGR of 16.8 %, and demand for use in low-voltage electric motors increased at a CAGR of 10.7 % - all of which are key end-use markets for Mkango's prospective neodymium, praseodymium, dysprosium, and terbium production.

Figure 19-8

Relative consumption of TREO per end-use category from 2008 through 2014



Source: *Adamas Intelligence (2014)*

In 2008, Adamas estimates that 16 % of all REOs consumed globally went into the production of fuel cracking catalysts and additives and this proportion increased to 19 % in 2014 resulting from above average demand growth versus all end-use categories combined (Figure 19-8). From 2008 through 2014 Adamas estimates that demand for REOs, and especially lanthanum oxide, used in fuel cracking catalysts increased at a healthy CAGR of 5.0 %, fueled by global demand growth for distilled hydrocarbons and fuel cracking capacity expansions. Similarly, from 2008 through 2014 Adamas estimates that global demand for REOs used in fuel cracking catalyst *additives* increased at a CAGR of 6.5 % on the back of ever-tightening emissions-related regulations and a greater proportion of the world's crude oil feedstocks coming from 'heavy' sources rich in metals and volatiles that needed to be treated.

Adamas views the permanent magnet and fuel cracking markets as promising sectors for offtake of Mkango's prospective production. Given the strong demand growth for REOs observed in these markets since 2008, Adamas believes that these sectors would readily absorb Mkango's prospective production of REOs used in permanent magnets and fuel cracking catalysts and additives in the future.

19.4 Historical Rare Earth Prices

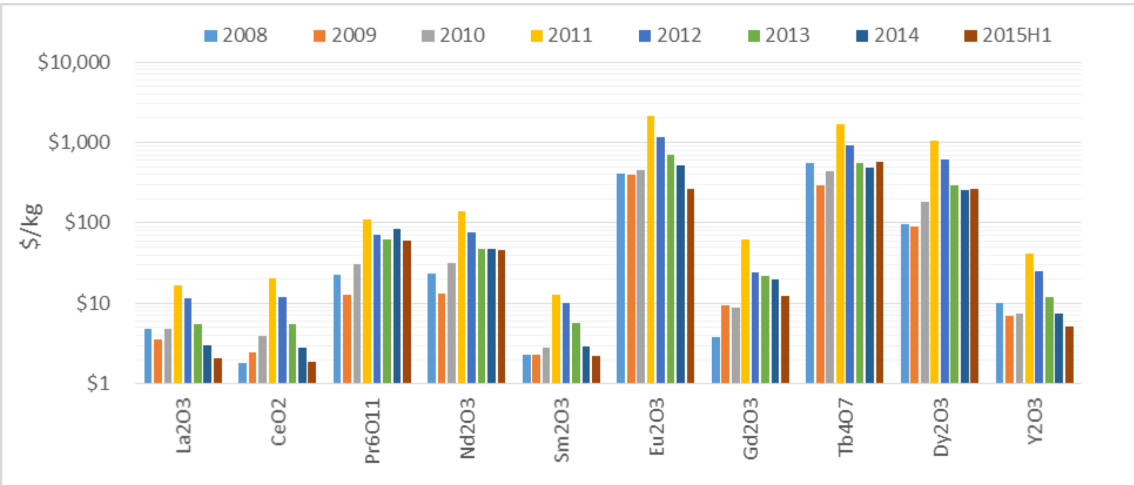
Rare Earth prices are established independently by producers in China and the materials are spot traded between willing buyers and sellers. Rare earth traders and producers regularly quote 'offer' prices to metal price reporting agencies, which serve as benchmarks for current transactions taking place in the market.

From 2008 to 2015 there were two discrete price streams for REOs globally: 1.) Prices in China for internal use or integration into value-added products (China domestic prices), and 2.) Prices in China specifically for export (China FOB prices). China FOB prices, in theory, were equivalent to Chinese domestic prices plus applicable export tariffs, as defined by China's Ministry of Commerce (MOFCOM) and General Administration of Customs (GAC). In practice, however, China FOB prices often exceeded domestic prices by far more than just applicable tariffs as opportunistic traders looked to capitalize on their monopoly.

From 2008 through the first half of 2015 China domestic and FOB prices have followed similar trends, with domestic prices most often leading and export prices lagging. As can be seen in Figure 19-9 and Figure 19-10, both China domestic and FOB prices for REOs have been wide-ranging and at times very volatile.

Figure 19-9

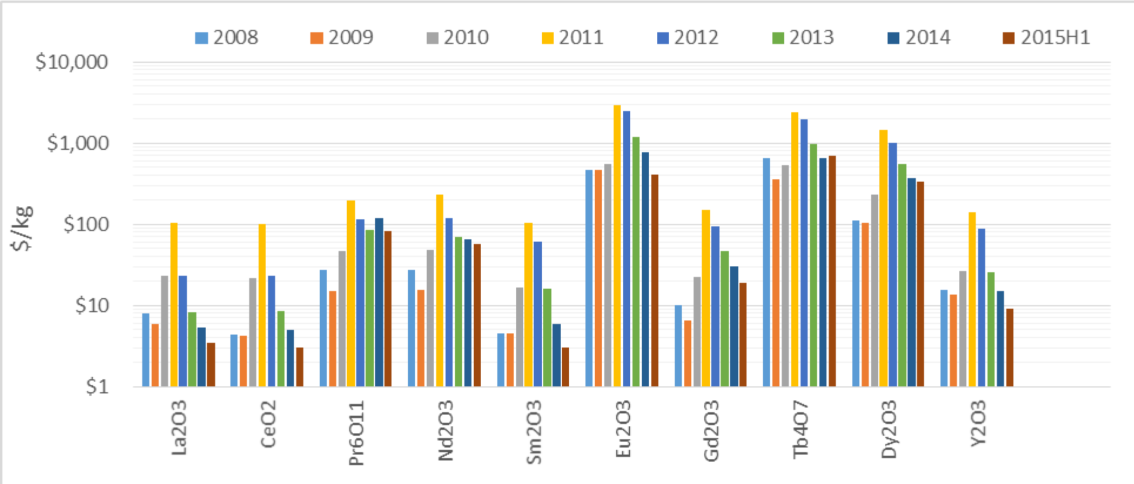
Annual average Chinese domestic REO prices from 2008 through the first half of 2015



Source: *Adamas Intelligence (2014)*

Figure 19-10

Annual average Chinese export REO prices from 2008 through the first half of 2015



Source: *Adamas Intelligence (2014)*

From 2008 through 2011 the annual average China domestic and FOB prices of all REOs increased dramatically. This rise was brought on largely by the fact that China had slashed the amount of REOs available for export in the previous year, causing fear among foreign end-users that supplies could be disrupted, resulting in a buying frenzy that pushed prices to record highs in mid-2011. Prices of most REOs have since decreased year-over-year, giving up most or all of their 2011 gains with the exception of neodymium oxide, praseodymium oxide, dysprosium oxide, and terbium oxide which have retained some upside (Figure 19-9 and Figure 19-10).

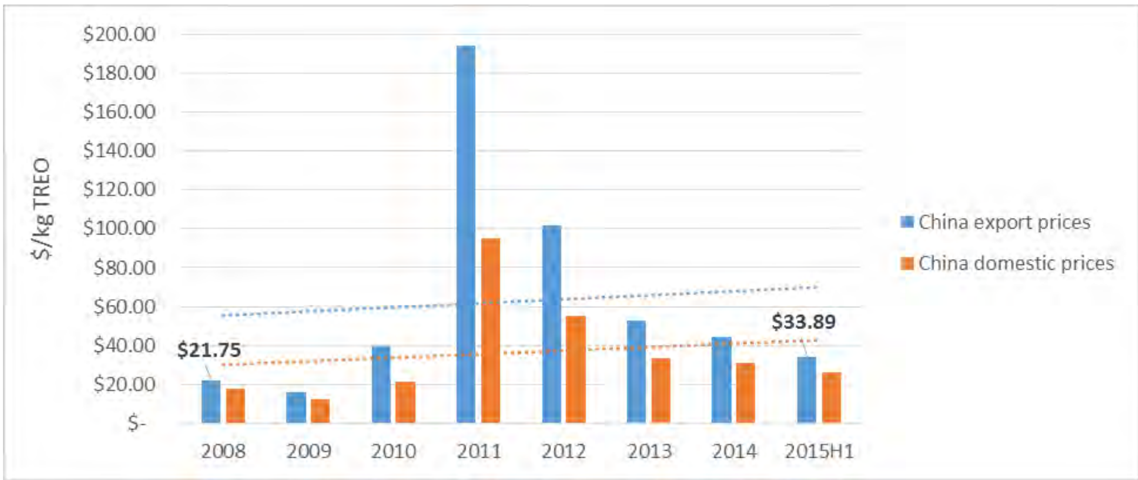
A major downside of the 2011 price spike was that it fueled a surge of illegal/unregulated REO production in China that has since served to continuously undermine China domestic and FOB prices to the point that even China's cost leaders are struggling with profitability. As a result, the current prices of several REOs, such as lanthanum oxide, cerium oxide, and yttrium oxide are at eight-year lows (Figure 19-9 and Figure 19-10).

Interestingly, *w*hile the prices of several REOs are at multi-year lows, the prospective basket value of Mkango's Songwe Hill production has increased by over 50 % since 2008 (Figure 19-11), speaking to the basket's relative abundance of neodymium oxide, praseodymium oxide, and other REOs that have better-sustained their worth amidst the post-2011 price slide.

In 2008, the basket value of Songwe Hill's prospective TREO production was $21.75 per kilogram and over the first half of 2015 the basket value averaged US$ 33.89 per kilogram. Since 2008 the Songwe Hill basket value has averaged US$ 62.95 per kilogram TREO (trailing 7.5-year average), whereas since 2013 it has averaged US$ 43.63 per kilogram TREO (trailing 2.5-year average). Excluding the price spike of 2011 and 2012, the Songwe Hill basket value has averaged US$ 34.62 per kilogram TREO since 2008 (trailing 7.5-year average excluding 2011 and 2012).

Figure 19-11

TREO basket value of Songwe Hill's prospective rare earth production since 2008



Source: *Adamas Intelligence (2014)*

19.5 Policy, Consolidation and Export Uncertainly in China

Prior to May 1, 2015 China applied tariffs to an ever-widening array of rare earth compounds, chemicals, metals, and alloys exported from the nation. As noted in Table 19-1, the export tariffs amounted to 15 % to 25 % of the domestic price of the material in China meaning that prices for rare earth materials exported from China were 15 % to 25 % higher (or more) than Chinese domestic prices for the same goods.

China justified its application of tariffs as a measure to conserve the nation's strategic resources while minimizing the environmental impacts of large-scale production. However, nations reliant on Chinese rare earth exports contended that the tariffs (as well as export quotas) served to create an unfair advantage for rare earth consumers and end-users in China and collectively took this argument to the World Trade Organization (WTO) in 2011 and again in 2013.

Following a highly-publicized WTO ruling against China's rare earth export tariffs (and export quotas) in early -2014, China officially abolished the tariffs on May 1, 2015, resulting in a 15 % to 25 % decrease in Chinese FOB prices shortly thereafter. Simply put, the elimination of export tariffs has led to the near-convergence of Chinese domestic and Chinese FOB prices, and ultimately, the unification of global REO prices at the Chinese domestic level.

Following an unsuccessful appeal to the WTO in August 2014, China's MOFCOM and GAC announced on December 31, 2014 the nation's cancellation of export quotas formerly applied to rare earth, tungsten, and molybdenum metals, oxides, compounds, and concentrates.

Table 19-1
Evolution of China's export tariffs on various REE products from 2008 to 2015

Export Tariff	2008	Pre- May 1, 2015
15%	Neodymium metal, neodymium oxide, cerium oxide, cerium hydride, cerium carbonate, other cerium compounds, lanthanum oxide, other rare earth oxides, rare earth metal ore, mixed rare earth chloride, unmixed rare earth chloride, rare earth fluoride, lanthanum carbonate, mixed rare earth carbonate, unmixed rare earth carbonate.	Rare earths minerals, cerium oxide, cerium hydrate, cerium carbonate, other compounds of cerium, lanthanum oxide, neodymium oxide, other rare earths oxide, non-mixed rare neodymium fluoride, praseodymium fluoride, yttrium fluoride, other rare earths fluoride, lanthanum earths chloride, chloride of mixed rare earths, terbium fluoride, carbonate of mixed rare earths, carbonate of non-mixed rare earths, praseodymium chloride, yttrium chloride, neodymium carbonate, praseodymium carbonate, yttrium carbonate.
20%	Not applicable	NdFeB strip-casting permanent magnet flake, other NdFeB alloys, other ferro alloys.
25%	Dysprosium metal, terbium metal, other unmixed or fused rare earth metals, battery mixed or fused rare earth metal, mixed or fused rare earth metal, scandium metal, yttrium metal, yttrium oxide, europium oxide, dysprosium oxide, terbium oxide, terbium chloride, dysprosium chloride, terbium carbonate, dysprosium carbonate, rare earth metal, other yttrium and scandium compounds.	Neodymium metal, dysprosium metal, terbium metal, lanthanum metal, cerium metal, praseodymium metal, yttrium metal, non-mixed or non-fused rare earths metal, mixed or fused rare earth metals, other mixed or fused rare earths metals, yttrium oxide, europium oxide, dysprosium oxide, terbium oxide, praseodymium oxide, terbium chloride, dysprosium chloride, lanthanum chloride, neodymium chloride, terbium carbonate, dysprosium carbonate, other rare earths metals, other compounds of yttrium and scandium, other lanthanum compounds, other neodymium compounds, other terbium compounds, other dysprosium compounds, other praseodymium compounds, other yttrium compounds, ferro alloys containing more than 10 wt. % rare earths elements.

In parallel, MOFCOM announced the establishment of an 'export license' system whereby companies that wish to export rare earth products from China must first apply for one of 75 different 'flavours' of export licenses from the Ministry of Commerce, depending on the type of rare earth product the company wishes to export (compounds, metals, alloys, minerals, etc.). Moreover, a company wishing to export rare earth products must also demonstrate that they have pre-established export agreements with a foreign buyer, and if approved, can only export the material in question from one of eight eligible ports; namely Huangpu, Huhehaote, Nanchang, Ningbo, Nanjing, Tianjin, Shanghai, Qingdao, and Xiamen.

While China's replacement of export quotas with a strict and complex export licensing regime may superficially satisfy its obligations as a WTO member, the shift has arguably increased China's ability to control, limit, and micro-manage exports of rare earths while increasing uncertainty and risk for buyers outside of China. Foreign buyers' purchase agreements with potential Chinese rare earth suppliers are now be subject to review and approval by the Ministry of Commerce prior to a license being granted, creating potential for unforeseen supply disruptions or conflicts of interest between foreign enterprises and their state-backed Chinese competitors.

Since the early 2000s the Chinese government has been driving the consolidation of its rare earth industry as a means enhancing the efficiency of producers while bolstering government oversight of their operations and reducing illegal rare earth production. While not directly mandating the consolidation of rare earth mining and processing companies, the government has wielded influence over the process by deciding which players receive production quotas and export licenses thereby arbitrating the importance of certain organizations. Moreover, China has incentivized consolidation and vertical integration by offering a 16 % VAT rebate to producers that yield high-value-added rare earth materials, such as magnetic powders, alloys, and phosphors.

These passive-aggressive measures to influence consolidation have been largely ineffective, thus in January 2014 China's State Council announced a formal plan that would see the nation's rare earth producers consolidated into six large state-run groups by the end of 2015. The six groups are to be led by Baotou Iron and Steel Group, Xiamen Tungsten, China Minmetals Corporation, Aluminum Corporation of China, Guangdong Rising Assets Management, and Ganzhou Rare Earth Group.

Adamas Intelligence believes that consolidation of major players into large state-run groups, and the subsequent elimination of excess production capacity in China, will serve to reduce illegal rare earth production in the nation going forward while increasing the pricing power of China's legitimate producers. Moreover, consolidation into six coordinated state-run groups, as opposed to dozens of under-utilized companies vying for market share, will boost pricing discipline, decrease volatility, and foster a *more* predictable market in the coming years.

19.5.1 Rare Earth Prices in 2015

Overall, 2015 has been a negative year for rare earth prices although the market is beginning to show signs of a turnaround. The first quarter of 2015 saw prices of several rare earths rally on strong demand in anticipation of the abolishment of China's rare earth export tariffs and rumoured changes to the resource tax levied from domestic miners that many were speculating would drive prices higher. However, the second and third quarters of 2015 saw rare earth prices decline steadily. Bloated with inventories, end-users were largely absent from the market, fuelling a build-up of supplies in China that, coupled with a lack of pricing discipline, sent prices tumbling.

Both Chinese domestic and Chinese FOB prices have reached multi-year lows in 2015, challenging the profitability of China's major producers. China's (and the world's) largest producer of rare earth oxides and value-added products, China Northern Rare Earth Group, reported a net operating profit margin of just 8 % in the first half of 2015 – a profit that would have been decimated were it not for a rally in the first quarter of the year. Other producers with more upstream-focused operations have fared no better. China Minmetals Rare Earth reported a net operating profit margin of just 4 % in the first half of 2015 and Xiamen Tungsten reported a net operating profit margin of less than 1 %.

Producers in China have cited weak prices, overcapacity issues, and excessive illegal production as the main hindrances to profit, spurring a number of producers to rationalize production or temporarily cease operations in a bid to draw-down inventories and increase prices. Since the beginning of the year a number of rare earth mining and processing companies in Jiangsu, Sichuan, Guangdong, Ganzhou, Inner Mongolia, and elsewhere have opted to curtail or suspend production in order to purge inventories and allow the government crackdown on illegal production to make headway.

Inferring from an index of prices (Figure 19-12) tracked by the Association of China Rare Earth Industry (ACREI), Adamas believes that most rare earth prices bottomed-out in the third quarter of 2015 and forecasts that prices of neodymium oxide, praseodymium oxide, dysprosium oxide, and others will rise through the end of the year as global inventories of these oxides trend towards historic levels.

Figure 19-12
Index of the unit value of TREO produced in China over time (Year 2010 = 100)

Source: *Association of China Rare Earth Industry, Index as of October 12, 2015*

19.6 Forecast Global TREO Production from 2015 through 2020

In a recent market research report titled "Rare Earth Market Outlook Update" (Adamas Intelligence, 2015), Adamas Intelligence forecasted different scenarios for future global REO production from 2015 through 2020, two of which are in Figure 19-13 below as "Low Production" and "Business as Usual". For the purpose of this study for Mkango, Adamas included an additional scenario, labelled "High Production" in Figure 19-13.

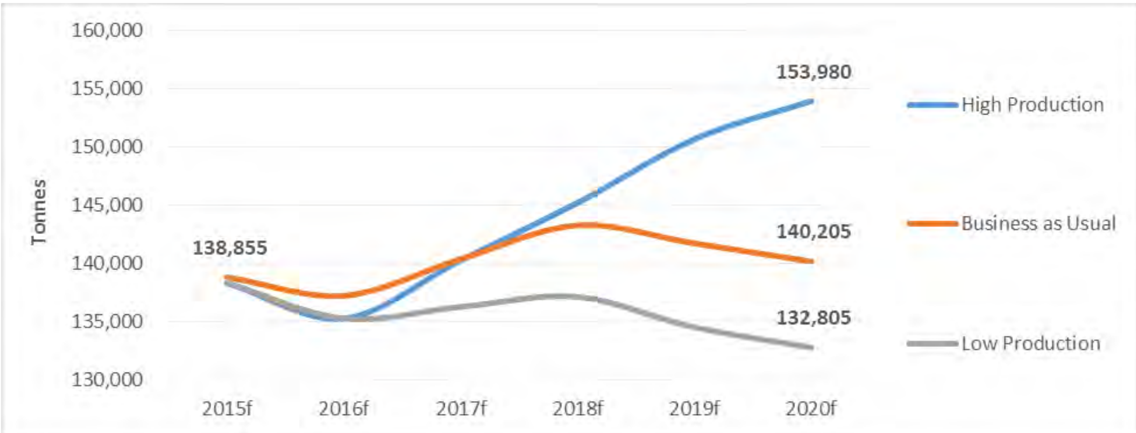
In the "Business as Usual" scenario, Adamas forecasts that China's Ministry of Land and Resources (MLR) will hold the nation's production quotas steady at 2015 levels through 2020, and forecasts that illegal/unregulated REO production in China will decrease by 56 % over the same period owing to an ongoing crackdown in the nation. Moreover, Adamas forecasts that Lynas Corp.'s Mt. Weld mine in Australia will reach full Phase II output of 22,000 tonnes of TREO per annum by 2018 and production from all other nations combined will remain flat at 2015 levels through 2020 (Figure 19-13).

In the "Low Production" scenario, Adamas again forecasts that China's MLR will hold the nation's production quotas steady at 2015 levels through 2020, but in this case, forecasts the full elimination of illegal/unregulated REO production in China by 2020. Additionally, Adamas forecasts that Lynas Corp.'s Mt. Weld mine in Australia will reach full Phase II output of 22,000 tonnes of TREO per annum by 2018 and production from all other nations combined will remain flat at 2015 levels through 2020.

In the "High Production" scenario, Adamas forecasts that China's MLR will increase national production quota levels by 4,000 tonnes in 2017 (versus 2015), and by an additional 4,000 tonnes in 2019, thereafter holding steady through 2020. As in the previous scenario, illegal/unregulated REO production in China is forecasted to be eliminated by 2020, serving as the rationale for the nation's decision to boost production quotas through the end of the decade. As in the other two scenarios, Adamas forecasts that Lynas Corp.'s Mt. Weld mine in Australia will reach full Phase II output by 2018 and production from other nations, including Russia, India, Malaysia, Vietnam, and Brazil, will remain flat at 2015 levels through 2020. Lastly, in the "High Production" scenario Adamas forecasts that two new producers outside of China (assumed to be one LREO-rich, one HREO-rich) commence production in 2018 and collectively ramp up to a combined capacity of approximately 13,000 tonnes of TREO per annum by 2020 (Figure 19-13).

Figure 19-13

Forecasted global TREO production scenarios from 2015 through 2020



Source: *Adamas Intelligence (2014)*

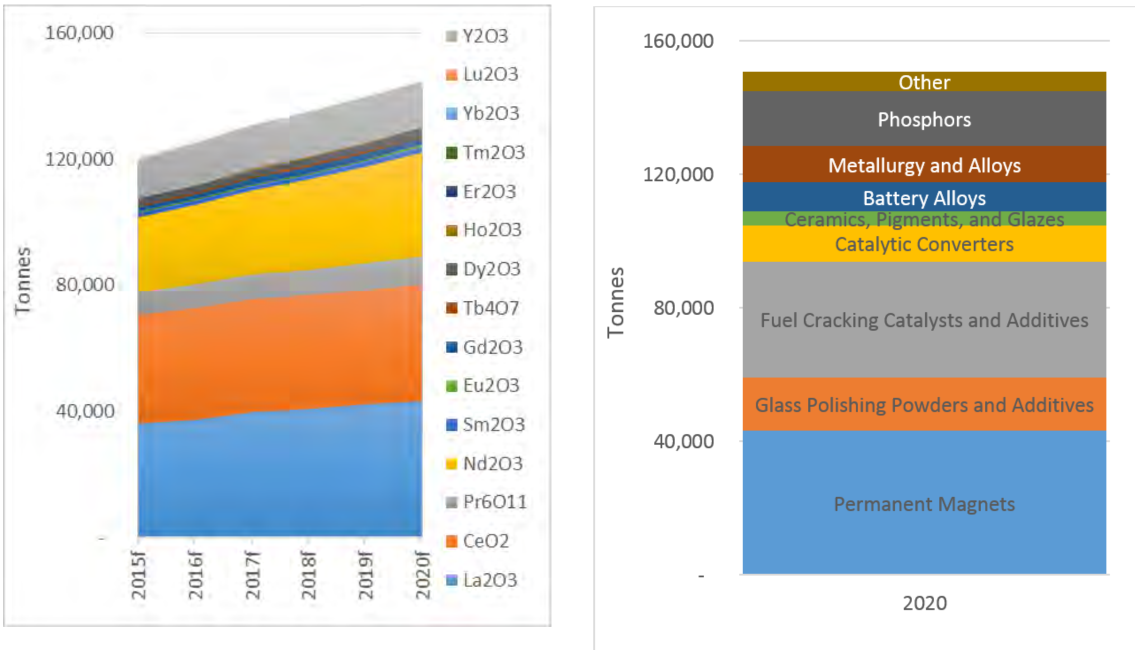
19.7 Forecast Global TREO Demand from 2015 through 2020

In the aforementioned "Rare Earth Market Outlook" report (Adamas Intelligence, 2014), Adamas forecasts future REO demand by region for hundreds of important end-uses and applications for the period spanning 2015 through 2020. Adamas forecasts that global TREO demand will total approximately 125,000 tonnes in 2015 and will increase for individual REOs by 1 % to 13 % annually through 2020.

Global TREO demand growth is forecasted to be driven heavily by strong demand growth for neodymium oxide, praseodymium oxide, dysprosium oxide, lanthanum oxide, and others from 2015 through the end of the decade. In 2020 Adamas forecasts that global TREO demand will conservatively amount to approximately 150,750 tonnes, as shown in Figure 19-14.

Figure 19-14

Forecasted global TREO demand from 2015 - 2020 and demand by end-use category in 2020



Source: *Adamas Intelligence (2014)*

Adamas forecasts strong demand growth for REOs used in the production of permanent magnets and fuel cracking catalysts – REOs that collectively make up over 80 % of Songwe Hill's proposed TREO production by weight, and approximately 90 % by value - in the year 2020.

As alluded to by Adamas' production forecast scenarios described on the previous page, the ongoing reduction of illegal REO production in China will lead total global production to decrease through the end of the decade in two scenarios, amplifying the need for new sources of production, such as Songwe Hill and others, to support the market's demand growth going forward.

19.8 Forecast Supply-Demand Balance in 2020

In all three supply-demand scenarios considered from 2015 through 2020, Adamas forecasts that global demand for oxides of neodymium, praseodymium, dysprosium, terbium, lanthanum, and yttrium will significantly exceed global annual production in the year 2020, as noted in Figure 16 below.

It's understood that significant quantities of these REOs and others exist in global inventories, particularly in China, which can be drawn-down in order to ease impending supply shortages in some cases. However, as quantified by Adamas in their "*Rare Earth Market Outlook Update: Supply, Demand and Pricing from 2014 through 2020*" report (Adamas Intelligence, 2015), the current inventory levels of several REOs are likely to be exhausted prior to 2020 should no new sources of production emerge.

In 2020 Adamas forecasts that global demand for neodymium oxide will exceed global annual production by 10,100 tonnes to 12,800 tonnes and this deficit will increase rapidly thereafter should global production of neodymium oxide not increase dramatically. Similarly, Adamas forecasts that global demand for praseodymium oxide will exceed global annual production in 2020 by 1,000 tonnes to 2,100 tonnes, and global demand for dysprosium oxide will exceed global annual production in 2020 by 1,000 tonnes to 1,500 tonnes. Also noteworthy, Adamas forecasts that global annual demand for lanthanum oxide, driven primarily by use in fuel cracking catalysts, will exceed global annual production in 2020 by 5,600 tonnes to 11,000 tonnes, an impending imbalance that few in the industry have acknowledged (Table 19-2).

Table 19-2

Forecasted supply-demand balance of key REOs in Songwe Hill basket in the year 2020

		Annual Supply - Demand Balance in 2020 (Global)		
Oxide	**Songwe Hill Production (tonnes per annum)**	**Business as Usual**	**Low Production**	**High Production**
La	**1,075**	- 9,919	- 10,993	- 6,007
Pr	**227**	- 1,843	- 2,085	- 1,122
Nd	**756**	- 12,781	- 13,647	- 10,414
Tb	**7**	- 159	- 233	- 159
Dy	**35**	- 1,089	- 1,463	- 1,042
Y	**165**	- 3,970	- 7,355	- 4,327
Sum of Individual REO Shortages		**- 29,762**	**- 35,776**	**- 23,070**

		Cumulative Deficit from 2015 – 2020 (Global)		
Oxide	**Songwe Hill Production (tonnes per annum)**	**Business as Usual**	**Low Production**	**High Production**
La	**1,075**	- 40,304	- 44,065	- 32,920
Pr	**227**	- 5,354	- 6,208	- 3,955
Nd	**756**	- 42,201	- 45,172	- 37,675
Tb	**7**	- 650	- 913	- 716
Dy	**35**	- 4,279	- 5,616	- 4,500
Y	**165**	- 10,379	- 22,641	- 14,533
Sum of Individual REO Shortages		**-103,167**	**-124,616**	**-94,299**

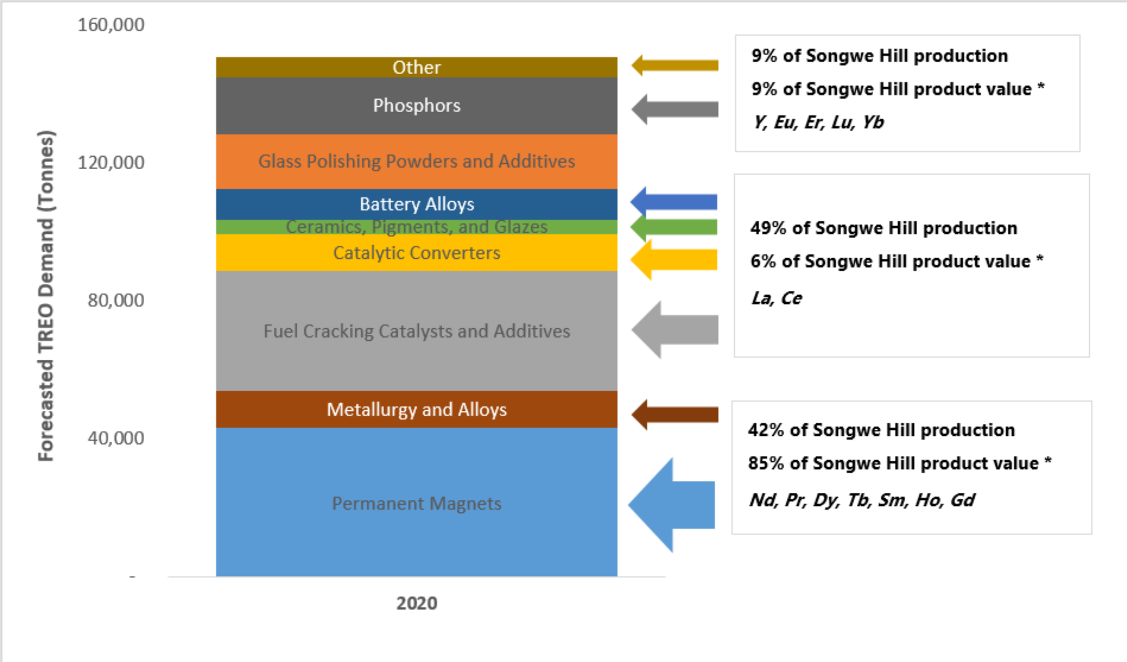
Source: *Adamas Intelligence*

The Songwe Hill Rare Earth Project is projected to yield an average of 2,841 tonnes of TREO annually – a modest amount that Adamas believes will not shock the global market or significantly undermine prices given that over 90 % of Songwe Hill's annual TREO production will feed into high-demand, low-inventory markets for permanent magnets, alloys, and fuel cracking catalysts (Figure 19-15).

Taking into account the looming shortages facing REOs used in the production of high-strength permanent magnets, as examined on the previous page, it is believed that there would be strong demand for offtake of Songwe Hill's prospective production of neodymium, praseodymium, dysprosium, terbium, and other oxides by end-users in China, Japan, and elsewhere.

Figure 19-15

Over 80% of Songwe product value in 2020 will come from high-demand REOs for magnets



Note: ** Value inferred using "Business as Usual" price forecasts*
Source: *Adamas Intelligence (2014)*

Similarly, taking into consideration the increasingly tight market forecasted for lanthanum oxide through the end of the decade, and the strong demand Adamas forecasts for its use in fuel cracking catalysts in 2020, it is believed that there would be strong demand for Songwe Hill's prospective production of lanthanum oxide by end-users in the U.S., Europe, and elsewhere.

Moreover, with promising demand growth forecasted for other oxides used in nascent applications, such as optical fibre, laser crystals, functional plastics, advanced ceramics, and others, it is believed that the remaining oxides prospectively produced at Songwe Hill would be sought after by a growing array of end-users globally.

19.9 Forecast REO Prices in 2020

Inferring from the three supply-demand balance scenarios examined herein, Adamas forecasted annual average REO prices from 2015 through 2020 for each scenario (Table 19-3). The forecasts exclude prices for oxides of holmium, thulium, ytterbium, and lutetium because the global trade of these oxides is relatively small and reliable pricing information (current or historic) is generally unavailable.

In the "Business as Usual" scenario Adamas forecasts that the Songwe Hill basket value (i.e. value of a kilogram of mixed REOs in which the mix reflects the relative proportion of each REO in Songwe's total annual TREO production) will increase from approximately US$ 30.00/kg TREO in

2015 to US$ 60.00/kg TREO in 2020 on the back of strong neodymium oxide, praseodymium oxide, dysprosium oxide, terbium oxide, and lanthanum oxide prices (Table 19-3).

Table 19-3
Forecasted per-REO contribution to Songwe Hill basket value in 2020

Rare Earth Oxide	November 2015 "Business as Usual" Base Case US$/kg	November 2015 "High Production" Scenario 3 US$/kg	November 2015 "Low Production" Scenario 2 US$/kg
Lanthanum	3.12	2.35	3.61
Cerium	0.42	0.33	0.43
Praseodymium	8.62	7.52	8.98
Neodymium	31.56	28.19	33.24
Samarium	0.18	0.15	0.18
Europium	4.52	3.49	4.67
Gadolinium	1.17	1.02	1.23
Terbium	1.94	1.69	2.12
Dysprosium	7.22	6.37	7.87
Yttrium	1.00	0.84	1.41
Songwe Hill Basket (US$/kg TREO)	**59.76**	**51.95**	**63.75**
% of Basket Value from "Magnet" rare earths[1]	**82.6**	**84.3**	**81.9**

Note: *[1] "Magnet" rare earths assumed to be neodymium, praseodymium, dysprosium and terbium*

In the "Low Production" scenario Adamas forecasts that the Songwe Hill basket value will increase from approximately US$ 30.00/kg TREO in 2015 to US$ 64.00/kg TREO in 2020 fueled by a rapid reduction in global inventories of several REOs leading to increasingly tight supplies, and ultimately shortages (Table 19-3).

In the "High Production" scenario Adamas forecasts that the Songwe Hill basket value will increase from approximately US$ 30.00/kg TREO in 2015 to US$ 50.00/kg TREO in 2020 owing to modest price increases for high-demand REOs used in permanent magnets (Table 19-3).

In all three scenarios Adamas forecasts that over 80 % of the value of Songwe Hill's prospective TREO production in 2020 would be derived from production of neodymium oxide, praseodymium oxide, dysprosium oxide, and terbium oxide, combined (Table 19-3).

19.10 Basket Value Discount for Toll-Separation or Sale of Concentrate

Mining, liberating, separating, and refining REOs to market-desired specifications for the diverse array of end-uses and applications that utilize them is technically-formidable, requiring sophisticated processing facilities and complex processes that vary according to the rare earth minerals of economic interest.

Building and operating a rare earth processing and separation plant is a high-cost and high-risk endeavour requiring specialized expertise that are arguably rarer than the REEs themselves. For this reason, many emerging REO producers, including Mkango, have opted not to build and operate their own separation and refining facilities (at least initially) in favour of paying a third-party to process the REOs on their behalf, or simply selling the mixed rare earth chemical concentrate they produce as-is to a willing buyer.

The Songwe Hill Rare Earth Project will prospectively produce a mixed rare earth chemical concentrate. As such, a deduction needs to be made to the basket values forecasted on the previous page (or an addition needs to be made to the project's projected operating cost) to account for the unexpended costs of separating and purifying REOs from the concentrate. Because the general lack of consensus regarding REO separation and purification costs among industry participants, and the heterogeneity of feedstocks and processing methods globally, a variety of approaches need to be considered when honing in on an appropriate basket value discount.

Based on a review of estimated toll-processing costs globally, an analysis of similar projects' cost projections, and a comparison of Mkango's proposed concentrate with similar market-traded concentrates in China, Adamas believes that Mkango's toll-processing cost assumption of US$ 10.00 per kilogram TREO is within the range of costs Mkango can reasonably expect to incur.

19.11 Contracts

Mkango is pursuing opportunities for strategic alliances and off-take agreements.

At the time of writing, there are no other contracts or agreements in place.

20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

Pre-Feasibility (Scoping level) environmental and social baseline studies were conducted in 2013 by Digby Wells Environmental in collaboration with Malawian specialists. These studies were aligned with the requirements of the Equator Principles, International Finance Corporation (IFC) Performance Standards as well as specific requirements and interpretations of Malawian Legislation as provided by the Department of Environmental Affairs (DEA).

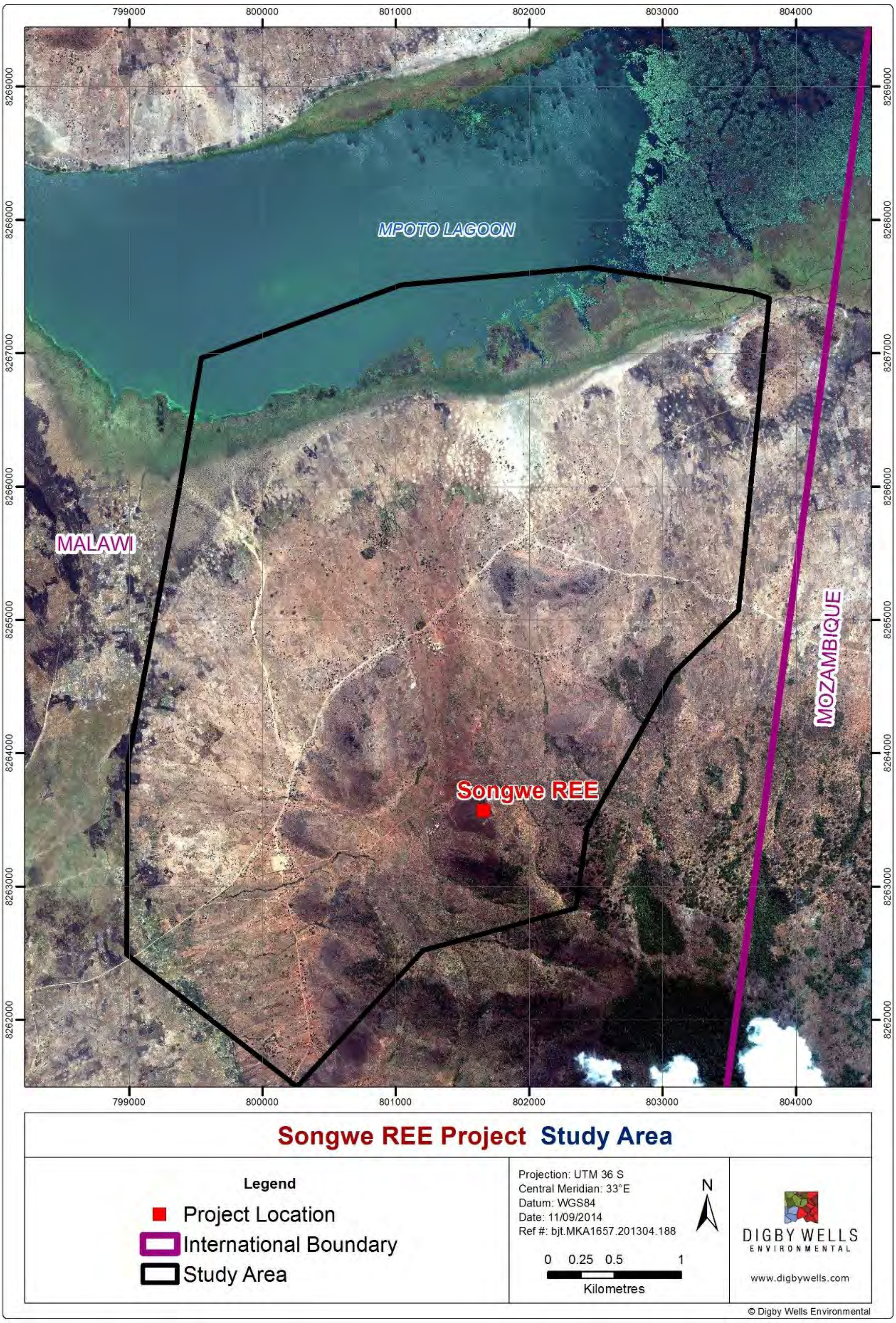
A Project Brief for the proposed environmental and social studies for the Environmental, Social and Health Impact Assessment (ESHIA) was submitted to the DEA in the fourth quarter of 2013, the DEA has responded with a suggested Terms of Reference which will be addressed in the ESHIA prior to the Definitive Feasibility Study.

The following chapter is a summary of the environmental and social status in the study area. This Project is a Greenfields development and as such, only exploration has taken place at the site to date using geophysical techniques, trenching and drilling to delineate the ore body. There is limited infrastructure on site including a tented exploration camp and a core shed.

The study area is shown in Figure 20-1. The study area for the Pre-Feasibility environmental and social studies was determined by evaluating the areas which could be subjected to mining disturbance and the construction of infrastructure including the north and east flank of Songwe Hill and the Mkango Resources exploration camp. The study area was then extended by approximately 500m in each direction from these areas. Mpoto Lagoon was also assessed, predominantly for the potential indirect impacts on the fauna and water quality.

Figure 20-1

Study Area for Specialists



Some impacts may, however, occur further than the study area. There is also the potential for cross-border impacts into Mozambique. The boundaries of the study area are determined roughly by the Mozambican border to the east, Mount Mulanje to the south, Phalombe River to the east and the north bank of Mpoto Lagoon to the north.

20.1 Dust Fallout

Currently, monthly dust fallout monitoring is in progress to monitor ambient dust deposition rates in the study area. Sites considered to be sensitive receptors around the proposed mining infrastructure were selected as positions for capturing dust fallout measurements. The monitoring of fall-out dust utilising the bucket collection system is internationally recognised and documented as an accepted method of determining dust fallout deposition rates. Since there is very little on methodology and standards with regards to dust fallout monitoring in the IFC documents, the robust South African approach was adopted.

The National Dust fallout standard (South African Department of Environmental Affairs) given in the Table 20-1 was used to guide the project data.

Table 20-1
Acceptable dust fall rates as measured

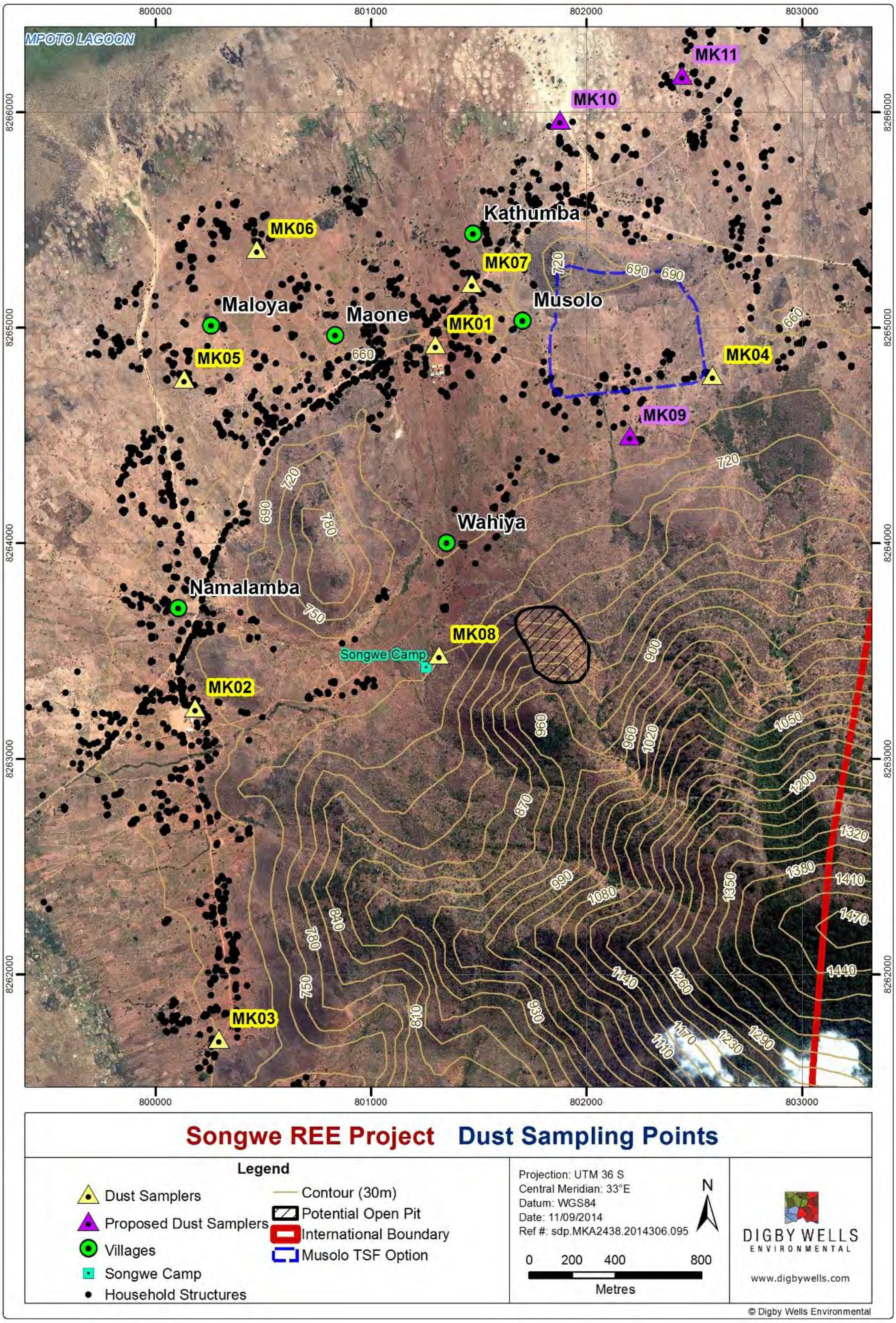
Restriction Areas	**Dust fall rate ($mg/m^2/day$, 30-day average)**	**Permitted Frequency of exceeding dust fall rate**
Residential Area	D < 600	Two within a year, not sequential months
Non-Residential Area	600 < D < 1200	Two within a year, not sequential months

Source: *South African Department of Environmental Affairs (2013)*

The dust bucket samplers were installed in March 2013 (Figure 20-2). There are eight single dust monitoring units. The locations of these monitoring units are displayed in Figure 20-3.

Figure 20-2
An installed dust sampler, Songwe Hill

Figure 20-3
Dust Fallout Sampler locations



In line with the IFC guideline: "…Before a project is developed, baseline air quality monitoring at and in the vicinity of the site should be undertaken to assess background levels of key pollutants, in order to differentiate between existing ambient conditions and project-related impacts" dust fallout monitoring records have been collected to establish background conditions.

The main pollutants of concern will be associated with the operational phase of the mine. The process of drilling and blasting, vehicle travel over unpaved dry and dusty roads, coupled with the activities of excavators and bulldozers and the presence of overburden, stockpiles and crushers and tailings piles subject to wind erosion exacerbate the generation of fugitive dust. Since the mine is likely to rely on its own power source (diesel generators); emissions of SO_2, NO_X, CO, CO_2, VOCs, and particulates will need to be assessed.

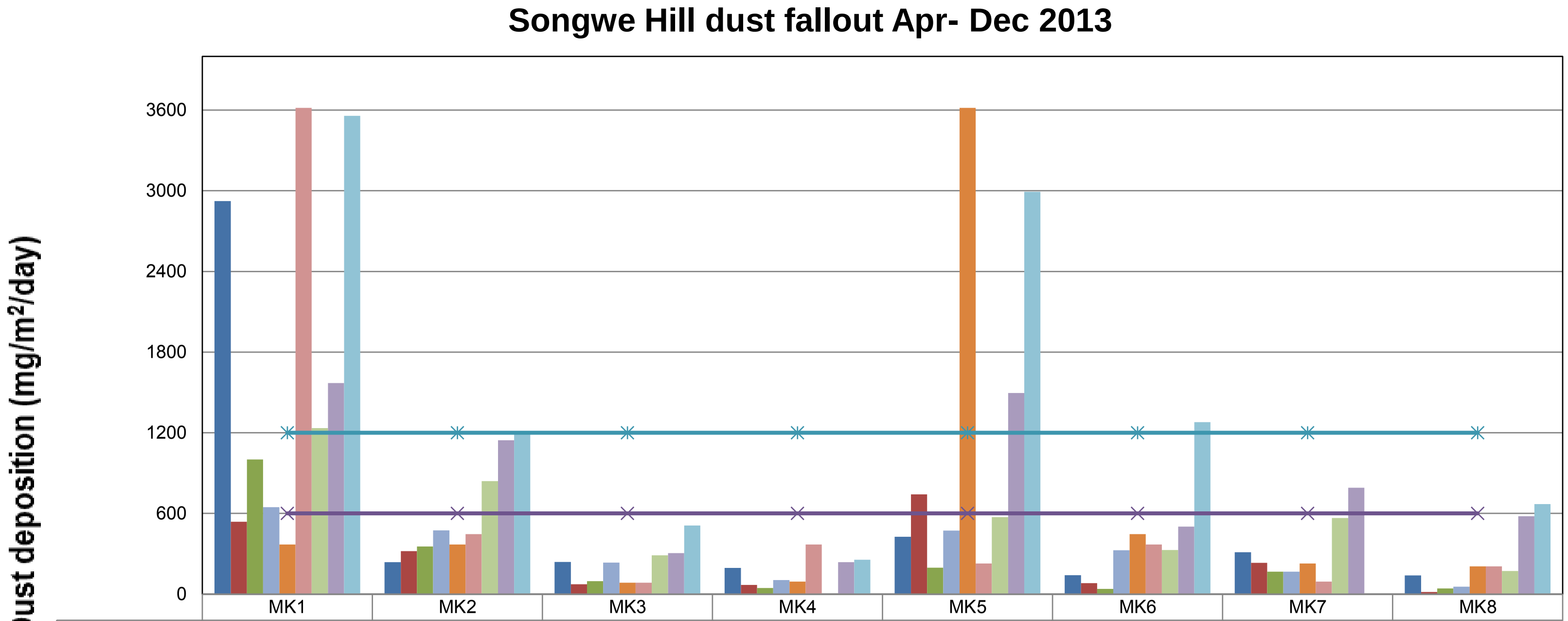
20.1.1 Dust Monitoring Results

Thirty months of dust deposition data had been collected at the time of the compilation of this Technical Report (from April 2013 to September 2015).

The monthly dust deposition rates are illustrated in Figure 20-4 to Figure 20-6. The figures show the monthly and inter-annual variability in dust deposition rates. The results for three samples (in October and December 2013 and December 2014) have been omitted from this figure as a result of exceptionally high rates, at 6,199, 17,190 and 7,399 mg/m^2/day respectively. The occurrence of rates of this magnitude is highly unlikely without interference, and they are flagged as anomalous.

Figure 20-4

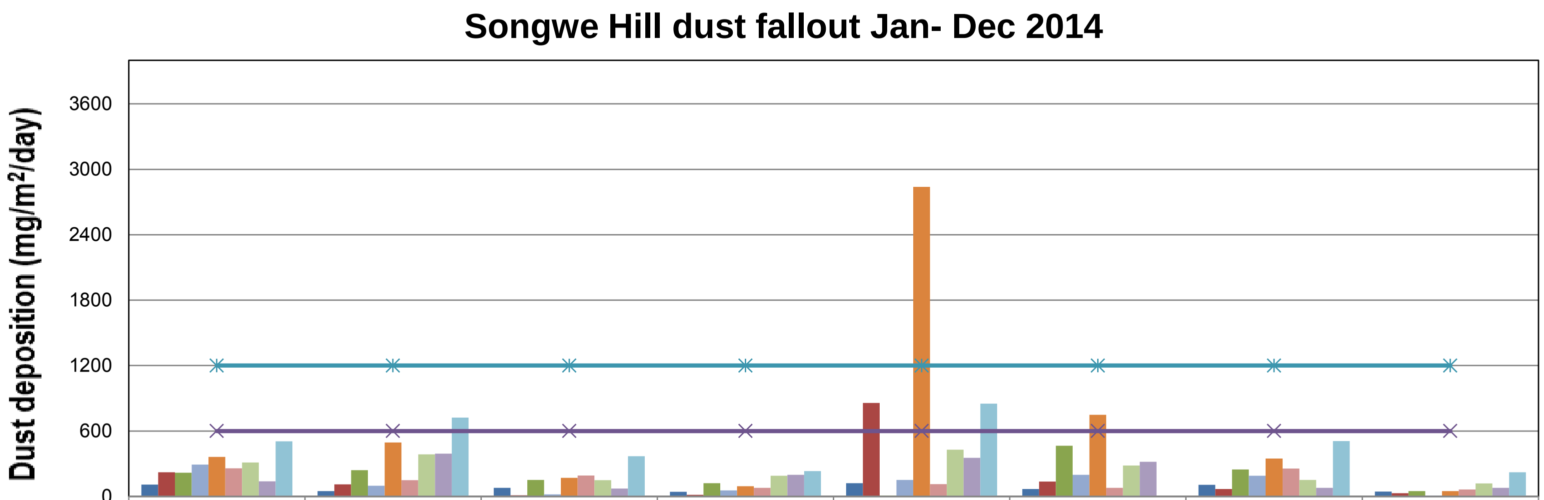
Dust fallout rates observed at Songwe – April to December 2013



	MK1	MK2	MK3	MK4	MK5	MK6	MK7	MK8
Apr 2013	2923	237	239	195	426	140	312	139
May 2013	538	319	74	68	742	81	232	15
Jun 2013	1002	354	96	46	196	38	167	42
Jul 2013	646	474	234	105	473	327	167	55
Aug 2013	369	369	85	93	3617	446	228	206
Sep 2013	3617	446	85	369	228	369	93	206
Oct 2013	1234	841	288	0	573	328	566	172
Nov 2013	1569	1145	305	238	1496	502	791	580
Dec 2013	3557	1205	510	256	2993	1279	0	669
Residential	600	600	600	600	600	600	600	600
Industrial	1200	1200	1200	1200	1200	1200	1200	1200

Figure 20-5

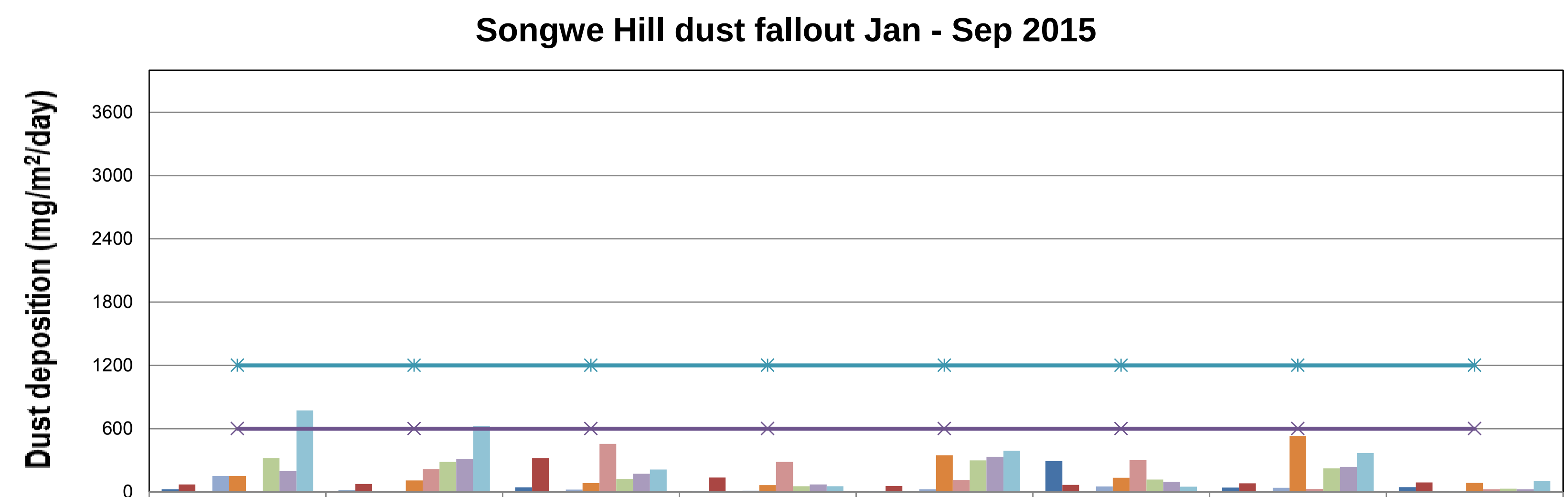
Dust fallout rates observed at Songwe – January to December 2014



	MK1	MK2	MK3	MK4	MK5	MK6	MK7	MK8
Jan 2014	107.83	49.07	78.41	41.46	120.81	68.43	105.44	45.35
Feb 2014	220.6	110.54	11.19	14.01	857.06	136.13	66.82	30.14
Mar 2014	216.15	240.01	151.11	120.78	8.21	464.72	247.38	48.93
Apr 2014	291.4	96.97	19.38	54.55	150.34	197.31	189.95	6.77
May 2014	362.43	493.6	169.37	92.75	2838.89	747.79	346.91	49.54
Jun 2014	257.13	149.81	191.79	77.49	113.03	77.61	256.52	63.07
Jul 2014	311.44	385.93	148	190.48	429.08	282.3	151.28	118.46
Aug 2014	137.87	392.18	71.83	197.64	354.65	317.77	77.85	77.57
Dec 2015	505.33	722.78	368.82	232.11	851.84	0	507.22	220.69
Residential	600	600	600	600	600	600	600	600
Industrial	1200	1200	1200	1200	1200	1200	1200	1200

Figure 20-6

Dust fallout rates observed at Songwe – January to September 2015



	MK1	MK2	MK3	MK4	MK5	MK6	MK7	MK8
Jan 2015	24.2	14.34	44.28	8.68	9.38	293.46	41.4	44.9
Feb 2015	71.7	76.16	320.24	136.85	56.19	65.8	81.23	89.12
Mar 2015								
Apr 2015	150.77	1.62	22.82	12.67	24.15	52	38.23	5.89
May 2015	150.86	108.58	82.96	65.02	348.59	133.78	532.5	85.84
Jun 2015	9.42	214.18	455.43	284.82	112.82	302.14	27.9	24.63
Jul 2015	320.41	283.52	123.33	54.64	299.89	118.26	224.08	31.28
Aug 2015	198.65	312.09	172.69	71.81	332.74	96.4	238.27	25.19
Sep 2015	771.88	623.69	212.76	54.55	390.88	48.99	368.8	101.91
Residential	600	600	600	600	600	600	600	600
Industrial	1200	1200	1200	1200	1200	1200	1200	1200

There is a good accumulation of dust fallout data, which in the ESHIA, will be further analysed and benchmarked. Dispersion modelling will also take place to establish what potential impacts the Project will have on the receiving environment. An outcome of the ESHIA will be a recommendation on whether PM10 (particulate matter up to 10 micrometres in size) monitoring will be required.

20.2 Topography

To the north of Songwe Hill the topography comprises an alluvial plain immediately south of Lake Chilwa, which passes southwards into a more elevated region characterized by numerous hills and mountains. The Songwe Hill has moderate to steep sides with a summit elevation of 990 m which is approximately 230 m above the surrounding plain. On the south-eastern side, Songwe Hill abuts against the higher Mauze Hill which rises to an elevation of 1,592 masl.

Two main physiographic units are evident in the study area comprising the Phalombe-Chilwa plain to the north and the Mauze-Songwe Hills to the south.

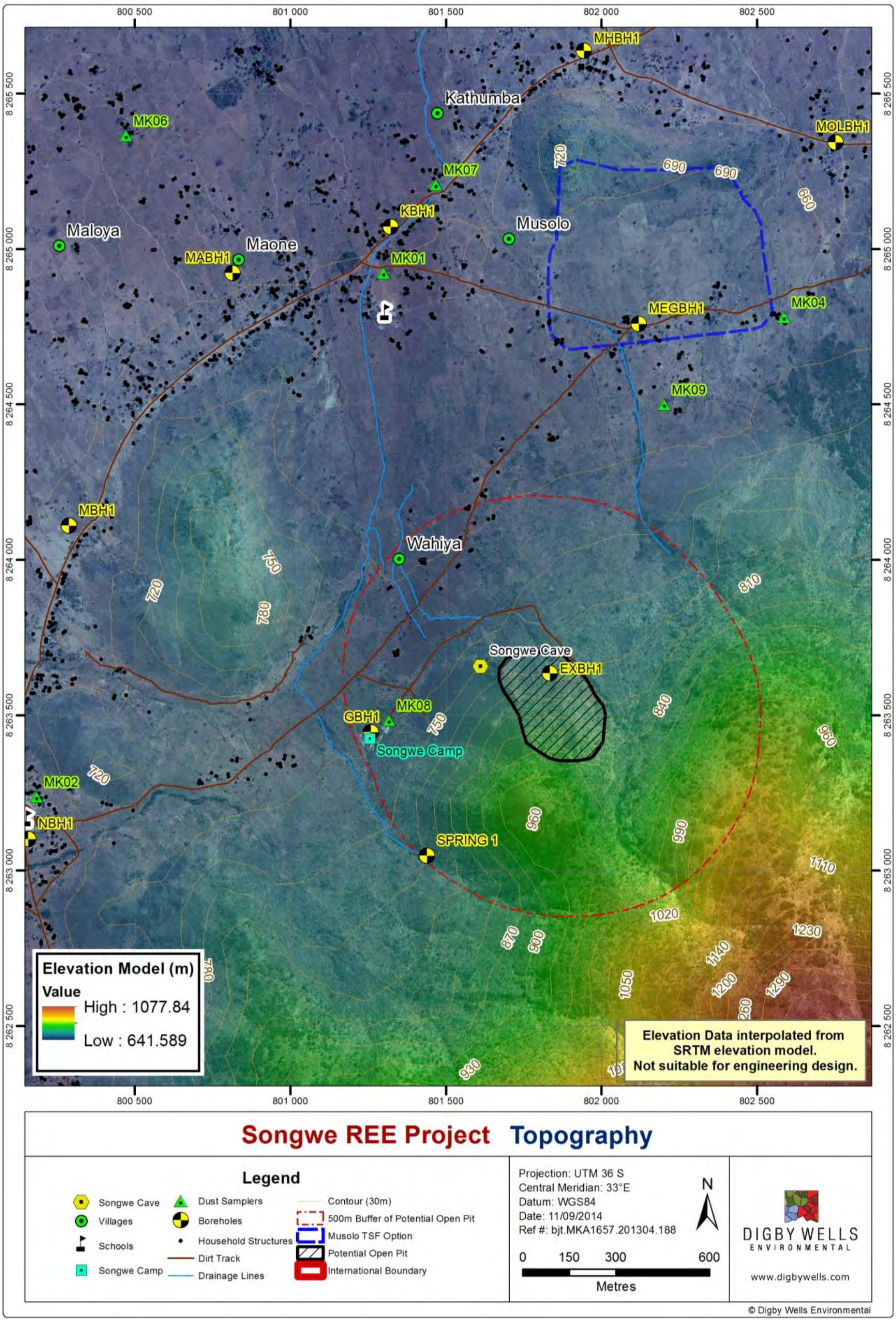
20.2.1 Phalombe-Chilwa Plain

To the north of Songwe Hill the physiography comprises an alluvial plain immediately south of Lake Chilwa, which passes southwards into a more elevated region characterized by numerous hills and mountains. This plain of Miocene age forms the flat topography from 700 m to about 800masl. It is made up of colluvial material and isolated inselbergs. The colluvial material represents the former extents of Lake Chilwa.

20.2.2 Mauze and Songwe Hills

This zone rises from the Phalombe plain to elevations of nearly 1,600 masl. These mountains belong to the Chilwa Alkaline Province and have some general similarities in rock composition and geomorphology with the nearby Mulanje-Michesi massifs to the south. The Songwe Hill has moderate to steep sides with a summit elevation of 990m which is approximately 230 m above the plain. On the south-eastern side, Songwe Hill abuts against the higher Mauze Mountain that rises to an elevation of 1,592 masl. The slopes surrounding Songwe hill range from flat to in excess of 35 degrees. Figure 20-7 indicates the topography of the study area.

Figure 20-7
Topography of the study area



20.2.3 Mass movements (Landslides)

The investigations carried out thus far indicate that the river channels draining much of the study area have been pathways of previous landslides. A number of old scars and depositional areas were identified (Figure 20-8). Loose detached rocks and clefts are present on the western slopes and on the slopes of the massif. This behaviour is quite common for similar syenitic rocks of the Mulanje-Michesi and Zomba massifs where previous landslide events were documented (e.g. Bloomfield, 1965B; von Porschinger, 1999; Cheyo, 1999).

The triggering mechanisms for these landslides are attributed to the fracture patterns within the syenites which act as zones of weakness and rapid soil weathering, the geomorphological and climatic factors and could be exacerbated by poor land use practises. For example, the headward erosion along joints is responsible for formation of clefts which are responsible for some of the major rock falls and mass movements experienced in the study area (Garson and Walshaw, 1969). Tropical cyclones occasionally pass into the southern region of Malawi through the Mozambique channel which have been known to trigger a number of landslides, for example the 1946 landslide in Zomba and the 1991 landslide in Phalombe (Pike and Rimmington, 1965), there are some indications of landslide activity in the study area. Landslides were raised by local communities as potential effects of the Project. The Project is located in the rift valley and a more in-depth assessment into potential seismic activity and causes of local landslides is recommended.

Figure 20-8
Boulder-strewn depositional area of an old landslide in the study area

20.3 Fauna

Field assessments were carried out which included the recording of species within the study area. Mammals recorded included monkeys, baboons, mole rats, rodents and a member of the subfamily Viverrinae. Reptilian species that were sighted and recorded in the study area included two species types of skinks, and two species of agama lizards. A number of snakes and frogs were also recorded. Up to nine species of fish were recorded in the Mpoto lagoon. Various invertebrates were also recorded. None of the recorded taxa in the study area are listed in the IUCN red list, CITES or protected according to the national legislation. At the study area the majority of the bird species recorded are seed eaters, nectar feeders, and birds of prey. Further studies will be undertaken to confirm species present and their protection status.

Results from the survey show that reptiles, mostly skinks and agama lizards, inhabit the shrub/grass mosaic habitat, as well as the fields of cultivation and in human habitations. The shrub/grass mosaic habitat is a preferred habitat for the lizards due to of the presence of the rocks and boulders. This habitat is also suitable for insects, which forms a greater part of lizards' diet. Skinks were also common on the walls of dwelling houses, and on rocks in the fields of cultivation. These habitats are suitable for skinks as they easily get food and shelter.

Signs of rodents were mainly found in the grassy and shrub/grass mosaic habitat. This habitat is suitable for the rodents as it is nearby their food sources, i.e. grasses and insects can easily be collected (De Graaff, 1981). Baboons and monkeys occasionally, during crop seasons, visit the fields of cultivation. During the crop season the monkeys and baboons descend from the nearby forests in search for food in people's gardens.

Frogs were confined to water pools in the dambo areas and along Mpoto lagoon. Frogs depend on water mainly for breeding and to keep their skins moist to avoid desiccation (Hickman, 2011). Bats were also detected in some trees and banana leaves in the dambo areas. The banana plantation is a preferred habitat for fruit bats as they easily feed on the ripening bananas (Martin, 2001). The dambo habitat is also a preferred habitat for insectivorous bats since insects which form part of their food are associated with the water bodies.

20.4 Flora

The field assessments show that the study area is relatively rich in plant species diversity, considering that the area was most likely forested in the past, but has been deforested by people over time. About 160 plant species were identified within the study area. There was no one clearly dominating species. Some species found on the hill top were not found on the hill slopes and vice-versa. On the flat land (which is under cultivation) lying between Songwe Hill and Mpoto lagoon, there exists a complex mix of native species. On this flatland there are patches of dominating native plant species populations. Communities derive fuel wood, construction materials, wild fruits, and plant based medicines from the study area.

Vegetation types on Songwe Hill can be crudely divided into three classes. These are:

- savanna woodland - this vegetation type comprise of mainly tree species punctuated by grass species that include *Pennisetum spp, Melinis repens, Setaria sphacelata*, and *Hyparrhenia rufa*. Herbs are rare in the understory due to the domination of grasses;

- grassland vegetation - this vegetation type found in aggregates of uniform stands. Common species include *Pennisetum spp, Melinis repens, Setaria sphacelata*, and *Hyparrhenia rufa*. *Melinis repens* is rare on the hill top but relatively common on lower cultivated slopes of the hill; and
- shrub/herbaceous vegetation (found on cultivated land) - common species include *Markhamia acuminata, Combretum microphylum, Senna petersiana, Vitex buchananii, Vernonia glabra*, and *Diospyros squarrosa*. These species form uniform herbaceous mixes or exit as monocultures in cultivated fields.

Figure 20-9 shows an example of the type of vegetation found on Songwe Hill.

Figure 20-9
Grass and shrub mosaic on Songwe Hill

20.4.1 Endangered Flora

As of 1996, Malawi reported about 26 species of endangered tree species (FAO,1996). Of these, six species are found on Songwe Hill. These are: *Afzelia quanzensis, Brachystegia microphylla, Pterocarpus angolensis, Terminalia sericea*, and *Aloe spp*. Another national Red List species, *Dalbergia melanoylon*, was claimed to present on in the study area by local communities. This species was however not spotted during the survey. None of the National Red List species numbered more than five individuals. The six species mentioned here have become endangered as a result of overharvesting due to their value in home construction, curio making, high value charcoal, and medicine; uses that date back to pre-colonial times (Topham, 1930). The endangered flora are not seen as a fatal flaw, and mitigation measures can be put in place to conserve these species.

20.4.2 National Red List species versus IUCN Red List

Of the six species on the national Red List, only two (Dalbergia melanoxylon and *Pterocarpus angolensis*) are listed on the IUCN Red List. *Afzelia quanzensis Brachystegia microphylla*, *Terminalia sericea*, and *Aloe spp* are not listed under IUCN. Table 20-2 gives a summary of the results.

Table 20-2
Comparison of National Red List plant species found on Songwe with the IUCN Red List; (IUCN 2012. IUCN Red List of Threatened Species)

National Red List species	IUCN Red list status
Afzelia quanzensis	Not yet assessed for IUCN inclusion
Brachystegia microphylla	Not yet assessed for IUCN inclusion.
Pterocarpus angolensis	Near threatened; IUCN suggests need for updating
Terminalia sericea	Not yet assessed for IUCN inclusion
Dalbergia melanoxylon	Near threatened; IUCN suggests need for updating
Aloe spp	Unknown

Dalbergia melanoxylo is one of 85 species of the genus listed under IUCN and faces extinction risk in countries other than Malawi (Backeus *et al*., 2006). While *Afzelia quanzensis* is threatened in Malawi, it is under low risk elsewhere (Hyde, *et al.,* 2013a). This regional discrepancy calls for a risk assessment to re-evaluate the threat status at national and regional levels.

The absence of local Red List species on the IUCN is surprising. Of the approximately 56 species of the genus *Brachystegia* (Hyde *et al*., 2013b), currently only about 8 species of *Brachystegia* are listed under IUCN. *B. microphylla* is not one of them.

Of the 450 globally known Aloe species, only 43 species are listed on IUCN Red List. The one individual found on Songwe Hill needs to be identified before its IUCN status is confirmed (Figure 5 23).

Figure 20-10
An aloe growing on the Songwe hilltop

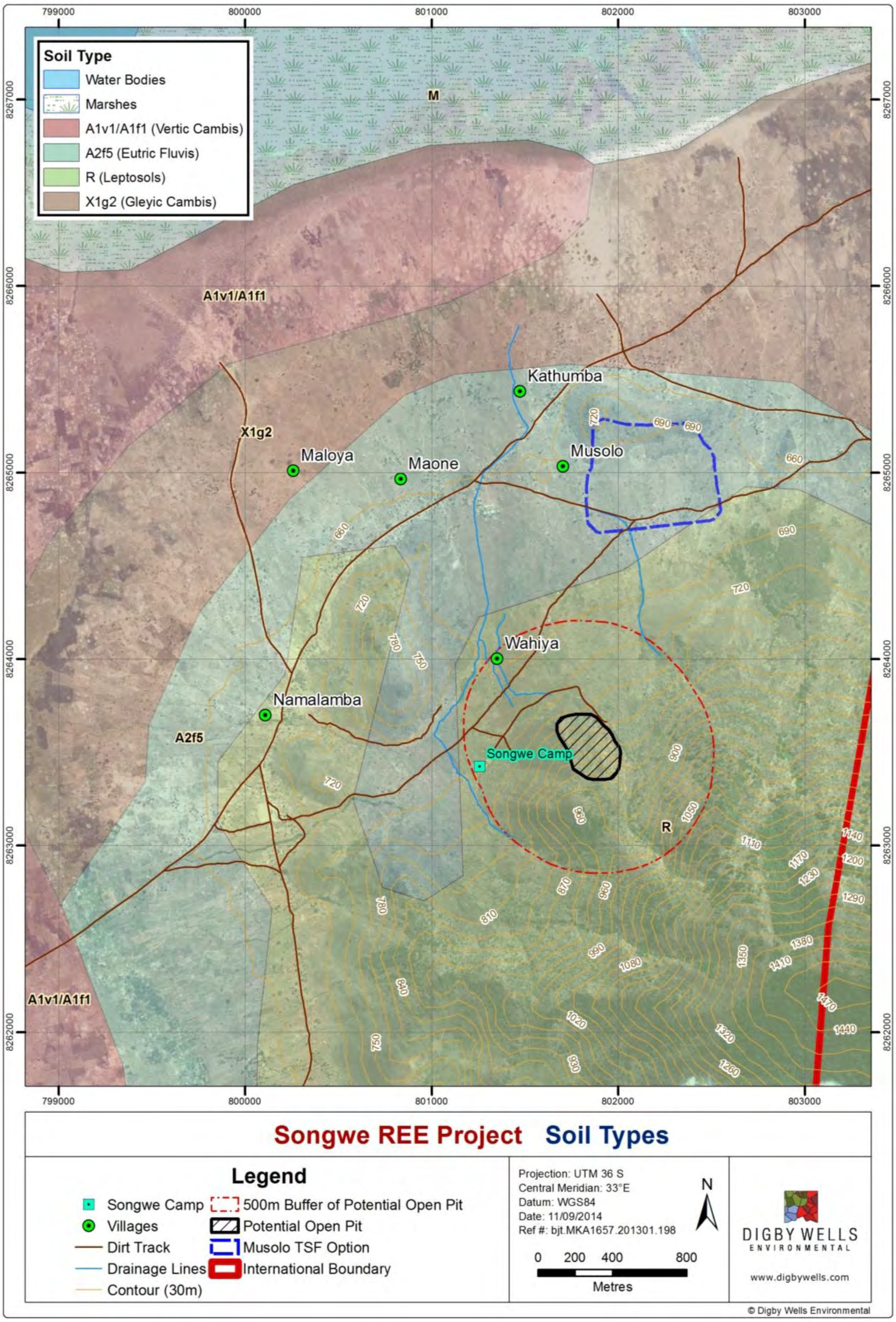
During the project planning, mitigation measures, such as setting up a nursery to conserve these species can be considered.

20.5 Soils

A soils assessment was undertaken to determine the type of soils present which will be important when planning infrastructure and assessing impacts. The main soil groups in the study area can be categorised into three main groups of cambisols, eutrisols, gleysols, fluvisols with some (compositional) variants among them e.g. gleyic cambisols, eutric fluvisols, etc. Figure 20-11 shows a generalised soil map of the study area.

Figure 20-11

Main soil types of the study area (modified from data from Land Husbandry Dept., Lilongwe Malawi)



20.5.1 Soil erosion and sedimentation

Most of the soils developed in the study area are of youthful age with higher rates of erosion in the upper reaches and deposition of debris from landslides in the alluvial fans in the lower reaches. The soil profiles are poorly developed with incomplete soil horizon sequences and poor soil consolidation as a result of repeated events of erosion and deposition. Deep gullies emanating from the middle section drain into the lower reaches of the plain where they diffuse into alluvial fans (Figure 20-12).

Figure 20-12
Gully erosion in the study area

Land use activities particularly deforestation and cultivation on the steep slopes exacerbates soil erosion of the mountain slopes.

The lower lying areas support occasional villages with the land intensively farmed for tobacco, maize, millet, pigeon peas, cassava and sweet potatoes. Small-scale raising of animals such as chickens, goats, pigs and cattle is common within the grasslands of the plains. The lower lying areas are prone to flooding in the wet season but support dry season cultivation and grazing. The land which is to be disturbed by the proposed Project has intrinsic value in terms of local agriculture and livelihood contribution.

20.6 Surface Water

Near the camp site, there are some small seasonal streams and rivulets that only flow during the rainy season or after significant rainfall events in the study area, such as the Naisi and Naligogoda Streams. Most of these originate near Songwe Hill. These small streams and rivulets either flow into the Mpoto Lagoon (Figure 20-13) or are blocked by small hills within the vicinity of Mpoto

Lagoon, forming small patches of dambos. Most of the channels for these rivulets are not well defined and this is a major cause of localised flooding during rainfall events. Mpoto Lagoon varies in size according to season. The people in the study area utilise the lagoon's remnant moisture during the recession period for horticulture.

All of these small rivulets and streams were not flowing during the field visits except some trace flows that were observed from a spring that marks the headwaters of the Msongwe River to the south west of the camp on Songwe Hill (Figure 20-14). In addition, there are no observed gauge records at the Ministry of Irrigation and Water Development for any of the streams and rivulets.

Figure 20-13
A view down a rivulet to the Mpoto Lagoon

Figure 20-14
A spring on the south face of Songwe Hill

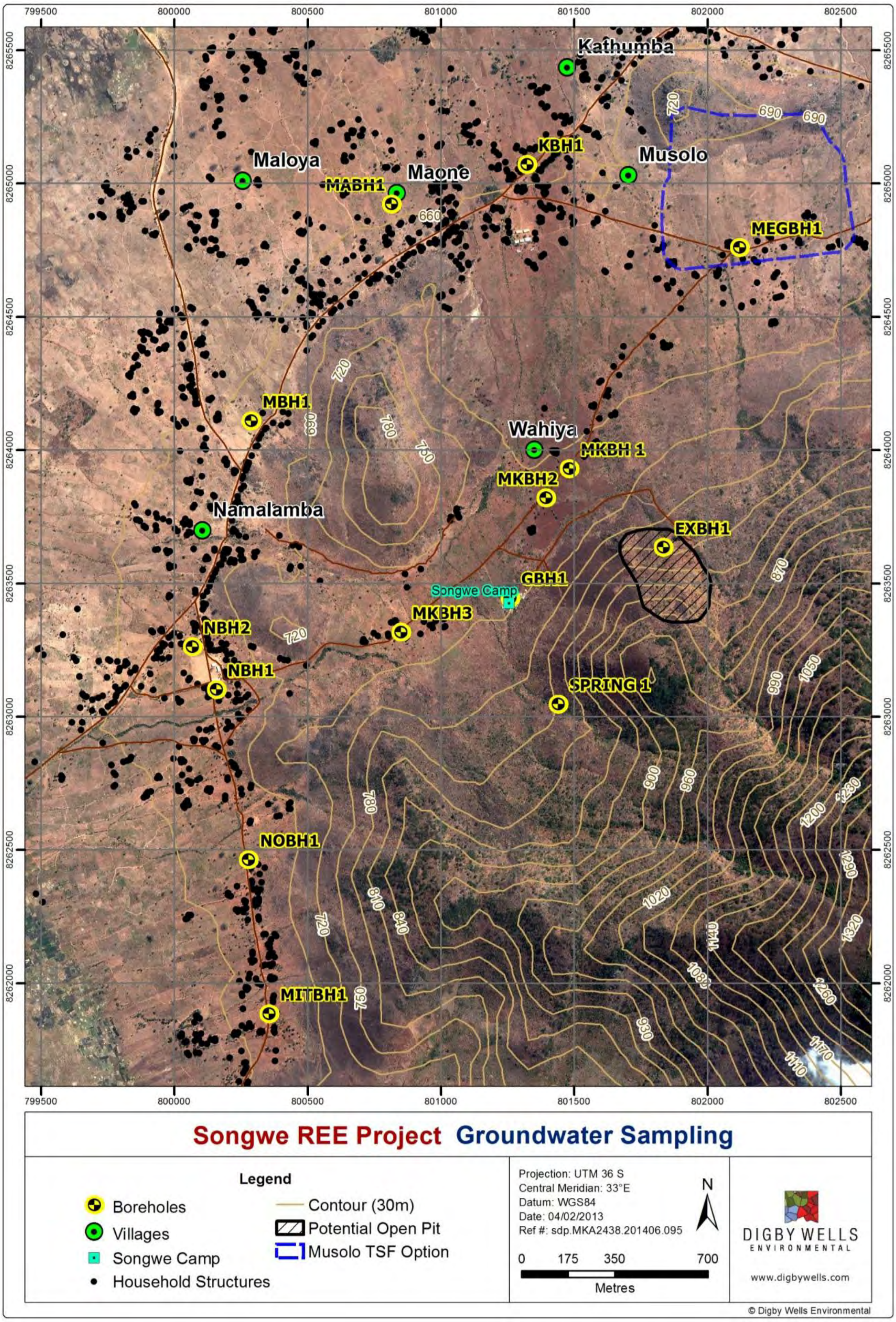
Lake Chilwa is located approximately 24km from the study area and is joined to Mpoto lagoon via a rivulet. It is noted that this wetland area was designated a RAMSAR site in 1996.

20.7 Groundwater

The groundwater specialist study was undertaken to a higher level of detail than some of the other studies due to the importance of quantifying whether groundwater was a viable water supply option. A summary of the detailed groundwater findings is given below.

Groundwater is the main source of potable water for the population in the area as surface water flows are erratic. The most prevalent hydraulic infrastructure in the study area consists of boreholes for domestic water supplies. Most of the people use communal borehole points for their domestic water requirements. In addition, there are gravity fed standpipes from Michesi which are rarely operational for domestic water supply. A total of 14 boreholes and 1 spring were identified within the study area. These are shown in Figure 20-15.

Figure 20-15
Groundwater sampling points



A total of three boreholes totalling 170 m were drilled under the supervision of Digby Wells for groundwater testing. Borehole yields varied between 0.89 ℓ/s and 1.8 ℓ/s. Higher yielding boreholes are usually associated with fractured geological formations or linear features, as well as deep weathered formations. The drilling and aquifer testing data indicates that the East-West trending fault extending from the east of the proposed pit yielded the most water.

20.7.1 Groundwater Occurrence

The occurrence and movement of groundwater, as well as the groundwater quality, are functions of the geological formations in which the groundwater occurs, including the alteration thereof as a result of human activities, such as mining. The natural groundwater system within the proposed Songwe Hill pit area consists primarily of weathered and fractured aquifers.

Preferential groundwater flow zones are usually associated with highly weathered or fractured formations, as well as along fault zones or intrusive features. The drilling programme at Songwe Hill confirmed that a fractured aquifer exists 40 m to 45 m below surface. The aquifer seems to have a moderate yield (1 to 4 ℓ/s), but is considered to be a vital water resources for domestic use and stock watering.

The first 25 m to 35 m in the study area consists mostly of highly weathered coarse-grained syenite. An upper aquifer could be associated with this weathered horizon. The sustainability of the shallow weathered aquifer is dependent on seasonal recharge from rainfall. The weathered zone is generally low yielding (less than 0.1ℓ/s) because of its insignificant thickness. These aquifers are typically unconfined to semi-confined aquifer systems and therefore susceptible to any surface activities or impacts.

The deeper aquifers below the weathered zone yield significant quantities of water. Although there are a number of fractures in the syenite, a yield of 1 to 2 ℓ/s could be expected. All groundwater movement is along secondary structures such as fractures, dykes, faults, cracks and joints in the rock. The contact between the syenite and gneiss generally yield low to medium groundwater yields.

The groundwater storage and potential yielding capacity of the carbonatite is still unknown. The carbonatite units within the proposed mining pit area and could contribute to groundwater influx into the pit area; requiring extensive dewatering.

20.7.2 Groundwater Levels

The current groundwater levels in the study area ranges from 33 to 34 metres below ground level (mbgl); based on measurements obtained from the new boreholes. The deeper groundwater level (51 mbgl) at the exploration camp borehole can possibly be related to its higher elevation.

It is assumed that the groundwater table in the study area would generally follow the local topography, mirroring the local surface drainage pattern.

On a regional scale it is assumed that the groundwater flow will be in a northerly direction, from the study area towards the Lagoon. Localised, smaller variations can be expected within the study area and especially around the exploration camp area where groundwater might flow from all directions towards the north and northwest. Seasonal monitoring of the boreholes in the study area will assist with an assessment of the groundwater level fluctuation and gradient in close proximity. Initially summer and winter monitoring is recommended, but quarterly is preferable.

The current level measurements or monitoring sites are insufficient to provide an accurate local groundwater flow map. All of the community boreholes were sealed and did not allow for groundwater level measurements. All groundwater level monitoring stations (springs and boreholes) to be used for this study and future groundwater level monitoring should be surveyed with an accurate differential GPS system to ensure accurate reporting and groundwater level contour mapping.

20.7.2.1 Water Quality

The groundwater in the study area is predominantly sodium/calcium-bicarbonate (Na/Ca - HCO_3) type waters. The samples indicate recently recharged groundwater exposure to their host geological environment evident in boreholes ManBH1, NBH1, MolBH1 and MHBH1, as well as the spring close to the camp site. These boreholes indicate dynamic groundwater flow within an aquifer, with the sodium replacing calcium and magnesium in solution.

The groundwater sampled from the exploration camp borehole is fit for human consumption based on the Malawian water quality standards, as well as the World Health Organisations limits for drinking water. The fluoride concentration was higher than the limit defined by the WHO, but is still within the Malawian Standards range.

20.8 Radiation

The purpose of the radiological study was to provide a baseline of the radiological status of the Songwe Hill deposit, the current Mkango Resources exploration camp and the study area which is inhabited and cultivated by the local community.

A Gamma Spectrometric survey and a Gamma Dose-rate survey was performed. This survey provided data on the natural existing background radionuclide concentrations and background gamma radiation levels in the study area.

In the context of the natural environment, radiation can occur from natural sources such as cosmic and terrestrial radiation. The average range of dose rates measured in most places in the world falls between 0.06 – 0.20 μSv/h (millisieverts/hour). Preliminary baseline external dose rates (at one metre height) on the pre-operational study area indicate significantly higher than average global dose rates.

Critically, the current background radiation levels are in line with the airborne gamma ray spectrometer surveys flown in 1984 by Hunting Geology & Geophysics Ltd (UK) under contract to the United Nations and would be expected from an ore body such as this.

There will need to be regulatory control with regards to exposure to radiation and radioactive contamination (at least requiring safety assessments for workers and members of the public). Adequate mitigation measures can be put in place to minimise this risk.

20.9 Social and Community

20.9.1 Stakeholder Engagement

For a study of this nature to be implemented successfully, it is imperative that stakeholders (persons or groups who may be directly or indirectly affected by the Project, including those who may have interests in the Project/or ability to influence its outcome) be consulted at every stage of the process. Stakeholders include:

- individuals;
- communities;
- business leaders;
- elected officials;
- Government entities;
- non-governmental organisations;
- community-based organisations;
- international community; and
- academic society.

Stakeholders also add value to the study process by providing local knowledge on culture, social dynamics and environmental conditions.

During the Pre-Feasibility Studies, different stakeholders at international, regional, national, district and local levels have been identified and a more textured understanding has been created regarding their roles and responsibilities.

It is recommended that Mkango implement a Stakeholder Engagement Plan (SEP) in support of the ESHIA and on-going operations. This will also provide guidance as to the management of information flow between the developer and its stakeholders. This chapter details the process of engagement undertaken thus far, identification of issues and a proposed SEP recommended for the next phase of engagement.

The Environment Management Act, the National Environmental Policy, Guidelines for Environmental Impact Assessment (EIA) in Malawi, Mines and Minerals Act and the Mining Policy are the main pieces of legislation and guidance that are considered at national level in addition to the guidelines of the IFC on Social and Environmental engagement.

Expectations for stakeholder engagement during the ESHIA are included in Performance Standard 1 (PS1): Social and Environmental Assessment and Management System, and Performance Standard 5 (PS 5): Land Acquisition and Involuntary Resettlement.

IFC Policy requires Project owners to engage with affected communities through disclosure of information, consultation, and informed participation, in a manner commensurate with the risks to and impacts on the affected communities. Since the Project is categorised as a category A development, it is vital that consultation be thorough and timeous to ensure all parties are given an opportunity to get involved.

An initial round of meetings was held to gather preliminary issues and concerns on the Project. The result of the consultation was the development of a Stakeholder Engagement Plan (SEP) for the next phase of the Project.

Site visits were undertaken and local authorities and communities were engaged through meetings. The meetings held included:

- one meeting with members of Phalombe District Executive Committee at Nambiro Primary School Teachers Development Centre Hall;
- one village meeting in Group Village Headman Maone which was attended by villagers in all villages under the group village headman Maone (Figure 20-16). The attendees included men, women and children; and
- one meeting with members of the Village Development Committee (VDC) which was held at the Headquarters of Traditional Authority (TA) Nazombe.

Follow up consultations were undertaken during the course of 2014.

Figure 20-16
Village meeting at Maone Group Village Headman

The SEP should ensure that further stakeholder engagement is transparent, also defining the formal grievance/complaint procedure. The SEP will provide guidance that will enable that timely, relevant, accessible and easily understandable information is provided to stakeholders in an appropriate non-technical format (Figure 20-17).

Figure 20-17
The Proposed Four Levels of Stakeholder Engagement

In order to ensure a wider audience is reached and all issues and concerns are raised, it is proposed to hold at least two further rounds of meetings. The first consultation took place in November 2014. The second round will be held prior to the ESHIA being finalised. The objective of this second round of consultations will be for stakeholders to verify that their first comments were indeed considered in the investigations, and to comment on the preliminary findings and suggested mitigation measures for reducing negative impacts and enhancing positive impacts. A community action group and a grievance mechanism has been set up to provide a structured way of receiving and resolving grievances or complaints from affected stakeholders.

20.9.2 People and Socio-economics

The Pre-Feasibility socio-economic baseline study results indicate that the local economy in the study area is agro-based with the majority amongst the potentially affected communities having low incomes of less than K5000 (USD15) per month. Farming is the main livelihood strategy. Land is mostly customary land with few properties under private ownership. The majority of holders have a landholding size of less than 1 hectare. Land use is mostly agricultural activities, human settlements and wetland cultivation. Population densities are highest on the flatter areas with further concentration along the roads.

The dominant age group is the economically active age group of 21 to 49, with many pre-teen children. Education and literacy levels are very low with most people not being able to go to school and then not beyond primary school education if they do. The dominant ethnic group is the Lomwe tribe, with a few Chewa, Nyanja and Mang'anja. The majority speak and write Chichewa and the dominant religion is Christianity with a few being non-religious and ancestral worship is still practised by some.

The traditional governance institutions are still respected in the communities and the study area is under General Village Headman (GVH) Maone with 10 Village Headmen and GVH Namalima with 4 Village headmen all under Traditional Authority Nazombe.

The most common staple food was maize and main source of animal protein is fish followed by beef, then poultry and lastly bush meat. In addition, legumes (mostly pigeon peas) are a source of plant protein. The potentially affected communities were mostly experiencing public health problems that included Malaria, HIV/AIDS, diarrhoea and pneumonia/coughs. In terms of social services and facilities such as education, health and water and sanitation seems to be inadequate with no health facility nearby.

Infrastructure is in a very poor condition in the study area. There are only earth roads that need continuous maintenance, particularly after rains. There is no electricity or post office centres.

A cave is located on Songwe Hill which will be investigated with regard to archaeology.

It has been realized that poverty in Malawi is one of the root causes of environmental degradation. Some of the environmental problems in Malawi include soil erosion, deforestation, water resources degradation, fisheries depletion, loss of biodiversity, air pollution, and human habitat degradation (Kosamu, 2010). It is therefore vital to understand the social dynamics of the study area, potential issues and concerns and how the Project will impact on the local communities, in both a positive and negative manner.

20.9.3 Proposed Corporate Social Responsibility (CSR) Projects

Mineral sector activity has the potential to generate significant direct and indirect economic benefits for Malawi and; if managed wisely, can contribute to social development.

For the study area specifically, the Songwe REE Project has the potential to create local employment, most likely for the unskilled sector, as well as improve skills transfer over the life of the Project. Mkango will investigate any community based initiatives which could be supported in terms of the corporate social responsibility and community development initiatives. These could potentially include investment into health care facilities, upgrading infrastructure, stimulating economic growth via small businesses and education.

During the stakeholder engagement, the stakeholder groups will be invited to participate in order to determine their needs. Through these meetings, Mkango must evaluate possible community development initiatives, as it is only by working with the community that projects are successful. Community initiatives must not to infringe on any responsibilities of the government or create reliance and dependency of communities on the mine. These programmes should be self-sustaining and aim at practical ways to improve the local community.

One of the outcomes of the stakeholder meetings is to have a reliable and well-constructed community forum. The affected communities will ultimately have a large say in what projects are of importance in the study area and how the money will be allocated.

Once the community and conservation development initiatives have been identified, proposals can be compiled with costs and benefits. These costs can be derived as a percentage of profit or estimated as an annual capital expense.

Mkango has already achieved in the field of CSR projects. Mkango has developed and established close relationships with the local communities surrounding Songwe Hill. Since 2010 Mkango has provided employment in the local area in the form of fieldwork, road construction and on-site security. In addition, Mkango has provided a training program for Malawian graduate geologists, training to local people to become sampling assistants and made donations of educational and sporting equipment to surrounding local schools. Over the past four years the company has also helped improve the following infrastructure within the local community:

- construction of two new bridges and refurbishment of existing bridges and ongoing maintenance;
- refurbishment of the road to local village, Namalamba, and to Songwe Hill;
- a new water borehole drilled to supply Namalamba school and village;
- refurbishment of three other water boreholes in the surrounding area; and
- painting of classrooms and provision of stationery supplied at the local school.
- a secondary school scholarship program to pay annual school fees for the top 6 male/female students from the 3 primary schools neighbouring the project site

As the Project advances, Mkango has begun implementing successful early-stage social responsibility initiatives, including a tree planting program and soya bean seed growing project, which are focused on empowerment and reducing poverty and hunger. The soya bean project has to date, donated soya bean seeds for planting to over 100 families in 10 villages within the Phalombe district.

During November 2013 and 2014 a new pigeon pea (Manolo) growing project was initiated to replace the Soya Bean programme to help alleviate hunger and community within the 10 village communities close to the Songwe Project. 3,400 kg of high yield hybrid seed was distributed to communities surrounding the Songwe Hill Project. Each farmer was given 4 kg of seed and the chiefs were given 6 kg, based on the size of their land. At harvest, twice the amount of seed will be returned back the Company, to keep for the following season so that it can be distributed to new recipient farmers. This would ensure that in the following season three times the original number of famers would participate. The Company is working with the National Smallholder Farmers Association of Malawi (NASFAM) who are the leading smallholder-owned business and development organization in Malawi producing economic and social benefits for members, their communities and the country whose mission is to improve the livelihoods of smallholder farmers. Through a sustainable network of smallholder-owned business organizations, NASFAM promotes farming as a business in order to develop the commercial capacity of its members, and delivers programs which enhance member productivity.

20.9.4 Resettlement Consideration

Involuntary resettlement is often a consequence of large scale developments such as mining. There are generally several impacts associated with involuntary resettlement, over and above that obvious loss of assets. The Songwe REE Project is expected to result in some degree of involuntary resettlement.

20.10 Potential Environmental Impacts

Some of the activities are likely to result in environmental impacts, both positive and negative. At this stage the studies indicate that the following impacts need to be considered:

- creation of tailing dumps and pollution control dams;
- employment and skills development;
- investment in local economy and social responsibility programmes;
- altered topography;
- visual aspect to local land users;
- habitat degradation and contamination;
- soil erosion, contamination and sedimentation;
- eco-system functioning of Mpoto Lagoon;
- increase in dust and noise;
- stormwater control, containment of polluted water and impact on stream flow;
- dewatering of local aquifer and groundwater contamination;
- safety concerns along transportation routes;
- direct and indirect employment opportunities;
- development of local businesses;
- in-migration and disturbance to livelihoods;
- increase in spread of diseases and social pathologies; and
- potential for local economic development and improvement in services.

In most cases the negative impacts can be mitigated and will be discussed as part of the various management plans developed for the ESHIA. The Project is at a phase where impacts and risks can be assessed; and where necessary the Project can be adjusted or re-structured to avoid or reduce the impact.

21 CAPITAL AND OPERATING COSTS

21.1 Capital Costs

21.1.1 Mining Capital Expenditure

The mining of the open pit will be conducted by a mining contractor. During the PFS a mining contractor was approached to submit a cost for the complete mining operation. The contractor visited site and met with the relevant Consultants and client team members. The contractor submitted a budget estimate for the mining operation, based on the responsibility matrix shown in Table 21-1.

Table 21-1
Contractor responsibility matrix

Sl No.	Work Details	Mkango Responsibility	Contractor's Responsibility
1	Workshop and stores	To be provided by Mkango	To bring tools for use in workshop
2	Power and permanent lighting	To be provided by Mkango	Nil
3	Mobile illumination at mines to include faces, dumps and haul roads	Nil	To be provided by the contractor
4	Accommodation for expats and locals	To be provided by Mkango fully furnished accommodation	Nil
5	Offices	To be provided by Mkango fully furnished	Nil
6	Local medical facilities / clinic	To be provided by Mkango	Nil
7	Security, both at camp and offices	To be provided by Mkango	Nil
8	Messing infrastructure for Expats and locals	To be provided by Mkango	To be operated and maintained by contractor
9	Fencing of mines and establishment	To be provided by Mkango	Nil
10	Basic communication and internet infrastructure	To be provided by Mkango	Nil
11	Potable drinking water	To be provided by Mkango at Central Take-off point	Take-off by contractor
12	Water for mining purposes	To be provided by Mkango at Central Take-off point	Take-off by contractor
13	Major pumping	Mkango should install one main pumping station	Operation and maintenance by contractor
14	Training Centre	Facilities should be provided by Mkango	Contractor to operate training by providing training equipment, aids and instructor for operation and soft training
15	Sewerage	To be provided by	Nil

Sl No.	Work Details	Mkango Responsibility	Contractor's Responsibility
		Mkango	
16	Explosive magazine	To be provided by Mkango	Contractor should provide sized and capacity requirements
17	Diesel and explosive	Storage facility and supply by Mkango	Receipt of quantity and ensure quality
18	Mines de-watering	Nil	In contractor scope of work
19	Haul road maintenance	Nil	In contractor scope of work
20	Mine plan and work schedule	To be provided by Mkango	Production as per mine plan and schedule y deploying requisite equipment and man power
21	Rehabilitation and CSR activities	To be provided by Mkango	Nil
22	Facilitation for Visa, DIRE, Work Permit, etc. for expats	To be organised by Mkango	To follow as per Mkango instructions
23	Mining laws and legislation enforcement	To be done by Mkango	Contractor to follow as per direction of Mkango
24	Drainage system in mines	Nil	Contractors scope of work
25	Waste dump management	Nil	Contractors scope of work

The mining fleet will be owned and operated by the contractor. Table 21-2 shows the make-up of the contractor's mobilisation fee.

Table 21-2
Contractor mobilisation fee

Details	No. of Machine(s)	Mobilization cost (US$)
Mobilization for Equipment		
AC ROC L6 Drill Machine	2	80,000
Volvo EC 480 Excavator	2	83,500
Volvo FMX / CAT 740 ADT	8	200,000
CAT D6 Dozer	1	40,000
Cat 140K grader	1	40,000
Volvo L120	1	30,000
Fuel Service Truck	1	12,500
Backhoe Loader	1	20,000
Volvo Water Truck	2	25,000
Light Sets	6	10,000
250 KVA Gensets	2	8,000
Water Pumps	2	8,000
Pick-up Van	5	18,000
Bus	2	25,000
Sub Total	**36**	**600,000**
a) Total Cost of Equipment Mobilization (US$)		600,000
b) Mobilization for Containers (10 Nos.)* (US$)		50,000
c) Mobilization for Expats (20 Nos.)** (US$)		100,000
d) Work shop Tools and Tackles		100,000
Total (A+B+C) (US$)		**850,000**

Allowance has been made for site preparation, bush and top soil clearing for the waste dump area. Perimeter fencing around the pit has also been included.

The capital cost of other infrastructure required to support the mining operation was included in the overall site infrastructure and included the following items:

- storm water control;
- security and access control;
- workshops;
- offices;
- change houses;
- stores and warehousing;
- water supply and storage; and
- fuel and explosives storage facilities.

The capital expenditure associated with the mining operation is made up predominantly by the contactor establishment cost.

The mining capital costs are shown in Table 21-3.

Table 21-3
Mining capital cost

Item	Cost (US$)
Contractor mobilisation	850,000
Pit fencing	60,000
Bush clearing and top soils removal	747,000
Total	**1,657,000**

21.1.2 Processing plant and infrastructure capital cost

The capital cost estimate was generated based on a block flow diagram and preliminary process flow diagrams (PFDs) which formed the basis of the mechanical equipment list. Based on the mechanical equipment list, mechanical equipment costs were derived from the SNC-Lavalin database and budgetary quotations obtained from vendors. Other Project discipline costs including bulk materials, construction materials, spares, labour costs, vendor supervision, freight, contingency and EPCM costs are determined by a statistical relationship to the major mechanical equipment cost. In October 2015, a request was made by Mkango to re-evaluate the costs, taking into account changes in Forex and escalation between the July 2014 estimate and October 2015.

The PFS capital estimate is specific to the construction of a new greenfield rare earth minerals processing facility and defined on-site infrastructure, including a sulphuric acid plant located in Malawi. The process plant is designed to treat a nominal 0.5 million tonnes per annum (Mtpa) of run of mine (RoM) ore.

The plant battery limits are as follows:

- top of RoM bin;
- product from hydrometallurgy process;
- tailings pipeline outlet to tailings dam;
- storm water dam; and
- boreholes.

In brief, the processing plant scope of work includes the following facilities and services:

- 0.5 Mtpa beneficiation process plant;
- hydrometallurgical plant;
- 270 tpd acid plant and storage;
- plant complex infrastructure covering:
    - 2.5 MW Diesel Power supply/generation and distribution;
    - contribution to ESCOM for provision of grid power to site;

- o fuel storage;
- o gravel roads within the plant complex totalling approximately 4.4 km;
- o plant earthworks;
- o pre-fabricated construction camp;
- o plant architectural buildings and workshops totalling approximately 3,480 m^2;
- o main access road is excluded;

- ancillary facilities and utilities:
  - o water reticulation;
  - o laboratory;
  - o plant utilities; and
- associated engineering, procurement, project management and construction management services.

The capital cost estimate is based on the Project being implemented as an EPCM reimbursable contract.

21.1.2.1 Processing Plant and Infrastructure Estimate Parameters

The base date is the 1st October 2015 (escalated from July 2014) with no provision included for escalation beyond this date. The capital cost estimate is presented in US$ (base currency), based on the exchange rates defined in Table 21-4 below. The exchange rates were determined by SNC-Lavalin's estimating department and have been used as the basis for developing the capital estimate.

Table 21-4
Currency exchange rates and equipment supply foreign exposure

Currency	Factor	Equipment Foreign Exposure (US$)	Percentage (%)
EURO	1.104	3,247,270	1.9
US$	1.0000	21,642,875	12.9
ZAR	0.073	143,397,211	85.2
		168,287,356	**100**

Note: *The cost for diesel supply was converted at 1 MWK = 0.0023 US$ where MWK is Malawian Kwacha.*

The estimate is a Pre-Feasibility Estimate with an overall weighted accuracy of +25 to -20 %.

The estimate excludes project risk or any project management reserves. Estimating contingency is included in the estimate and is factored on all costs. Estimating contingency takes into account the current level of engineering and is intended to cover items which are included in the scope of work as described in this Study, but which cannot be adequately defined at the time due to lack of accurate, detailed design information and to account for the normal variability of productivity and bids received during the execution stage. Contingency is not intended to cover items which are listed in the exclusions section of this Technical Report.

21.1.2.2 Capital expenditure summary

Capital cost estimates were generated for the process plant, sulphuric acid plant and the associated plant infrastructure. The capital cost estimates are presented in Table 21-5 to Table 21-7.

Table 21-5
Process plant capital estimate cost summary

Description	Supply and delivery (US$)	Transport (US$)	Installation (US$)	Total (US$)
Direct Costs				
Earthworks			1,849,287	1,849,287
Civil			5,887,176	5,887,176
Structural	4,061,408	408,929	2,353,760	6,824,097
Architectural				
Mechanical	15,406,423	1,551,219	3,625,606	20,583,248
Platework	747,015	75,214	805,628	1,627,857
Piping	2,770,941	287,363	1,636,222	4,694,526
Electrical	2,826,785	292,023	1,276,426	4,395,234
Control and instruments	2,447,169	246,397	796,310	3,489,876
First fills	4,785,574			4,785,574
Direct costs Subtotal				**54,136,875**
Indirect Costs				
Field indirects – site offices, camp and feeding			5,132,176	5,132,176
Vendor assistance during construction	501,326			501,326
Commissioning spares	568,545			568,545
EPCM costs	12,830,439			12,830,439
Indirect costs Subtotal				**19,032,486**
Other Costs				
Estimating contingency	17,786,656			17,786,656
Owner's costs	6,366,921			6,366,921
Owner's risk/contingency				Excluded
Escalation				Excluded
Other costs Subtotal				**24,153,578**
Total Estimation Costs				**US$ 97,322,938**

The below line estimate of the mill feed stockpile enclosure is US$ 1,350,327 and is not included in the estimate. The base case design for the stockpile is an open stockpile.

Table 21-6
Acid plant capital cost estimate summary

Description	Supply and Delivery (US$)	Transport (US$)	Installation (US$)	Total (US$)
Direct Costs				
Civil			1,686,770	1,686,770
Structural	1,154,324	116,225	438,221	1,708,770
Mechanical	15,094,987	2,260,348	4,777,145	22,131,630
Piping	79,753	8,030	43,252	131,035
Electrical	Included in plant			
Control and Instruments	Included in plant			
Direct costs Subtotal				**25,658,205**
Indirect Costs				
EPCM costs	2,571,631			2,571,631
Indirect costs Subtotal				**2,571,631**
Other Costs				
Estimating contingency	4,182,205			4,182,205
Owner's costs	2,268,843			2,268,843
Owners risk/contingency				Excluded
Escalation				Excluded
Other costs Subtotal				**6,451,048**
Total Estimation Costs				**US$ 34,680,884**

Table 21-7
Process plant infrastructure capital cost estimate summary

Description	Supply and Delivery (US$)	Transport (US$)	Installation (US$)	Total (US$)
Direct Costs				
Earthworks – plant complex roads excluding main access road			2,341,236	2,341,236
Civil			1,014,140	1,014,140
Structural				
Architectural – plant complex buildings			1,535,261	1,535,261
Mechanical – mobile equipment and weigh bridge	623,761	66,458	42,408	732,627
Platework	0	0	0	0
Piping – tailings, return water, distribution	467,546	88,463	890,935	1,446,944
Electrical – 2.5 MW power generation plant and 2 off x 1.5 km HT distribution line, plus ESCOM power supply	8,200,316	423,011	5,899,337	14,522,665

Description	Supply and Delivery (US$)	Transport (US$)	Installation (US$)	Total (US$)
Control and instrumentation	0	0	0	0
First fills diesel – 20 days	963,388			963,388
Direct costs Subtotal				**22,556,260**
Indirect Costs				
Field indirects – site offices, camp and feeding	2,359,151			2,359,151
Vendor assistance during construction	437,178			437,178
Commissioning spares	-			-
EPCM costs	2,948,939			2,948,939
Indirect costs Subtotal				**5,745,267**
Other Costs				
Estimating contingency				
Owner's costs	5,608,318			5,608,318
Owners risk/contingency	2,373,689			2,373,689
Escalation				Excluded
Other costs Subtotal				Excluded
Total Estimation Costs				**7,982,007**
Total plant infrastructure Capex				**36,283,534**

The cost type for the total process plant, acid plant and infrastructure is summarised in Table 21-8.

Table 21-8
Total process plants and infrastructure estimate cost, by cost type

Cost Category	Total Cost (US$ million)	Percentage of Directs
Direct cost general	102.3	60.8 %
Direct cost camp	7.5	4.5 %
EPCM	18.3	10.9 %
Vendor support during construction	0.9	0.5 %
Other indirect costs	0.6	0.3 %
Owners	11.1	6.6 %
Estimating allowance	27.6	16.4 %
TOTAL	**168.3**	

21.1.3 Tailings Storage Facility Capital costs

Capital costs associated with the TSF have been determined to an accuracy of ± 25 %. The total capital cost associated with the TSF has been estimated at US$ 12.65 million (Table 21-9). For the purpose of the PFS, rates from a previous project based in the DRC have been utilised.

The estimated cost is inclusive of a provision for the Contractors Preliminary and General Costs at 30 % of the value of the measured works. No allowance has been made for contingencies. It is expected an overall contingency allowance for the Project shall be provided for by Mkango.

Table 21-9
Summary of estimated capital costs - TSF

Item	Description	Amount (US$ millions)
	Tailings Storage Facility	
1	Schedule B: Site clearance and topsoil stripping	1.10
2	Schedule C: TSF starter embankment	1.70
3	Schedule D: drainage system to TSF starter embankment	0.23
4	Schedule E: decant penstock, drainage collection sumps and access platform	0.62
5	Schedule F; Slurry delivery system	0.46
6	Schedule G: Surface water management works	0.17
7	Schedule H: miscellaneous	0.13
8	Schedule I: liner	2.64
	Total Measured Works	**7.06**
	Storm Water and Return Water Dam	
9	Schedule B: site clearance and topsoil stripping	0.06
10	Schedule C: TSF starter embankment	0.48
11	Schedule D: miscellaneous	0.03
12	Schedule I: liner	0.16
	Total Measured Works	0.73
	Total Cost Calculation	
	Unmeasured Items @ 25 %	1.95
	P & Gs @ 30 %	2.92
	TOTAL COST	**12.65**

The following qualifications are made with regards to the above mentioned capital costs associated with the TSF:

- unmeasured items are estimated at 25 % of the measured works; and
- P & Gs have been allowed for, accounting for 30 % of the total works.

The above cost estimate excludes:

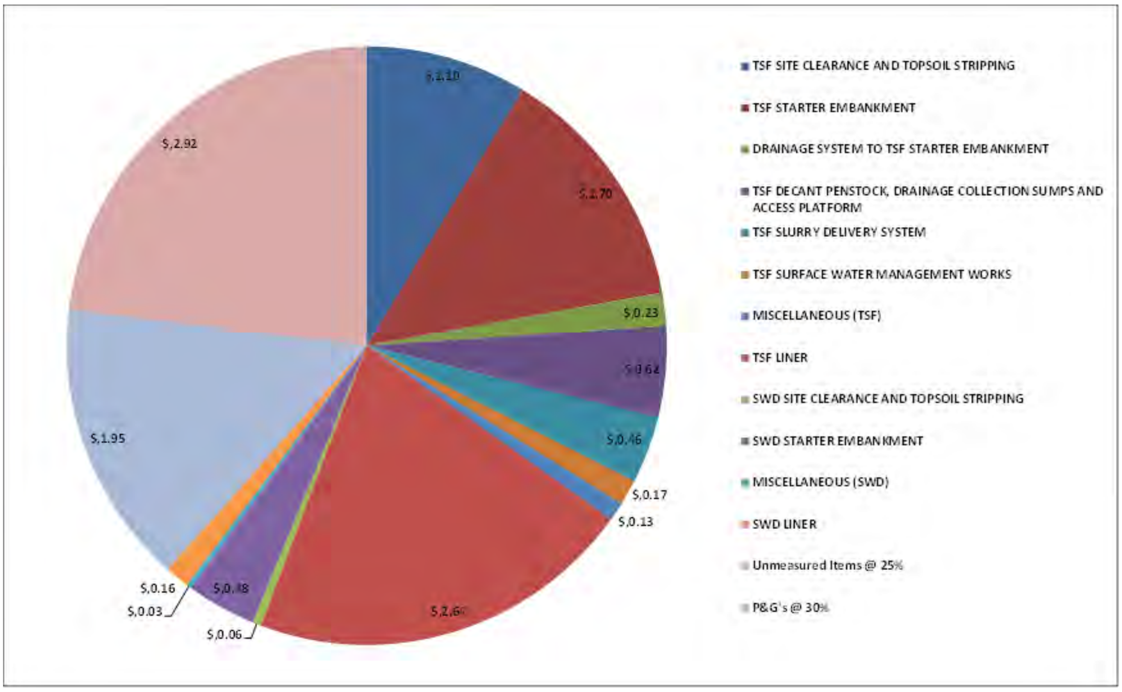
- pumps;
- mechanical and electrical components;
- access roads between the TSF and process plants;
- the return water pipelines from the RWD and SWD to the process plant;
- all electrical, mechanical and instrumentation equipment;
- moving of existing infrastructure; and

- escalation.

A graphical representation of the breakdown of the capital costs associated with the TSF shown in Figure 21-1.

Figure 21-1

Capital cost breakdown in US$ millions - TSF



21.1.4 Summary of initial capital expenditure

Table 21-10 is a summary of the initial capital expenditure of the Project.

Table 21-10

Summary of initial capital expenditure

Description	Amount (US$ millions)
Site Facilities and Infrastructure	21.8
Power Supply	14.5
Mining	1.7
Beneficiation Plant	43.0
Hydrometallurgical Plant	54.4
Sulphuric Acid Plant	34.7
Tailings Storage Facility	12.7
Other	14.0
Total Initial Capital Expenditure	**196.6**
Contingency	19.7
Total Initial Capital Expenditure including Contingency	**216.3**

21.2 Operating Costs

21.2.1 Mining Operating Costs

The operating cost estimate for open pit mining is based on the budget estimate submitted by the mining contractor who was approached during this study.

In order to evaluate the contractor's submission the operating cost was estimated by MSA (Sections 21.2.1.2 to 21.2.1.4) and the results of this operation were compared to the contractor cost. The costs and equipment fleet selected proved to be similar so the contractor cost estimate was accepted and used as the operating cost in the study.

A detailed breakdown of the cost was not provided by the contractor. The rate quoted for drill, blast and haul of ore to the plant site and waste to the designated waste dump is US$ 4.24 per tonne mined.

Table 21-11 summarises the quoted rate of US$ 4.24 per tonne mined translated into rates per kilogram and per tonne processed.

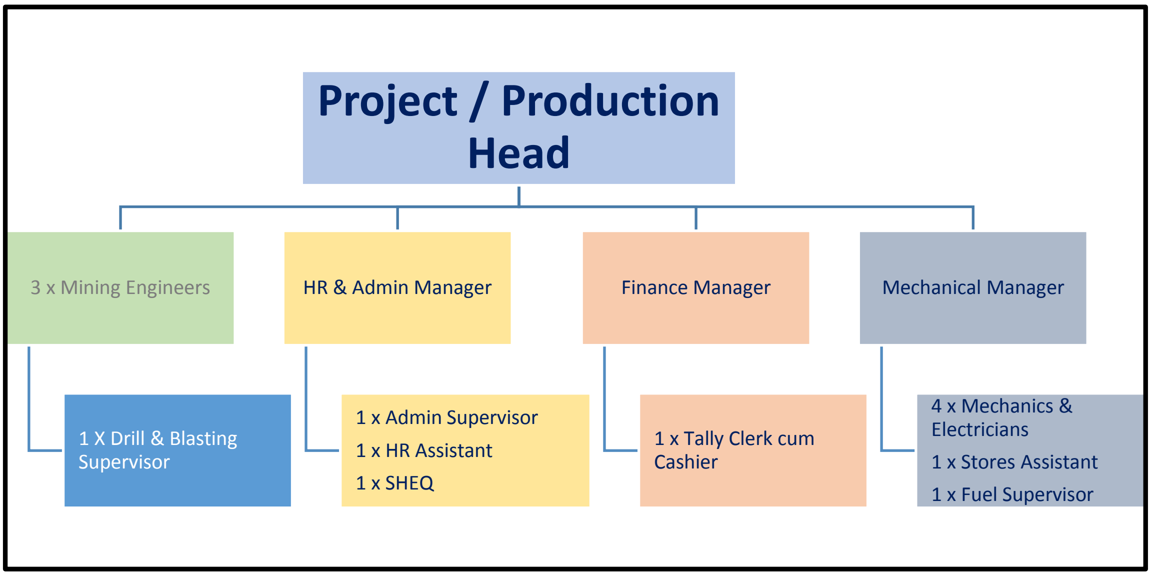
Table 21-11
Estimated mining contractor costs

Item	LoM US$/kg	LoM US$/tonne milled
Contract mining cost	4.12	23.45

21.2.1.1 Labour Cost

The contractor provided an organogram of the Project supervisory team. This is shown in Figure 21-2 below.

Figure 21-2
Mining contract supervisory structure



Based on the fleet size and a labour complement determined by MSA a labour cost estimate was completed. Part of this labour cost is included in the contractor cost and part of it will be incurred by the mine owner as an owner's team cost. A summary of the labour cost estimate is shown in Table 21-12 below.

Table 21-12
Labour summary

Category	Complement	Cost/Year (US$)
Owners Team		
Management	3	475,000
Technical Services	10	341,000
Administration	7	244,000
Camp	18	233,200
Security	49	496,000
Subtotal: Owners Team	**87**	**1,789,200**
Mining Contractor		
Mining	90	Included in contractor cost
Maintenance	21	
Administration	17	
Allowance for leave	16	
Subtotal Contractor	**144**	
Total Mine Site	**231**	**1,789,200**

The following functions will be performed by the owner's team:

- general management – a general manager will be required to oversee the entire mining and processing operation;
- contract management - the mining contractor will need to be managed by a mining professional;
- engineering management – a site engineer will be required to manage the infrastructure on site;
- technical services – mining technical services will be required. This includes mine planning, geology, grade control and survey;
- administration – general administration and contract administration will be done by the mine owner;
- camp management – the residential camp on site will need to be run and managed. Although it is possible to outsource this function, the costs for this have been included in the owners cost in the study; and
- security – the mine owner will be responsible for overall site security and although this can be outsourced he costs have been allowed for in the owners, operating cost.

Table 21-13 shows a summary of the labour complement for the owner's team.

Table 21-13 Owners team			
Position	**Number**	**Cost to Company (US$)**	**Annual Cost (US$)**
Management			
Mine Manager	1	240,000	240,000
Engineering Manager	1	160,000	160,000
Pit Superintendent	1	75,000	75,000
Technical services			
Senior geologist	1	75,000	75,000
Geologist	1	52,000	52,000
Grade controllers	4	14,000	56,000
Mine planner	1	75,000	75,000
Surveyor	1	75,000	75,000
Survey assistants	2	4,000	8,000
Administration			
Admin Manager	1	160,000	160,000
Clerks	4	14,000	56,000
Drivers	2	14,000	28,000
Camp			
Camp Manager	1	130,000	130,000
Chef	1	52,000	52,000
Kitchen assistants	6	4,000	24,000
Cleaners	6	2,400	14,400
Gardeners	2	2,400	4,800
Laundry assistants	2	4,000	8,000
Security			
Security Manager	1	160,000	160,000
Shift supervisor	3	52,000	156,000
Guards	45	4,000	180,000

21.2.1.2 Mining Equipment Operating Cost

Operating costs per hour were estimated for the mining fleet. These costs were based on a fuel cost of US$ 1.62 per litre. The required hours for each type of machine was calculated from the mining schedule and multiplied by the hourly cost to estimate the cost per month. The hourly cost and productivity used for each machine type are shown in Table 21-14.

Table 21-14 Basis of mining fleet operating cost		
Equipment type	**Productivity per unit**	**US$/hr**
Drills	25 m/hr	185
Excavator	814 t/hr	193
Trucks	180 t/hr	134

The cost of diesel and parts for equipment maintenance was included in the machine operating cost per hour.

The cost of operating the dozers, graders and water trucks for ramp and road maintenance was estimated to be US$ 0.15 per tonne mined, based on experience from other operations.

21.2.1.3 Mining Consumables Operating Cost

The main cost element of mining consumables will be bulk explosives. The cost per tonne for bulk explosives is included in the cost estimate U$ 1,500 per tonne.

21.2.1.4 Mining Operating Summary

Table 21-15 shows a summary of the mining operating cost estimate prepared by MSA from first principles.

Table 21-15
Summary of mining operating costs

Item	Total Cost	Cost per tonne Mined	Cost per tonne Processed
Drilling	8,024,270	0.17	0.95
Explosives	24,271,205	0.52	2.86
Load and haul	62,242,091	1.33	7.34
Ramps and roads	7,038,649	0.15	0.83
Labour (contractor)	48,585,600	1.04	5.73
Labour (owner's team)	32,205,600	0.69	3.80
Sub total	**182,367,415**	**3.89**	**21.50**
Contractor mark-up (15%)	27,355,112	0.58	3.22
Total	**209,722,527**	**4.47**	**24.72**

Allowing for a contractor mark-up of 15 % the estimated cost comes to US$ 4.47 per tonne mined. This is comparable to the US$ 4.24 per tonne mined submitted by the mining contractor. As such the budget estimate submitted by the contractor is considered to be a reliable estimate and therefore this cost was used in the financial analysis in the study. The contractor cost equates to a cost per tonne milled of US$ 23.45.

21.2.1.5 Milling/flotation operating costs

The milling/flotation operating costs are detailed in Table 21-16.

Table 21-16 Estimated milling/flotation operating costs		
Item	**LoM US$/kg**	**LoM US$/tonne processed**
Labour (fixed)	0.73	4.13
Maintenance spares (fixed)	0.32	1.81
Miscellaneous (fixed)	0.31	1.75
Utilities - power (variable)	0.31	1.78
Utilities - water (variable)	0.02	0.11
Hydrometallurgical (variable)	1.99	11.34
Mill liners (variable)	0.04	0.22
Total	**3.72**	**21.15**

21.2.1.6 Hydrometallurgical costs

The hydrometallurgical costs are show in Table 21-17.

Table 21-17 Estimated hydrometallurgical costs		
Item	**LoM US$/kg**	**LoM US$/tonne processed**
Labour (fixed)	0.30	1.69
Utilities - power (variable)	0.21	1.19
Utilities - water (variable)	0.03	0.16
Utilities - diesel fuel (variable)	0.31	1.77
Maintenance spares (fixed)	0.29	1.68
Miscellaneous (fixed)	0.02	0.12
Consumables (variable)	5.94	33.80
Total Leaching / precipitation / purification cost	**7.10**	**40.40**

21.2.1.7 General and administration and other costs

The estimated general and administration (G&A) and other costs are summarised in Table 21-18.

Table 21-18 Estimated G&A and other costs		
Item	**LoM US$/kg**	**LoM US$/tonne processed**
G&A	0.67	3.80
Ongoing social development	0.29	1.66
TSF	0.21	1.21
Provision for reclamation	0.16	0.89
Other environmental costs	0.05	0.30
Concentrate transport	0.12	0.70
Total G&A & other costs	**1.50**	**8.55**

21.2.1.8 Power and water costs

An allowance of US$ 0.11 per cubic metre of water has been provided for in the operating cost estimate and power costs have been estimated at US$ 0.07684 per kWh. It has been assumed that power will be co-generated from the proposed sulphuric acid plant supplemented with power from the Malawian power grid.

21.2.1.9 Tolling and concentrate sales costs

The LoM tolling costs are estimated at US$ 10.00 per kilogram or US$ 56.90 per tonne processed.

21.2.2 Processing plant operating cost

The cash operating cost estimate includes the estimated costs of crushing, milling, flotation, leaching, purification and precipitation in addition to other costs associated with the operation of the processing plant.

The operating expenditure (Opex) estimate includes a cost for the operation of the 270 t/d sulphuric acid plant and the stand-by diesel plant.

21.2.2.1 Basis of operating expenditure estimate

The following sources, general data and assumptions were used as the basis for estimating the operating cost for the processing plant:

- the base is 1st October 2015 (no provision is included for escalation beyond this date);
- this PFS assumes that RoM throughput is 500,000 tpa, with a TREO production capacity of approximately 2,840 tpa excluding a large proportion of the Cerium;
- all operating costs are expressed in US$ unless otherwise specified. Exchange rates adopted at the time of study were:
    - US$ 1.00 = 547.5 MWK;
    - US$ 1.00 = 13.7 ZAR;
- labour costs are estimated based on the current reasonable labour market rates in the area of Malawi project sites as provided by Mkango;
- the proposed sulphuric acid plant at the mine site is assumed to be capable of co-generating up to 60 % of the required power for the mine site operations – the total demand being 6 MW. The Opex estimate of the sulphuric acid plant is included in the hydrometallurgical plant Opex estimate;
- since natural gas is not readily available at Songwe Hill, diesel has been selected as the alternative fuel for the dryers;
- maintenance costs are estimated at 5 % of the supply and delivery direct mechanical cost from the Capex estimation for the process plant and acid plant;
- reagent consumption is based on the preliminary mass balance and stoichiometry;

- reagent prices vary according to source of supply, market fluctuation and amount required. The selected reagent prices were either verified by, or in some cases, directly supplied by Mkango. In cases where multiple prices for the same reagent were obtained, the higher unit cost was selected; and
- no project contingency has been provided for.

21.2.2.2 Opex summary

Table 21-19 summarizes the operating cost estimate for the Songwe Hill Project processing plant. The results illustrate that the reagent cost constitutes more than 70 % of the total operating cost estimate.

Table 21-19
Operating cost summary – processing plant*

Category	Annual cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	US$	US$	US$	US$/t RoM	US$/t RoM
Labour					
Beneficiation plant	2,002,650	2,002,650		4.01	
Hydrometallurgical plant	816,802	816,802		1.63	
Total	**2,819,453**	**2,819,453**		**5.64**	
Utilities – Power					
Beneficiation plant	918,807		918,807		1.84
Hydrometallurgical plant	614,192		614,192		1.23
Total	**1,532,998**		**1,532,998**		**3.07**
Utilities – Water					
Beneficiation plant	53,900		53,900		0.11
Hydrometallurgical plant	78,139		78,139		0.16
Total	**132,039**		**132,039**		**0.26**
Utilities – Diesel Fuel					
Beneficiation plant					
Hydrometallurgical plant	886,763		886,763		1.77
Total	**886,763**		**886,763**		**1.77**
Maintenance spares					
Beneficiation plant	877,633	877,633		1.76	
Hydrometallurgical plant	812,147	812,147		1.62	
Total	**1,689,779**	**1,689,779**		**3.38**	
Miscellaneous					
Beneficiation plant	850,586	850,586		1.70	
Hydrometallurgical plant	55,843	55,843		0.11	
Total	**906,430**	**906,430**		**1.81**	
Consumables					
Beneficiation plant	5,671,097		5,671,097		11.34
Hydrometallurgical plant	16,902,438		16,902,438		33.80
Total	**22,573,535**		**22,573,535**		**45.15**
Mill liners					
Beneficiation plant	110,880		110,880		0.22
Hydrometallurgical plant					
Total	**110,880**		**110,880**		**0.22**

Category	Annual cost	Fixed cost	Variable cost	Fixed cost	Variable cost
	US$	US$	US$	US$/t RoM	US$/t RoM
Cost					
Beneficiation plant	10,485,553	3,730,869	6,754,683		
Hydrometallurgical plant	20,166,324	1,684,792	18,481,532		
Total	**30,651,877**	**5,415,662**	**25,236,215**		
US$/tonne					
Beneficiation Plant (US$/tonne RoM)	20.97	7.46	13.51		
Hydrometallurgical Plant (US$/tonne RoM)	40.33	3.37	36.96		
Total	**61.30**	**10.83**	**50.47**		

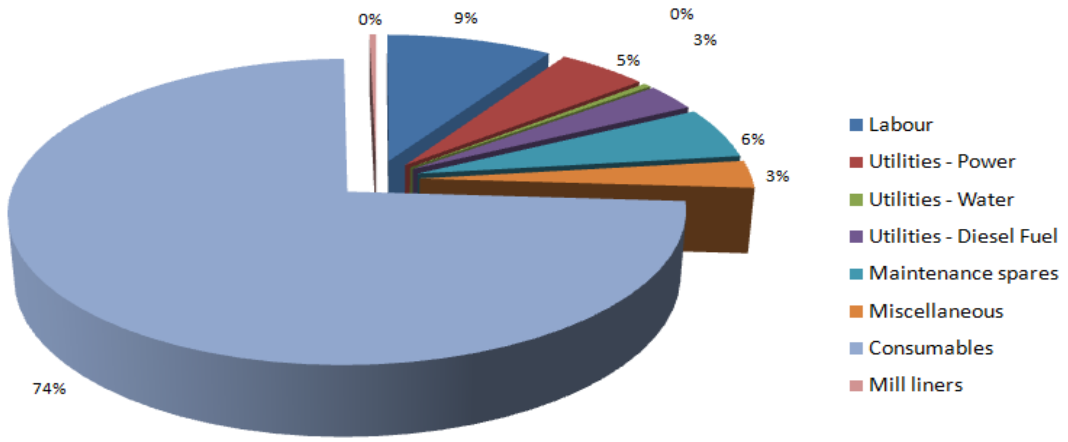
Note: ** Steady state*

21.2.2.3 Cost elements

Figure 21-3 below illustrates each individual cost elements' contribution to the total operating cost estimate.

Figure 21-3

Operating cost summary



Labour cost

Labour costs are estimated by applying typical salary costs, inclusive of benefits, to a proposed organization. Annual salary for each position is estimated based on the current reasonable labour market rates in the area of the Songwe Hill Project sites in Malawi and it is based on a total cost to company.

Reagent cost

Based on results of test work, a suite of flotation reagents and their corresponding consumptions were used for the operating cost analysis. Selection of reagents for the hydrometallurgical plant was based on testwork and the consumption was based on a preliminary mass balance and stoichiometric calculations.

Reagent cost for the Beneficiation Plant is estimated at US$ 5,671,097 and for the Hydrometallurgical Plant is estimated at US$ 16,902,438. Since reagent prices vary significantly and contribute more than 70 % of the total operating cost, it would be beneficial to obtain a negotiated price for a more accurate future operating cost estimate.

Power, water and fuel cost

The electricity price for the Project is assumed to be 0.07684 US$/kWh, as supplied by the Mkango. The annual electricity cost is estimated at US$ 1,532,998. The proposed sulphuric acid plant has the potential to generate up to 60 % of the required power for the plant.

Fuel cost is estimated at US$ 886,763 per annum for the drying operations at the hydrometallurgical plant and for the sulphuric acid plant start-up.

Transportation cost

The reagent cost estimate includes the transportation costs. It is assumed that shipping cost to Nacala port ranges between US$ 61 and US$ 95 per tonne and that the rail cost from Nacala to Blantyre is US$ 50 per tonne.

Sulphuric acid plant operating cost

The proposed sulphuric acid plant burns sulphur to produce sulphuric acid and generates electricity from the waste heat. The plant will be capable of producing all of the required sulphuric acid and a portion of the power for the mine site.

The operating cost for the sulphuric acid plant is estimated at US$ 5,802,846 per annum. This cost mainly comprises the cost of sulphur, with an assumed cost of US$ 252 per tonne, based on a quote to SNC-Lavalin by an Indian chemical distributor in November 2015.

Maintenance cost

Maintenance costs for equipment, piping, electrical, instrumentation and other associated utilities are estimated at 5 % of the supply and delivery direct mechanical cost.

The total maintenance cost for the Project is estimated at US$ 1,689,779 per annum, comprising US$ 877,633 for the Beneficiation Plant and US$ 812,147 for the Hydrometallurgical Plant.

Contingency

No contingency has been provided for in the operating cost estimate.

Exclusions

The operating cost estimate excludes all operating costs not directly associated with the processing facility. These include the following:

- mining and exploration costs;
- tailings disposal costs;
- environmental, social and closure costs;

- value added taxes and duties on operating supplies and transportation costs;
- organic, aqueous or solid waste disposal fees, should there be any; and
- general and administrative costs, including marketing, insurance, communications, procurement services, accounting, safety, auditing, travel, consultants' fees and external analytical services.

21.2.3 Tailings Storage Facility Operating costs

The TSF operational cost has been estimated based on current prices for similar TSF operations elsewhere within Africa and operated by specialist contractors. In the case of low tailings depositional rates the operating costs are dictated by the costs associated with establishing and maintaining the staff and equipment necessary to manage the facility and is estimated at US$ 1/tonne of tailing deposition (@ 500 ktpa the cost shall be US$ 0.5 million per annum). The total operational cost associated with the TSF is estimated at US$ 0.59 million per annum and comprises:

- US$ 1/tonne of tailing deposition management (500 ktpa amounts to US$ 0.5 million per annum);
- US$ 45,700 per annum for pipe and valve replacements per annum; and
- quarterly inspections and annual reviews of the facility, US$ 40,000 per annum.

21.2.3.1 Engineering design

In addition to the capital costs associated with the construction of the TSF provision has been made for engineering design and construction site supervision. The total cost up to the completion of the construction of the TSF is estimated at US$ 13.29 million and comprises:

- construction of the TSF US$ 12.65 million;
- engineering Definitive Feasibility Study at US$ 160,000;
- engineering detailed design at US$ 180,000; and
- engineering construction supervision at US$ 300,000.

21.2.3.2 Rehabilitation and closure costs

The cost for rehabilitation and closure of the TSF has been compiled by the appointed environmental consultant and is thus not included in the above LoM expenditure estimate, but included in elsewhere within the overall Technical Report.

21.2.4 Operating cost summary

The operating costs described in the sections above are summarised in Table 21-20.

Table 21-20 Estimated total cash cost summary				
Item	**LoM US$/kg REO**	**LoM US$/t processed**	**2018 – 2022 US$/kg**	**2018-2022 US$/t processed**
Mining Operating	4.1	23.5	3.0	21.1
Mill/Flotation	3.7	21.2	3.0	21.0
Hydrometallurgical	7.1	40.4	5.7	40.3
G&A and Other	1.5	8.6	1.3	8.6
Cash Operating Costs	**16.4**	**93.6**	**13.0**	**91.1**
Tolling/Concentrate Sales	10.0	56.9	10.0	70.9
Total Cash Costs	**26.4**	**150.5**	**23.0**	**162.0**

21.3 Environmental Closure Cost Estimate

The preliminary planned closure cost estimate was calculated using the block plan provided by SNC Lavalin. The estimated total cost for the closure of the Songwe REE Project is US$ 7,108,000. In line with best practice, Mkango would establish a trust or other similar such entity to accumulate these funds for closure and rehabilitation. Table 21-21 below provides a summary of the costs.

Table 21-21 Summary of closure costs for Songwe		
Summary of liability costs – Life of Mine		
No.	**Description**	**Amount (US$)**
1	Demolition	4,410,000
2	Rehabilitation	1,196,000
3	Rock Dump Reshaping and Rehabilitation	400,000
	Subtotal	**6,006,000**
4	Groundwater Monitoring	213,000
5	Vegetation Maintenance	53,000
6	Vegetation Monitoring	2,000
7	Project Management (12%)	673,000
8	Contingency (10%)	561,000
	Total	**7,508,000**

The following key assumptions were used for the closure cost estimate:

- the block plan is representative of the infrastructure and liabilities associated with the proposed mine;
- the closure estimate excludes potential liabilities associated with social obligations to surrounding communities, retrenchment payments and long term water management;

- a contingency of 10 % has been included to allow for areas which may have been undervalued or which have been overlooked; and
- for the post-closure period, monitoring of groundwater and surface water has been assumed to take place for a period of five years, with sampling taking place on a quarterly basis. Vegetation monitoring and maintenance will take place for three years.

22 ECONOMIC ANALYSIS

22.1 Introduction

The capital expenditure and operating costs of the Pre-Feasibility study completed in September 2014 have been updated to reflect changes due to escalations in equipment prices, exchange rate movements and changes in reagent prices. In addition, Mkango commissioned an independent rare earth market review from Adamas Intelligence (Adamas) to evaluate the future rare earth market in the context of Mkango's potential development timeframe. Adamas forecasted three different scenarios for future global REO production from 2015 through 2020 summarized as follows:

- "Business as Usual" or the Base Case. China's Ministry of Land and Resources (MLR) holds production quotas steady at 2015 levels through 2020 and illegal/unregulated REO production in China will decrease by 56% over the same period. Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter. Production from all other nations combined will remain flat at 2015 levels through 2020;
- "Low Production Scenario" (higher prices). The MLR will hold the China's production quotas steady at 2015 levels through 2020. Illegal/unregulated REO production in China fully eliminated by 2020. Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter. Production from all other nations combined will remain flat at 2015 levels through 2020; and
- "High Production Scenario" (lower prices). The MLR will increase national production quota levels by 4,000 tonnes in 2017 (versus 2015), and by an additional 4,000 tonnes in 2019, thereafter holding steady through 2020. Illegal/unregulated REO production in China fully eliminated by 2020. Australian production reaches 22,000 tonnes of TREO per annum by 2018 and flat thereafter. Production from all other nations combined will remain flat at 2015 levels through 2020. One new light rare earth producer and one new heavy rare earth producer come into production in 2018.

An updated discounted cash flow model prepared by Mkango Resources was reviewed by MSA which incorporates the LoM Plan figures, economic assumptions as to USA inflation rates and rare earth oxide prices as outlined in other Sections of this PFS. The escalation/de-escalation technique has been employed to ensure the quantum and timing of any taxes payable is calculated correctly. The financial evaluation has been undertaken on an after-tax, un-leveraged, nominal and real rate of return basis.

A range of discount rates was used to determine the Net Present Values (NPV); the NPVs are at 1st January 2016, in the same money terms.

A sensitivity analysis shows the impact on the NPVs and IRRs to changes in the metal prices, capex and opex.

22.2 Financial Model Inputs

22.2.1 Metal prices

Long term rare earth price assumptions were derived from Adamas Intelligence's "Business as Usual" 2015 to 2020 pricing scenario, projected flat in real terms beyond 2020. This equates to a basket value for Songwe Hill of approximately US$ 60 per kg REO in 2020 and beyond.

The main revenue drivers are neodymium (53 %), dysprosium (12 %) and praseodymium (14 %) as illustrated in Table 22-1.

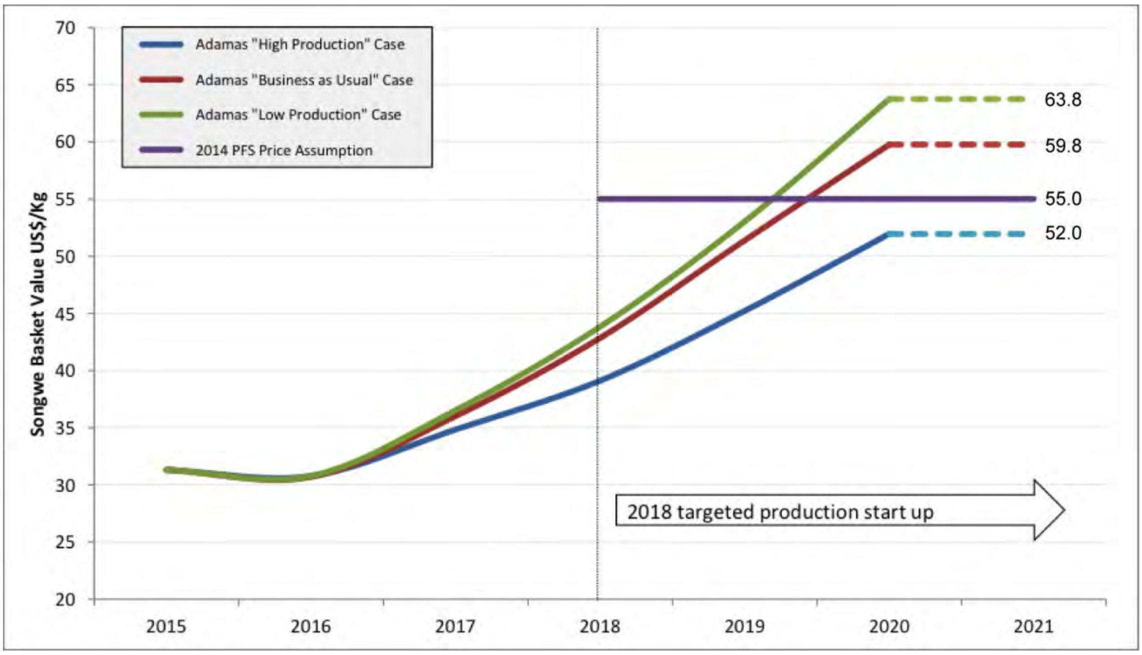
Table 22-1
2020 REO Basket Value (Base Case – Adamas "Business as Usual" Case)

Rare Earth Oxide		REO in conc[1] (tonnes)	REO in concentrate split	REO in concentrate (US$/kg)	REO in concentrate Split by value
Lanthanum	La_2O_3	1,075	37.8 %	3.1	5.2 %
Cerium	CeO_2	341	12.0 %	0.4	0.7 %
Praseodymium	Pr_6O_{11}	227	8.0 %	8.6	14.4 %
Neodymium	Nd_2O_3	756	26.6 %	31.6	52.8 %
Samarium	Sm_2O_3	114	4.0 %	0.2	0.3 %
Europium	Eu_2O_3	27	0.9 %	4.5	7.6 %
Gadolinium	Gd_2O_3	62	2.2 %	1.2	2.0 %
Terbium	Tb_4O_7	7	0.3 %	1.9	3.3 %
Dysprosium	Dy_2O_3	35	1.2 %	7.2	12.1 %
Yttrium	Y_2O_3	165	5.8 %	1.0	1.7 %
Holmium[2]	Ho_2O_3	6	0.2 %		
Erbium[2]	Er_2O_3	13	0.5 %		
Thulium[2]	Tm_2O_3	2	0.1 %		
Ytterbium[2]	Yb_2O_3	10	0.3 %		
Lutetium[2]	Lu_2O_3	1	0.0 %		
Total REO in concentrate		**2,841**	**100.0 %**	**59.8**	**100.0 %**
"Magnet" REO in concentrate[3]		**1,026**	**36.1 %**	**49.3**	**82.6 %**

Note: [1] *Average annual at full capacity excluding first and last years*
[2] *No value currently attributed to these rare earths in the financial evaluation*
[3] *"Magnet" REO assumed to be neodymium, praseodymium, dysprosium and terbium*

Two additional pricing scenarios were also analysed based on Adamas Intelligence's "Low Production" and "High Production" 2015 to 2020 pricing scenarios, projected flat in real terms beyond 2020 as illustrated below in Figure 22-1 in comparison to the "Business as Usual" Base Case and the assumption used in Mkango's 2014 Pre-Feasibility Study.

Figure 22-1
Pricing scenarios



In 2008, the basket value of Songwe Hill's prospective TREO production was $21.75 per kilogram and over the first half of 2015 the basket value averaged US$ 33.89 per kilogram. Since 2008 the Songwe Hill basket value has averaged US$ 62.95 per kilogram TREO (trailing 7.5-year average), whereas since 2013 it has averaged US$ 43.63 per kilogram TREO (trailing 2.5-year average). Excluding the price spike of 2011 and 2012, the Songwe Hill basket value has averaged US$ 34.62 per kilogram TREO since 2008 (trailing 7.5-year average excluding 2011 and 2012).

Rare earth prices have reached multi-year lows in 2015, challenging the profitability of China's major producers. Adamas Intelligence believes that consolidation of major players into large state-run groups, and the subsequent elimination of excess production capacity in China, will serve to reduce illegal rare earth production in the nation going forward while increasing the pricing power of China's legitimate producers. Moreover, consolidation into six coordinated state-run groups, as opposed to dozens of under-utilized companies vying for market share, will boost pricing discipline, decrease volatility, and foster a more predictable market in the coming years.

In all three supply-demand scenarios considered from 2015 through 2020, Adamas forecasts that global demand for oxides of neodymium, praseodymium, dysprosium, terbium, lanthanum, and yttrium will significantly exceed global annual production in the year 2020, implying significantly higher prices versus those currently in 2015.

22.2.2 Malawian taxes

The prevailing taxation regime for mining companies in Malawi includes the following provisions:

- corporate income tax at 30 %;

- exploration, development and capital costs can be expensed against profit in the year incurred or carried forward to be expensed against the first year of production;
- royalty at a rate of 5 % of revenue;
- net operating losses - current taxable income may be offset against net operating losses brought forward, and current operating losses may be increased by net unexhausted trading losses brought forward. Mining operations may carry losses forward for only six years but this may be negotiated in the development agreement. Net operating losses may not be carried back; and
- resource rent tax for miners - miners must pay a resource rent tax of 10 % on after-tax profits if the rate of return exceeds 20 %. This is a recently introduced tax and details of operation are not clear, e.g. no formula has been provided for calculating the rate of return and is not considered in the valuation.

22.2.3 Capital Expenditure and Operating Costs

The capital expenditure and operating cost inputs to the financial model are those as outlined in Section 21.

22.3 Economic Analysis

22.3.1 Mineral Resource and Mineral Reserve Estimates

The Pre-Feasibility Study for the Songwe Hill Rare Earth Project based on the NI 43-101 Mineral Resource Estimate prepared by MSA entitled "NI 43-101 Technical Report and Mineral Resource Estimate for the Songwe Hill Rare Earth Element (REE) Project, Phalombe District, Republic of Malawi" was filed on 22 November 2012. The Report's Mineral Resource Estimates, as previously announced, are summarized in Table 22-2.

Table 22-2
Indicated and Inferred Mineral Resource Estimate

Cut-off Grade	Indicated Mineral Resource Estimate	Inferred Mineral Resource Estimate
1.0 % TREO	13.2 Mt grading 1.62 % TREO	18.6 Mt grading 1.38 % TREO
1.5 % TREO	6.2 Mt grading 2.05 % TREO	5.1 Mt grading 1.83 % TREO

Note: *TREO – Total Rare Earth Oxides including yttrium; In situ – no geological losses applied; Mt – million tonnes.*

The Study supports the declaration of a Mineral Reserve Estimate for the Project as summarised in Table 22-3.

Table 22-3
Probable Mineral Reserve Estimate

Cut-off Grade	Probable Mineral Reserve Estimate
1.0 % TREO	8.5 Mt grading 1.60 % TREO

Note: *TREO – Total Rare Earth Oxides including yttrium;*

The following modifying factors were used to convert the Mineral Resource Estimate to the Mineral Reserve Estimate: Mining recovery – 95 %; mining dilution – 5 %; plant recovery – 34 %; product price – US$ 59.76 per kg TREO; operating cost – US$ 93.55 per tonne ore processed or US$ 16.44 per kg TREO recovered.

Indicated Mineral Resources are inclusive of Mineral Reserves. Mineral Resources that are not Mineral Reserves do not have demonstrated economic viability. The financial valuation is based on the mining of the 8.5 Mt of estimated Mineral Reserves only.

22.3.2 Financial Valuation

Based on the preceding assumptions, the Project is economically viable with:

- a NPV @ 10 % (nominal) (7.3 % real) of US$ 345 million as at 1st January 2016; and
- an IRR of 37 % (nominal) (33 % real).

Table 22-4 through to Table 22-8 summarise selected financial inputs and the corresponding results. All costs are quoted in real January 2016 United States Dollars (US$).

Table 22-4

Summary of mining and processing inputs and results

Item	Unit	Value
Life of Model	Years	18
MINING		
Total life-of-model ore production	000't	8,483
Waste mined	000't	38,442
Strip ratio	W:O	4.5
Total LoM Plant feed	000't	8,483
Average yearly Plant Feed	000't	500
PROCESSING		
Tonnes to hydrometallurgical plant	000't	8,483
Contained REOs in product	000't	48.3
Average annual production Of REOs (excl. 1st and last year)	tpa	2,841

Table 22-5

Summary of selected financial inputs and corresponding results - Capital

Item	Unit	Value
CAPITAL		
Total Real Development Capital	US$ million	197
Contingency	US$ million	20
Total Real Development Capital incl. Contingency	US$ million	216[1]
Sustaining capital and reclamation	US$ million	25[1]
Total Real Capital Expenditure	**US$ million**	**241**
Maximum Exposure (Real Negative Cashflow)	**US$ million**	**191**

Note: [1] *Totals may not represent the sum of the parts due to rounding*

Table 22-6
Summary of selected financial inputs and corresponding results - costs

Item	Unit	Value
LoM Total Cash Cost Breakdown: US$/kg REO		
Mining	US$/kg	4.1
Beneficiation	US$/kg	3.7
Hydrometallurgical	US$/kg	7.1
G&A and Other	US$/kg	1.5
Operating Cash Costs	**US$/kg**	**16.4**
Tolling/concentrate sales	US$/kg	10.0
Total Cash Costs	**US$/kg**	**26.4**
LoM Total Cash Cost Breakdown: US$/t processed		
Mining	US$/t	23.5
Beneficiation	US$/t	21.2
Hydrometallurgical	US$/t	40.4
G&A and Other	US$/t	8.6
Operating Cash Costs	**US$/t**	**93.6**
Tolling/concentrate sales	US$/t	56.9
Total Cash Costs	**US$/t**	**150.5**

Table 22-7
Summary of selected financial inputs and corresponding results (Nominal)– post tax valuation

Item	Unit	Value
Post Tax Valuation		
Project cash flow post-tax (Nominal) (including royalty)	US$ million	1,118
Payback period from Project start	Years	4.8
Payback period from start of production	Years	2.8
Post-tax NPV @ 10 % (Nominal) discount rate	US$ million	345
Post-tax IRR (Nominal)	%	37 %

Table 22-8
NPVs of the Project[1]

Financial Evaluation	Nominal discount rate[2]	Real discount rate	Base Case – Adamas "Business as Usual" Case Post-tax NPV (US$ million)	Adamas "Low Production" Case Post-tax NPV (US$ million)	Adamas "High Production" Case Post-tax NPV (US$ million)	Sept 2014 Pre-Feasibility Study Post-tax NPV (US$ million)[3]
	9.0 %	6.3 %	385	446	258	326
Base Case	**10.0 %**	**7.3 %**	**345**	**400**	**228**	**293**
	11.0 %	8.3 %	308	359	201	262
	12.0 %	9.3 %	276	323	177	234
	13.0 %	10.2 %	248	290	156	210
	14.0 %	11.2 %	222	261	137	188
Nominal Internal Rate of Return			37 %	40 %	29 %	36 %
Real Internal Rate of Return			33 %	36 %	26 %	32 %

Note: *[1] As at 1 January 2016, in the same money terms*
[2] Includes inflation at 2.5 %
[3] As at 1 July 2014, in the same money terms

22.3.3 Sensitivity Analysis

The sensitivity chart, Figure 22-2 below, shows the nominal NPV @ 10 % variation for the Base Case due to changes in revenue, capital and operating costs, holding all other inputs constant. The Project is most sensitive to the metal prices and more sensitive to Opex than Capex. The revenue sensitivity assumes that all rare earth metal prices change by the same percentage and that the tolling rate does not change with rare earth prices.

Figure 22-2
NPV @ 10 % nominal sensitivy analysis

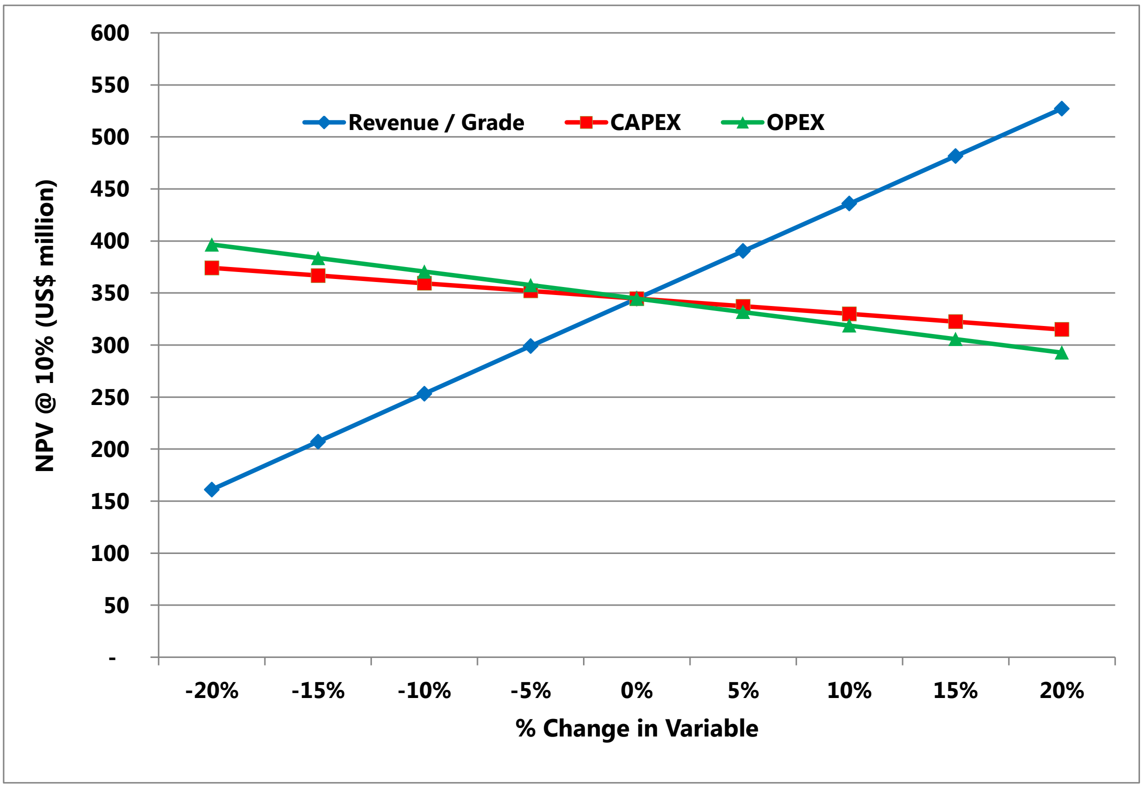
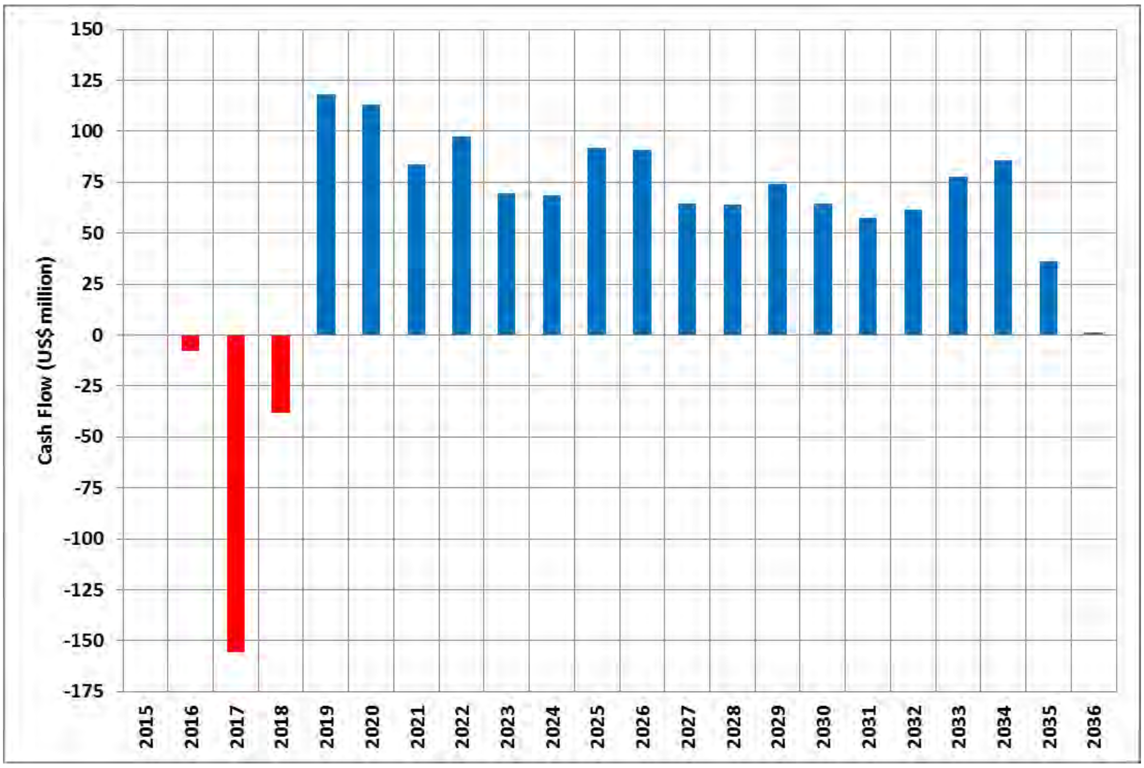


Figure 22-3 shows the nominal annual flows over the life of the Project.

Figure 22-3
Annual cash flow (nominal)



Maximum negative cash flow of US$ 202 million (nominal) occurs in 2018 as shown in the cumulative cash flow graph (Figure 22-4).

Figure 22-4
Cumulative annual cash flow (nominal)

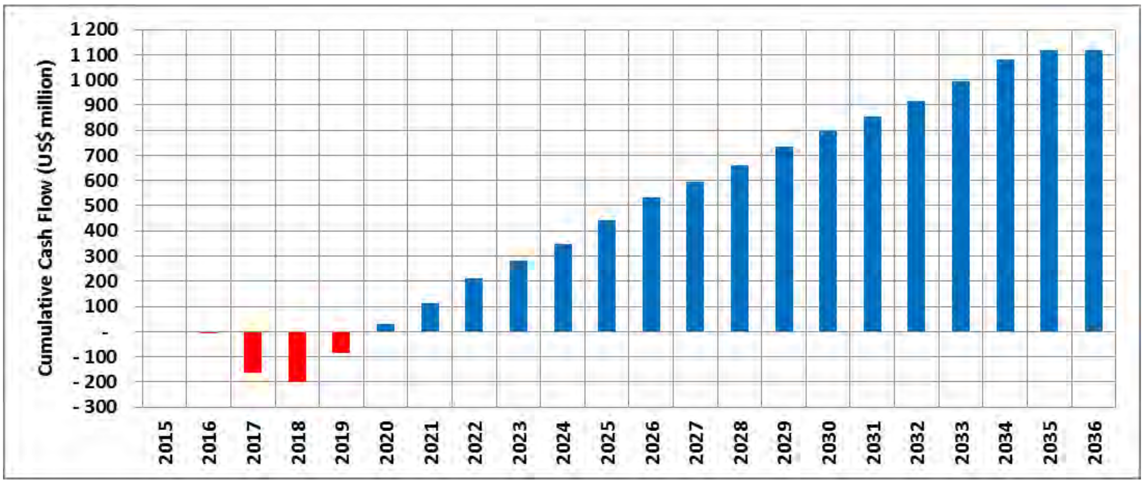


Table 22-9 shows the matrices of the NPV for percentage variations in revenue (all metals), capital and operating expenditure.

Table 22-9

Sensitivity of NPV (Nominal) to changes in metal prices (all metals), Capex and Opex.

		REVENUE						
		NPV (US$ million)						
Nominal discount rate: -->		0.0%	9.0%	**10.0%**	11.0%	12.0%	13.0%	14.0%
Change in Metal Prices	20%	1,612	584	527	476	431	391	354
	15%	1,489	534	482	434	392	355	321
	10%	1,365	485	436	392	354	319	288
	5%	1,242	435	390	350	315	283	255
	0%	**1,118**	**385**	**345**	**308**	**276**	**248**	**222**
	-5%	995	336	299	267	238	212	189
	-10%	871	286	253	224	199	176	155
	-15%	747	235	207	182	159	139	122
	-20%	624	185	161	139	120	103	88

		OPEX						
		NPV (US$ million)						
Nominal discount rate: -->		0.0%	9.0%	**10.0%**	11.0%	12.0%	13.0%	14.0%
Change in OPEX	20%	969	328	293	261	233	207	185
	15%	1,006	343	306	273	244	217	194
	10%	1,043	357	319	285	255	227	203
	5%	1,081	371	332	297	265	237	213
	0%	**1,118**	**385**	**345**	**308**	**276**	**248**	**222**
	-5%	1,155	399	358	320	287	258	231
	-10%	1,193	414	371	332	298	268	240
	-15%	1,230	428	384	344	309	278	249
	-20%	1,268	442	397	356	320	288	259

		CAPEX						
		NPV (US$ million)						
Nominal discount rate: -->		0.0%	9.0%	**10.0%**	11.0%	12.0%	13.0%	14.0%
Change in CAPEX	20%	1,083	355	315	279	248	219	194
	15%	1,092	363	322	287	255	226	201
	10%	1,101	370	330	294	262	233	208
	5%	1,109	378	337	301	269	240	215
	0%	**1,118**	**385**	**345**	**308**	**276**	**248**	**222**
	-5%	1,127	393	352	316	283	255	229
	-10%	1,136	400	359	323	291	262	236
	-15%	1,145	408	367	330	298	269	243
	-20%	1,153	415	374	338	305	276	250

Table 22-10 below shows the effect on the $NPV_{@10\%}$ for a two-way variation in Opex and Capex.

Table 22-10
Sensitivity of NPV @ 10 % (nominal) to two way variation in Opex and Capex.

		NPV @ 10% (Nominal) (US$ million)								
		Change in OPEX								
		20.0%	15.0%	10.0%	5.0%	**0.0%**	-5.0%	-10.0%	-15.0%	-20.0%
Change in CAPEX	20%	263	276	289	302	**315**	328	341	354	367
	15%	270	283	296	309	**322**	335	348	361	374
	10%	278	291	304	317	**330**	343	356	369	382
	5%	285	298	311	324	**337**	350	363	376	389
	0%	**293**	**306**	**319**	**332**	345	**358**	**371**	**384**	**397**
	-5%	300	313	326	339	**352**	365	378	391	404
	-10%	308	320	333	346	**359**	372	385	398	411
	-15%	315	328	341	354	**367**	380	393	406	419
	-20%	322	335	348	361	**374**	387	400	413	426

22.4 Mine Life

The mine has an estimated operating life of 18 years based on the current mine plan tonnage.

22.5 Discounted cash flow model

Table 22-11 and Table 22-12 show the DCF model for the Mkango Project in nominal terms.

Table 22-11
Cash Flow Model – Mkango Project

DESCRIPTION	UNIT	TOTAL	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
MINING																							
Waste mined	t	38,441,726	-	-	1,068,865	1,528,326	1,040,988	2,064,652	1,842,227	1,917,310	1,868,717	1,469,575	1,596,984	2,394,980	3,067,241	2,603,481	3,021,995	3,283,584	3,223,874	2,775,661	2,788,040	885,228	-
Strip ratio	W:O	4.53	-	-	1.5	3.5	0.8	6.2	3.3	4.0	3.5	1.6	2.0	709.4	14.2	5.2	11.3	18.2	54.0	5.5	5.6	12.9	-
ROM tonnes	t	8,482,603	-	-	734,831	440,201	1,357,370	333,705	562,700	481,045	529,640	928,782	807,944	3,376	216,344	500,012	268,161	180,092	59,711	507,924	502,116	68,650	-
PROCESSING																							
Tonnes processed	t	8,482,603	-	-	200,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	500,000	282,603	-
Grade processed	%	1.60%	-	-	2.3%	2.2%	1.9%	1.8%	2.0%	1.5%	1.5%	1.8%	1.8%	1.4%	1.4%	1.5%	1.4%	1.3%	1.3%	1.5%	1.5%	1.2%	-
Contained REO in feed	t	136,139	-	-	4,500	11,204	9,402	8,999	9,881	7,577	7,513	9,013	8,750	6,806	6,999	7,494	6,781	6,338	6,476	7,329	7,630	3,447	-
Contained REO in mineral concentrate	t	91,213	-	-	3,015	7,507	6,299	6,030	6,620	5,076	5,034	6,039	5,863	4,560	4,689	5,021	4,544	4,246	4,339	4,910	5,112	2,310	-
REO recovered to final mixed product	t	48,275	-	-	1,596	3,973	3,334	3,191	3,504	2,687	2,664	3,196	3,103	2,413	2,482	2,657	2,405	2,247	2,296	2,599	2,706	1,222	-
OPERATING INCOME (NOMINAL)																							
Sales	US$m	3,736.1	-	-	73.6	225.3	225.4	221.2	248.9	195.6	198.8	244.5	243.3	194.0	204.4	224.4	208.1	199.4	208.8	242.2	258.5	119.7	-
Less royalty	US$m	187	-	-	4	11	11	11	12	10	10	12	12	10	10	11	10	10	10	12	13	6	-
Less tolling / separation costs	US$m	636.2	-	-	17.2	43.9	37.7	37.0	41.6	32.7	33.3	40.9	40.7	32.5	34.2	37.5	34.8	33.4	34.9	40.5	43.3	20.0	-
NET REVENUE (NOMINAL)	**US$m**	**2,913.1**	**-**	**-**	**52.8**	**170.2**	**176.4**	**173.1**	**194.8**	**153.1**	**155.6**	**191.4**	**190.4**	**151.8**	**160.0**	**175.6**	**162.9**	**156.0**	**163.4**	**189.6**	**202.3**	**93.7**	**-**
OPERATING EXPENDITURE (NOMINAL)																							
Mining opex																							
Contract mining cost	US$m	270	-	-	8	9	12	12	12	12	13	13	13	14	19	19	20	22	21	22	22	7	-
Contract mining cost (real)	US$/t	4.24	-	-	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	4.24	-
Milling / flotation opex																							
Labour (fixed)	US$m	47.2	-	-	1.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.8	2.9	3.0	3.0	3.1	3.2	3.3	-
Maintenance / spares (fixed)	US$m	21	-	-	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
Miscellaneous (fixed)	US$m	20.0	-	-	0.5	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	-
Utilities - power (variable)	US$m	20.3	-	-	0.2	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.5	0.5	-
Utilities - water (variable)	US$m	1	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Consumables (variable)	US$m	129.0	-	-	2.4	6.3	6.4	6.6	6.7	6.9	7.1	7.3	7.4	7.6	7.8	8.0	8.2	8.4	8.6	8.8	9.1	5.3	-
Mill liners (variable)	US$m	3	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Total milling / flotation opex	**US$m**	**241.0**	**-**	**-**	**4.7**	**11.6**	**11.9**	**12.2**	**12.5**	**12.8**	**13.1**	**13.4**	**13.8**	**14.1**	**14.5**	**14.8**	**15.2**	**15.6**	**16.0**	**16.4**	**16.8**	**12.0**	**-**
Total milling / flotation opex (real)	***US$/t ore processed***	***21.2***	***-***	***-***	***21.7***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***21.0***	***25.9***	***-***
Leaching / precipitation / purification																							
Labour (fixed)	US$m	19	-	-	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-
Maintenance / spares (fixed)	US$m	19.1	-	-	0.4	0.9	0.9	0.9	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	-
Miscellaneous (fixed)	US$m	1	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Utilities - power (variable)	US$m	13.6	-	-	0.1	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9	1.0	1.0	0.3	-
Utilities - water (variable)	US$m	2	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
Utilities - diesel (variable)	US$m	20.2	-	-	0.4	1.0	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.4	1.4	0.8	-
Consumables (variable)	US$m	385	-	-	7	19	19	20	20	21	21	22	22	23	23	24	24	25	26	26	27	16	-
Total leaching / precipitation / purification	**US$m**	**459.7**	**-**	**-**	**8.7**	**22.3**	**22.8**	**23.4**	**24.0**	**24.6**	**25.2**	**25.8**	**26.5**	**27.1**	**27.8**	**28.5**	**29.2**	**29.9**	**30.7**	**31.5**	**32.2**	**19.6**	**-**
Leaching / precipitation / purification (real)	***US$/t ore processed***	***40.4***	***-***	***-***	***40.4***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***40.3***	***42.4***	***-***
Total processing costs	**US$m**	**700.7**	**-**	**-**	**13.4**	**33.8**	**34.7**	**35.5**	**36.4**	**37.3**	**38.3**	**39.2**	**40.2**	**41.2**	**42.3**	**43.3**	**44.4**	**45.5**	**46.6**	**47.8**	**49.0**	**31.6**	**-**

Table 22-12

Cash Flow Model – Mkango Project

G&A / other																						
Total G&A & other costs	**US$m**	**96.8**	**0.0**	**0.1**	**3.4**	**4.9**	**4.9**	**4.9**	**5.2**	**4.9**	**5.1**	**5.5**	**5.6**	**5.3**	**5.5**	**5.7**	**5.7**	**5.7**	**5.9**	**6.3**	**6.5**	**5.6**	**0.0**
Total G&A & other costs (real)	***US$/t ore processed***	***8.6***	**-**	**-**	***15.9***	***8.9***	***8.7***	***8.5***	***8.8***	***8.1***	***8.1***	***8.5***	***8.5***	***7.9***	***7.9***	***8.1***	***7.9***	***7.7***	***7.8***	***8.0***	***8.1***	***12.2***	**-**
TOTAL CASH OPERATING COSTS (NOMINAL)	**US$m**	**1,067.1**	**0.0**	**0.1**	**25.0**	**47.9**	**51.1**	**52.3**	**53.8**	**54.7**	**56.0**	**57.7**	**59.1**	**60.2**	**66.9**	**67.6**	**70.3**	**73.0**	**73.7**	**75.8**	**77.8**	**43.9**	**0.0**
Total operating costs (real)	***US$/t ore processed***	***93.6***	**-**	**-**	***116.3***	***86.9***	***90.3***	***90.2***	***90.5***	***89.8***	***89.7***	***90.2***	***90.2***	***89.5***	***97.1***	***95.7***	***97.1***	***98.4***	***96.9***	***97.2***	***97.3***	***94.8***	**-**
Total operating costs ex tolling (real)	***US$/kg TREO***	***16.4***	**-**	**-**	***14.6***	***10.9***	***13.5***	***14.1***	***12.9***	***16.7***	***16.8***	***14.1***	***14.5***	***18.5***	***19.6***	***18.0***	***20.2***	***21.9***	***21.1***	***18.7***	***18.0***	***21.9***	**-**
CAPITAL EXPENDITURE (NOMINAL)																						
Development Capex																						
Site facilities & infrastructure	US$m	38.4	-	26.7	11.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mining	US$m	2	-	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mill / concentrator	US$m	45.5	-	31.6	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leach / purification plant	US$m	57.54	-	40	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acid plant	US$m	36.7	-	25.5	11.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Road	US$m	5.5	-	5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tailings	US$m	13	-	9	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other	US$m	9.0	8.1	0.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total development capex (nominal)	**US$m**	**207.8**	**8.1**	**140.9**	**58.9**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Contingency	US$m	20.8	-	14.5	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total development capex incl contingency (nominal)	**US$m**	**228.6**	**8.1**	**155.3**	**65.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Sustaining capital	US$m	23.0	-	-	-	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.6	-
TOTAL CAPEX (NOMINAL)	**US$m**	**251.7**	**8.1**	**155.3**	**65.2**	**1.1**	**1.1**	**1.2**	**1.2**	**1.2**	**1.2**	**1.3**	**1.3**	**1.3**	**1.4**	**1.4**	**1.4**	**1.5**	**1.5**	**1.6**	**1.6**	**1.6**	**-**
Total development capex incl contingency (real)	***US$m***	**216.3**	***7.9***	***147.8***	***60.6***	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
PRE-TAX CASH FLOW (NOMINAL)																						
Net operating income	US$m	2,913.1	-	-	52.8	170.2	176.4	173.1	194.8	153.1	155.6	191.4	190.4	151.8	160.0	175.6	162.9	156.0	163.4	189.6	202.3	93.7	-
Less cash costs	US$m	1,067	0	0	25	48	51	52	54	55	56	58	59	60	67	68	70	73	74	76	78	44	0
EBITDA	**US$m**	**1,846.0**	**(0.0)**	**(0.1)**	**27.7**	**122.3**	**125.3**	**120.8**	**141.0**	**98.4**	**99.6**	**133.6**	**131.3**	**91.6**	**93.1**	**108.0**	**92.6**	**83.0**	**89.7**	**113.8**	**124.5**	**49.8**	**(0.0)**
Less depreciation	US$m	252	8	155	65	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	-
EBIT	**US$m**	**1,594.3**	**(8.1)**	**(155.4)**	**(37.5)**	**121.2**	**124.2**	**119.6**	**139.8**	**97.2**	**98.3**	**132.4**	**130.0**	**90.3**	**91.7**	**106.6**	**91.1**	**81.5**	**88.2**	**112.2**	**122.9**	**48.2**	**(0.0)**
Less taxation	US$m	476	-	-	-	-	11	36	42	29	29	40	39	27	28	32	27	24	26	34	37	14	-
PROFIT AFTER TAX	**US$m**	**1,118.3**	**(8.1)**	**(155.4)**	**(37.5)**	**121.2**	**113.2**	**83.8**	**97.9**	**68.0**	**68.8**	**92.7**	**91.0**	**63.2**	**64.2**	**74.6**	**63.8**	**57.1**	**61.7**	**78.6**	**86.0**	**33.7**	**(0.0)**
Add depreciation	US$m	252	8	155	65	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	-
Less capital expenditure	US$m	251.7	8.1	155.3	65.2	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.6	-
Less change in working capital	US$m	- 0	- 0	- 0	1	3	0	- 0	1	- 1	0	1	- 0	- 1	0	0	- 0	- 0	0	1	0	- 2	- 1
POST TAX CASH FLOW NOMINAL	**US$m**	**1,118.3**	**(8.1)**	**(155.4)**	**(38.3)**	**118.3**	**113.1**	**83.9**	**97.3**	**69.3**	**68.8**	**91.6**	**91.0**	**64.4**	**64.2**	**74.2**	**64.3**	**57.3**	**61.5**	**77.8**	**85.7**	**35.9**	**1.5**
POST TAX CASH FLOW REAL	**US$m**	**819.5**	**(7.9)**	**(147.9)**	**(35.6)**	**107.2**	**99.9**	**72.3**	**81.8**	**56.9**	**55.1**	**71.6**	**69.4**	**47.9**	**46.5**	**52.5**	**44.4**	**38.6**	**40.4**	**49.9**	**53.6**	**21.9**	**0.9**

23 ADJACENT PROPERTIES

No information from any adjacent properties is incorporated in this Technical Report and no interpretations or results regarding the Songwe Hill property have utilized information from adjoining properties.

24 OTHER RELEVANT DATA AND INFORMATION

24.1 Legal Framework

The Project will be operating within Malawi and will therefore need to comply with all mining, processing and operating laws in the host country. In addition to local legislation, the Project may seek funding from private institutions that may require the Project to be complaint with international standards and protocols. The Project will therefore also seek to be compliant with the Equator Principles and the International Finance Corporation's Performance Standards and Environmental Health and Safety Guidelines.

The following legal review focusses on the legislation and requirements that are pertinent to the environmental aspects of the Project, including any processes, permits or licences required prior to obtaining a mining licence. The legal framework will be updated and detailed further during the Feasibility phase.

24.1.1 Malawian Legislation

Several Acts regulate the minerals sector in Malawi. Amongst these are the Mines and Minerals Act 1981 (and regulations), the Petroleum (Exploration and Production) Act 1983, and the Explosives Act 1968. In addition to the mining legislation there are also various environmental Acts and policies which will apply. A summary of the main laws, regulations and policies is presented here.

24.1.1.1 The Malawi Constitution

After Malawi's transition to a democratic disposition in 1994 and the adoption of a new constitution in 1995 a review of the existing environmental situation was undertaken. The Malawi Constitution (1995) lays a strong foundation for policy and legal reform in environmental governance, and also establishes the improvement of rural standards as a national policy objective. Section 13 of Chapter III (Fundamental Principles) declares:

"The State shall actively promote the welfare and development of the people of Malawi by progressively adopting and implementing policies and legislation aimed at achieving the following goals:

(1) To manage the environment responsibly in order to:

- *Prevent the degradation of the environment;*
- *Provide a healthy living and working environment for people of Malawi;*
- *Accord full recognition to the rights of future generations by means of environmental protection and sustainable development of natural resources; and conserve and enhance the biological diversity of Malawi; and*
- *Conserve the biological diversity of Malawi;*

(2) To enhance the quality of life in rural communities and to recognise rural standards of living as a key indicator of the success of Government Policies."

Environmental provisions were subsequently inserted in the Mines and Minerals Act including the stipulation that an Environmental Impact Assessment (EIA) be submitted to the Department of Research and Environmental Affairs for review with each mineral rights application. However, the existing pieces of the legislation were reviewed and amended in a piecemeal manner. In other words, the Mines and Minerals Act was amended merely to include a semblance of environmental concern but no fundamental substantive changes were made to reflect new developments and realities both domestic and international.

24.1.1.2 Mining Legislation

The Mines and Minerals Act defines the rules under which players in the minerals sector conduct business. It outlines the rights, duties and obligations of Government and of the exploration and mining investors as well as the applicable restrictions (Ministry of Minerals, 2013). Once Mkango have completed its Pre-Feasibility studies and Feasibility studies, it will be in a position to convert its current Prospecting Licence into a Mining Licence, under the Mines and Minerals Act.

Conversion of Prospect Licence to Mining licence

Mkango is a limited company having been granted rights in the form of an exclusive prospective licence. The company qualifies to be granted such a licence under section 13 of the Mines and Minerals Act. All that remains for the Company to acquire the Mining Licence is to submit an application to the Minister under section 38 of the Act for a Mining Licence. The following extracts from the Mines and Mineral Act are of relevance to converting into a Mining Licence:

"***37. Application for mining licence***

(1) An application for the grant of a mining licence may be made by the holder of an exclusive prospecting licence or by a person who is not such a holder.

(2) Where an application for the grant of a mining licence is made by the holder of an exclusive prospecting licence, the application shall be made—

> *(a) only in respect of land subject to the exclusive prospecting licence;*
>
> *(b) only if the holder has given notice to the Minister of the discovery in commercial quantities of any mineral to which his licence relates; and*
>
> *(d) not later than two months, or such further period as the Minister may allow, after that notice was given to the Minister.*

(3) An application for the grant of a mining licence—

> *(a) shall give information of the kind referred to in section 16 (a);*
>
> *(b) shall identify the minerals which it is proposed to mine;*
>
> *(c) shall state the number of the exclusive prospecting licence (if any) held by the applicant*
>
> *and shall give details of any exclusive prospecting licence held by the applicant, or by any person controlling, controlled by or under joint or common control with, the applicant, during the preceding four years;*

(d) shall be accompanied by a plan of the area over which the licence is sought drawn in such manner as the Minister may require and showing—

(i) the name of each lawful occupier of a holding in, or partly in, that area and, in the case of more than one such holding, the boundaries within that area of each such holding; and

(ii) such other particulars as the Minister may require;

(e) shall state the period for which the licence is sought;

(f) shall give or be accompanied by a statement giving details of the mineral deposits in the area of land over which the licence is sought, including details of all known minerals proved, estimated or inferred, ore reserves and mining conditions;

(g) shall be accompanied by a technological report on mining and treatment possibilities and the intention of the applicant in relation thereto;

(h) shall give or be accompanied by a statement giving particulars of the programme of proposed mining operations including a statement of—

(i) the estimated date by which the applicant intends to work for profit;

(ii) the estimated capacity of production and scale of operations;

(iii) the estimated overall recovery of ore and mineral products;

(iv) the nature of the products;

(v) proposals for the prevention of pollution, the treatment of wastes, the safeguarding of natural resources, the progressive reclamation and rehabilitation of land disturbed by mining and for the minimization of the effects of mining on surface water and ground water and on adjoining or neighbouring lands;

(vi) the residual effects on the environment of the mining operations and proposals for their minimization;

(vii) any particular risks (whether to health or otherwise) involved in mining the mineral, and proposals for their control or elimination; and

(viii) any significant effect which the carrying out of the programme would be likely to have on the environment and on any monument or relic in the area over which the licence is sought and proposals for eliminating or controlling that effect;

(i) shall give or be accompanied by a statement giving a detailed forecast of capital investment, operating costs and revenues and the anticipated type and source of financing;

(j) shall be accompanied by a report on the goods and services required for the mining operations which can be obtained within Malawi and the applicant's proposals with respect to the procurement of those goods and services;

(k) shall give or be accompanied by a statement giving particulars of the applicant's proposals with respect to the employment and training of citizens of Malawi;

(l) shall be accompanied by a statement giving particulars of expected infrastructure requirements; and

(m) may set out any other matter which the applicant wishes the Minister to consider

39. Restriction on grant of Mining Licence

(4) Subject to any relevant agreement of a kind referred to in section 10, no mining licence shall be granted to an applicant unless—

(a) the programme of proposed mining operations—

(i) takes proper account of environmental and safety factors; and

(ii) will ensure the most efficient and beneficial use of the mineral resources concerned;

(b) the area of land over which the licence is sought is not in excess of the area reasonably required to carry out that programme;

(c) the applicant has adequate financial resources, technical competence and experience to carry on effective mining operations;

(d) the applicant's proposals for the employment and training of citizens of Malawi are adequate;

(e) the applicant's proposals with respect to the procurement of goods and services obtainable within Malawi are satisfactory;

(f) any relevant option given pursuant to section 31 has been exercised and given effect to or satisfactory arrangements have been made for that purpose; and

(g) the applicant is not in default."

Mines and Minerals Policy

The Malawian Mines and Mineral Policy (2013) has the following objectives:

(i) To promote the development of the mining sector;

(ii) To contribute to socio-economic development of the country including poverty reduction and sustainable development;

(iii) To contribute to the country's foreign exchange base;

(iv) To optimise mining activities within Malawi so as to enhance "value added" elements of the sector and promote linkages with other sectors of the economy;

(v) To expand employment opportunities in Malawi;

(vi) To foster the needed economic diversification;

(vii) To promote artisanal and small scale mining; and

(viii) To promote women in mining

Through this Policy, Government seeks to guide and direct mineral resource development by stressing private sector initiatives and involvement and the need to attract modern technology and investment capital.

24.1.1.3 Environmental Legislation

With the advent of multiparty democracy in 1994, a new Constitution was promulgated and provisions on environment generally were provided for. The National Environmental Policy (1996) provides an overall structure against which relevant sectoral environmental policies can be reviewed to ensure that the policies are consistent with the principles of sustainable development, while the Environment Management Act (1996) and the Mines and Minerals Act (1981) contain sections that specifically deal with the protection and management of the environment. Section 24 of the Environment Management Act outlines the requirements for projects, for which an Environmental Impact Assessment (EIA) is needed (Ministry of Minerals, 2013).

Although the Mines and Minerals Act predates the environmental legislation, its provisions on environmental protection do not appear to have generated difficulties in implementing the ESHIA framework. The Act states that in granting mineral rights the Minister should consider the need to conserve natural resources in or on the land over which mineral rights are sought. This gives the Minister the power to integrate environmental conditions in mineral rights, including the requirement to lodge a security for the performance of rehabilitation of explored or mined areas. It is in the application of this mandate that licensees for minerals prospecting and exploration prepare a mitigation and rehabilitation plan for their activities which is included in their license. Importantly, these requirements respect and do not appear to have given rise to conflicts with the obligations that arise under an EIA approval. Mining activity, from mine construction to mine closure are covered by the EIA process. Notwithstanding this, there would be merit in better harmonizing the provisions of future mining legislation with environmental legislation to remove any potential conflict or contradiction between them (Land et al, 2009).

Environmental Management Act (1996)

EIA provisions in the Environment Management Act (EMA) are found in sections 24, 25, 26, 27, 29, 63, 69 and 76. An EIA is mandatory under Part V in sections 24 – 26 of the EMA for projects that will have adverse impacts on the environment. The EMA is the key piece of legislation for EIA as it establishes an administrative process and key players including the Technical Committee on the Environment (TCE) which is instrumental in the EIA process. The EMA is the instrument through which the National Environment Policy is implemented. It is the paramount law on environment to the extent that in Section 7 it establishes that any legislation that is inconsistent with it is considered irrelevant to the extent of the inconsistency.

One aim of the EMA is to prevent government departments and authorities operating independently and provides through the TCE, a coordinated approach to environmental protection with all relevant government departments playing an active role. The EMA established a process of environmental assessment and has precedence over other legislation where approvals may be required or licenses are required under other Acts.

The Act further provides for comprehensive management of the environment that ranges from pollution and how to manage waste and the requirement of permits and licences.

Pollution Control.

Section 42 of the Act prohibits anyone to discharge or emit any pollutant into the environment except in accordance with this Act.

1. Air Pollution

This falls under section 43 of the Act whereby no person shall discharge effluent or emit any gas or other gaseous substance into the environment except under a licence issued by the Minister subject to the conditions as the Minister shall determine.

2. Waste Licence

This is dealt with under section 38 where it is prohibited for anyone to handle, store, transport, classify or destroy waste save for domestic waste without the license issued under the Act.

Section 38(1) reads as follows:

No person shall handle, store, transport, classify or destroy waste other than domestic waste or operate a waste disposal site or plan, or generate waste except in accordance with the licence issued under this section.

3. Hazardous Waste Licence

This is covered under section 39 where a permit is required for any person to import or export and transport any hazardous waste or substance in Malawi.

Section 39 reads as follows:

"1. Notwithstanding the Control of Goods Act, no person shall import or export any hazardous waste or substance except under the permit issued by the Minister subject to such conditions as the Minister may determine, and in case of exportation the exporter shall before a permit is issued produce to the Minister written confirmation from the appropriate authority or the receiving country that the hazardous waste or substance may be exported to that country.

2. No person shall transport within Malawi hazardous waste or substance except under a permit issued by the Minister subject to such conditions as the Minister may impose."

Environmental Standards

Malawi, like other developing countries in Africa, lags behind in developing its own environmental quality standards for: air, water, soil, noise, vibrations, radiation, effluent and solid waste.

Meanwhile the Authority can use the powers provided by the Environment Management Act No. 23 of 1996 under Section 43 (1 3) to grant licences, regulate and enforce for the discharge of pollutants into the environment.

Also, in Part VI, under environmental quality standards, section 30 (1 3) provides:

"(1) The Minister may, on the advice of the council, prescribe environmental quality standards generally and, in particular, for air, water, soil, noise, vibrations, radiation, effluent and solid waste.

(2) The prescription of the environmental quality standards under subsection (1) shall be based on scientific and environmental principles and shall take into account the practicability and availability of appropriate technology for ensuring compliance with such standards.

(3) The Minister may prescribe different environmental quality standards to apply in different areas of Malawi with respect to different segments of the environment and the Minister may, from time to time, vary such standards."

Despite the aforementioned, the non-availability of National Standards in Malawi resulted in the use of stricter WHO guidelines that the World Bank Group and the International Finance Corporation (IFC) subscribe to, in assessing possible impacts associated with any project.

Guidelines for EIA

The Guidelines for EIA in Malawi were developed with the purpose of facilitating compliance with Malawi's EIA requirements by Government, project developers, donors and the general public (Government of Malawi, 1997). These guidelines help to integrate environmental concerns in national development. According to section 1.5 of the guidelines, if an EIA is deemed necessary, it is timed to coincide with Feasibility studies and detailed design when the information it provides is most useful to the project planners. A prescribed list of projects for which EIA is mandatory in Malawi has been drawn up and published in the government gazette (Government of Malawi Gazette Notice No 28 of 1998). The guidelines also have chapters on preparation of EIA reports, public consultation and evaluation of the adequacy of EIA reports.

The mining of minerals is an activity that requires a full EIA to be compiled.

National Environmental Policy

National Environmental Policy (2004) elaborates the rights and responsibilities of communities in the management of the environment; states Government's responsibilities in environmental planning, impact assessment, audit and monitoring, and outlines primary policy objectives and strategies in a number of key sectors (Environmental Affairs Department, 2004).

24.1.1.4 Process of EIA in Malawi

Developers of exploration and mining projects have to submit an initial environmental assessment known as a project brief that may lead to the requirement of an EIA study. An approved EIA study comprises an environmental management plan which is incorporated into the exploration or mining license. It is expected that social considerations to benefit local communities would be incorporated in the EIA study following good corporate social responsibility practices. Because of limited experience with EIAs for the mineral sector in Malawi, these expectations are mainly based in the experience of the Kayelekera uranium project which is sponsored by a foreign publicly listed mining company. The domestic industry has neither the legal obligation nor corporate practice to employ global standards of good practice (Land et al, 2009).

24.1.1.5 Licences and Permits Required

A number of permits and licences will be required for Mkango, most of which will be required prior to mining taking place. It is important that the process or application for these permits and licences are initiated as early as possible in order not to delay the project.

The tables (Table 24-1 and Table 24-2) below highlight the main permits required, however this list will be reviewed and updated, where required, during the Feasibility phase.

Table 24-1
Cross Sector Licences Required for project

Act, Regulation or Byelaw	Permit or Licence	Requirements	Implementing Agency
Water Resources Act CAP72.03	Water Right	Permit is required to use and/or abstract water, build dams	Water Resources Board: Water Abstraction Control Sub-committee
Water Resources (Water Pollution Control) Regulations	Effluent Discharge Consent	To control water pollution. Effluent must conform with standards set by the Malawi Bureau of Standards	Pollution Control Sub-committee
Environment Management Act, No 23 of 1996, s.42	Air Pollution Licence	Licence is required to emit any gas or other pollutants into the atmosphere	Environmental Affairs Department
Environment Management Act, No 23 of 1996, s.38	Waste Licence	A licence is required to handle, store, transport, classify or destroy waste other than domestic waste, or operate a waste disposal site	Environmental Affairs Department
Environment Management Act, No 23 of 1996, s.39.	Hazardous Waste Licence	A permit is required to import or export and transport any hazardous waste in Malawi	Environmental Affairs Department

Table 24-2
Licence Required and Applicable Authority

Category of Licence	Authority to Apply to
Mining Licence	Ministry of Energy
Air Pollution Licence	The Minister of Environmental and Climate Change
Waste Licence	The Minister of Environmental and Climate Change
Hazardous Waste Licence	The Minister of Environmental and Climate Change
Permit to discharge waste or effluent	Minister of Environmental and Climate Change
Explosive Import Permit	Registrar of Firearms
Storage licence	Chief Inspector of Explosives
Dealers license	Chief Inspector of Explosives
Permit to possess	Chief Inspector of Explosives
Blasting license	Chief Inspector of Explosives

24.1.1.6 Other Applicable Malawi Legislation

A number of other Acts, policies and standards will apply to the project. Incorporated in this section are some of the more important laws and regulations. These will be reviewed and updated during the Feasibility stage.

Water Resources and Legislation

Upon commencement of the project, out of the many resources that will require protection and proper permits and licensing is Water Resource. In the process of the project particular elements of pollution cannot be ruled out. Thus the Water Resources and the Water Polluting Control Regulations were promulgated to manage such a resource.

Water Resources Act

1. Pollution of Public Water

Section 16 of the Act criminalizes any act that interferes with or alters the flow of or pollutes or fouls any public water save for where one has the authority under the Act or any other written law.

Section 16 reads:

"1. Any person who, save under the authority of this Act or any other written law, interferes with or alters the flow of or pollutes or fouls any public water, shall be guilty of an offence.

2. For purposes of this section the pollution of fouling of public water means the discharge into, or in the vicinity of public or in a place where public water is likely to flow, of any matter or substance likely to cause injury whether directly or indirectly to public health, livestock, animal life. Crops, *orchards or gardens which are irrigated by such water or any product in the processing of which such water is used or which occasion or which is likely to occasion, a nuisance."*

Water Resources (Water Pollution Control) Regulations

Regulation 6 provides as follows:

Any person may apply for the Minister's consent to discharge any waste or effluent specified in regulation 4. Regulation 4 reads as follows:

1. Except with the prior written consent of the Minister granted in accordance with these Regulations, no person shall discharge or cause to be discharged into public water;

a. Any water or effluent resulting from;

i. Any sewage treatment works

ii. Any water-borne sanitation system; or

iii. The use of water for any manufacturing, mining or other industrial process

2. The provision of sub regulation (1)

a. shall in respect of the waste or effluent specify in paragraph (a) thereof, apply whether the discharge of such waste or effluent is by seepage or drainage; and

b. Shall not apply where any waste or effluent specified therein has been accepted into a local authority sewer.

Heritage and Archaeological Legislation

Malawi legislation is quite clear on heritage safeguarding. Before any land altering development activity is undertaken, an archaeological impact assessment is mandatory. Section 29 of the Monuments & Relics Act of 1990 (Cap. 29:01 Laws of Malawi) reads:

"(1) A person in charge of any survey, excavation, exploration, construction or new development shall, at the earliest stages of planning for such activities, give notice to the Minister to enable, where necessary, rescue archaeology to be carried out (...)

(2) (...) the cost of such work shall ... be borne by the person in charge of any survey, excavation, exploration, construction or other development."

A Malawi Heritage Safeguarding Policy which is to give guidance to the implementation and enforcement of this Act has recently been drafted and awaits formal adoption. As it is, permits need to be obtained from the Deputy Director of Culture (Antiquities) in Lilongwe for all Cultural Heritage Impact Assessment activities and subsequent safeguarding work, including rescue archaeology. The consultant is to be accompanied in his/her work by two Antiquities Officers. Reports have to be submitted 14 days after conclusion of the work.

International Conventions for Culture and Heritage

ICOMOS, UNESCO's advisory body on cultural issues, has developed relevant guidelines for implementation of the Convention with reference to impact assessment (ICOMOS 2011). These have been adhered to in the study at hand. Malawi is a signatory to the WHC. Malawi is equally a signatory to the 2003 UNESCO Convention on Intangible Cultural Heritage.

Land Use

The land policy (2000) stipulates that the Government has a duty to protect the free enjoyment of legally acquired property rights in land. For that reason, a landholder is entitled to compensation if the owner's property happens to be acquired by the Government for public use. In most cases landowners voluntarily allow their land to be used to fulfil the government's development obligations. However, to be made whole, the amount of compensation paid must be fair and adequate. It is obvious that people in the project area have to benefit in full from this provision.

Some of the people in the project area enjoy freehold tenure system of land. Land policy explains that freehold tenure has some unique features that provide security of tenure and exclusive user rights:

- A freeholder has exclusive possession of the land in perpetuity. There are no term limits placed on the title of the owner.
- Subject to land use planning, the owner has the right to subdivide or lease the land, etc., without seeking the government's approval.
- No development conditions are imposed on the owner if the land in question lies outside the boundary of a planning area.
- The Government has no legal right to interfere with the occupational right to land.

Land in the project area is mostly customary land with a few pockets under private ownership and the majority have a landholding size of less than 1 hectare. No land acquisition programmes are going on in the area. However, the new government policy of co-management of natural resources between government and the local communities may lead to co-ownership of land and associated resources.

The core areas are administered under the legal powers of the Local Government Act (1998) section 22.

The National Physical Development Plan

The National Physical Development Plan was prepared to guide the preservation of the nation's agricultural land potential, particularly the best arable lands. The Plan also formulates land use measures to facilitate agricultural and other sectoral developments. It provides a spatial framework for the co-ordination of sectoral development projects and balances space requirements for all competing uses of land. The Land policy further highlights that:

"(a) In conformity with NPDP and support to Malawi's economic base, rural physical development planning will ensure the promotion of efficient use of land to meet the demands of the future population.

(b) To prevent the development of serious land population problems in areas with high population concentrations, land use plans will be prepared with specific guidelines for each rural district.

(c) To ensure that traditional fishing communities have adequate access to lakeshore areas for fishing operations, special areas will be reserved on the lakeshore for this purpose. Similarly, land use plans will contain guidelines for the location of livestock grazing consistent with agricultural land use.

(d) Villagers will be sensitized during the land use planning process to provide and establish fuel-wood plantations to meet the demands for wood energy. Fragile areas such as steep slopes, wetlands and areas susceptible to flooding will be zoned to prevent or minimize the adverse environmental impact of cultivation and other developments.

(e) To prevent the undesirable impact of haphazard urban expansion onto prime agricultural land, deliberate controls will be applied to discourage urban expansion to such areas."

Forestry Act

The Forestry Act (9 May, 1997) lists 12 purposes in section 3 of Part I. The relevant ones are:

- To identify and manage areas of permanent forest cover as protection or production forest in order to maintain environmental stability; to prevent resource degradation and to increase social and economic benefits;
- To augment, protect and manage trees and forest on customary land in order to meet basic fuel wood and forest produce needs of local communities and for conservation of soil and water;
- Control trafficking in wood and other forestry produce including exportation and importation, and
- Protect fragile areas such as steep slopes, river banks, water catchments and to conserve and enhance biodiversity.

Gender Policy

The Gender Policy seeks to strengthen gender mainstreaming in the natural resources and environment sector in order to achieve equality and sustainable environmental development. Consequently it also aims at promoting the increased participation of women in the sound management, conservation and utilisation of natural resources and the environment, increased access to and control over natural resources and benefits by women in the sector and to improve access to and control by women over technology relating to natural resources management. The desired output of the policy is to achieve sustainable and equitable development. Malawi's natural resources and environment are being rapidly depleted and degraded due to the combined effects of rapid population growth, poor land management practices and poverty. Women are hardest hit by effects of environmental mismanagement because of the gender roles, which they play in resource utilisation. Strategically, these objectives are to be fulfilled through the facilitation of women and girls' participation in population and environment decision making, resource ownership and management especially during compensation for loss of gardens.

HIV/AIDS Policy

Section 3.2 of the HIV policy (2008) calls for HIV prevention strategies which include the provision of information and education, condoms, sterile injection equipment, voluntary counselling and testing (VCT), antiretroviral (ARV) medicines (e.g., to prevent mother-to-child transmission or to provide post-exposure prophylaxis (PEP)) and, once developed, safe and effective microbicides and vaccines. The policy is related to the project in that in section 3.2.3.1 emphasises on the use of condoms for prevention of HIV, unwanted pregnancies and STIs. The project could bring in a number of temporary workers who will have money and some will have left their families and may be tempted to engage in sexual activities and will have to use preventive against various illnesses. People in the impact area, particularly women and adolescent girls, will have to be routinely provided accurate, targeted and relevant information and knowledge regarding the epidemic and be motivated to adopt and sustain new behaviours within their cultural setting. Routine HIV/AIDS counselling and testing will be encouraged as an essential tool for tracking and safeguarding positive behaviour.

Decentralisation Policy

Section 22 of the Decentralisation Policy (1998) lists the functions of the central government that will be transferred and shall be under the control of district assemblies. Of special interest is that Zomba district assembly shall assist government to preserve the environment through prevention of environmental degradation in general.

Environmental and Social Management Guidelines in the Road Sector

The guidelines of 2007 have been produced with an aim of providing guidelines for integrating environmental issues in the overall road project cycle (planning, design, and implementation). The National Roads Authority (NRA) was established through an Act of Parliament No. 13 of 16th May, 1997 whose vision is to have the Malawi public road network developed and maintained up to a standard where all motorized and non-motorized traffic can reach every society of the country in adequate, safe, reliable, efficient, economic and environmentally friendly manner at all times of the year. The guidelines contain 8 checklists which must be used during road projects.

Occupational Safety, Health and Welfare Act

This Act No. 21 of 1997, entry into force 29 August 1997, repeals the Factories Act. This Act provides for occupational safety and health, responsibilities of employers, welfare facilities and workplaces. It also has provisions for accident investigation, dangerous substances, explosion protection, fire protection, first-aid organization, housekeeping, information of personnel, labour inspectors, law, lifting of loads, lighting, machinery guarding regulations, medical examinations, noise and vibration control, notification of accidents and diseases, penalties, protective clothing, radiation protection, ventilation. Appropriate protective wear would be needed.

Malawi Bureau of Standards

The Malawi Bureau of Standards (MBS) is responsible for checking that standards are adhered to by all sectors. Several standards have been developed and of relevance to this project are MS 539: Industrial effluents – Tolerance limits for discharge into inland surface waters, MS 214: Drinking water – specification, MS 733: Borehole and shallow well quality – specification, MS 676: Water quality – chemical methods of test, MS677: Water quality – Microbiological methods, MS 676: Water quality – chemical methods of test, MS 677: Water quality – Microbiological methods, MS 678: Drinking water quality – Control and surveillance of water in public supply networks.

Areas of Conservation Status

The Lake Chilwa wetland, located north of the project, is an internationally recognised area under the Ramsar Convention which is an international accord. Through this Convention the government of Malawi has delegated the responsibility of management of Ramsar sites in Malawi to the National Parks and Wildlife Department under the National Parks & Wildlife Act (1992)(GN. NO 89 OF 30/3/94). There is supposed to be a Lake Chilwa Basin Authority to which management responsibilities will be delegated from the Department of Parks and Wildlife but this is not yet in place. The wetland falls under the recently formulated Lake Chilwa wetland management plan.

There is no legal protection for the area where the mine will be located. However, these are managed by several groups. The National Wetlands Committees oversees the activities of Lake Chilwa as a Ramsar site. The Bird Hunters Association (BHA) has established hot spots for breeding of birds around Lake Chilwa and these areas are protected by the communities around those spots.

24.1.2 IFC and Equator Principles

In terms of compliance of the project with World Bank criteria and making an evaluation of the project against International Finance Corporation (IFC) standards, it is pertinent to note that there is still no comprehensive Mineral Legislation in Malawi that would by itself satisfy the requirements of the World Bank and the IFC. This can be discerned from the various laws and policies that are applicable. Mkango and the project consultants will therefore have to ensure that the project complies with both the Malawi legislation, and the latest IFC guidelines.

One of the subtle differences between the host country and IFC requirements is the actual document produced. In Malawi an EIA is compiled, and for IFC an Environmental and Social Impact Assessment (ESIA) is compiled (in projects where health is a major issue, the term Environment, Social and Health Impact Assessment (ESHIA) could also be used). The IFC places emphasis on the incorporation of social and health issues into the project, hence the slight change in the term used. Essentially the documents are very similar; however, the ESIA tends to include more detail and is a more rigorous process to follow.

24.1.2.1 Equator Principles

The Equator Principles are a set of voluntary guidelines which a number of financial institutions (EPFIs) have adopted with the intention of creating an industry standard for assessing and managing environmental and social issues in the project finance sector.

The Equator Principles are based on the policies and guidelines of the IFC which is the private sector development arm of the World Bank. The project ESHIA must therefore comply with the following requirements:

- applicable IFC environmental, social and disclosure policies;

- IFC Safeguard Policies for environmental and social issues;
- sectoral guidelines (environmental, health and safety guidelines specific to particular industries, sectors, or types of projects;
- General Environmental, Health and Safety Guidelines); and
- host country laws, regulations and permits required by the project.

The requirements as set out in the policies and guidelines listed above are discussed in more detail in the body of this report. First, the main requirements applicable to the project as contained in principles 1 to 10 of the Equator Principles are discussed below.

Principle 1: Review and Categorization

When a project is proposed for financing, the relevant EPFI will, as part of its internal social and environmental review and due diligence, categorise such project based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the IFC (Exhibit I).

Proposed projects may be categorised as one of the following:

- Category A: Projects with potential significant adverse social or environmental impacts that is diverse, irreversible or unprecedented;
- Category B: Projects with potential limited adverse social or environmental impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and
- Category C: Projects with minimal or no social or environmental impacts.

The Project falls within a Category A project and all commitments relevant to Category A projects as set out in principles 2 throughout 10 must be complied with. The category of the project may be downgraded once more detail on the project is confirmed.

Principle 2: Social and Environmental Assessment

An ESIA process must be completed to address the relevant social and environmental impacts and risks of the project. The ESIA will include all relevant issues included in Exhibit II of the Equator Principles. The ESIA will also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

Principle 3: Applicable Social and Environmental Standards

The ESIA will make reference to and comply with the applicable IFC Performance Standards and the applicable Industry Specific Environmental Health and Safety Guidelines (EHS Guidelines). The relevant IFC Performance Standards and Guidelines are dealt with in more detail below.

The ESIA will establish the project's overall compliance with, or justified deviation from, the respective Performance Standards and EHS Guidelines.

The ESIA will address compliance with relevant host country laws, regulations and permits that are applicable to social and environmental aspects of the project.

Principle 4: Action Plan and Management System

Outcomes of the ESIA will be the development of Management Plans and an Action Plan (AP) which addresses the relevant findings, and draws on the conclusions of the Assessment. The AP will describe and prioritise the actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment.

Mkango will be required to establish a Social and Environmental Management System (SEMS) that addresses the management of these impacts, risks, and corrective actions required to comply with applicable host country social and environmental laws and regulations, and requirements of the applicable Performance Standards and EHS Guidelines, as defined in the AP.

Principle 5: Consultation and Disclosure

Consultations with communities affected by a project should be undertaken by the government, the developer or third party expert in a structured and culturally appropriate manner. The public participation process will ensure that project affected communities are provided free, prior and informed consultation and will facilitate their informed participation as a means to establish, to the satisfaction of the EPFI, whether a project has adequately incorporated affected communities' concerns.

In order to accomplish this, the ESIA documentation and AP, or non-technical summaries thereof, will be made available to the public by Mkango for a reasonable minimum period in the relevant local language and in a culturally appropriate manner. The results of the public participation process will be documented; including any actions agreed resulting from the consultations. Disclosure will occur early in the ESIA process, before the project construction commences, and on an on-going basis.

Principle 6: Grievance Mechanism

To ensure that consultation, disclosure and community engagement continues throughout construction and operation of the project, Mkango must establish a grievance mechanism as part of the Social and Environmental Management System (SEMS) which will be scaled to the risks and adverse impacts of the project. This will allow Mkango to receive and facilitate resolution of concerns and grievances about the project's social and environmental performance raised by individuals or groups from among project-affected communities.

Mkango must inform the affected communities about the mechanism in the course of its community engagement process and ensure that the mechanism addresses concerns promptly and transparently, in a culturally appropriate manner, and is readily accessible to all segments of the affected communities.

Principle 7: Independent Review

The ESIA, AP and consultation process documentation will be reviewed by an independent social or environmental expert not directly associated with project, in order to assist EPFIs due diligence, and assess Mkango's compliance with the Equator Principles.

Principle 8: Covenants

The following covenants will be included in the financing documentation:

- to comply with all relevant host country social and environmental laws, regulations and permits in all material respects;
- to comply with the AP (where applicable) during the construction and operation of the project in all material respects;
- to provide periodic reports in a format agreed with EPFIs (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that documents compliance with the AP (where applicable);
- to provide representation of compliance with relevant local, state and host country social and environmental laws, regulations and permits; and
- to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.

Where a borrower is not in compliance with its social and environmental covenants, EPFIs will work with the borrower to bring it back into compliance to the extent feasible, and if the borrower fails to re-establish compliance within an agreed grace period, EPFIs reserve the right to exercise remedies, as they consider appropriate.

Principle 9: Independent Monitoring and Reporting

To ensure on-going monitoring and reporting over the life of the loan, EPFIs will require the appointment of an independent environmental and/or social expert, or require that the borrower retain qualified and experienced external experts to verify its monitoring information which would be shared with EPFIs.

Principle 10: EPFI Reporting

Each EPFI commits to report publicly at least annually about its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations.

As mentioned above under Principle 3 the EP requires that the ESIA makes reference to and complies with the applicable IFC Performance Standards and the applicable Industry Specific EHS Guidelines.

24.1.2.2 IFC Performance Standards

The IFC has launched a new set of business standards for managing environmental and social risks for project finance, which came into effect on 1st January 2012. The IFC Performance Standards comprise a collection of eight quality standards which Mkango will be required to meet throughout the life of an investment by the EPFI. The performance standards should be read in conjunction with their guidance notes.

The relevant IFC Performance Standards are summarised based on information from the IFC website.

Performance Standard 1: Social and Environmental Assessment and Management System

Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. An effective Environmental and Social Management System (ESMS) is a dynamic and continuous process initiated and supported by management, and involves engagement between the client, its workers, local communities directly affected by the project (the Affected Communities) and, where appropriate, other stakeholders. Drawing on the elements of the established business management process of "plan, do, check, and act," the ESMS entails a methodological approach to managing environmental and social risks and impacts in a structured way on an on-going basis. A good ESMS appropriate to the nature and scale of the project promotes sound and sustainable environmental and social performance, and can lead to improved financial, social, and environmental outcomes.

Performance Standard 2: Labour and Working Conditions

Performance Standard 2 recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental1 rights of workers. For any business, the workforce is a valuable asset, and a sound worker-management relationship is a key ingredient in the sustainability of a company. Failure to establish and foster a sound worker-management relationship can undermine worker commitment and retention, and can jeopardize a project. Conversely, through a constructive worker-management relationship, and by treating the workers fairly and providing them with safe and healthy working conditions, clients may create tangible benefits, such as enhancement of the efficiency and productivity of their operations.

Performance Standard 3: Pollution Prevention and Abatement

Performance Standard 3 recognizes that increased economic activity and urbanization often generate increased levels of pollution to air, water, and land, and consume finite resources in a manner that may threaten people and the environment at the local, regional, and global levels. There is also a growing global consensus that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens the public health and welfare of current and future generations. At the same time, more efficient and effective resource use and pollution prevention and GHG emission avoidance and mitigation technologies and practices have become more accessible and achievable in virtually all parts of the world. These are often implemented through continuous improvement methodologies similar to those used to enhance quality or productivity, which are generally well known to most industrial, agricultural, and service sector companies.

Performance Standard 4: Community Health, Safety and Security

Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities. While acknowledging the public authorities' role in promoting the health, safety, and security of the public, this Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

Performance Standard 5: Land Acquisition and Involuntary Resettlement

Performance Standard 5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use. Resettlement is considered involuntary when affected persons or communities do not have the right to refuse land acquisition or restrictions on land use that result in physical or economic displacement. This occurs in cases of (i) lawful expropriation or temporary or permanent restrictions on land use and (ii) negotiated settlements in which the buyer can resort to expropriation or impose legal restrictions on land use if negotiations with the seller fail.

Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management

Performance Standard 6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems."

Performance Standard 7: Indigenous Peoples

Performance Standard 7 recognizes that Indigenous Peoples, as social groups with identities that are distinct from mainstream groups in national societies, are often among the most marginalized and vulnerable segments of the population. In many cases, their economic, social, and legal status limits their capacity to defend their rights to, and interests in, lands and natural and cultural resources, and may restrict their ability to participate in and benefit from development. Indigenous Peoples are particularly vulnerable if their lands and resources are transformed, encroached upon, or significantly degraded. Their languages, cultures, religions, spiritual beliefs, and institutions may also come under threat. As a consequence, Indigenous Peoples may be more vulnerable to the adverse impacts associated with project development than non-indigenous communities. This vulnerability may include loss of identity, culture, and natural resource-based livelihoods, as well as exposure to impoverishment and diseases.

Performance Standard 8: Cultural Heritage

Performance Standard 8 recognizes the importance of cultural heritage for current and future generations. Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities. In addition, the requirements of this Performance Standard on a project's use of cultural heritage are based in part on standards set by the Convention on Biological Diversity.

24.1.2.3 IFC Environmental Guidelines

The following IFC Guidelines are specifically relevant to the project (numbered as in the Guidelines).

1.1 Environmental

1.2 Air Emissions and Ambient Air Quality

1.3 Energy Conservation

1.4 Wastewater and Ambient Water Quality

1.5 Water Conservation

1.6 Hazardous Materials Management

1.7 Waste Management

1.8 Noise

24.1.2.4 IFC Community Health and Safety Guidelines

The following IFC Guidelines are specifically relevant to the project (numbered as in the Guidelines).

3.1 Water Quality and Availability

3.2 Structural Safety of Project Infrastructure

3.3 Life and Fire Safety

3.4 Traffic Safety

3.5 Transport of Hazardous Materials

3.6 Disease Prevention

3.7 Emergency Preparedness and Response

24.1.2.5 IFC Construction and Decommissioning Guidelines

The following IFC Guidelines are specifically relevant to the project (numbered as in the Guidelines).

4.1 Environment

4.2 Occupational Health and Safety

4.3 Community Health and Safety

25 INTERPRETATION AND CONCLUSIONS

The discounted cash flow model that has been developed, based on

- the Indicated Mineral Resource,
- the capital expenditure and operating cost estimates developed as part of this PFS, and
- rare earth oxide prices equivalent to a total long term rare earth basket price for the Project of approximately US$ 60 per kg REO (this basket price reflects the selective removal of a large proportion of the cerium during the hydrometallurgical process, which enhances the value of the product mix),

indicates that the Project is economically viable under the assumptions made in the PFS.

The PFS has indicated that the Songwe Hill Project has a US$345 million after-tax net present value, using a 10 % nominal discount rate, and a 37 % after-tax internal rate of return.

25.1 Mining

This work has shown that the Songwe Hill Rare Earths Project can be developed into a viable mining operation. The mine will be a conventional open pit mine with the rock being drilled and blasted, loaded by diesel powered excavator and hauled from the pit to the plant site by rigid bodied dump trucks. The mine has a life of 18 years at the planned production rate of 500,000 tonnes per annum of ore. The open pit will have a strip ratio of 4.5 tonnes of waste to 1 tonne of ore and will reach a final depth of 300m, measured from the pit bottom to the highest point on the pit rim.

The mining operating cost is estimated to be US$ 23.45 per tonne milled.

The mining plan is based on the current Mineral Resource estimate which includes only Indicated and Inferred Mineral Resources. The Inferred Mineral Resources, although included in the pit shell, were treated as waste material and therefore were excluded from the ore production schedule and financial model. There is considerable upside potential, both in mine life and in reduction in operating costs, to be gained from increasing the Mineral Resource confidence to re-categorise all or part of these Inferred Mineral Resources into either Indicated and/or Measured Mineral Resources. If the size of the orebody, within the pit shell can be increased it will allow the mining rate to be reduced while maintaining the same ore production schedule, thereby decreasing operating costs and increasing mine life.

There are no Measured Mineral Resources in the current Mineral Resource statement and therefore confidence in the entire mining plan is commensurate with the level of confidence in Indicated Mineral Resources only.

There was limited core available for geotechnical logging and analysis. In order to mitigate against the risk of misinterpretation of the geotechnical parameters and possible inaccuracy in the geotechnical design as a result of low data volume, the pit design was tested against a range of slope angles to test the sensitivity of the Project to variations in slope design. The mine design was found to be tolerant of variation of the slope angle due to the low strip ratio, without the viability of the Project being compromised.

25.2 Process Design

The process flow sheet consists of the beneficiation plant and the recovery plant.

The beneficiation plant comprises of the comminution and flotation circuits. The purpose of the comminution circuit is to reduce the size of solid ore particles and thus increase the surface area of solids to enable the liberation of valuable materials that are locked within the gangue minerals. This is achieved by means of crushing and milling. Flotation is used to upgrade the mineralized material. Flotation is a method of separation, which uses the differing surface properties of the various minerals in the ore. It involves the selective attachment of mineral particles to air bubbles generated in the flotation cell which float to the surface of the slurry and then flow over the lip of the cells into the launders. A selective flotation reagent regime is used to separate rare earths oxide minerals from gangue minerals.

The recovery process flow sheet comprises a two stage selective hydrochloric acid leach process. The hydrochloric acid is recycled via calcium sulphate precipitation with sulphuric acid. The process flow sheet also includes caustic conversion, rare earth dissolution, purification, cerium rejection and rare earth hydroxide precipitation. This approach offers advantages including a significant reduction in acid costs as well as a further concentration of the rare earths thus providing a reduction in downstream capital and operating costs.

The current process design includes the use of sodium hydroxide (NaOH) for the raw rare earths precipitation. The use of lime ($Ca(OH)_2$) instead of sodium hydroxide (NaOH) for raw rare earth precipitation should be investigated because lime is far cheaper than sodium hydroxide and the use of lime will also reduce the calcium chloride ($CaCl_2$) requirements.

The total estimated capital expenditure for the process plant section of the Songwe Hill Project is US$ 168.3 million;

The total estimated operating expenditure for the process plant section of the Songwe Hill Project is estimated to be US$ 61.6 per tonne milled.

25.3 Tailings Storage Facility

The following is deduced from the work conducted during the PFS:

- an cost estimate of the TSF has been undertaken to determine:
  - capital costs to an accuracy of ±25 percent; and
  - operating costs to an accuracy of ±25 percent.
- the preferred site for the establishment of the TSF has been designed to accommodate a volumetric storage capacity of 11 million dry tonnes over a 22 year LoM and comprises the following:
  - a HDPE lined TSF;
  - a HDPE lined RWD/SWD system; and
  - associated infrastructure (i.e. slurry delivery infrastructure, storm water diversion trenches, etc.);

- there is uncertainty regarding the geochemical and geotechnical nature of the tailings, which shall be clarified in the subsequent phases of the Project. For the purposes of the PFS design it is assumed that the worst case scenario shall be mitigated by the installation of a HDPE liner to the facility;
- the initial capital cost is estimated at US$ 13.29 million and comprises:
  - construction of the TSF US$ 12.65 million;
  - engineering Definitive Feasibility Study at US$ 160,000;
  - engineering detailed design at US$ 180,000; and
  - engineering construction supervision at US$ 300,000;
- the total operational cost associated with the TSF is estimated at US$ 0.59m/year and comprises:
  - US$ 1/tonne of tailing deposition management (500 ktpa amounts to US$ 0.5 million per annum);
  - US$ 45,700/annum for pipe and valve replacements; and
  - quarterly inspections and annual reviews of the facility, US$ 40,000/annum.

25.4 Environmental

A significant amount of environmental and social baseline studies have already been undertaken to date and the project team already has a good understanding of the current environmental baseline. Ongoing dust monitoring and the installation of a weather station are providing data which will feed into the ESHIA. There is a good understanding of the environmental risks as well as the current legislative environment.

A SEP is proposed which will form the backbone to engagement with affected stakeholders. The first stakeholder consultations took place in November 2014. A community action group has been set up to provide an engagement mechanism forum.

At this stage there is no environmental or social reason not to continue with the Project into Feasibility phase. There are, however, a number of recommendations that should be followed in order to undertake the Project in a manner that is socially acceptable and results in a process acceptable to the developer, authorities and relevant stakeholders.

Complying with IFC guidelines and policies is a major benefit to the Project as it ensures that the process is undertaken in a globally acceptable manner. Furthermore the benefits for the local community, industry and country as a whole need to be emphasised to indicate that the Project is committed to ensuring it leaves a positive legacy.

26 RECOMMENDATIONS

Based on the outcomes of the PFS, it is recommended that consideration be given by Mkango to continue with an additional, more advanced technical and economic study at the Definitive Feasibility Study level, so as to increase the level of confidence in the viability of the Project.

26.1 Drilling programme

A drilling programme would be undertaken to provide additional information as follows:

- improvement in confidence of the Mineral Resource;
- upgrading of the Inferred Mineral Resources within the potential pit outline to at least Indicated Mineral Resources; and
- upgrading a significant part of the Indicated Mineral Resources to Measured Mineral Resources, so as to increase confidence in the overall viability of the Project; and
- additional, suitably orientated borehole cores to provide
  - additional geotechnical information and
  - samples of both the ore and waste for rock strength tests, so that
- the geotechnical designs would then be updated with this additional information, which will in-turn inform a new and revised open pit design.

26.2 Mining

- The additional information gained for the drilling programme outlined above would facilitate the development of an updated mining plan. This updated plan would then be used to develop a "bill of quantities" so as to obtain firm quotations from a number of mining contractors This will increase confidence in the mining operating costs to well within the required confidence levels for a Definitive Feasibility Study.

26.3 Mineral Processing and Metallurgical Testwork

26.3.1 Flotation

Flotation has played a significant role in reducing downstream costs by rejecting acid consuming gangue minerals such as calcite. The resultant concentrate still contains significant proportions of calcite as well as the iron carbonate, ankerite. It is recommended that priority be given to implementing a program focusing on increasing recovery, reducing mass pull and improving the concentrate grade.

26.3.2 Cerium Rejection

Cerium is rejected during the process, however a recycle stage is required to ensure minimal losses of the desired other rare earths. Literature reviews suggest that the separation can be improved through better purification of the solution prior to cerium rejection. Mixed rare earth hydroxide precipitation and oxidation are also reported to be critical steps where cerium rejection can be compromised and these need to be optimised further.

26.3.3 Fluorine Deportment

Fluorine is suspected of causing rare earth losses during leaching and precipitation redissolution due to the formation of refractory rare earth fluorides. Analysis of solids and leach residues during the testwork program added some weight to this theory. Fluorine analysis is costly and requires special equipment that is not carried by all analytical facilities, however. Nevertheless, it is recommended in future programs that fluorine is tracked through the process to quantify the degree it plays in rare earth losses through the flowsheet.

26.3.4 Radionuclide Deportment

Although the "head of chain" radioactive elements thorium and uranium were tracked through the testwork program, there were insufficient quantities of intermediate and final products available to send to specialised facilities for a full radionuclide deportment analysis. This is particularly through the hydrometallurgical process where the "decay chain daughters" can be separated and concentrated due to their variable chemical properties. It is recommended that radionuclide deportment be undertaken during the next test program.

26.3.5 Lanthanum Removal

At the time of writing, lanthanum prices were continuing to fall in a similar trend to cerium. Lanthanum can be partially rejected via precipitation or more effectively via solvent extraction techniques if desired. It is recommended that the options of lanthanum rejection be evaluated during future testwork programs.

26.3.6 Rare Earth Separation

Rare earth separation to high purity products (99.9 % or better REO) should be evaluated. It is recommended that this work be done subsequent to operation of a hydrometallurgical pilot plant where sufficient quantities of feed will be produced.

26.3.7 Piloting

Moving into Definitive Feasibility and Detailed Design phases, piloting of the beneficiation and hydrometallurgical flowsheets is essential once the processes have been optimised. Consideration should be given to:

- Required outcomes of the pilot plants
- Pilot plant host facilities – equipment, staff, expertise and analysis capabilities
- Pilot plant location - accessibility to equipment vendors, engineering companies etc
- Sample size – size of equipment available and length of time of operation

It is recommended that the engineers chosen for the detailed design of the commercial plant be involved with the design and operation of the pilot plant.

As mentioned previously, the pilot plant should also deliver a product of appropriate quantity and quality for separation test work.

26.4 Recovery Methods

A large amount of reagents will be consumed during normal operation. Furthermore, more types of reagents will be needed for the rare earth project than a typical mining project. There may be some supply chain and logistical issues as a consequence and securing reliable reagent suppliers or distributors is recommended.

Reagent prices vary significantly according to source of supply, market fluctuations, and amount required. Since reagent cost contributes to more than 70 % of the estimated total Opex, it will be necessary to investigate opportunities to negotiate prices in order to optimise operating costs.

The process design is quite complex and it is critical to the success of the Project so additional optimisation testwork is recommended. A pilot scale testwork campaign is essential to prove and optimise the process design.

26.5 Tailings

Based on the design and supporting information available at the time of the TSF design, it is recommended that subsequent design work focuses on the following:

- detailed characterisation of the proposed tailings material(s) with specific emphasis on:
  - determining the geochemical characteristics and pollution potential of the tailings materials; and
  - confirmation of the geotechnical characteristics of the tailings based on laboratory testing of representative samples, focussing on determining its strength, settling and consolidation characteristics;
- a hydrological study for the Mkango Project so that more applicable storm event data is used in the design of the TSF other infrastructure;
- a geotechnical investigation of the TSF site in order to confirm the type, extent and characteristics of the *in situ* materials as well as available construction materials;
- an assessment of the need for additional contamination control measures such as liners, dewatering and/or contaminated water treatment;
- optimisation of the costs associated with the construction, operation and closure of the TSF, namely:
  - the earthworks associated with the construction of the facility which has the potential to be more economical if the waste rock obtained from the open pit is used and not borrowed from the basin of the TSF, RWD and SWD;
  - possible further optimisation of the TSF preparatory works in terms of layout, footprint extent, etc.; and
- compilation of a more detailed schedule of quantities describing the proposed preparatory works and the pricing of the schedules to a greater level of accuracy.

26.6 Environmental

Detailed Specialist studies will need to be undertaken for the ESHIA, which need to be compliant with both the Malawian legislation and IFC requirements.

26.6.1 Management of impacts and issues

The Project is at a phase where high impacts and risks that can be assessed and where necessary, the Project can be adjusted or re-structured to avoid or reduce the impact.

26.6.2 Risks and recommendations

- The following risks and recommendations for work to be undertaken in the Definitive Feasibility Study have been identified:reputational risk recommendation:
  - prepare as much project information as possible and disseminate it to the Government, TA's, GVH's and communities;
- institutional constraint recommendation:
  - provide regular feedback and results of monitoring to authorities;
- dealing with contaminants recommendation:
  - due to its location on a hillside, the Project will have to ensure that the containment facilities are highly engineered and compliant with the relevant regulations. Management Plans which deal with potential spillages and containment issues will be developed as part of the ESHIA;
  - water control measures will need to be well designed, constructed and managed including berms, trenches, dams and security measures;
- water provision recommendation:
  - the use of groundwater as a potential water supply source needs to be further investigated;
- resettlement recommendation:
  - the process and framework for resettlement should be discussed between Mkango and social consultants in order to establish possible options for alternative land and resources and a Resettlement Action Plan proposed;
- radiological concerns recommendation:
  - there will be a need to investigate further the regulatory control with regards to radiation;
- perceptions and expectations recommendation:
  - develop programmes for clearly explaining:
    - the Project to the communities,
    - the Project implementation processes; and

- the ESHIA processes

  in a way that will dispel most of the misconceptions and fears they have about the Project;

- by undertaking a thorough Stakeholder Engagement Process, many of the unanswered questions, fears and perceptions can be clarified and it will open up the channels of communication; it is noted that the first stakeholder consultations took place in November 2014;
- develop a Grievance Mechanism as early as possible so that any grievances lodged are dealt with adequately; it is noted that a community action group has been formed to provide a grievance mechanism forum; and

- Community and Civil Society Organisations (CSO) Recommendation:
  - best practices will need to be employed.

26.7 Proposed Budget for the Definitive Feasibility Study

A provisional, indicative budget has been prepared for the currently envisaged scope for the preparation and completion of a Definitive Feasibility Study for the Project, based on the work streams identified above (Table 26-1). It represents the minimum anticipated costs required to complete the Feasibility Study, and may change as the work streams and associated costs are refined in preparation for the execution of the Definitive Feasibility Study.

Table 26-1
Estimated technical costs – Definitive Feasibility Study

Description	Amount (US$)
Mining and other studies	550,000
Processing plant and infrastructure	1,050,000
Metallurgical optimisation and pilot testwork	2,000,000
Geotechnical and resource drilling	1,500,000
Environmental, social, health impact assessment	900,000
Other	400,000
Contingency	600,000
Total	**7,000,000**

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APPENDIX 1:

Glossary of Abbreviations, Acronyms and Technical Terms

Glossary of Abbreviations, Acronyms and Technical Terms

Abbreviations and Acronyms

φ	Friction angle
1V:3H; 1V:2H	Slope ratios are expressed in metres as 1V:3H; 1V:2H where the first number represents the vertical distance and the second represents the horizontal distance
Actlabs	Activation Laboratories
AMIS	African Mineral Standards
BFA	Bench Face Angle
$CaCl_2$	Calcium chloride
$CaCO_3$	Calcite
CAD	Canadian Dollars
$(CaFe(CO_3)_2)$	Ankerite
CAGR	Compound annual growth rate
CAP	Chilwa Alkaline Province
$CaSO_4$	Gypsum
Ce	Cerium
Ce_2O_3	Cerium Oxide
CRM	Certified Reference Material
CSO	Civil Society and Community Liaison
D	Disturbance Factor
DEA	Malawian Department of Environmental Affairs
Dy_2O_3	Dysprosium Oxide
EIA	Environmental Impact Assessment
EM	Electromagnetic
EMP	Electron microprobe
EMPA	
EPCM	Engineering, procurement, construction and management costs
EPL	Exclusive Prospecting Licence
Epoch	Epoch Resources (Pty) Ltd
ESHIA	Environmental, Social and Health Impact Assessment
Eu	Europium
Eu_2O_3	Europium Oxide
Fe	Iron
$Fe:PO_4$	Iron to phosphate ratio
FOB	Free on Board

FRP	Fibreglass reinforced plastic
G&A	General and Administration
Genalysis	Intertek-Genalysis Laboratory
GSDM	Geological Survey Department of Malawi
GSI	Geological Strength Index
GVH	General Village Headman
H1	First half of the year (beginning January to end June)
HCl	Hydrochloric Acid
HDPE	High density polyethylene
HREE	Heavy Rare Earth Elements
HREO	Heavy Rare Earth Oxides
H_2SO_4	Sulphuric Acid
IFC	International Finance Corporation
ICP-MS	Inductively coupled plasma mass spectrometry
ICP-OES	Inductively coupled plasma optical emission spectrometry
IRR	
ITCZ	Inter-Tropical Convergence Zone
JICA	Japan International Cooperation Agency
k	Potassium
kg/m^3	Kilogram per cubic metre (density)
km	kilometre
km^2	Square kilometre
K_2O	Potassium Oxide
kPa	kilopascal
ktpa	Kilo tonnes per annum
kV	Kilovolt
kW	Kilo Watt
La	Lanthanum
Lancaster	Lancaster Exploration Ltd
La_2O_3	Lanthanum Oxide
LIMS	Laboratory information management system
LoM	Life of Mine
LREE	Light Rare Earth Elements
LREO	Light Rare Earth Oxides
m	Metres
m^3	Cubic metres
mamsl	Metres above mean sea level

MCCs	Motor Control Centres
Mkango	Mkango Resources Limited
mm	millimetres
m/m	Mass fraction
MMAJ	Metal Mining Agency of Japan
Mn	Manganese
MRMR	Mining Rock Mass Rating
MOU	Memorandum of Understanding
m/h	Metre per hour
m/s	Metre per second
Mt	Million tonnes
Mtpa	Million tonnes per annum
MVA	Megavolt amperes (one million volt amperes)
MWK	Malawian Kwacha
NaOH	Sodium hydroxide
NATA	The National Association of Testing Authorities Australia
Nb	Niobium
Nd	Neodymium
Nd_2O_3	Neodymium Oxide
NELAC	National Environmental Laboratory Accreditation Conference
NGL	Natural ground level
NI 43-101	National Instrument 43-101 *Standards of Disclosure for Mineral Projects*
NPV	Net Present Value
OHL	Overhead line
OSA	Overall slope angle
P	Phosphorus
P & G	Preliminary and General
PFS	Pre-Feasibility Study
ppm	Parts per million
QA	Quality assurance
QA/QC	Quality assurance and quality control
QC	Quality control
QEMSCAN	Quantitative Evaluation of Minerals by Scanning Electron Microscopy
QP	Qualified Person
REE	Rare Earth Elements

REO	Rare Earth Oxides
RMR_{89}	Rock Mass Rating (Bieniawski, 1989)
RoM	Run of mine
ROW	Rest of the World
RQD	Rock quality designation
RWD	Return Water Dam
SAA	South African Airways
SCC	Standards Council of Canada
SDV	SDV Malawi Ltd
SGS	SGS Inc. Lakefield, Canada
Sm	Samarium
SME	Society for Mining, Metallurgy and Exploration
Sm_2O_3	Samarium Oxide
SO_2	Sulphur dioxide
SO_3	Sulphur trioxide
Sr	Strontium
$SrCO_3$	Strontianite
SWD	Storm Water Dam
SX	Solvent extraction
t	tonne
TA	Traditional Authority
Tb	Terbium
Tb_2O_3	Terbium Oxide
Th	Thorium
tpa	Tonnes per annum
tpd	Tonnes per day
t/h	Tonnes per hour
tpm	Tonnes per month
TREO	Total Rare Earth Oxides
TSF	Tailings storage facility
TSX.V	Toronto Stock Exchange Venture or TSX Venture Exchange
UCS	Uniaxial compressive strength
US$	United States Dollars
US$/kg	United States Dollars per kilogram
US$/t	United States Dollars per tonne
US$/tonne	United States Dollars per tonne
USA	United States of America

USGS	United States Geological Survey
UTM	Universal Transverse Mercator
v/v	Volume concentration
wt%	Weight per cent
WTO	World Trade Organisation
XRD	X-ray diffraction
Y	Yttrium
Y_2O_3	Yttrium Oxide
Yb_2O_3	Ytterbium Oxide
ZAR	South African Rand

Technical Terms

Airborne magnetic surveys	Surveys flown by helicopter or fixed wing aircraft to measure the magnetic susceptibility of rocks at or near the earth's surface
Alkaline rocks	Rocks containing an excess of sodium and/or potassium
Amphibolite	A metamorphic rock comprised mainly of amphibole
amsl	Elevation above mean sea level
Apatite	A mineral $Ca_5(F,Cl)(PO4)_3$ found in igneous rocks which is a source of phosphate and locally contains significant amounts of rare earth elements
Archean	The third oldest of four geological eons in the history of the earth. It extends from 2,500 million years back to approximately 3,800 million years
Baryte	A mineral consisting of barium sulphate $BaSO_4$
Basement	The igneous and metamorphic crust of the earth, underlying sedimentary deposits
Bastnäsite	A family of rare-earth carbonate-fluoride minerals
Brecciated	A body of rock that has been intensely fractured
Calcite	A mineral consisting of calcium carbonate $CaCO_3$
Carbonate	A rock, usually of sedimentary origin, composed primarily of calcium, magnesium or iron and CO_3 or a mineral characterized by presence of the carbonate ion (CO_3^{2-})
Carbonatite	An igneous intrusive or extrusive rock that consists of more than 50% carbonate minerals. Calcitic carbonatite is dominantly calcium carbonate, dolomitic carbonatite is dominantly magnesium carbonate, ankeritic carbonatite is dominantly iron carbonate
Ce	Cerium, a LREE
Channel sample	A sample taken by cutting a shallow "channel' across an outcrop surface permitting a continuous sampling of the outcrop and providing assay results that are representative of a specified width across the outcrop
Chondrite	Stony meteorites that have not been modified due to melting or differentiation of the parent body, and are considered to have very primitive compositions
Craton	Large, ancient mass of the earth's crust comprised of various

	crustal blocks amalgamated by tectonic processes
Diamond Drilling	Method of obtaining a cylindrical core of rock by drilling with a diamond impregnated bit
Dolomite	A carbonate mineral composed of calcium and magnesium carbonate, $CaMg(CO_3)_2$; a rock predominantly comprised of this mineral is also referred to as dolomite or dolostone
Dy	Dysprosium, a HREE
Dyke	A tabular body of intrusive igneous rock, crosscutting the host strata at an oblique angle
Eluvial	geological deposits and soils that are derived by in situ weathering or weathering plus gravitational movement
EPL (Exclusive Prospecting License)	A mineral right granted by the Government of Malawi that allows the holder to carry on prospecting operations related to the mineral or group of minerals specified in the prospecting license
Er	Erbium, a HREE
Fabric	The orientation in space of the elements of which a rock is composed
Fault	A fracture or fracture zone in the earth's crust, along which displacement of opposing sides has occurred
Fenitisation	A distinctive alkali metasomatic alteration of host rocks surrounding a carbonatite intrusion
Fluorite	A mineral composted of calcium fluoride (CaF_2); a.k.a. fluorspar
Fold	A planar sequence of rocks or a feature bent about an axis
Ga	Billion years
Gd	Gadolinium, a HREE
GPS (global positioning system)	A satellite-based navigation system that provides reliable location information anywhere on Earth when there is an unobstructed line of sight to four or more GPS satellites
Gneiss	A foliated metamorphic rock that has a banded appearance
Grab samples	Rock samples taken from outcrop in non-systematic manner
Ho	Holmium, a HREE
HREE	Heavy Rare Earth Elements – Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu
Hydrothermal	Processes that involve heated water
ICP-OES	Inductively Coupled Plasma Optical Emission Spectroscopy, an analytical method used for elemental analyses
ICP-MS	Inductively Coupled Plasma Mass Spectrometry, an analytical method used for elemental analyses, particularly trace elements including the rare earth elements
La	Lanthanum, a LREE
Lacustrine	formed at the bottom or along the shore of lakes, as geological strata
Lithogeochemical	Study involving the chemical composition of rocks
LOI	Loss on ignition. The amount of volatile substances that are driven out of a sample by heating, reported as part of an elemental or oxide analyses of a rock or mineral
LREE	Light Rare Earths – La, Ce, Pr, Nd and Sm
Lu	Lutetium, a HREE

Ma	Million years
Magnetometer	An instrument for measuring the intensity of the earth's magnetic field
Magnetic susceptibility	The degree of magnetization of a material in response to an applied magnetic field
Magnetite	An important iron oxide mineral Fe_3O_4
Mafic	Pertaining to or composed dominantly of magnesium and iron rock-forming silicates. Typically synonymous with "dark minerals"
Metamorphism	Changes to rocks and minerals generally as a result of changes in pressure and/or temperature
Metasomatic	A metamorphic change in the rock which involves the introduction of material from another source
Monazite	A rare earth and thorium phosphate mineral found as an accessory mineral in felsic igneous rocks, pegmatite dykes and heavy mineral sands
mt	Million metric tonnes
Muscovite	A potassium-bearing white mica
Nd	Neodymium, a LREE
Nepheline	A rock-forming feldspathoid mineral with composition $Na_3KAl_4Si_4O_{16}$, that occurs in low-silica intrusive and volcanic rocks
Orogen	A belt of rocks characterized by folding, faulting, metamorphism and intrusion recording active ancient tectonic regimes that culminated in mountain-building
Orogeny	A deformation and/or magmatic event in the earth's crust, usually caused by collision between tectonic plates
Paragneiss	Banded metamorphic rock derived from sedimentary rocks
Parisite	A rare earth-bearing fluor-carbonate mineral
Phonolite	Fine-grained to porphyritic igneous rocks that are rich in nepheline and potash feldspar
Plug	A near vertical, more or less cylindrical, intrusion that appears more or less circular in plan
Porphyritic	Igneous rock containing larger crystals of one or more minerals in a dominantly fine grained groundmass
Pm	Promethium, a LREE
Pr	Praseodymium, a LREE
Precambrian	Informal name for the geological time periods that predate the Paleozoic (older than ca. 545 million years)
Radiometrics	A measure of the natural radiation in the earth's surface (sometimes referred to as Gamma-Ray Spectrometry)
Rare Earth Elements	15 elements of the Lanthanide Series ranging from atomic number 57 (Lanthanum) to atomic number 71 (Lutetium)
Rare Earth Oxides	The resource and market details refer to REE in the oxide form and the group is collectively discussed as Rare Earth Oxides (REO) as the REE are frequently separated and sold in their oxide form / as oxide compounds.
Shear zone	A tabular to sheet-like, planar or curvi-planar zone composed of rocks that are more highly strained than rocks adjacent to the zone, typically zones of much more intense foliation, deformation, and folding
THREE	Total Heavy Rare Earth Elements (includes yttrium)
TREE	Total Rare Earth Elements

Total Rare Earth Oxides –	Refers to the sum total of rare earths present in a deposit
Schist	A crystalline metamorphic rock having a foliated or parallel fabric resulting from the alignment of platy (micaceous) minerals
Scintillometer	An instrument that measures the intensity of ionizing radiation
SEM (scanning electron microscope)	A type of electron microscope that images a sample by scanning it with a high-energy beam of electrons
Sill	A tabular intrusion that is parallel to the layering in the host rocks
Sm	Samarium, a LREE
Spectrometer (gamma ray)	An instrument capable of detecting and analyzing the spectrum of the intensity of gamma radiation. Specifically, it can measure the relative intensity of radiation resulting from uranium, thorium and potassium
Sövite	The coarse-grained variety or facies of a carbonatite intrusive. Sövite is often a medium to coarse grained calcite carbonatite with variable accessory amphibole, biotite, pyrite, pyrochlore and fluorite
Strontianite	A mineral consisting of strontium carbonatite $SrCO_3$
Subsolidus	Refers to chemical reactions in rocks that take place under pressures and temperatures at which the magmatic liquids have completely solidified
Supergene	Process involving circulation of surface waters throughout an orebody, which can result in remobilization and enrichment of metals and minerals
Strike	Horizontal direction or trend of a geological structure, defined as the intersection of a horizontal plane with the plane of the structure
Syenite	An intrusive igneous rock composed dominantly of alkali feldspar, with little or no quartz and ferromagnesian minerals
Synchysite	*A* rare earth-bearing fluor-carbonate mineral
Tb	Terbium, a HREE
Tectonic	Pertaining to the forces involved in, or the resulting structures of, movement in the earth's crust
Thorite	An accessory mineral of composition $(Th,U)SiO_4$, the most common mineral of thorium
Tm	Thulium, a HREE
Trenching	The process of digging shallow linear pits in the shallow overburden to provide access to a more or less continuous section of bedrock
Xenotime	A rare earth-bearing phosphate mineral of composition YPO_4 in which the heavy rare earths are expressive secondary components
XRF (X-Ray Fluorescence)	A routine non-destructive analytical method to determine major and trace element concentrations in geological materials
Y	Yttrium. An element with atomic number 39, which behaves chemically in a similar fashion to the HREE and is typically included with the HREE for purposes of economic valuation
Yb	Ytterbium, a HREE
Zircon	A mineral consisting of zirconium silicate ($ZrSiO_4$)

APPENDIX 2:

Certificate of Author(s)

The MSA Group (Pty) Ltd
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email: info@msagroupservices.com
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PO Box 81356, Parkhurst, 2120, South Africa
Directors: KD Scott, WSM Majola

CERTIFICATE OF QUALIFIED PERSON

I, Robert Charles Croll, FSAIMM, do hereby certify that:

1. I am the Principal Consultant of:

   The MSA Group (Pty) Ltd
   20B Rothesay Avenue
   Craighall Park, Gauteng, South Africa,
   2196

2. This certificate applies to the Technical Report titled "Mkango Resources Limited; Songwe REE Project, Malawi – NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

3. I graduated with a Bachelor of Science degree in Mining Engineering from the University of the Witwatersrand, Johannesburg, South Africa in 1973. In addition, I graduated with a Master of Business Administration degree from the same university in 1977.

4. I am a Fellow of the Southern Africa Institute of Mining and Metallurgy.

5. I have worked in the mining industry for some 40 years. This period includes 12 years of operational experience; just under 4 years as a mining research analyst for stockbroking companies; just under 16 years associated with the assessment and due diligence assessments of international mining projects; and 8 years as a Mining Consultant responsible for the management and preparation of mining studies, due diligence reviews of mining projects, and other related tasks

6. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

7. I visited the Songwe Hill property on 19th May 2014 for 1day.

8. I am responsible for, or co-responsible for, the preparation of sections 1 to 4, 5.1, 5.3, 18, and 21 to 27 of the Technical Report.

9. I have not had prior involvement with the property that is the subject of the Technical Report.

10. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

11. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

12. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

13. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

"signed and stamped"

Robert Charles Croll
Fellow: Southern African Institute of Mining and Metallurgy

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THE MSA GROUP

Specialist Consultants to the Mining Industry

CERTIFICATE OF QUALIFIED PERSON

I, H. Scott Swinden, Ph.D. P.Geo, do hereby certify that:

14. I am the Principal Consultant of:

    Swinden Geoscience Consultants Ltd.,
    3 Crest Road,
    Halifax, Nova Scotia B3M 2W1
    CANADA

15. This certificate applies to the technical report titled "Mkango Resources Limited; Songwe REE Project, Malawi – NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

16. I have the following academic qualifications:

Ph.D. (Earth Sciences), 1988	Memorial University of Newfoundland
M.Sc. (Geology), 1976	Memorial University of Newfoundland
B.Sc. (Honours in Geology), 1970	Dalhousie University.

17. I am a member in good standing of the Association of Professional Geoscientists of Nova Scotia (No. 085), Fellow of the Geological Association of Canada, the Canadian Institute of Mining, Metallurgy and Petroleum, and the Society of Economic Geologists and Adjunct Professor of Earth Sciences at Dalhousie University.

18. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

19. I visited the Songwe Hill property on 21st to 25th April 2012 and from the 11th to 16th October 2012.

20. I am responsible for, or co-responsible for, the preparation of Sections 1, 4 to 11 and Section 23, but excluding sections 4.3 and 5.2 of the Technical Report.

21. I have had prior involvement with the property that is the subject of the Technical Report. The nature of my prior involvement is as an independent consultant to Mkango Resources Ltd since 2012.

22. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

23. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

24. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

25. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

"signed and stamped"

H. Scott Swinden
Ph.D. P.Geo

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CERTIFICATE OF QUALIFIED PERSON

I, Michael Robert Hall, Pr.Sci.Nat. do hereby certify that:

26. I am a Mineral Resource Consultant of:

    The MSA Group (Pty) Ltd
    20B Rothesay Avenue
    Craighall Park, Gauteng, South Africa,
    2196

27. This certificate applies to the technical report titled ""Mkango Resources Limited; Songwe REE Project, Malawi – NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

28. I graduated with a degree in BSc Eng (Mining Geology) from the University of the Leicester, England in 1980. In addition, I obtained an MBA from the Business School at the University of the Witwatersrand in 2003.

29. I am a member in good standing with the South African Council of Natural and Scientific Professions (SACNASP) and the Geological Society of South Africa (GSSA).

30. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

31. I visited the Songwe Hill property on 1st to 3rd September 2012.

32. I am responsible for, or co-responsible for, the preparation of Sections 1, 12, and 14 of the Technical Report.

33. I have not had prior involvement with the property that is the subject of the Technical Report.

34. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

35. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

36. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

37. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

"signed and stamped"

Michael Robert Hall
Pr.Sci.Nat.

THE MSA GROUP

Specialist Consultants to the Mining Industry

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Directors: KD Scott, WSM Majola

CERTIFICATE OF QUALIFIED PERSON

I, Clive Wyndham Brown, Pr Eng, Bsc Eng Mining do hereby certify that:

38. I am Principal Mining Engineer Associate of:

    The MSA Group (Pty) Ltd
    20B Rothesay Avenue
    Craighall Park, Gauteng, South Africa,
    2196

39. This certificate applies to the technical report titled "Mkango Resources Limited; Songwe REE Project, Malawi – NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

40. I graduated with a degree in Mining Engineering (Bsc Eng Mining) from the University of Witwatersrand in 1986.

41. I am a registered fellow of the Southern African Institute of Mining and Metallurgy.

42. I have worked as a mining engineer for a total of 26 years, during which time I have worked in underground and open pit mines, both hard rock and coal, in the functions of production management and technical services. I have been a consultant to the mining industry for 12 years assisting mining and exploration companies with Feasibility and other technical studies.

43. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

44. I visited the Songwe Hill property on 19th May 2014 for 1 day.

45. I am responsible for, or co-responsible for, the preparation of Sections 1, 15, 16, 21, 22, 25 and 26 of the Technical Report.

46. I have not had prior involvement with the property that is the subject of the Technical Report.

47. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

48. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

49. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

50. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

"signed and stamped"

Clive Wyndham Brown
Pr. Eng., B.Sc. Eng (Mining)

SNC-Lavalin (Pty) Ltd
Block A, Cullinan Place,
2 Cullinan Close
Morningside, Sandton, South Africa, 2146
+27 11 535 4900 +27 11 535 4980
Registration No: 2009/022727/07

CERTIFICATE OF QUALIFIED PERSON

I, Craig Michael de Jager, Pr Eng, Bsc Eng, BCom (Financial Management), NDip Surveying do hereby certify that:

1. I am the Manager Projects of:

   SNC Lavalin (Pty) Ltd
   Block C, Cullinan Place, 2 Cullinan Close, Morningside,
   P.O Box 784593
   Sandton, Gauteng, South Africa,
   2146

2. This certificate applies to the technical report titled ""Mkango Resources Limited; Songwe REE Project, Malawi – NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

3. I graduated with a BSc Civil Engineering Degree (Honours) from the University of the Witwatersrand in 1995. In addition I have also obtained a National Diploma in Surveying from the Cape Peninsula University of Technology in 1990 and a BCom Specialisation in Financial Management from the University of South Africa in 2004.

4. I am a Professional Engineer with the Engineering Council of South Africa (Reg. No. 20010250) and have been a member in good standing since 2001.

5. I have worked as an engineer and a project manager for a total of 20 years since my graduation.

6. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

7. I have not visited the site.

8. I am responsible for, or co-responsible for, the preparation of Sections 1, 17, 21, 22, 25 and 26 of the Technical Report.

9. I have not had prior involvement with the property that is the subject of the Technical Report.

10. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

11. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

12. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

13. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

"signed and stamped"

Craig Michael de Jager
Pr. Eng., B.Sc. Eng.

CERTIFICATE OF QUALIFIED PERSON

I, Christian John Nicholas Dempers, Pr. Eng., FSAIMM, do hereby certify that:

14. I am a Principal Process Engineer of:
    SENET (Pty) Ltd
    Building 12, Greenstone Hill Office Park, Emerald Boulevared, Greenstone
    P.O Box 9820
    Edenglen, Gauteng, South Africa,
    1613

15. This certificate applies to the technical report titled "Mkango Resources Limited; Songwe REE Project, Malawi – NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

16. I graduated with a BSc Chemical Engineering Degree from the University of Cape Town in 1998. In addition, I have also obtained a MSc Chemical Engineering Degree from the University of Cape Town in 2000 and a BCom from the University of South Africa in 2007.

17. I am a Professional Engineer with the Engineering Council of South Africa (Reg.No. 20150196), and I am a fellow of the Southern African Institute of Mining and Metallurgy.

18. I have worked as a process manager and process engineer for a total of 15 years since my graduation.

19. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

20. I visited the Songwe Hill property on 19th May 2014 for 1 day.

21. I am responsible for, or co-responsible for, the preparation of Sections 1, 13, 17, 18, 21, 22, 25, and 26 of the Technical Report.

22. I have not had prior involvement with the property that is the subject of the Technical Report.

23. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

24. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

25. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

26. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

"signed and stamped"
Christian John Nicholas Dempers
Pr. Eng., FSAIMM

CERTIFICATE OF QUALIFIED PERSON

I, Guy John Wiid Pr.Eng do hereby certify that:

27. I am a practising Professional Engineer and a Director of:

    Epoch Resources (Pty) Ltd
    Building 22A, The Woodlands Office Park
    Woodlands Drive, Woodmead
    Gauteng, South Africa, 2080

28. This certificate applies to the technical report "Mkango Resources Limited; Songwe REE Project, Malawi – NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

29. I graduated with a B.Sc Degree in Civil Engineering from the University of the Witwatersrand in 1988. In addition, I have also obtained an M.Sc Degree in Civil Engineering from the University of the Witwatersrand in 1995.

30. I am a Registered as a Professional Engineer with the Engineering Council of South Africa (ECSA) (Registration No. 940269). I am also a Member of the American Society of Civil Engineers (Membership No. 9945778).

31. I have worked as a Civil Engineer for a total of 24 years, during which time I have worked in the fields of Mine Waste Management, Mine Closure Planning and Environmental Management.

32. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

33. The project site was visited on my behalf by Dr George Papageorgiou on the 18th to the 20th of May 2014.

34. I am responsible for, or co-responsible for, the preparation of sections 1, 18, 21, 22, 25 and 26 of the Technical Report.

35. I have not had prior involvement with the property that is the subject of the Technical Report.

36. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

37. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

38. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

39. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

"signed and stamped"
GJ Wiid
Pr.Eng

Physical Address	Building 22A, The Woodlands, Woodlands Drive, Woodmead, 2148, Johannesburg, South Africa
Postal Address	PO Box 6, The Woodland, 2080, South Africa
Telephone	+27 (11) 656 0380/1
Facsimile	+27 (11) 802 3654
Web Address	www.epochresources.co.za
Company Registration	Epoch Resources (Pty) Ltd, No 2005/007908/07
Directors	GJ Wiid, G Papageorgiou, A Savvas, SJP Coetzee
Associate Consultant	Prof G Heyman

CERTIFICATE OF QUALIFIED PERSON

I, Graham Errol Trusler, P.Eng., do hereby certify that:

40. I am the Chief Executive Officer of:

    Digby Wells & Associates (Pty) Ltd
    Fern Isle
    359 Pretoria Avenue
    Randburg, Gauteng, South Africa,
    2125

41. This certificate applies to the technical report titled "Mkango Resources Limited: Songwe REE Project, Malawi - NI 43-101 Pre-Feasibility Report", that has an effective date of 09 November 2015 and a report date of 1 December 2015 (the Technical Report).

42. I graduated with a degree in B.Sc (Chem.Eng.) from the University of Natal in 1986. In addition, I have obtained a M.Sc. (Eng.), from the University of Natal in 1988 and a Batchelor of Commerce from the University of South Africa in 1993.

43. I am a Registered Professional Engineer with the Engineering Council of SA (Reg.No. 920088).

44. I have worked as an environmental consultant for a total of 24 years, during which time I have completed numerous specialist investigations as well as managed the environmental aspects of brownfields and greenfields projects and get environmental approvals for them. Countries in which these have been completed include South Africa, Mali, Zambia, Tanzania, Mozambique, Sierra Leone, Zimbabwe, Botswana, China, Russia, Kosova, Peru and Indonesia. These projects have been in the industrial, mining, metallurgical and water sectors.

45. I have read the definition of "qualified person" set out in National Instrument 43-101 (NI 43-101) and certify that by reason of my education, affiliation with a professional association (as defined in NI 43-101) and past relevant work experience, I fulfil the requirements to be a "qualified person" for the purposes of NI 43-101.

46. I visited the Songwe property on 20 June 2012 for 2 days.

47. I am responsible for, or co-responsible for, the preparation of section 4.3, 5.2, 20, 21, 22, and 24 to 26 of the Technical Report.

48. I have not had prior involvement with the property that is the subject of the Technical Report.

49. At the effective date of the Technical Report, to the best of my knowledge, information and belief, the sections for which I am responsible in the Technical Report contain all scientific and technical information that is required to be disclosed to make the Technical Report not misleading.

50. I am independent of the issuer according to the definition of independence described in section 1.5 of National Instrument 43-101.

51. I have read National Instrument 43-101 and Form 43-101F1 and, as of the date of this certificate, to the best of my knowledge, information and belief, those portions of the Technical Report for which I am responsible have been prepared in compliance with that instrument and form.

52. I consent to the filing of the Technical Report with any stock exchange and other regulatory authority and any publication by them for regulatory purposes, including electronic publication in the public company files on their websites accessible by the public, of the Technical Report.

Dated this 1st Day of December, 2015.

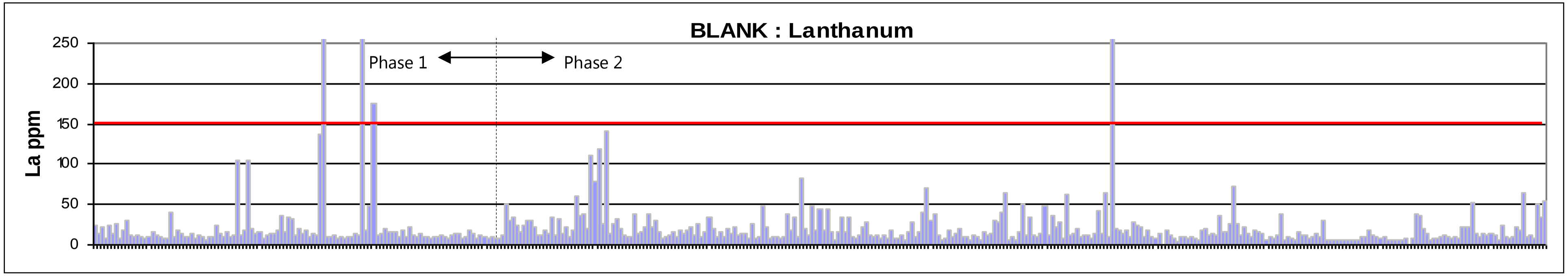
"signed and stamped"

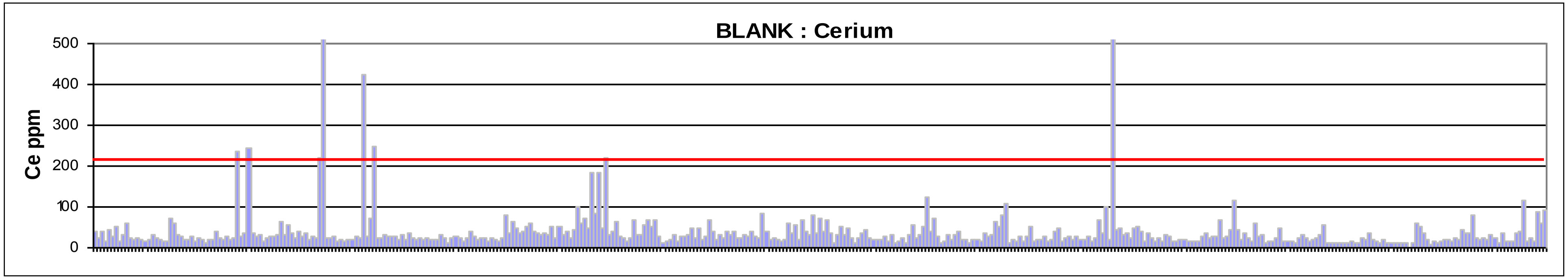
Graham Errol Trusler
(P.Eng Reg.No. 920088)

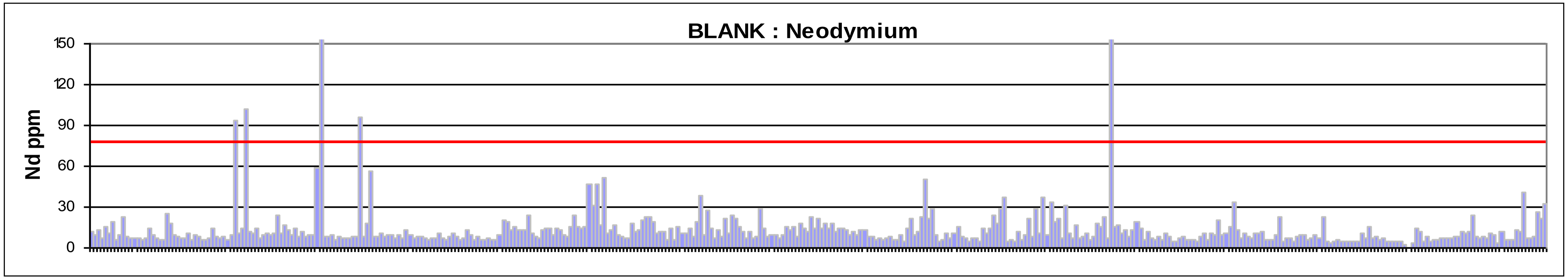
APPENDIX 3:

QA/QC Summaries

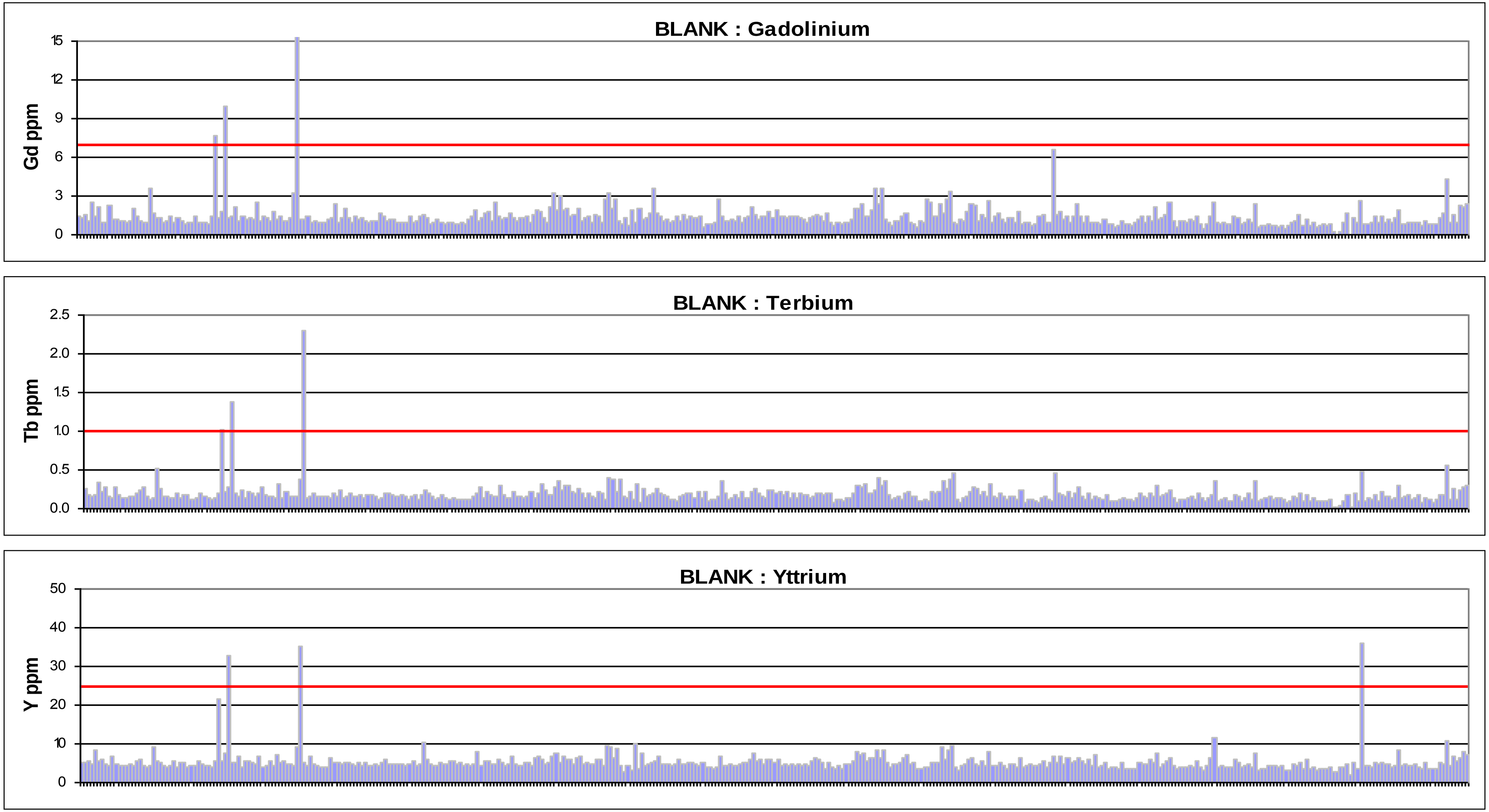
Performance of selected light rare earth elements in 407 Blank samples:



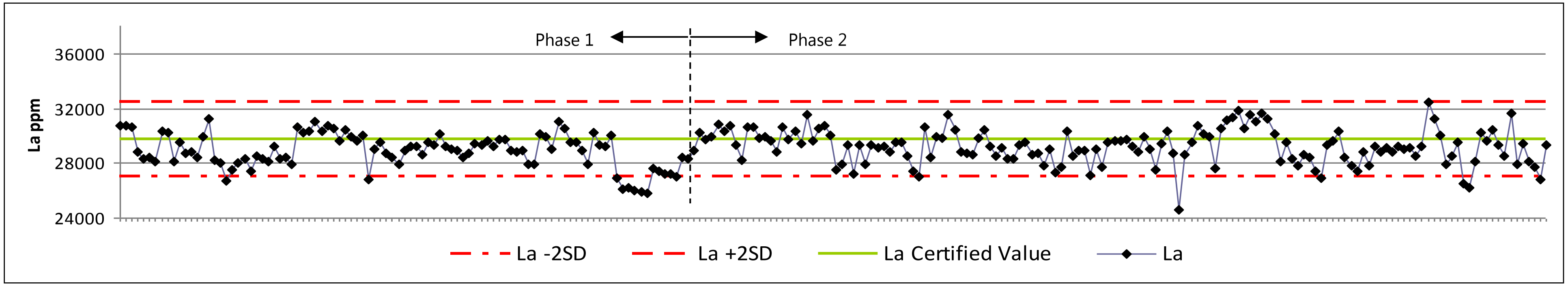


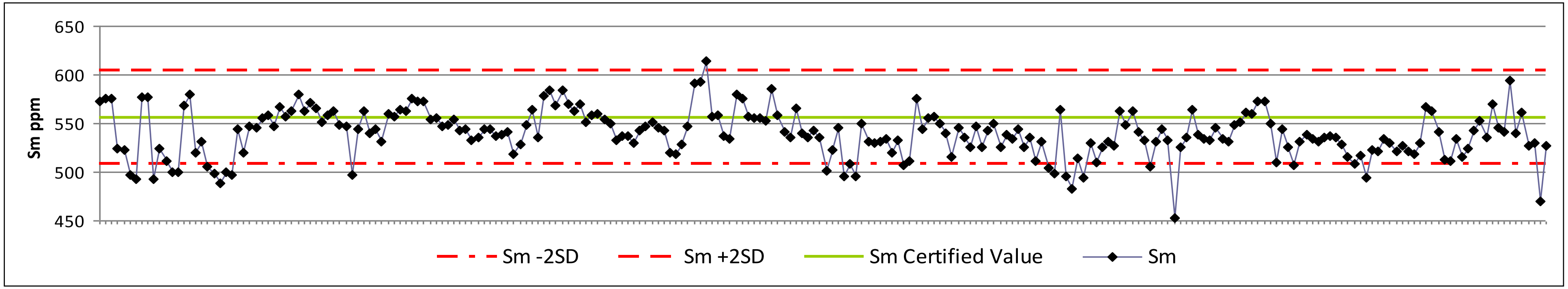


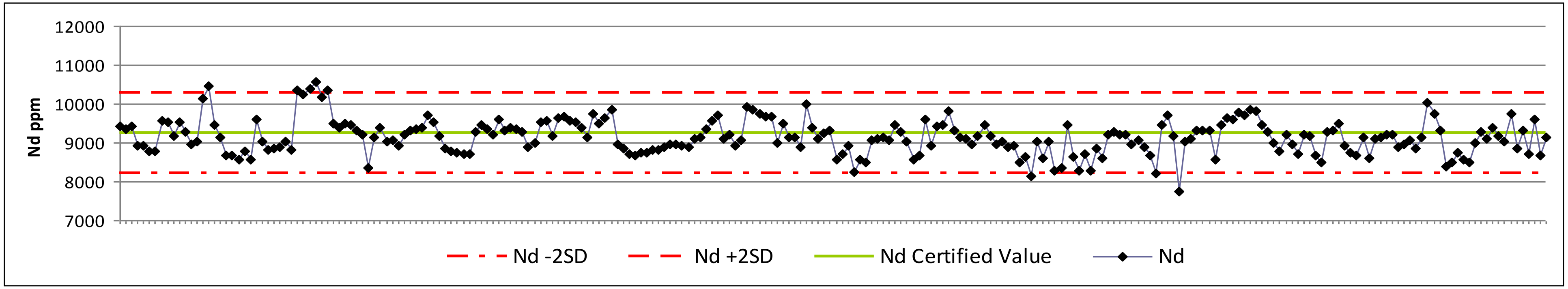
Performance of selected heavy rare earth elements in 407 Blank samples:



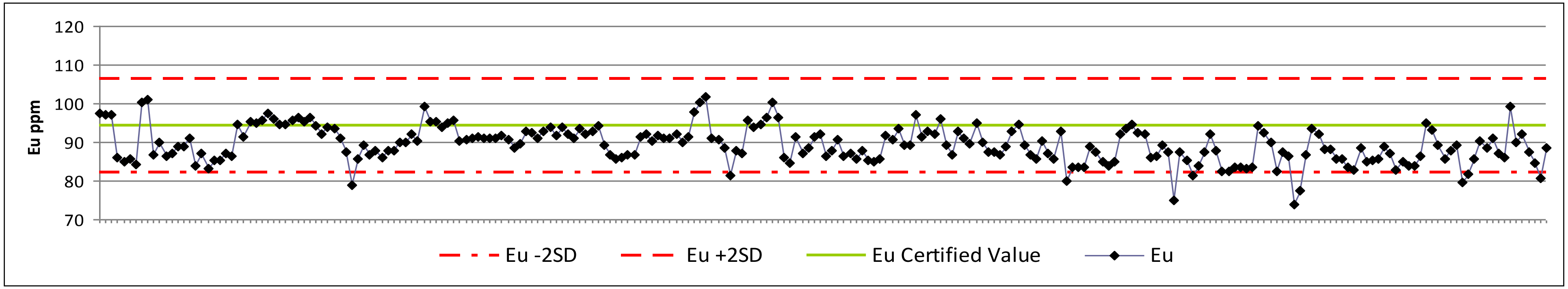
Accuracy of selected light rare earth elements in 242 samples of CRM AMIS185:

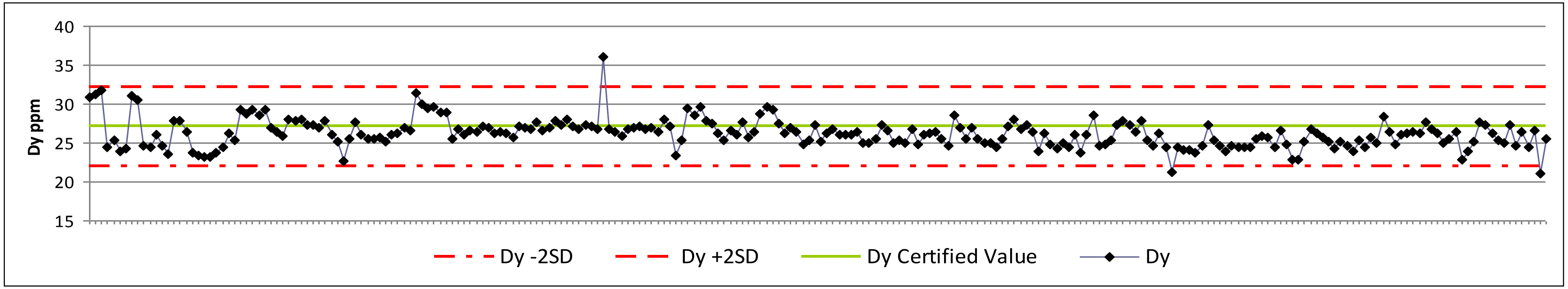


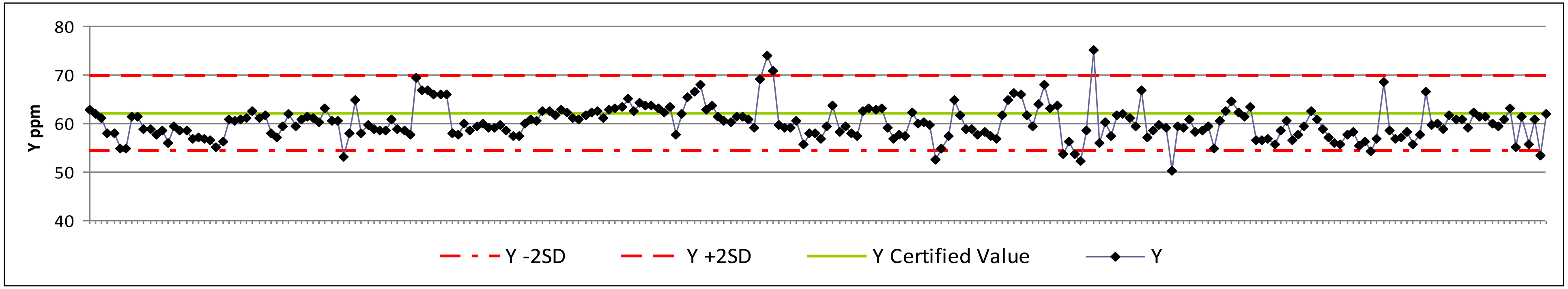




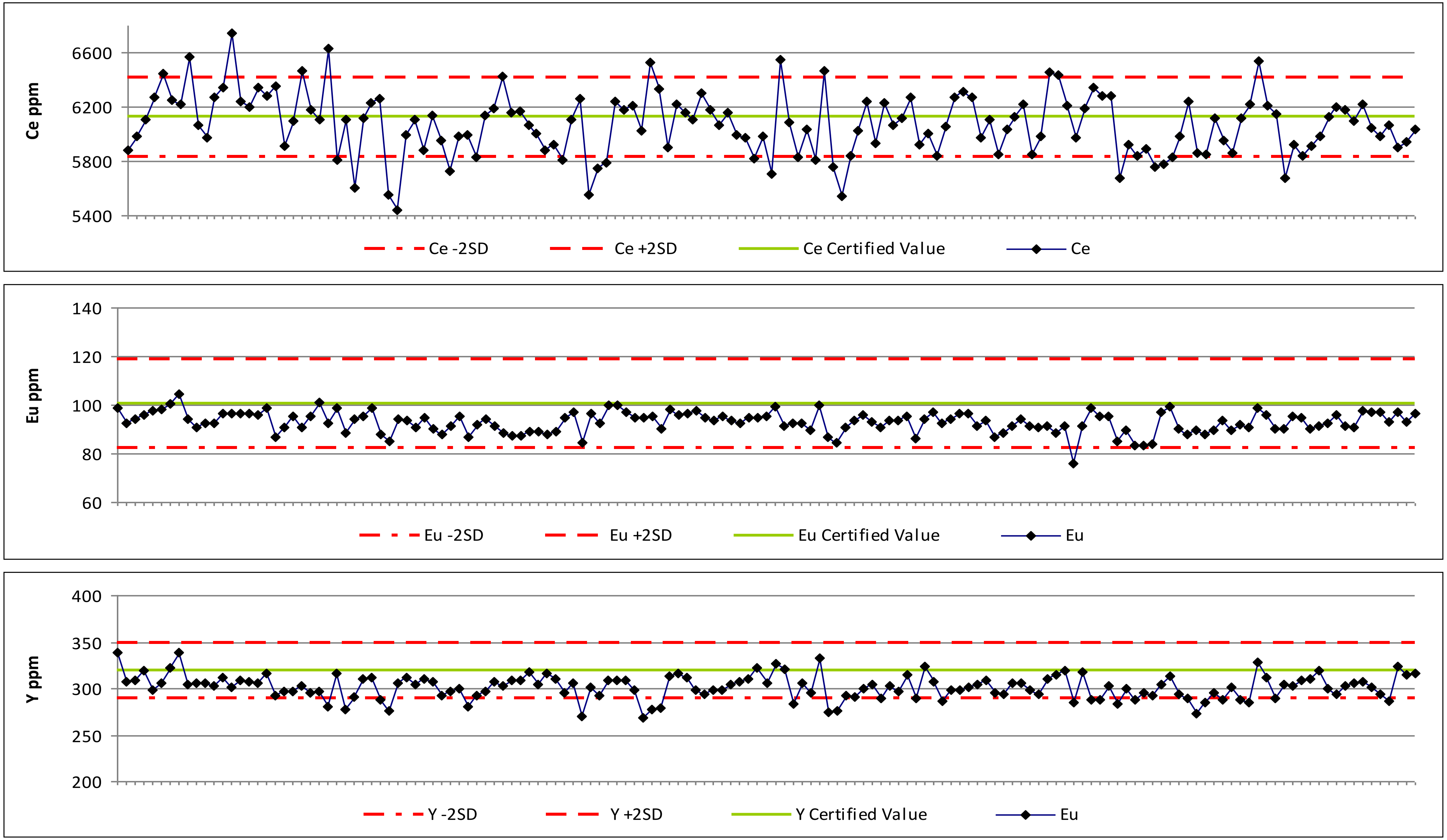
Accuracy of selected heavy rare earth elements in 242 samples of CRM AMIS185:



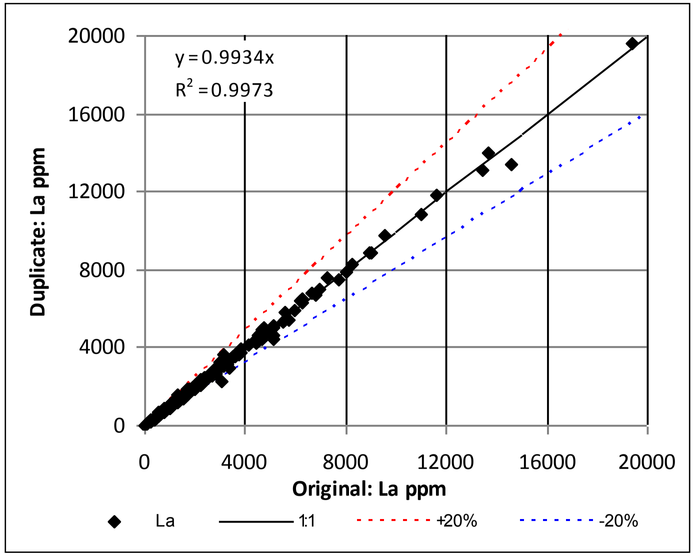


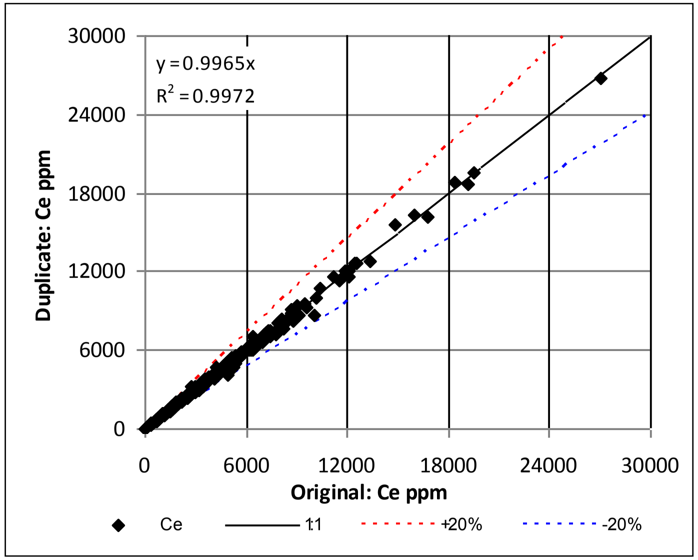


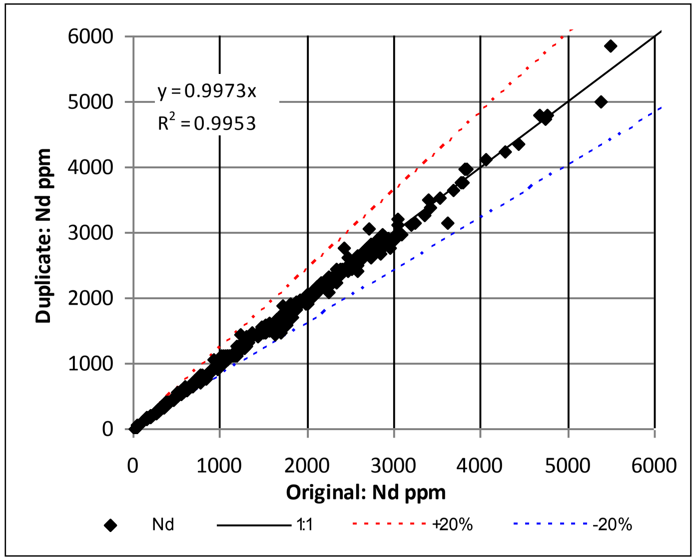
Accuracy of selected light and heavy rare earth elements in 149 samples of CRM GRE-04:

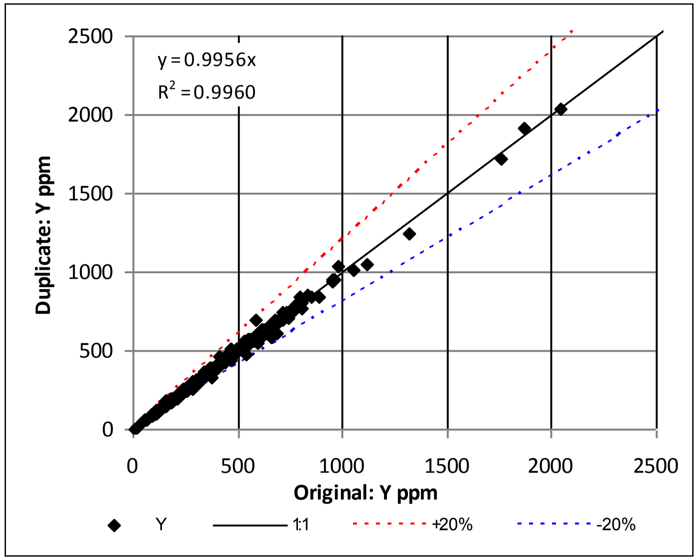


Repeatability of selected light and heavy rare earth elements in 297 duplicate sample pairs

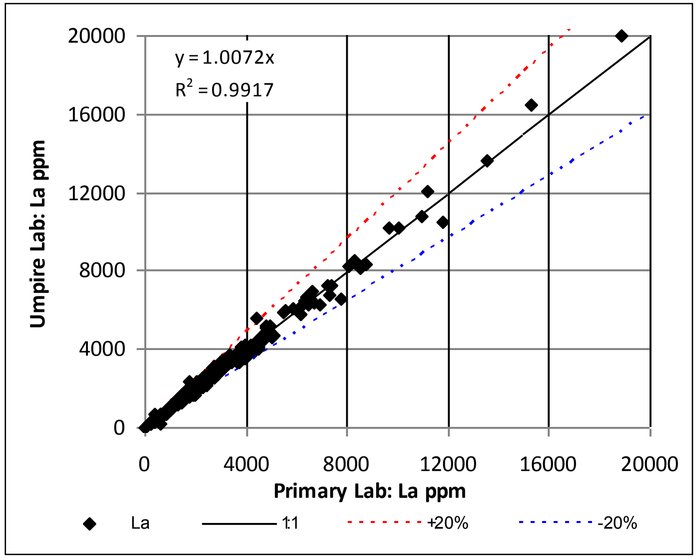


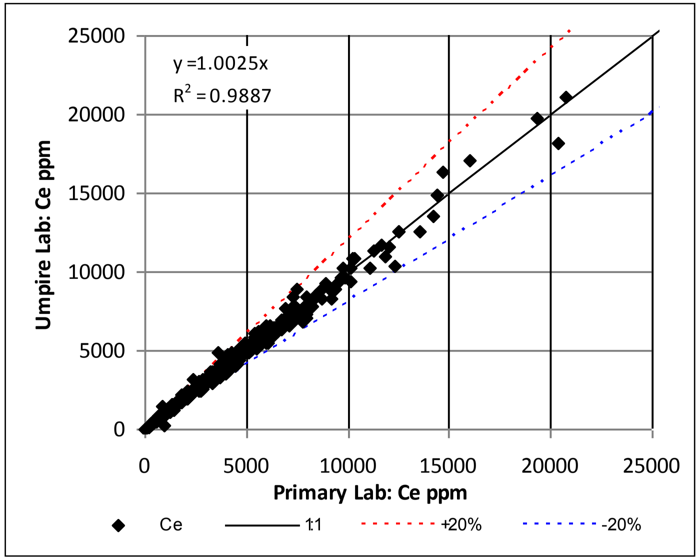


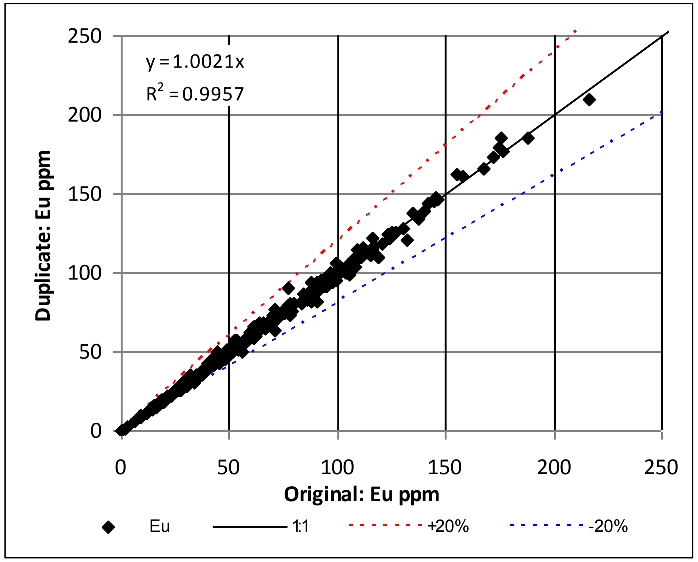


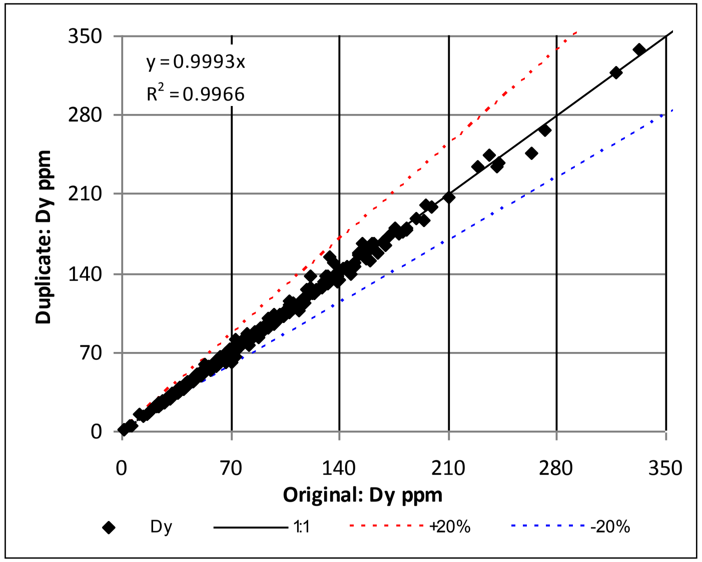


Repeatability of selected light and heavy rare earth elements in 405 umpire laboratory sample pairs







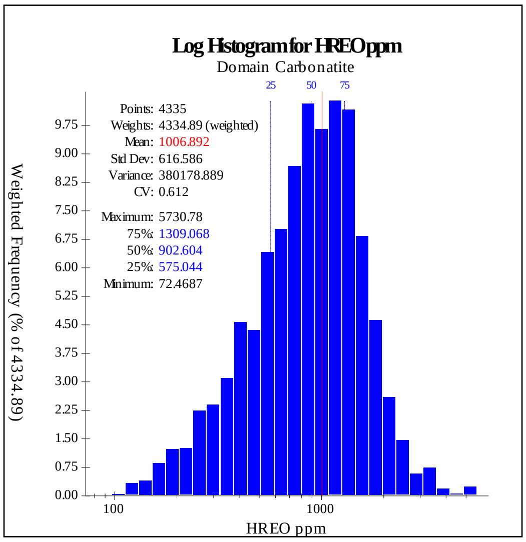


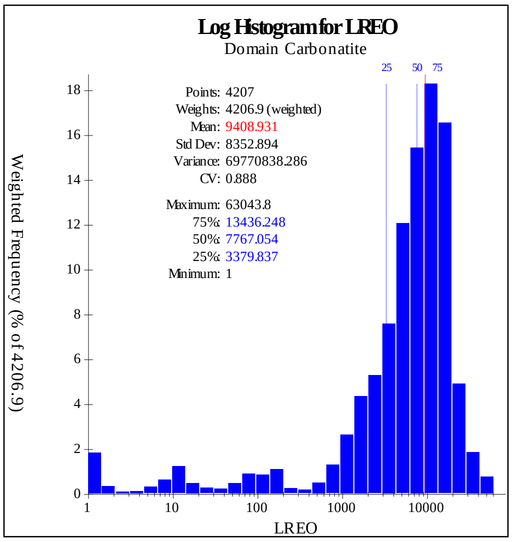
APPENDIX 4:

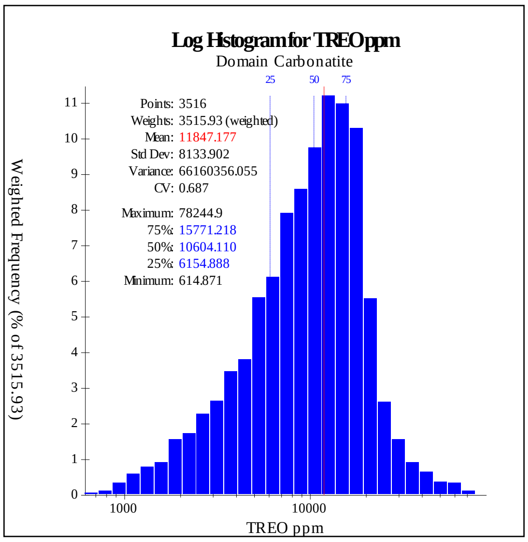
Domain Histograms

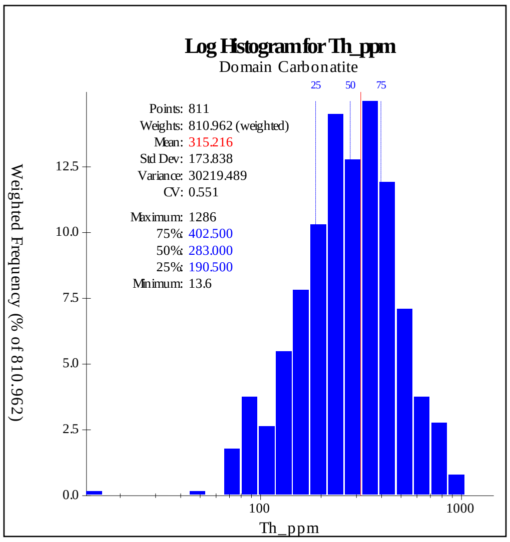
Boreholes vs Channel Samples

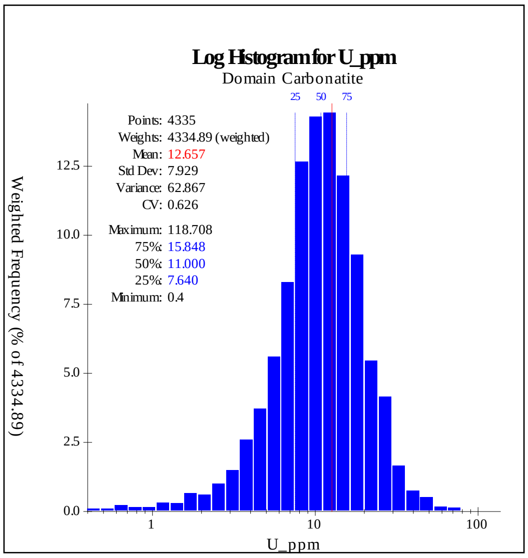
Carbonatite: Borehole samples

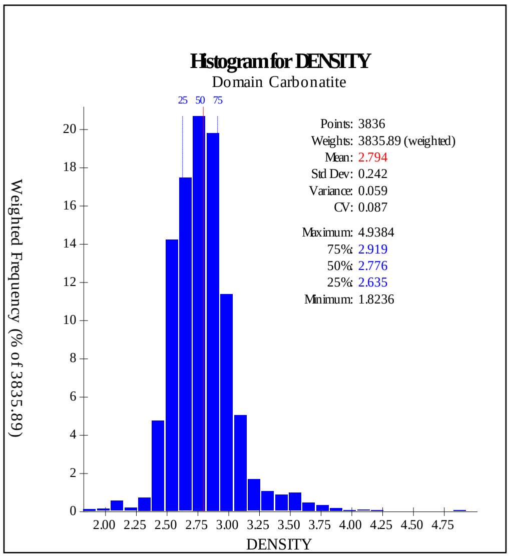




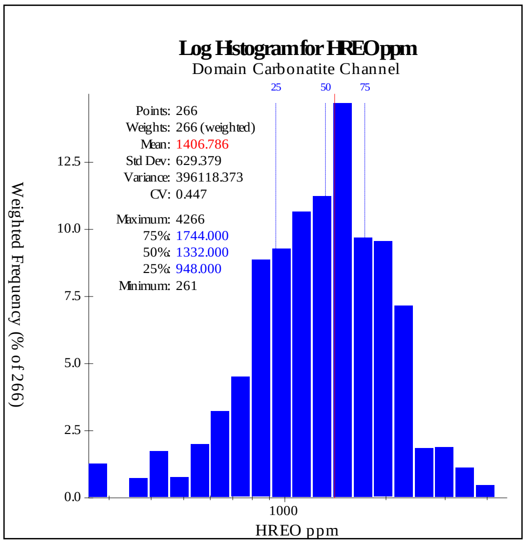


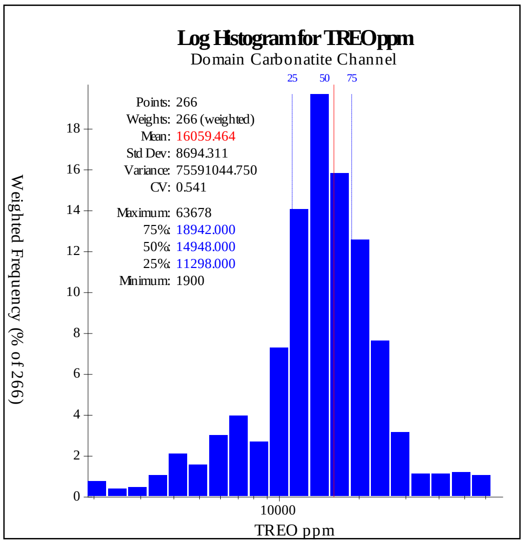


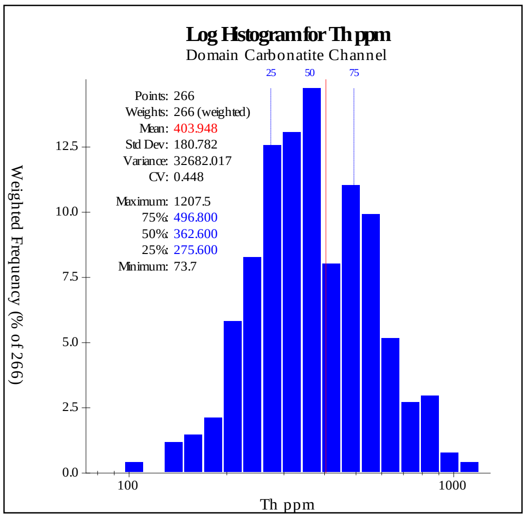


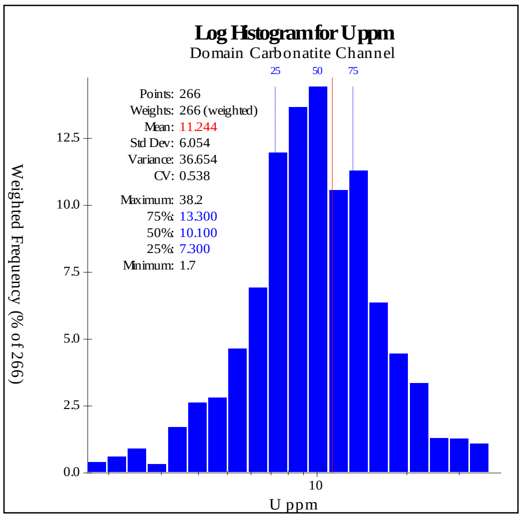


Carbonatite: Channel samples

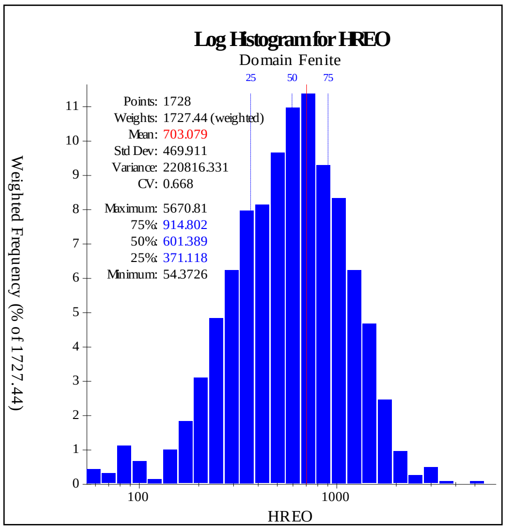


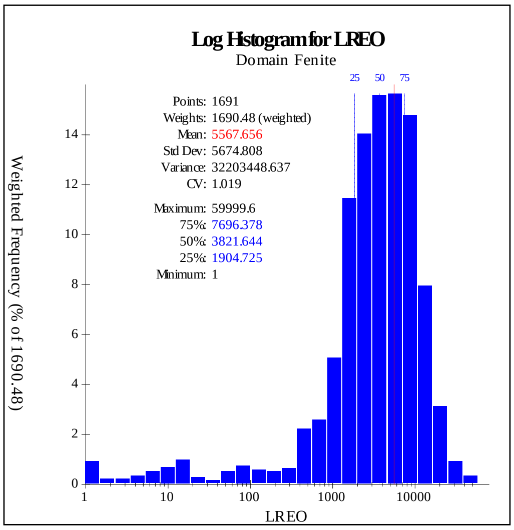


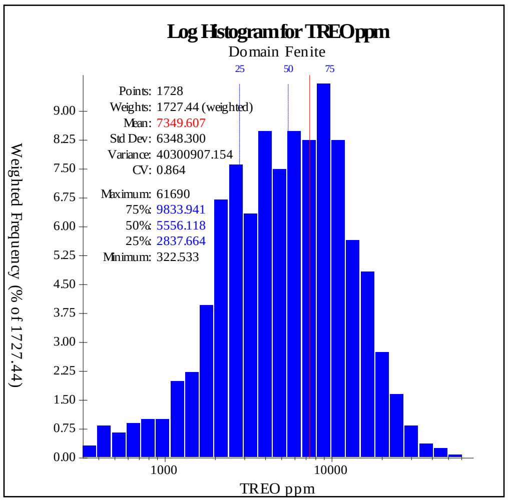


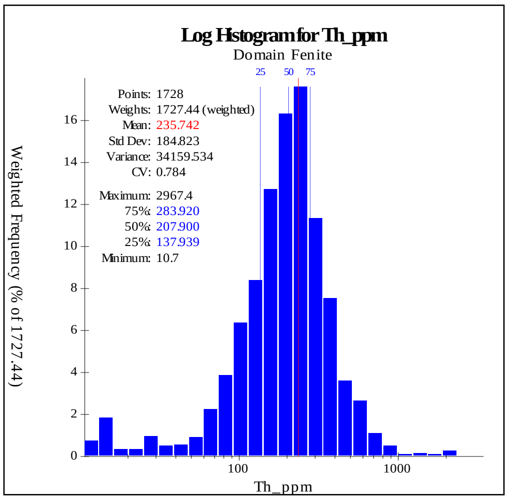


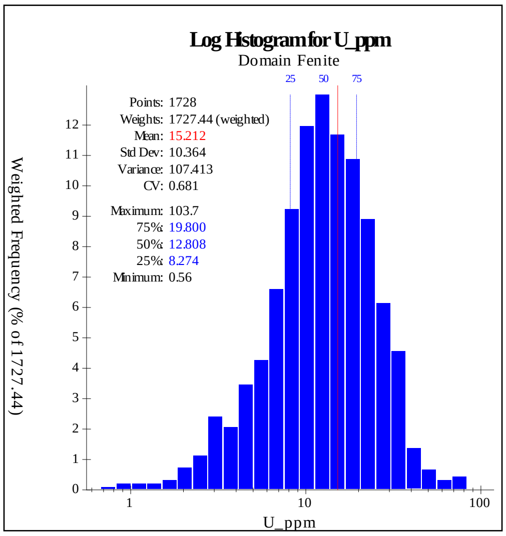
Fenite: Boreholes samples

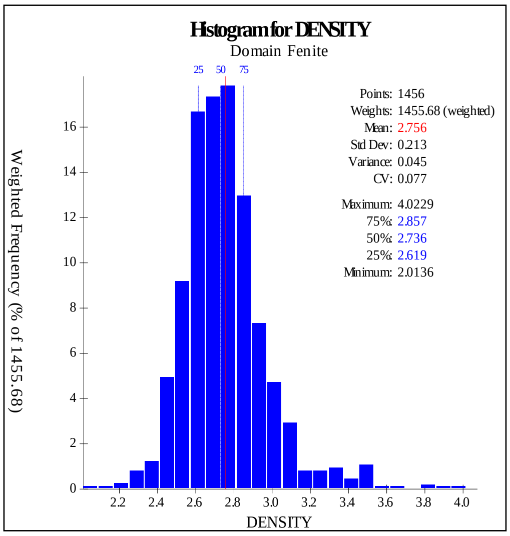




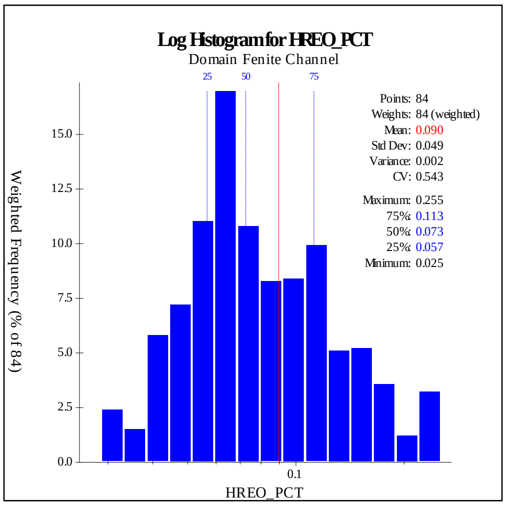


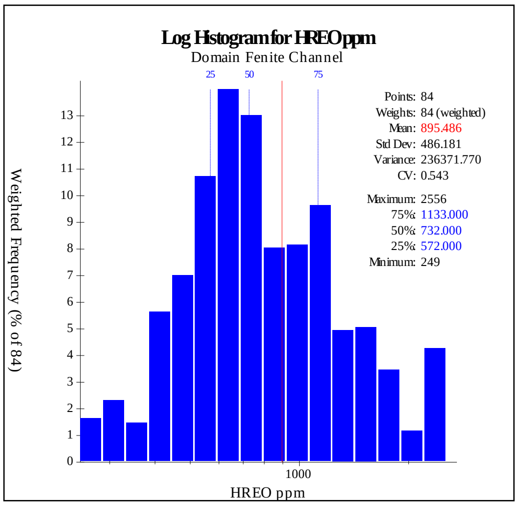


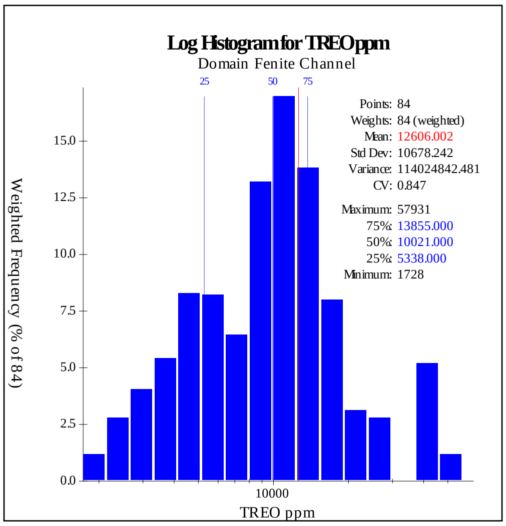


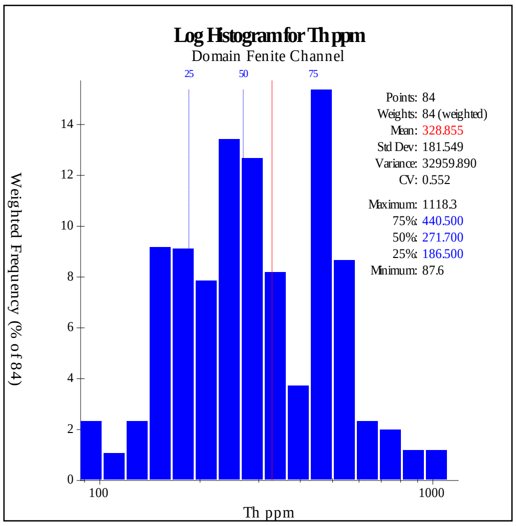


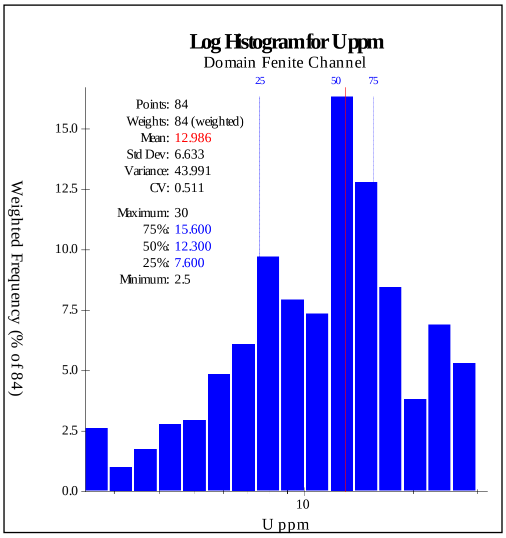
Fenite: Channel samples



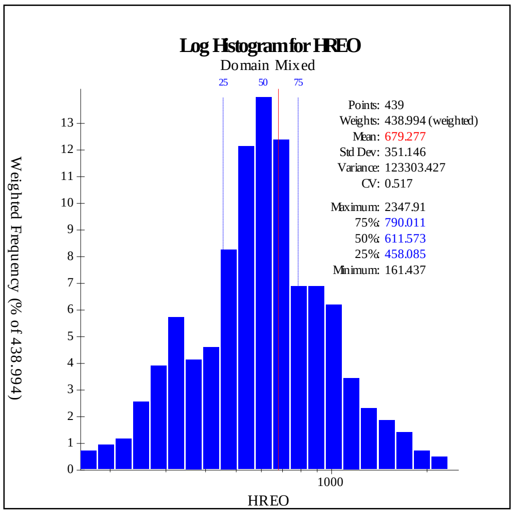


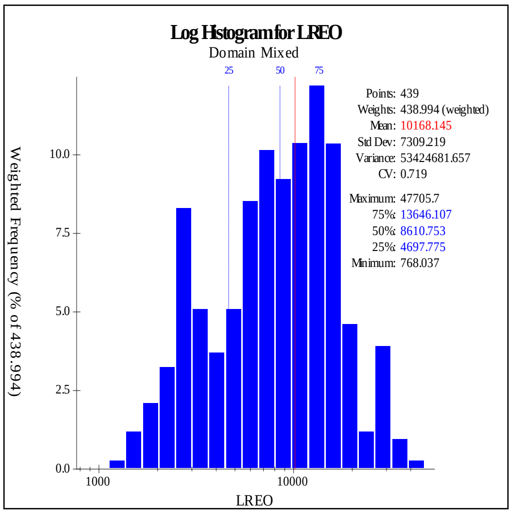


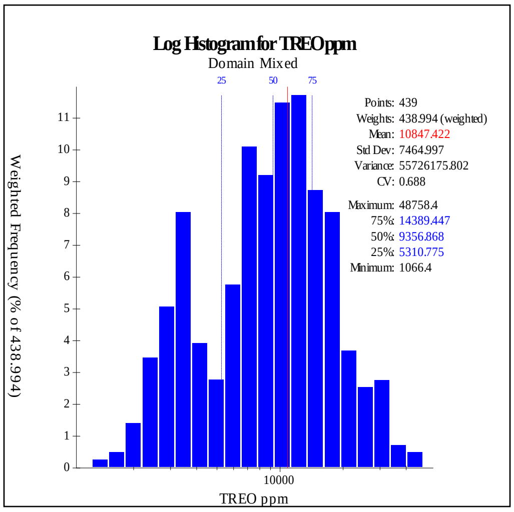


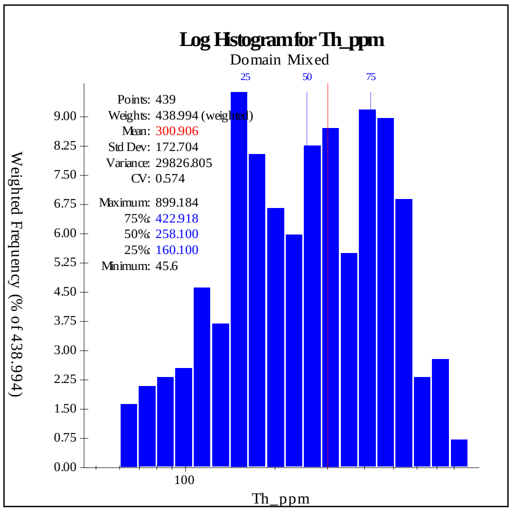


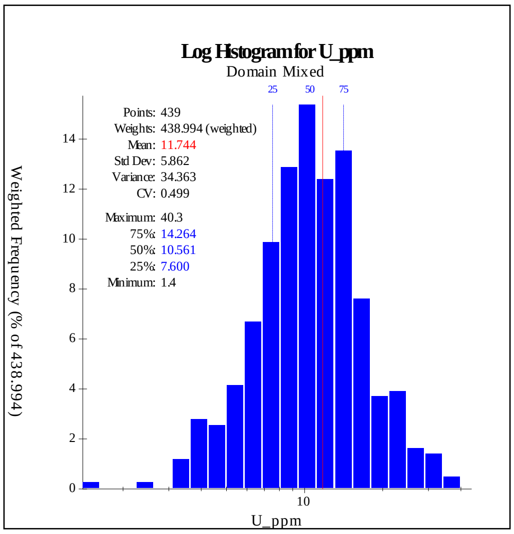
Mixed: Borehole samples

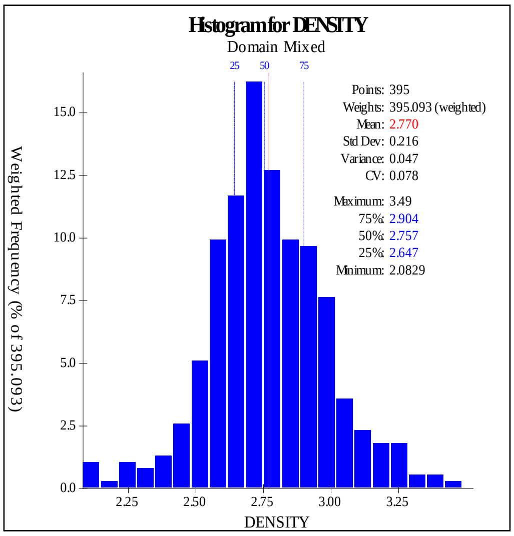




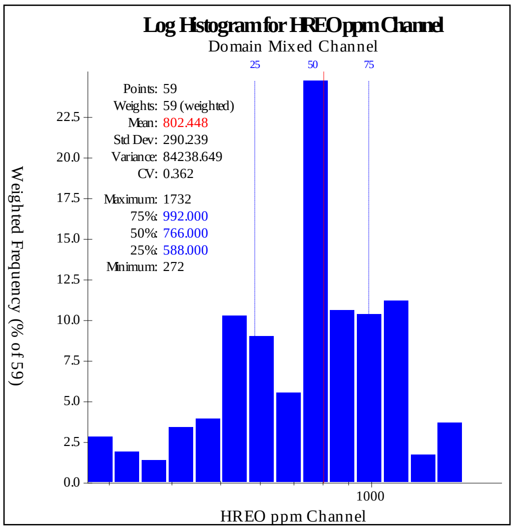


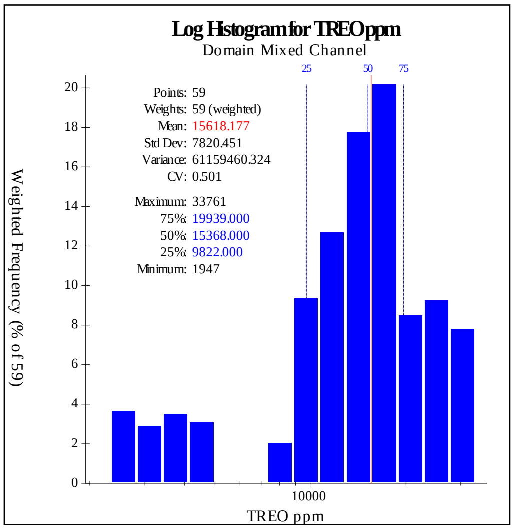


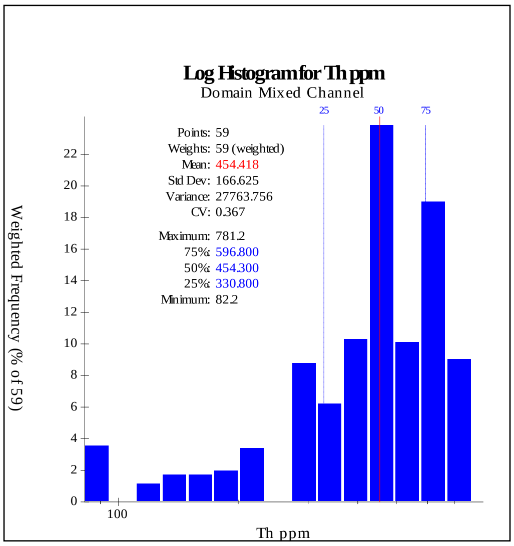


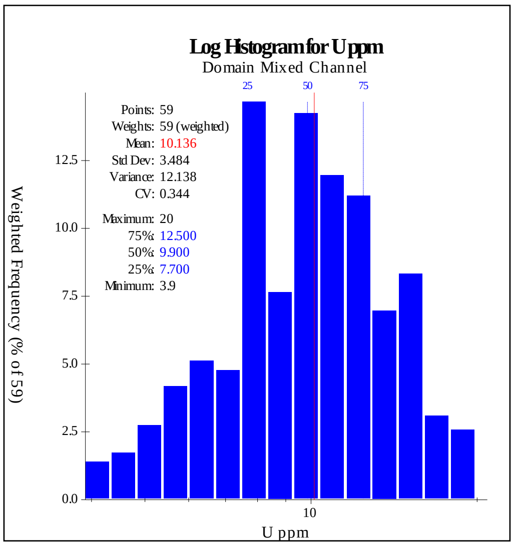


Mixed: Channel samples





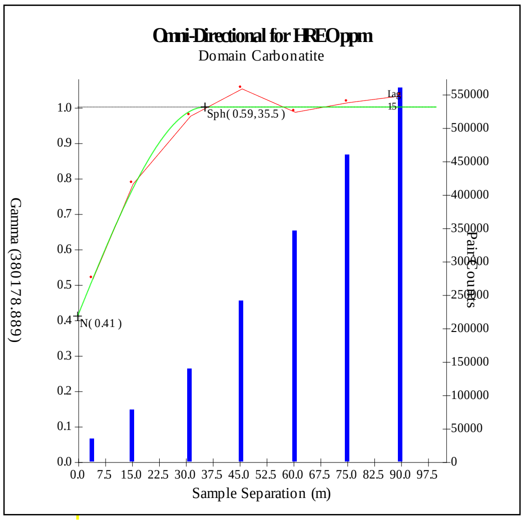


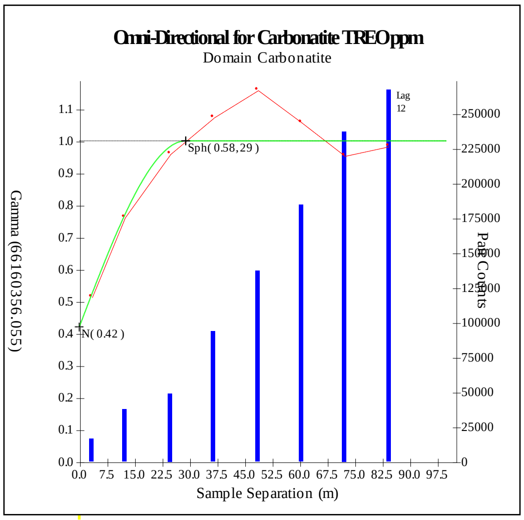


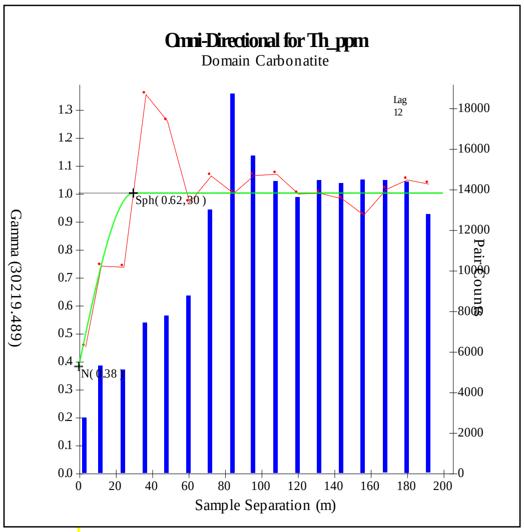
APPENDIX 5:

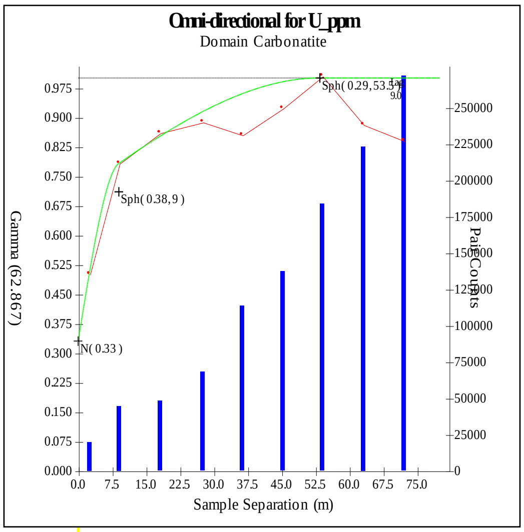
Variograms of 3 Domains

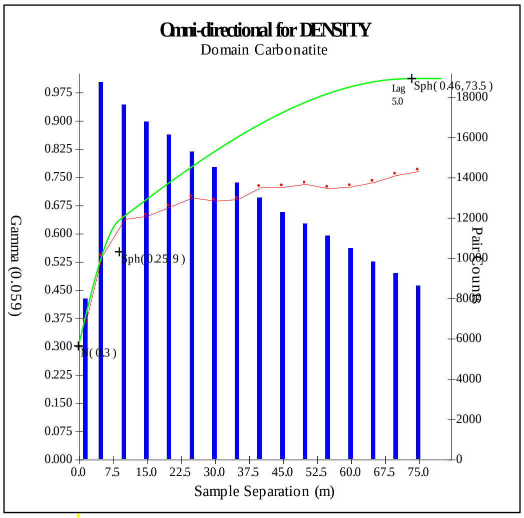
Carbonatite Domain



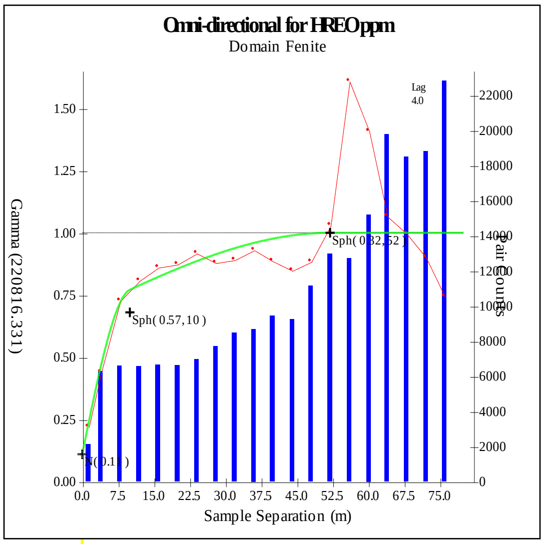


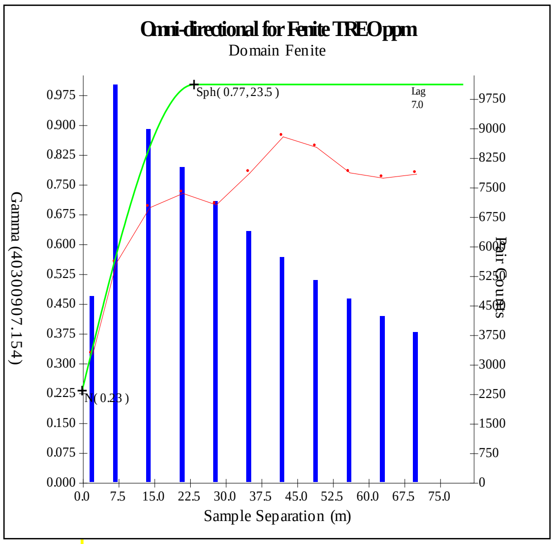


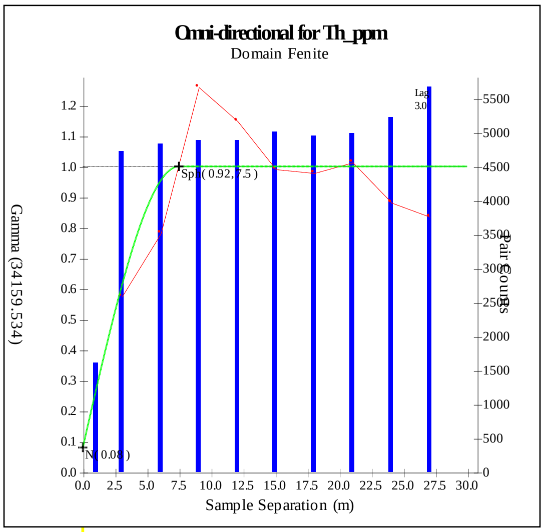


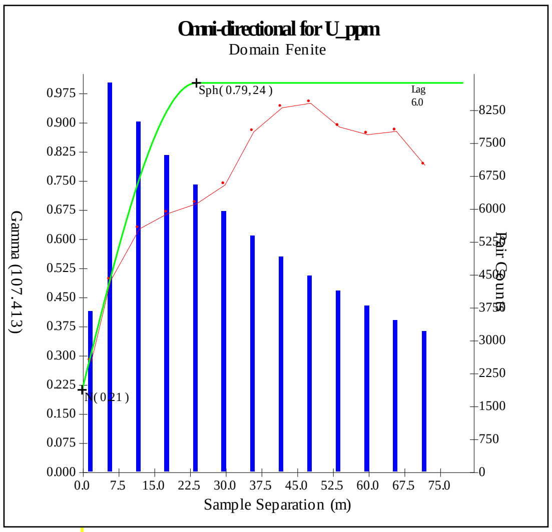


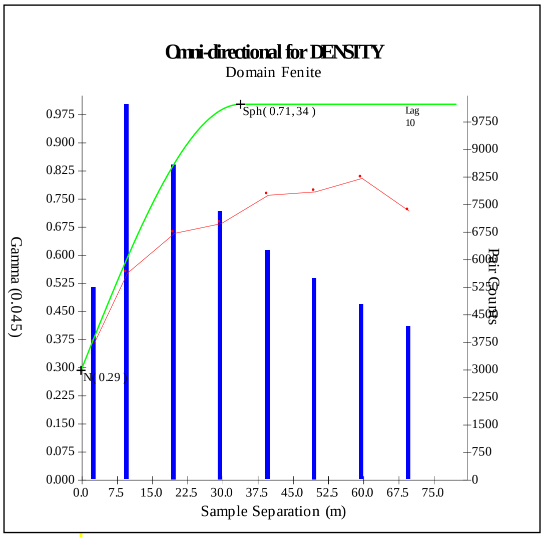
Fenite Domain



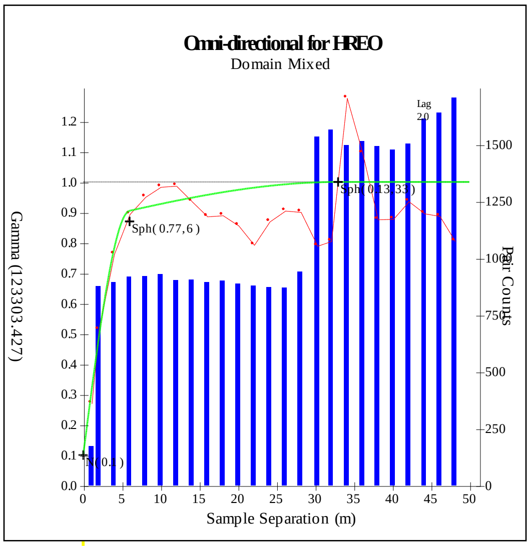


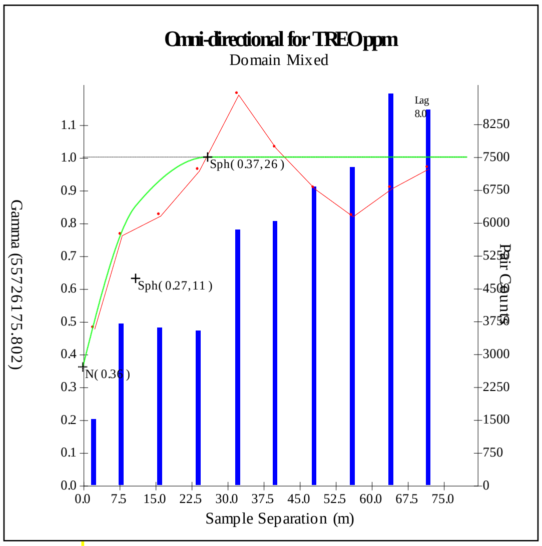


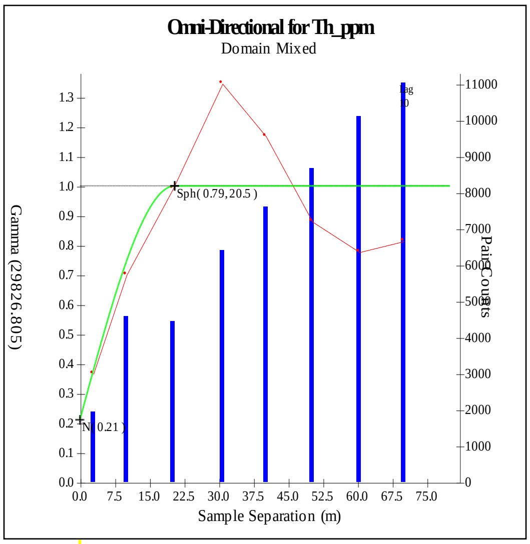


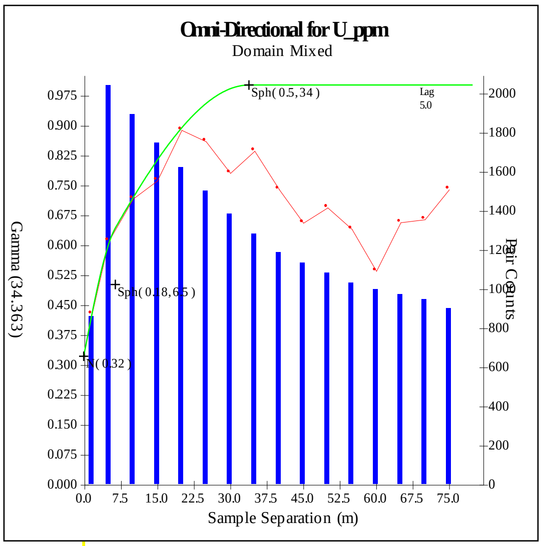


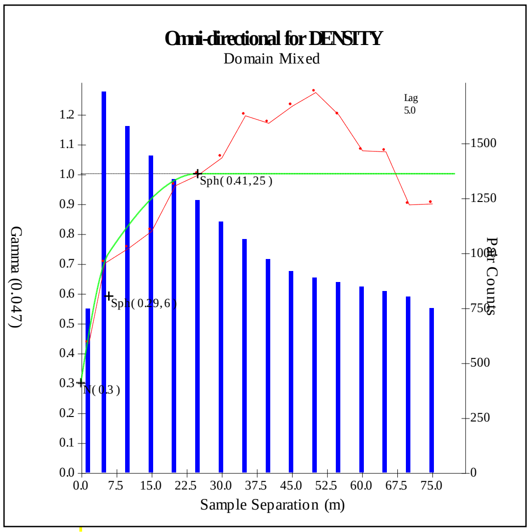
Mixed Domain











APPENDIX 6:

Individual REO Concentrations

REO Concentrations by Domain

In-situ Indicated Carbonatite Mineral Resource

Cut-Off	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
%TREO	Million	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
0.5	16.31	0.3274	0.5973	0.0642	0.2217	0.0321	1.2426	0.0085	0.0200	0.0024	0.0114	0.0018	0.0044	0.0006	0.0032	0.0004	0.0530	0.1058	1.3484	322	12
1	11.10	0.3951	0.7208	0.0775	0.2676	0.0387	1.4997	0.0095	0.0223	0.0027	0.0127	0.0021	0.0048	0.0006	0.0036	0.0005	0.0590	0.1178	1.6175	351	12
1.5	5.26	0.5022	0.9163	0.0985	0.3401	0.0492	1.9063	0.0103	0.0241	0.0029	0.0137	0.0022	0.0052	0.0007	0.0039	0.0005	0.0639	0.1275	2.0338	385	12
2	1.85	0.6582	1.2008	0.1291	0.4457	0.0645	2.4982	0.0104	0.0244	0.0029	0.0138	0.0022	0.0053	0.0007	0.0039	0.0005	0.0645	0.1286	2.6269	429	12

In-situ Inferred Carbonatite Mineral Resource

Cut-Off	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
%TREO	Million	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
0.5	17.09	0.2568	0.4686	0.0504	0.1739	0.0252	0.9748	0.0077	0.0180	0.0022	0.0102	0.0017	0.0039	0.0005	0.0029	0.0004	0.0476	0.0949	1.0698	304	12
1	8.64	0.3275	0.5974	0.0642	0.2218	0.0321	1.2430	0.0090	0.0211	0.0025	0.0120	0.0019	0.0046	0.0006	0.0034	0.0005	0.0559	0.1115	1.3545	324	11
1.5	1.90	0.4539	0.8281	0.0890	0.3074	0.0445	1.7228	0.0099	0.0233	0.0028	0.0132	0.0021	0.0051	0.0006	0.0037	0.0005	0.0616	0.1230	1.8458	349	11
2	0.39	0.6280	1.1457	0.1232	0.4253	0.0615	2.3837	0.0096	0.0224	0.0027	0.0127	0.0021	0.0049	0.0006	0.0036	0.0005	0.0593	0.1183	2.5020	358	11

In-situ Indicated Mixed Mineral Resource

Cut-Off	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
%TREO	Million	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
0.5	1.01	0.3749	0.6369	0.0642	0.2051	0.0278	1.3088	0.0061	0.0144	0.0017	0.0076	0.0012	0.0029	0.0004	0.0022	0.0003	0.0351	0.0717	1.3805	318	12
1	0.69	0.4520	0.7678	0.0774	0.2473	0.0335	1.5780	0.0063	0.0148	0.0017	0.0079	0.0013	0.0029	0.0004	0.0022	0.0003	0.0362	0.0739	1.6519	335	12
1.5	0.31	0.6051	1.0280	0.1037	0.3311	0.0448	2.1127	0.0069	0.0163	0.0019	0.0087	0.0014	0.0032	0.0004	0.0025	0.0003	0.0399	0.0816	2.1943	387	14
2	0.15	0.7440	1.2640	0.1275	0.4071	0.0551	2.5977	0.0069	0.0162	0.0019	0.0086	0.0014	0.0032	0.0004	0.0024	0.0003	0.0395	0.0808	2.6784	420	17

REO Concentrations by Domain

In-situ Inferred Mixed Mineral Resource

Cut-Off	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
%TREO	Million	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
0.5	1.90	0.4289	0.7287	0.0735	0.2347	0.0318	1.4976	0.0053	0.0125	0.0015	0.0066	0.0011	0.0025	0.0003	0.0019	0.0003	0.0305	0.0624	1.5600	251	11
1	1.68	0.4559	0.7746	0.0781	0.2495	0.0338	1.5918	0.0053	0.0125	0.0014	0.0066	0.0011	0.0025	0.0003	0.0019	0.0003	0.0304	0.0622	1.6541	248	11
1.5	1.43	0.4802	0.8158	0.0823	0.2628	0.0356	1.6766	0.0053	0.0124	0.0014	0.0066	0.0011	0.0025	0.0003	0.0019	0.0003	0.0302	0.0618	1.7384	243	11
2	0.11	0.6573	1.1167	0.1126	0.3597	0.0487	2.2950	0.0057	0.0134	0.0016	0.0071	0.0011	0.0027	0.0003	0.0020	0.0003	0.0327	0.0668	2.3618	255	11

In-situ Indicated Fenite Mineral Resource

Cut-Off	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
%TREO	Million	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
0.5	2.71	0.2876	0.5228	0.0563	0.1936	0.0292	1.0895	0.0064	0.0158	0.0020	0.0098	0.0016	0.0039	0.0005	0.0027	0.0004	0.0459	0.0889	1.1784	288	13
1	1.37	0.3980	0.7235	0.0779	0.2679	0.0404	1.5077	0.0076	0.0186	0.0024	0.0116	0.0019	0.0046	0.0006	0.0032	0.0004	0.0542	0.1050	1.6127	301	11
1.5	0.59	0.5236	0.9517	0.1025	0.3524	0.0531	1.9833	0.0088	0.0217	0.0028	0.0135	0.0022	0.0053	0.0007	0.0038	0.0005	0.0633	0.1226	2.1060	334	10
2	0.24	0.6478	1.1774	0.1268	0.4360	0.0657	2.4538	0.0101	0.0248	0.0032	0.0155	0.0025	0.0061	0.0008	0.0043	0.0006	0.0724	0.1402	2.5940	378	10

In-situ Inferred Fenite Mineral Resource

Cut-Off	Tonnes	La_2O_3	Ce_2O_3	Pr_2O_3	Nd_2O_3	Sm_2O_3	LREO	Eu_2O_3	Gd_2O_3	Tb_2O_3	Dy_2O_3	Ho_2O_3	Er_2O_3	Tm_2O_3	Yb_2O_3	Lu_2O_3	Y_2O_3	HREO	TREO	Th	U
%TREO	Million	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	ppm	ppm
0.5	17.47	0.2564	0.4661	0.0502	0.1726	0.0260	0.9713	0.0062	0.0153	0.0019	0.0095	0.0016	0.0038	0.0005	0.0026	0.0004	0.0446	0.0863	1.0577	271	13
1	8.27	0.3286	0.5973	0.0643	0.2212	0.0333	1.2448	0.0073	0.0180	0.0023	0.0112	0.0018	0.0044	0.0005	0.0031	0.0004	0.0523	0.1014	1.3462	295	12
1.5	1.73	0.4631	0.8417	0.0907	0.3117	0.0470	1.7541	0.0088	0.0215	0.0027	0.0134	0.0022	0.0053	0.0007	0.0037	0.0005	0.0627	0.1215	1.8756	331	11
2	0.41	0.5998	1.0901	0.1174	0.4037	0.0608	2.2719	0.0099	0.0243	0.0031	0.0151	0.0025	0.0060	0.0007	0.0042	0.0006	0.0707	0.1370	2.4089	350	11

APPENDIX 7:

Individual REO Distribution

REO Distribution by Domain

***In-situ* Indicated Carbonatite Mineral Resource - REO Distributions at 0.5%, 1.0%, 1.5% and 2.0% TREO Cut-Offs**

Cut-Off %TREO	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
0.5	24.28	44.29	4.76	16.44	2.38	0.63	1.49	0.18	0.84	0.14	0.32	0.04	0.24	0.03	3.93	100
1	24.43	44.56	4.79	16.54	2.39	0.59	1.38	0.17	0.78	0.13	0.30	0.04	0.22	0.03	3.65	100
1.5	24.69	45.05	4.84	16.72	2.42	0.51	1.19	0.14	0.67	0.11	0.26	0.03	0.19	0.03	3.14	100
2	25.06	45.71	4.91	16.97	2.45	0.40	0.93	0.11	0.53	0.09	0.20	0.03	0.15	0.02	2.45	100

***In-situ* Inferred Carbonatite Mineral Resource - REO Distributions at 0.5%, 1.0%, 1.5% and 2.0% TREO Cut-Offs**

Cut-Off %TREO	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
0.5	24.01	43.80	4.71	16.26	2.35	0.72	1.68	0.20	0.95	0.15	0.37	0.05	0.27	0.04	4.45	100
1	24.18	44.11	4.74	16.37	2.37	0.67	1.56	0.19	0.89	0.14	0.34	0.04	0.25	0.03	4.12	100
1.5	24.59	44.86	4.82	16.65	2.41	0.54	1.26	0.15	0.72	0.12	0.27	0.04	0.20	0.03	3.34	100
2	25.10	45.79	4.92	17.00	2.46	0.38	0.90	0.11	0.51	0.08	0.19	0.02	0.14	0.02	2.37	100

***In-situ* Indicated Mixed Mineral Resource - REO Distributions at 0.5%, 1.0%, 1.5% and 2.0% TREO Cut-Offs**

Cut-Off %TREO	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
0.5	27.15	46.13	4.65	14.86	2.01	0.44	1.04	0.12	0.55	0.09	0.21	0.03	0.16	0.02	2.54	100
1	27.36	46.48	4.69	14.97	2.03	0.38	0.90	0.10	0.48	0.08	0.18	0.02	0.13	0.02	2.19	100
1.5	27.58	46.85	4.72	15.09	2.04	0.32	0.74	0.09	0.40	0.06	0.15	0.02	0.11	0.02	1.82	100
2	27.78	47.19	4.76	15.20	2.06	0.26	0.60	0.07	0.32	0.05	0.12	0.02	0.09	0.01	1.47	100

REO Distribution by Domain

***In-situ* Inferred Mixed Mineral Resource - REO Distributions at 0.5%, 1.0%, 1.5% and 2.0% TREO Cut-Offs**

Cut-Off %TREO	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
0.5	27.50	46.71	4.71	15.05	2.04	0.34	0.80	0.09	0.43	0.07	0.16	0.02	0.12	0.02	1.96	100
1	27.56	46.83	4.72	15.08	2.04	0.32	0.75	0.09	0.40	0.06	0.15	0.02	0.11	0.02	1.84	100
1.5	27.62	46.93	4.73	15.12	2.05	0.30	0.71	0.08	0.38	0.06	0.14	0.02	0.11	0.02	1.74	100
2	27.83	47.28	4.77	15.23	2.06	0.24	0.57	0.07	0.30	0.05	0.11	0.01	0.09	0.01	1.38	100

In-situ Indicated Fenite Mineral Resource - REO Distributions at 0.5%, 1.0%, 1.5% and 2.0% TREO Cut-Offs

Cut-Off %TREO	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
0.5	24.41	44.36	4.78	16.43	2.48	0.54	1.34	0.17	0.83	0.14	0.33	0.04	0.23	0.03	3.89	100
1	24.68	44.86	4.83	16.61	2.50	0.47	1.15	0.15	0.72	0.12	0.28	0.04	0.20	0.03	3.36	100
1.5	24.86	45.19	4.87	16.73	2.52	0.42	1.03	0.13	0.64	0.11	0.25	0.03	0.18	0.02	3.01	100
2	24.97	45.39	4.89	16.81	2.53	0.39	0.96	0.12	0.60	0.10	0.24	0.03	0.17	0.02	2.79	100

***In-situ* Inferred Fenite Mineral Resource - REO Distributions at 0.5%, 1.0%, 1.5% and 2.0% TREO Cut-Offs**

Cut-Off %TREO	La_2O_3 %	Ce_2O_3 %	Pr_2O_3 %	Nd_2O_3 %	Sm_2O_3 %	Eu_2O_3 %	Gd_2O_3 %	Tb_2O_3 %	Dy_2O_3 %	Ho_2O_3 %	Er_2O_3 %	Tm_2O_3 %	Yb_2O_3 %	Lu_2O_3 %	Y_2O_3 %	Total %
0.5	24.25	44.07	4.75	16.32	2.46	0.59	1.45	0.18	0.90	0.15	0.36	0.04	0.25	0.03	4.21	100
1	24.41	44.37	4.78	16.43	2.48	0.54	1.33	0.17	0.83	0.14	0.33	0.04	0.23	0.03	3.89	100
1.5	24.69	44.88	4.83	16.62	2.50	0.47	1.15	0.15	0.71	0.12	0.28	0.04	0.20	0.03	3.34	100
2	24.90	45.26	4.88	16.76	2.53	0.41	1.01	0.13	0.63	0.10	0.25	0.03	0.17	0.02	2.93	100

PART IV

FINANCIAL INFORMATION ON THE GROUP

A Audited consolidated historical financial information on the Group for each of the three years ended 31 December 2015

Consolidated Financial Statements of

MKANGO RESOURCES LTD.

For the years ended December 31, 2013 and 2012

Management's Responsibility

To the Shareholders of Mkango Resources Ltd.:

Management is responsible for the preparation and presentation of the accompanying consolidated financial statements, including responsibility for significant accounting judgments and estimates in accordance with International Financial Reporting Standards. This responsibility includes selecting appropriate accounting principles and methods, and making decisions affecting the measurement of transactions in which objective judgment is required.

In discharging its responsibilities for the integrity and fairness of the consolidated financial statements, management designs and maintains the necessary accounting systems and related internal controls to provide reasonable assurance that transactions are authorized, assets are safeguarded and financial records are properly maintained to provide reliable information for the preparation of consolidated financial statements.

The Board of Directors has appointed an Audit Committee, consisting primarily of Directors who are neither management nor employees of the Company. The Audit Committee is responsible for overseeing management in the performance of its financial reporting responsibilities, and for approving the financial information included in the annual report. The Audit Committee has the responsibility of meeting with management, and the external auditors to discuss the internal controls over the financial reporting process, auditing matters and financial reporting issues. The Audit Committee is also responsible for recommending the appointment of the Company's external auditors.

MNP LLP, an independent firm of Chartered Accountants, is appointed by the Shareholders to audit the consolidated financial statements and report directly to them; their report follows. The external auditors have full and free access to, and meet periodically and separately with, both the Audit Committee and management to discuss their audit findings.

Signed "Alex Lemon"	*Signed "Sandra Beaulieu"*
Alex Lemon, President	Sandra Beaulieu, CFO

April 26, 2014

Independent Auditors' Report

To the Shareholders of Mkango Resources Ltd.:

We have audited the accompanying consolidated financial statements of Mkango Resources Ltd. and its subsidiaries, which comprise the consolidated statements of financial position as at December 31, 2013 and 2012, and the consolidated statements of comprehensive loss, cash flows and changes in equity for the years then ended, and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with International Financial Reporting Standards, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We conducted our audits in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform an audit to obtain reasonable assurance whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditors' judgment including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained in our audits is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of Mkango Resources Ltd. and its subsidiaries as at December 31, 2013 and 2012, and their financial performance and their cash flows for the years then ended, in accordance with International Financial Reporting Standards.

Emphasis of Matter

Without qualifying our opinion, we draw attention to Note 2 in the consolidated financial statements which indicates the existence of a material uncertainty that may cast significant doubt on Mkango Resources Ltd.'s ability to continue as a going concern.

MNP LLP

Chartered Accountants

April 26, 2014
Calgary, Alberta

1500, 640 – 5th Avenue SW, Calgary, Alberta T2P 3G4, Phone: (403) 263-3385, 1 (877) 500-0792

Consolidated Statements of Financial Position
Reported in US dollars

As at:	*Notes*	*December 31, 2013*	*December 31, 2012*
ASSETS			
Current			
Cash and cash equivalents		$437,378	$320,766
Restricted cash	5	2,941	4,018
Accounts receivable		3,475	5,964
Prepaid expenses and deposits		58,242	110,466
Total currents assets		502,036	441,214
Property and equipment	6	5,051	6,313
Total assets		507,087	447,527
LIABILITIES			
Current			
Accounts payable and accrued liabilities		185,112	142,807
Due to related party	7	6,540	—
Warrants – derivative financial instruments	8(b)	18,115	—
Total current liabilities		209,767	142,807
EQUITY			
Share capital	8(a)	7,370,698	5,632,076
Contributed surplus		2,080,195	1,928,324
Deficit		(9,153,573)	(7,255,680)
Total equity		297,320	304,720
Total liabilities and equity		$507,087	$447,527

Going concern	2
Commitments	11
Subsequent events	13

Approved on behalf of the Board:

(signed) "William Dawes"
William Dawes, CEO and Director

(signed) "David Berg"
David Berg, Director

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Comprehensive Loss
Reported in US dollars

		For the year ended:	
	Notes	*December 31, 2013*	*December 31, 2012*
Expenses			
General and administrative		$1,257,192	$1,309,607
Mineral exploration expenditures		773,446	2,248,336
Depreciation	6	1,262	2,462
Share-based payments	8(c)	112,676	191,447
		2,144,576	3,751,852
Other items			
Interest income		(15)	(2,373)
Gain on revaluation of warrants	8(b)	(317,870)	(823,459)
Gain on forgiveness of amount due to related party		—	(15,343)
Foreign exchange loss (gain)		71,202	(52,034)
Net loss and comprehensive loss		$(1,897,893)	$(2,858,643)
Net loss per share – basic and diluted		$(0.04)	$(0.08)
Weighted average shares outstanding basic and diluted		47,415,063	37,442,855

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Cash Flows
Reported in US dollars

	Notes	For the year ended: December 31, 2013	December 31, 2012
Cash flow from operating activities			
Net loss and comprehensive loss for the year		$(1,897,893)	$(2,858,643)
Items not affecting cash:			
Share-based payments	8(c)	112,676	191,447
Gain on revaluation of warrants	8(b)	(317,870)	(823,459)
Depreciation	6	1,262	2,462
Gain on forgiveness of loan due to related party		—	(15,343)
Unrealized foreign exchange gain	8(b)	(848)	(19,592)
Change in non-cash operating capital			
Accounts receivable and prepaid expenses and deposit		54,713	98,535
Accounts payable and accrued liabilities and due to related party		48,845	9,957
Cash used by operating activities		(1,999,115)	(3,414,636)
Cash flow from financing activities			
Issue of share capital, net of issue costs	8(a)	2,114,650	—
Change in cash and cash equivalents		115,535	(3,414,636)
Cash and cash equivalents at the beginning of the year		324,784	3,739,420
Cash reclassified to restricted cash		(2,941)	(4,018)
Cash and cash equivalents at the end of the year		$437,378	$320,766

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Changes in Equity
Reported in US dollars

	Share capital	*Contributed Surplus*	*Deficit*	*Total*
Balance at December 31, 2011	$5,632,076	$1,736,877	$(4,397,037)	$2,971,916
Share based payments	—	191,447	—	191,447
Net loss and comprehensive loss	—	—	(2,858,643)	(2,858,643)
Balance at December 31, 2012	$5,632,076	$1,928,324	$(7,255,680)	$304,720
Common shares issued	2,252,209	—	—	2,252,209
Share issue costs	(176,754)	39,195	—	(137,559)
Warrant valuation	(336,833)	—	—	(336,833)
Share based payments	—	112,676	—	112,676
Net loss and comprehensive loss	—	—	(1,897,893)	(1,897,893)
Balance at December 31, 2013	$7,370,698	$2,080,195	$(9,153,573)	$297,320

Refer to accompanying notes to the consolidated financial statements.

Notes to the Consolidated Financial Statements
For the years ended December 31, 2013 and 2012
(reported in US dollars unless indicated otherwise)

1. General information

The principal business of Mkango Resources Ltd (the "Company" or "Mkango") is rare earth element and associated minerals exploration and development in the Republic of Malawi, Africa.

The Company was incorporated under the name Alloy Capital Corp. ("Alloy") on November 13, 2007 under the laws of the Province of Alberta, Canada. On December 20, 2010, Alloy was acquired through a "reverse takeover" by Lancaster Exploration ("Lancaster"). The articles of the Company were amended to change the name of the Company from Alloy Capital Corp. to Mkango Resources Ltd. Mkango's head office is located at 259 Windermere Road SW, Calgary, Alberta Canada, T3C 3L2.

Lancaster was incorporated August 3, 2007 by Memorandum and Articles of Association issued pursuant to the provisions of the BVI Companies Act. Lancaster's registered office is located at 56 Administration Drive, Wickhams Cay 1, Road Town, Tortola, British Virgin Islands.

On May 19, 2011, Lancaster Exploration Limited was incorporated under the laws of Blantyre, Malawi. Lancaster Exploration Limited is a wholly owned subsidiary of Lancaster.

The consolidated financial statements were authorized for issuance by the Board of Directors of the Company on April 26, 2014.

2. Going concern

These consolidated financial statements have been prepared on a going concern basis, which contemplates the realization of assets and the payment of liabilities in the ordinary course of business. The Company incurred a net loss of $1,897,893 for the year ended December 31, 2013 (2012 – $2,858,643) and has a deficit of $9,153,573 (2012 – $7,255,680). The Company is in the process of acquiring, exploring and developing its mineral interests. These factors indicate the existence of a material uncertainty that cast significant doubt on the Company's ability to continue as a going concern.

The operations of the Company for the next 12 months will be funded by a non-brokered private placement ("Financing"), which closed in two tranches on March 24, 2014 and April 3, 2014 (Note 13).

Should the Company be unable to continue as a going concern, it may be unable to realize the carrying value of its assets and to meet its liabilities as they become due. These consolidated financial statements do not reflect the adjustments or reclassification of assets and liabilities, which would be necessary if the Company were unable to continue its operations.

3. Basis of presentation

(a) ***Statement of compliance***

These consolidated financial statements have been prepared in accordance with International Financial Reporting Standards ("IFRS") as issued by the International Accounting Standards Board ("IASB") and interpretations issued by the International Financial Reporting Interpretations Committee ("IFRIC"), in effect on December 31, 2013.

(b) ***Basis of presentation and measurement***

These consolidated financial statements have been prepared using the historical cost convention, except for certain financial instruments measured at fair value through profit and loss ("FVTPL") and share-based payment transactions measured at fair value.

(c) ***Functional and presentation currency***

The consolidated financial statements are presented in US dollars, which is the functional currency of the Company and its subsidiaries.

(d) ***Principles of consolidation***

The accompanying consolidated financial statements of the Company include the accounts of the Company and its wholly owned subsidiaries. All intercompany balances and transactions are eliminated upon consolidation.

(e) ***Use of estimates and judgments***

The preparation of the consolidated financial statements in conformity with IFRS requires management to make judgments, estimates and assumptions that affect the application of accounting policies and the reported amounts of assets, liabilities, income and expenses. Actual results may differ from these estimates.

Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the period in which the estimates are revised and in any future periods affected.

Key areas of judgement made in applying the Company's accounting policies are as follows:

(i) *Exploration and evaluation expenditures (Note 4a)*

Costs incurred in respect of properties that have been determined to have proved reserves and for which an environmental impact study has been completed, are classified as development and production assets. In such circumstances, technical feasibility and commercial viability are considered to be established. Costs incurred in respect of new prospects with no established development past or present and no proved or probable reserves assigned are classified as exploration and evaluation expenses and are recognized in the statement of comprehensive loss. The decision to transfer assets from exploration and evaluation to property and equipment is subject to management's judgement regarding the project's commercial viability and technical feasibility. As at December 31, 2013, management has determined that the Company has not yet reached the development and production stage.

(ii) *Functional currency*

The functional currency of the Company and its subsidiaries is the currency of the primary economic environment in which each entity operates. The Company has determined the functional currency of each consolidated entity as the US dollar. Determination of functional currency may involve certain judgments to determine the primary economic environment and the Company reconsiders the functional currency of each entity if there is a change in events and conditions, which determine the primary economic environment.

Key areas of estimation where management has made difficult, complex or subjective assumptions, often as a result of matters inherently uncertain are as follows:

(i) *Measurement of share based payments and warrant valuation (Note 8c)*

The Company uses an option pricing model to determine the fair value of share-based payments and warrants. Inputs to the model are subject to various estimates about volatility, interest rates, dividend yields, forfeiture rates and expected life of the equity instruments issued. Fair value inputs are subject to market factors as well as internal estimates. The Company considers historic trends together with any new information to determine the best estimate of fair value at the date of grant.

(ii) *Income taxes (Note 9)*

The Company follows the liability method for calculating deferred taxes. Differences between the amounts reported in the consolidated financial statements of the Company and their respective tax bases are applied to tax rates in effect to calculate the deferred tax asset or liability. In addition, the Company recognizes the future tax benefit related to deferred tax assets to the extent that it is probable that the deductible temporary differences will reverse in the foreseeable future. Assessing the recoverability of deferred tax assets requires the Company to make significant estimates related to the expectations of future cash flows from operations and the application of existing tax laws in each jurisdiction. Additionally, future changes in tax laws in the jurisdictions in which the Company operates could limit the ability of the Company to obtain tax deductions in future periods.

(iii) *Determination of fair values (Note 10)*

The estimated fair value of financial assets and liabilities, by their very nature, are subject to measurement uncertainty.

(f) ***New accounting policies***

On January 1, 2013, Mkango adopted the following standards and amendments, which became effective for annual periods on or after January 1, 2013:

IAS 1, "Presentation of Financial Statements" which requires companies to group together items within other comprehensive income that may be reclassified to the net earnings section of the statement of comprehensive income or loss. The retrospective adoption of this amendment did not have any impact on the consolidated financial statements.

IFRS 7, "Financial Instruments: Disclosures" was amended to develop common disclosure requirements for financial assets and financial liabilities that are offset in the financial statements, or that are subject to enforceable master netting arrangements or similar agreements. The adoption of this amendment had no impact on the consolidated financial statements.

IFRS 10, "Consolidated Financial Statements," supersedes IAS 27 "Consolidated and Separate Financial Statements". This standard provides a single model to be applied in control analysis for all investees including special purpose entities. The adoption of this standard had no impact on the amounts recorded in the consolidated financial statements.

IFRS 11, "Joint Arrangements" replaces IAS 31 "Interests in Joint Ventures" along with amending IAS 28 "Investment in Associates". IFRS 11, "Joint Arrangements," requires a participant in a joint arrangement ("participant") to classify it's interest as a joint venture or joint operation. Joint ventures will be accounted for using the equity method of accounting whereas for a joint operation the participant recognizes its share of the assets, liabilities, revenue and expenses of the joint operation. Under previous IFRS, entities had the choice to proportionately consolidate or equity account for interests in joint ventures. The Company performed a review of its interest in other entities and did not identify any interests for which, it shares joint control, as such, there is no impact as a result of this standard.

IFRS 12, "Disclosure of Interests in Other Entities," combines the disclosure requirements for entities that have interest in subsidiaries, joint arrangements, and associates as well as consolidated structured entities. The adoption of this standard had no impact on the disclosures required in the consolidated financial statements.

IFRS 13, "Fair Value Measurement," establishes a framework for measuring fair value and sets out disclosure requirements for fair value measurements. This standard defines fair value as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The disclosure requirements of this standard have been applied as part of Note 10 to the consolidated financial statements.

(g) ***New IFRS pronouncements not yet implemented***

The following IFRS pronouncements have been issued by the IASB as at December 31, 2013 but are not yet effective. The Company does not plan to early adopt any of these new or amended standards and interpretations and is currently assessing the impact of these new or amended standards and interpretations. Certain other new standards and interpretations have been issued but are not shown as they are not expected to have a material impact on the Company's financial statements.

IFRS 2, "Share-based Payment". The amendments to IFRS 2, issued in December 2013, were made to the definitions of "vesting conditions" and "market conditions" and the definitions of "performance condition" and "service condition" were added. A performance condition requires the counterparty to complete a specified period of service and to meet a specified performance target during the service period. A service condition solely requires the counterparty to complete a specified period of service. The amendments are to be prospectively applied to share-based payment transactions for which the grant date is on or after July 1, 2014.

IFRS 3, "Business combinations". The amendments to IFRS 3, issued in December 2013, clarify the accounting for contingent consideration in a business combination. At each reporting period, an entity measures contingent consideration classified as an asset or a financial liability at fair value, with changes in fair value recognized in profit or loss. The amendments are effective for business combinations for which the acquisition date is on or after July 1, 2014.

IFRS 9, "Financial instruments". In November 2013, IFRS 9 was amended with significant changes to hedge accounting. In addition, an entity can now apply the "own credit requirement" in isolation without the need to change any other accounting for financial instruments. The standard is effective for annual periods beginning on or after January 1, 2018.

IAS 24, "Related party disclosures". The amendments to IAS 24, issued in December 2013, clarify that a management entity, or any member of a group of which it is a part, that provides key management services to a reporting entity, or its parent, is a related party of the reporting entity. The amendments also require an entity to disclose amounts incurred for key management personnel services provided by a separate management entity. This replaces the more detailed disclosure by category required for other key management personnel compensation. The amendments will only affect disclosure and are effective for annual periods beginning on or after July 1, 2014.

IAS 36, "Impairment of Assets". The amendment to IAS 36, issued May 2013, limits disclosure requirements to the recoverable amounts of an impaired cash generating unit ("CGU") when the carrying value is based on fair value less cost to sell. The amendments are to be applied retrospectively for annual periods beginning on or after January 1, 2014.

IFRIC 21, "Levies". IFRIC 21 Levies, issued in May 2013, provides guidance on the accounting for levies within the scope of IAS 37 provisions, contingent liabilities and contingent assets. The main features of IFRIC 21 are as follows:

- The obligating event that gives rise to a liability to pay a levy is the activity that triggers the payment of the levy, as identified by the legislation; and
- The liability to pay a levy is recognized progressively if the obligating event occurs over a period of time.

The standard is effective for annual periods beginning on or after January 1, 2014.

4. Significant accounting policies

The following accounting policies have been applied consistently in dealing with items which are considered material in relation to the Company's consolidated financial statements.

(a) ***Intangible exploration and property and equipment assets***

(i) *Recognition and measurement*

Exploration and evaluation ("E&E") expenditures

Exploration and evaluation costs which would typically include pre-licensing, preliminary property evaluation, drilling and directly attributable general and administrative costs are recognized in the statement of comprehensive loss as mineral exploration expenditures, including the costs of acquiring licences pending determination of technical feasibility and commercial viability.

The technical feasibility and commercial viability of extracting a resource is considered to be determinable based on several factors including the assignment of proven reserves. Upon determination of technical feasibility and commercial viability, the costs incurred prospectively are capitalized to a separate category within property and equipment referred to as mineral interests.

Property and equipment ("P&E") expenditures

Items of property and equipment, which include mineral interests, are measured at cost less accumulated depletion and depreciation and accumulated impairment losses. Development and production assets are grouped into CGUs for impairment testing and categorized within property and equipment as mineral interests. Property and equipment is comprised of drilling and mining servicing assets, office equipment and other corporate assets. When significant parts of an item of property and equipment, including mineral interests, have different useful lives, they are accounted for as separate items (major components).

Property and equipment assets, categorized as mineral interests, are assessed for impairment if facts and circumstances suggest that the carrying amount exceeds the recoverable amount.

Gains and losses on disposal of an item of property and equipment, including mineral interests, are determined by comparing the proceeds from disposal with the carrying amount of property and equipment and are recognized within the consolidated statement of comprehensive loss.

(ii) *Subsequent costs*

Costs incurred subsequent to the determination of technical feasibility and commercial viability and the costs of replacing parts of property and equipment are capitalized only when they increase the future economic benefits embodied in the specific asset to which they relate. All other expenditures are recognized in the consolidated statement of comprehensive loss, as incurred. Such capitalized costs generally represent costs incurred in developing proved and/or probable reserves and bringing in or enhancing production from such reserves, and is accumulated on a property-by-property basis. The carrying amount of any replaced or sold component is derecognized. The costs of the day-to-day servicing of property and equipment are recognized in the consolidated statement of comprehensive loss, as incurred.

(iii) *Depletion and depreciation*

The net carrying value of development or production assets will be depleted using the unit of production method by reference to the ratio of production in the year to the related proven and probable reserves, taking into account estimated future development costs necessary to bring those mineral reserves into production. Future development costs are estimated taking into account the level of development required to produce the reserves.

Corporate assets including vehicles are recorded at cost and are depreciated over the estimated useful life of the asset using the declining balance based on a 20 per cent. rate. Depreciation methods, useful lives and residual values are reviewed at each reporting date.

(b) ***Impairment***

(i) *Financial assets*

A financial asset is assessed at each reporting date to determine whether there is any objective evidence that it is impaired. A financial asset is considered to be impaired if objective evidence indicates that one or more events have had a negative effect on the estimated future cash flows of that asset.

An impairment loss in respect of a financial asset measured at amortized cost is calculated as the difference between its carrying amount and the present value of the estimated future cash flows discounted at the original effective interest rate. Individually significant financial assets are tested for impairment on an individual basis. The remaining financial assets are assessed collectively in groups that share similar credit risk characteristics.

All impairment losses are recognized in the consolidated statement of comprehensive loss.

An impairment loss is reversed if the reversal can be related objectively to an event occurring after the impairment loss was recognized. For financial assets measured at amortized cost the reversal is recognized in the consolidated statement of comprehensive loss.

(ii) *Non-financial assets*

The carrying amounts of the Company's non-financial assets are reviewed at each reporting date to determine whether there is any indication of impairment. If any such indication exists, then the asset's recoverable amount is estimated.

For the purpose of impairment testing, assets are grouped together into the smallest group of assets that generates cash inflows from continuing use that are largely independent of the cash inflows of other assets or groups of assets (the "cash-generating unit" or "CGU"). The recoverable amount of an asset or a CGU is the greater of its value in use and its fair value less costs to sell.

In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset. Value in use is generally computed by reference to the present value of the future cash flows expected to be derived from production of proven and probable reserves.

Fair value less costs to sell is the amount obtained from the sale of an asset or CGU in an arm's length transaction between knowledgeable, willing parties, less the costs of disposal.

An impairment loss is recognized if the carrying amount of an asset or its CGU exceeds its estimated recoverable amount. Impairment losses are recognized in the consolidated statement of comprehensive loss. Impairment losses recognized in respect of CGU's are allocated first to reduce the carrying amount of any goodwill allocated to the units and then to reduce the carrying amounts of the other assets in the unit (group of units) on a *pro rata* basis.

Impairment losses recognized in prior years are assessed at each reporting date for any indications that the loss has decreased or no longer exists. An impairment loss is reversed if there has been a change in the estimates used to determine the recoverable amount. An impairment loss is reversed only to the extent that the asset's carrying amount does not exceed the carrying amount that would have been determined, net of depletion and depreciation or amortization, if no impairment loss had been recognized.

(c) ***Decommissioning obligation***

The Company's activities may give rise to dismantling, decommissioning and site disturbance re-mediation activities. A provision is made for the estimated cost of site restoration and capitalized in the relevant asset category.

Decommissioning obligations are measured at the present value of management's best estimate of expenditures required to settle the present obligation at the reporting date. Subsequent to the initial measurement, the obligation is adjusted at the end of each period to reflect the passage of time and changes in the estimated future cash flows underlying the obligation. The increase in the provision due to the passage of time is recognized as finance costs whereas increases/decreases due to changes in the estimated future cash flows are capitalized. Actual costs incurred upon settlement of the decommissioning obligations are charged against the provision to the extent the provision was established. As at December 31, 2013, no decommissioning obligation has been recognised.

(d) ***Foreign currency translation***

Foreign currency denominated assets and liabilities are translated at the exchange rate prevailing at the date of the consolidated statement of financial position for monetary items. Non-monetary assets and liabilities are translated at the rates prevailing at the transaction date. Revenues and expenses are translated using exchange rates prevailing at the dates of the transaction. Any exchange gain or loss that arises on translation is included in the consolidated statement of comprehensive loss.

(e) ***Taxation***

Income tax expense comprises current and deferred tax. Income tax expense is recognized in profit or loss except to the extent that it relates to items recognized directly in equity, in which case it is recognized in equity.

Current tax is the expected tax payable on the taxable income for the year, using tax rates enacted or substantively enacted at the reporting date, and any adjustment to tax payable in respect of previous years.

Deferred tax is recognized using the liability method, providing for temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for taxation purposes. Deferred tax is not recognized on the initial recognition of assets or liabilities in a transaction that is not a business combination. In addition, deferred tax is not recognized for taxable temporary differences arising on the initial recognition of goodwill. Deferred tax is measured at the tax rates that are expected to be applied to temporary differences when they reverse, based on the laws that have been enacted or substantively enacted by the reporting date. Deferred tax assets and liabilities are offset if there is a legally enforceable right to offset, and they relate to income taxes levied by the same tax authority on the same taxable entity, or on different tax entities, but they intend to settle current tax liabilities and assets on a net basis or their tax assets and liabilities will be realized simultaneously.

A deferred tax asset is recognized to the extent that it is probable that future taxable profits will be available against which the temporary difference can be utilized. Deferred tax assets are reviewed at each reporting date and are reduced to the extent that it is no longer probable that the related tax benefit will be realized.

(f) ***Loss per share***

Basic loss per share is calculated by dividing the loss attributable to common Shareholders of the Company by the weighted average number of common shares outstanding during the period. Diluted loss per share is determined by adjusting the weighted average number of common shares outstanding for the effects of dilutive instruments. All instruments that could have a dilutive effect are considered anti-dilutive when the Company is in a loss position.

(g) ***Share-based payments***

The Company has issued options to Directors, officers, employees and non-employees to purchase common shares. The fair value of options determined using the Black-Scholes option pricing model on the date they are granted to employees is recognized as compensation expense with a corresponding increase in contributed surplus over the vesting period. Options to non-employees are measured at the fair value of the goods or services received, unless the fair value of the options are more reliably determinable, and are recognized each reporting date as compensation expense with a corresponding increase in contributed surplus over the vesting period. A forfeiture rate is estimated on the grant date and is adjusted to reflect the estimated number of options that vest.

(h) ***Cash and cash equivalents***

Cash comprises of cash on hand and term deposits held with banks, maturing in 3 months or less.

(i) ***Financial instruments***

(i) *Non-derivative financial instruments:*

Non-derivative financial instruments comprise cash and cash equivalents, restricted cash, accounts receivable, accounts payable and accrued liabilities and due to related party. Non-derivative financial instruments are recognized initially at fair value plus, for instruments not at fair value through profit or loss, any directly attributable transaction costs. Subsequent to initial recognition non-derivative financial instruments are measured as described below:

Financial assets at fair value through profit or loss ("FVTPL")

An instrument is classified at fair value through profit or loss if it is held for trading or is designated as such upon initial recognition. Financial instruments are designated at fair value through profit or loss if the Company manages such investments and makes purchase and sale decisions based on their fair value in accordance with the Company's risk management or investment strategy. Upon initial recognition, attributable transaction costs are recognized in profit or loss when incurred. Financial instruments at fair value through profit or loss are measured at fair value, and changes therein are recognized in profit or loss. The Company has classified cash and cash equivalents, and restricted cash as fair value through profit or loss.

Loans and receivables

Other non-derivative financial assets classified as loans and receivables include accounts receivable, which are measured at amortized cost using the effective interest method, less any impairment losses.

Other financial liabilities

Accounts payable and accrued liabilities and due to related party are classified as other financial liabilities and are measured at amortized cost using the effective interest method, less any impairment losses.

(ii) *Derivative financial instruments:*

Warrants denominated in a currency other than the Company's functional currency are derivative financial instruments designated as FVTPL and are measured at fair value with changes in fair value recognized in the consolidated statement of comprehensive loss.

(iii) *Share capital:*

Common shares are classified as equity. Incremental costs directly attributable to the issue of common shares and share options are recognized as a deduction from equity, net of any tax effects.

(j) ***Provisions***

The Company makes a distinction between:

- Provisions: present obligations, either legal or constructive, arising from past events, the settlement of which is expected to give rise to an outflow of resources the amount and timing of which are uncertain; and

- Contingent liabilities: possible obligations that arise from past events and whose existence will be confirmed only by the occurrence or non-occurrence of one or more future events not wholly within the control of the Company, or present obligations arising from past events the amount of which cannot be estimated reliably or whose settlement is not likely to give rise to an outflow of resources.

Provisions are recognized when the liability or obligation, giving rise to the indemnity or payment arises, to the extent that its amount can be reliably estimated and it is probable that the commitment will have to be settled. Contingent liabilities are not recognized in the consolidated financial statements, but rather are disclosed.

5. Restricted cash

The Malawi Revenue Authority, customs and excise division ("MRA"), required a 1,300,000 MWK ($2,941 as at December 31, 2013) bank guarantee from the Company in order to allow drilling equipment to be imported into the country for its Stage 2 drilling program.

6. Property and equipment

	Cost	*Accumulated Depreciation*	*Net Book Value*
Balance at December 31, 2011	10,020	(1,245)	8,775
Less Depreciation	—	(2,462)	(2,462)
Balance at December 31, 2012	$10,020	$(3,707)	$6,313
Less Depreciation	—	(1,262)	(1,262)
Balance at December 31, 2013	$10,020	$(4,969)	$5,051

7. Related party transactions

a) As of December 31, 2013 the Company had a payable to Leo Mining and Exploration Ltd. ("Leo Mining") in the amount of $6,540 (2012 – nil). The amount is unsecured and due on demand. Interest of 2 per cent. may be incurred on the outstanding amount annually; however this has been waived. Leo Mining is considered related by virtue of common Directors and officers who have an ownership in and exercise significant influence over both companies. The Company and Leo Mining have formalized their relationship with respect to services provided by Leo Mining. A written agreement sets out the types of services, which may be provided and the costs associated with such services. Generally the Company repays the disbursements made by Leo Mining on its behalf.

b) Digby Wells Environmental ("Digby"), by virtue of a common Director, is considered a related party. During the year ended December 31, 2013, the Company paid Digby $169,127 (2012 – nil) for environmental services. There were no amounts due to Digby as of December 31, 2013.

c) Included in accounts payable and accrued liabilities at December 31, 2013, was $8,077 (2012 – $3,870) due to directors and officers. The amounts owed are unsecured, due on demand and non-interest bearing.

d) Key management remuneration to Directors and executives

	2013	*2012*
Salary	$410,000	$353,158
Share-based payments	56,672	132,238
Total compensation	$466,672	$485,396

8. Share capital

a) ***Common Shares***

The Company is authorized to issue an unlimited number of common and preferred shares without nominal or par value. The Company has not issued any preferred shares to date. The holders of common shares are entitled to one vote for each share on all matters submitted to a Shareholder vote and are entitled to share in all dividends that the Company's Board of Directors, in its discretion, declares from available funds.

	Ref	Number	Amount
Closing balance December 31, 2011 and 2012		37,442,855	$5,632,076
Non-brokered offering	(i)	4,285,715	730,000
Warrants valuation – March 1, 2013	(i), (b)	—	(99,771)
Brokered offering	(ii)	8,836,033	1,522,209
Warrants valuation – April 11, 2013	(ii), (b)	—	(237,062)
Share issue costs – agent warrants	(ii)	—	(39,195)
Share issue costs – cash	(iii)	—	(137,559)
Closing balance December 31, 2013		50,564,603	$7,370,698

(i) On March 1, 2013, the Company issued 4,285,715 units at C$0.175 per unit pursuant to the non-brokered offering to Leo Mining, a related party. The C$750,000 (US$730,000) gross proceeds of the non-brokered offering were allocated between common shares C$647,518 (US$630,229) and warrants C$102,482 (US $99,771) based on the fair value of the warrants using the Black-Scholes option pricing model. Each unit consists of one common share and one-half of a common share purchase warrant of Mkango. Each whole warrant entitles the holder to acquire one common share for C$0.35 for a period of 12 months following the closing date of the financing. Leo Mining is the Company's majority Shareholder and is considered a related party by virtue of common Directors and officers who have an ownership in and exercise significant influence over the Company.

(ii) On April 11, 2013, the Company issued 8,836,033 units at C$0.175 per unit pursuant to the non-brokered offering. The C$1,545,544 (US $1,522,209) gross proceeds of the non-brokered offering were allocated between common shares C$1,304,848 (US $1,285,147) and warrants C$240,696 (US $237,062) based on the fair value of the warrants using the Black-Scholes option pricing model. Each unit consists of one common share and one-half of a common share purchase warrant of Mkango. Agents received 431,266 agents warrants valued at US$39,195. Each whole warrant entitles the holder to acquire one common share for C$0.35 for a period of 12 months following the closing date of the financing.

(iii) Share issue costs of US $137,559 were paid for agent and legal services and regulatory exchange filing fees.

b) ***Derivative financial instruments***

The exercise price of the share purchase warrants is fixed in Canadian dollars and the functional currency of the Company is the US dollar. Warrants are considered a derivative, as a variable amount of cash in the Company's functional currency will be received on exercise. Warrants issued do not include warrants issued to brokers and agents since they fall into the scope of IFRS 2.

	Exercise Price (CDN$)	*Weighted Average Years Remaining*	*Number of Warrants*	*Amount*
Balance at December 31, 2011	0.75	1.0	7,760,750	843,051
Change in fair value				
Foreign exchange impact				(19,592)
Warrant expiry			(7,760,750)	(823,459)
Balance at December 31, 2012			—	—
Warrants issued – March 1, 2013	0.35	0.20	2,142,858	99,771
Warrants issued – April 11, 2013	0.35	0.30	4,418,016	237,062
Fair value change at year end	—	—	—	(317,870)
Foreign exchange impact	—	—	—	(848)
Balance at December 31, 2013	$0.35	0.24	6,560,874	$18,115

The fair value of each warrant issued is determined at each reporting period using the Black-Scholes pricing model. The following assumptions were used in arriving at the fair value estimate for the warrants:

	March 1, 2013 (First Tranche)	*April 11, 2013 (Second Tranche)*	*December 31, 2013 (First Tranche)*	*December 31, 2013 (Second Tranche)*
Risk free interest rate	0.94%	0.95%	0.99%	0.99%
Expected volatility	141%	142%	235%	188%
Share price	$0.15	$0.16	$0.07	$0.07
Foreign exchange rate	1.0309	1.0101	1.0636	1.0636
Remaining life	1.00	1.00	0.16	0.28

c) ***Share-based payments***

The Company has a rolling Stock Option Plan (the "Plan") established to recognize contributions made by key personnel, to provide incentive to qualified parties to increase their proprietary interest in the Company and thereby encourage their continued association with the Company. The number of options granted under the Plan is limited to 10 per cent. in the aggregate of the number of issued and outstanding common shares of the Company at the date of the grant of the options.

The share-based payments expense that has been recognized in the consolidated statement of comprehensive loss for the year ended December 31, 2013 and 2012 is $112,676 and $191,447 respectively. The corresponding amount has been recognized in contributed surplus. The options vest over a variety of terms ranging from 12 to 18 months.

The following table provides a summary of the status of the Company's Stock Option Plan and changes during the years ended:

	Options Outstanding	*Weighted Average Exercise Price (CDN$)*	*Options Exercisable*	*Weighted Average Remaining Contractual Life (years)*
Balance at December 31, 2011	2,742,500	0.50	1,457,708	8.6
Granted – December 11, 2012	200,000	0.50	200,000	1.9
Balance at December 31, 2012	2,942,500	0.50	2,742,500	7.4
Granted – September 25, 2013	1,980,000	0.20	—	9.3
Balance at December 31, 2013	4,922,500	$0.39	2,942,500	7.7

The fair value of each option granted is estimated as of the grant date using the Black-Scholes option-pricing model. The following assumptions were used in arriving at the fair value for the options:

	September 25, 2013	*December 11, 2012*
Risk free interest rate	2.57%	1.13%
Expected life	10 years	3 years
Expected volatility	128%	118%
Dividends	Nil	Nil
Forfeiture rate	5%	5%
Fair value at issuance	$0.17	$0.44

9. Income tax

The differences between the income tax provisions calculated using the statutory rates and the reported income tax provision are as follows:

	December 31, 2013	*December 31, 2012*
Net loss for the year before taxes	$(1,897,893)	$(2,858,643)
Statutory tax rate	25.0%	25.0%
Expected income tax recovery	(474,473)	(714,661)
Increase resulting from: Revaluation of warrants	(79,468)	(205,865)
Share-based payments	28,169	46,689
Change in estimates, tax rates and other	(19,033)	(7,665)
Tax rate differential between Canada and foreign jurisdictions	(88,175)	(169,471)
Change in deferred tax assets not recognized	632,980	1,050,973
Income tax expense	$—	$—

No deferred tax assets have been recognized as it is not probable that future taxable profit will allow the deferred tax asset to be recovered. The major components of the deferred tax assets are as follows:

	December 31, 2013	*December 31, 2012*
Deferred tax asset: Property and equipment	$1,491	$1,112
Evaluation and exploration costs	1,366,010	1,133,975
Loss carryforwards	1,168,977	752,889
Share issue costs	82,891	98,413
Deferred tax assets	2,619,369	1,986,389
Less: Deferred tax assets not recognized	(2,619,369)	(1,986,389)
	$—	$—

As at December 31, 2013, the Company had $1,443,429 (2012 – $896,393) in non-capital losses available to claim against future taxable income in Canada. These non-capital losses expire as follows:

2027	$79,689
2028	33,104
2029	31,440
2030	29,319
2031	229,587
2032	440,903
2033	599,387
	$1,443,429

As at December 31, 2013, the Company had $2,657,284 (2012 – $896,393) in non-capital losses available to claim against future taxable income in Malawi. The non-capital losses have an indefinite life.

10. Financial instruments

Determination of fair values

As explained in Note 4, financial assets and liabilities have been classified into categories that determine their basis of measurement and for items measured at fair value, whether changes in fair value are recognized in the statement of comprehensive loss. Those categories are fair value through profit or loss; loans and receivables; and, for most liabilities, amortized cost.

In establishing fair value, the Company used a fair value hierarchy based on levels defined below:

- Level 1 – quoted prices in active markets for identical assets or liabilities;

- Level 2 – inputs other than quoted prices included in Level 1 that are observable for the asset or liability, either directly or indirectly; and
- Level 3 – inputs for the asset or liability that are not based on observable market data.

Cash and cash equivalents and restricted cash are measured at level 1; warrant derivative liability is measured at level 2.

The carrying value of accounts receivable, accounts payable and accrued liabilities and due to related party approximates the fair value due to their short term nature and maturity. Warrants with an exercise price in a currency other than the functional currency are to be recorded as a derivative liability and carried at fair value, see Note 8(b).

Financial risk management

The Company's management monitors and manages the financial risks relating to the operations of the Company. These include foreign currency, interest rate, liquidity and credit risks.

Foreign currency rate risk

The functional and reporting currency of the Company is the United States dollar. The Company enters into transactions denominated in the Canadian dollar, the United States dollar, and the local currency in Malawi (Kwacha). The Company raises its equity in the Canadian dollar and then purchases United States dollar and Malawi Kwacha funds to settle liabilities, as required. As at December 31, 2013 and 2012, the following balances were held by the Company:

	As at December 31,	
	2013	*2012*
Canadian dollar	$433,626	$71,783
United States dollar	3,152	185,892
United Kingdom Sterling	—	61,243
Malawi Kwacha	3,541	5,866
	$440,319	$324,784

A 5 per cent. change in the value of the Canadian dollar in comparison to the United States dollar would cause a change in net loss of approximately $22,000. A 5 per cent. change in the value of the Malawi Kwachi in relationship to the United States dollar would not cause a material change in net loss.

Interest rate risk

The Company's exposure to interest rate risk relates primarily to its cash and cash equivalents at banks. However, the interest rate risk is expected to be minimal. The Company does not presently hedge against interest rate movements.

Liquidity risk

Liquidity risk includes the risk that, as a result of the Company's operational liquidity requirements:

a) The Company will not have sufficient funds to settle a transaction on the due date;

b) The Company will be forced to sell financial assets at a value which is less than the fair value; or

c) The Company may be unable to settle or recover a financial asset at all. The Company's operating cash requirements including amounts projected to complete the Company's existing capital expenditure program are continuously monitored and adjusted as input variables change. As these variables change, liquidity risks may necessitate the Company to conduct equity issues or obtain project debt financing.

The Company manages its liquidity risk by maintaining adequate cash and cash equivalents. The Company is actively seeking additional funding to improve its exposure to liquidity risk. The Company continually monitors its actual and forecast cash flows to ensure that there are adequate reserves to meet the maturing profiles of its financial assets and liabilities.

The following table outlines the maturities of the Company's liabilities:

	Contractual Cash Flows	*Less than 1 Year*
Accounts payable and accrued liabilities	$191,652	$191,652
Due to related party	$6,540	$6,540

Credit risk

The Company's principal financial assets are cash and cash equivalents. The credit risk on cash and cash equivalents is limited because the majority are deposited with banks with high credit ratings assigned by international credit-rating agencies. Accounts receivable consists of GST and interest on investments with a credible financial institution.

11. Commitments

The Company was granted the Phalombe Licence for the Songwe property on January 21, 2010. The licence was issued by the Malawi Government on a three-year basis, originally, and on January 20, 2013 was renewed for an additional two years. The future spending commitments for the exploration rights with the Government of Malawi are 150,000,000 Kwacha, annually, (foreign exchange rate MWK442):

Exploration commitments	$339,367
Ground rent	29,027
Total annual commitment	$368,394

On September 10, 2010, the Company was granted an additional exploration licence by the Malawi Minister of Natural Resources, Energy and Environment in respect of an area of 468km^2 in Thambani, Mwanza District, Malawi. The licence was issued on a three-year basis, originally, and as of September 10, 2013 was renewed for an additional two years. The future spending commitments for exploration expenses with the Government of Malawi are 250,000,000 Kwachi, annually, (foreign exchange rate MWK442):

Exploration commitments	$565,611
Ground rent	10,588
Total annual commitment	$576,199

The Company expects to use the funds received from private placement equity financings to meet these commitments.

12. Capital management

The Company's total capital resources for the year ended December 31, 2013 is $297,320, which consists of total equity. The Company closed an equity issue in two tranches on March 1, 2013 and April 11, 2013, which has provided liquidity through 2013. The Company raised additional funds through an equity issue, which closed in two tranches on March 24, 2014 and April 3, 2014. It is anticipated that these additional funds will meet working capital requirements through 2014. The Company's objective when managing its capital is to have sufficient capital to maintain its ongoing operations, pursue its strategic opportunities and maintain a flexible capital structure which optimizes the cost of capital at an acceptable risk. The Company manages its capital structure and makes adjustments to it based on the funds available to the Company. The Company does not presently utilize any quantitative measures to monitor its capital. The Company has no externally imposed capital requirements.

13. Subsequent events

Private Placement

On February 24, 2014, the Company announced that it had entered into a non-binding term sheet with certain affiliates of Sprott Inc. (the "Finders") to act as finders for the Corporation under its proposed non-brokered private placement (the "Private Placement").

On March 24, 2014, the Company closed the first tranche of the non-brokered private placement ("Private Placement") with, amongst others, the Finders. Under the Private Placement, 16,262,603 Units of the Corporation were issued at a price of C$0.10 per Unit for gross cash proceeds of C$1,626,260.

Each Unit consist of one common share (a "Common Share") and one Common Share purchase warrant (a "Warrant") of Mkango. Each Warrant entitles the holder to acquire one Common Share for C$0.20 until March 24, 2019.

The Corporation paid cash finders' fees totaling C$85,628.22 and issued 24,500 Units and 880,782 finders' warrants in connection with the Private Placement. Each finders' warrant entitles the holder to acquire one Common Share for C$0.10 until March 24, 2016.

The securities issued under the first tranche of the Private Placement, including any Common Shares issued on the exercise of the Warrants, have a hold period expiring on July 25, 2014.

An insider of the Corporation participated in the Private Placement, thereby making the Private Placement a "related party transaction" as defined under Multilateral Instrument 61-101 – Protection of Minority Security Holders in Special Transactions ("MI 61-101"). The transaction, however, was exempt from the formal valuation and minority Shareholder approval requirements of MI 61-101 as neither the fair market value of any securities issued to or the consideration paid by the insider exceed 25 per cent. of the Company's market capitalization. Derek Linfield, a Director of the Corporation, subscribed for 1,500,000 Units. Following the closing of the Private Placement, Mr. Linfield now beneficially owns or controls 1,561,500 Common Shares, representing approximately 2.13 per cent. of the issued and outstanding Common Shares on an undiluted basis. Mr. Linfield also owns and controls a total of 1,500,000 Warrants.

On April 3. 2014, the second tranche of the Private Placement closed. The Company issued an additional 6,445,250 Units at a price of C$0.10 per Unit for gross cash proceeds of C$644,525 under the same terms as the first tranche of the Private Placement which closed on March 24, 2014.

The Corporation paid cash finders' fees totaling C$40,677 and issued 406,770 finders' warrants in connection with the Second Tranche. Each finders' warrant entitles the holder to acquire one Common Share for C$0.10 until April 3, 2016.

The securities issued under the Second Tranche, including any Common Shares issued on the exercise of the Warrants and the finders' warrants, have a hold period expiring on August 4, 2014.

If, after four months from the closing date of the Private Placement, the closing price (or the average of the 'bid' and the 'ask', if not traded) of the Common Shares on the TSX Venture Exchange exceeds C$0.30 for a period of 20 consecutive trading days, the Corporation may, within three trading days thereof, accelerate the expiry of the Warrants to 20 trading days after the issuance of a news release announcing the new expiry date.

In total, 22,707,853 Units of the Corporation were issued in connection with the Private Placement for gross cash proceeds of C$2,270,785.

The Private Placement remains subject to final acceptance of the TSX Venture Exchange.

Consolidated Financial Statements of

MKANGO RESOURCES LTD.

For the years ended December 31, 2014 and 2013

Management's Responsibility

To the Shareholders of Mkango Resources Ltd.:

Management is responsible for the preparation and presentation of the accompanying consolidated financial statements, including responsibility for significant accounting judgments and estimates in accordance with International Financial Reporting Standards. This responsibility includes selecting appropriate accounting principles and methods, and making decisions affecting the measurement of transactions in which objective judgment is required.

In discharging its responsibilities for the integrity and fairness of the consolidated financial statements, management designs and maintains the necessary accounting systems and related internal controls to provide reasonable assurance that transactions are authorized, assets are safeguarded and financial records are properly maintained to provide reliable information for the preparation of consolidated financial statements.

The Board of Directors has appointed an Audit Committee, consisting primarily of Directors who are neither management nor employees of the Company. The Audit Committee is responsible for overseeing management in the performance of its financial reporting responsibilities, and for approving the financial information included in the annual report. The Audit Committee has the responsibility of meeting with management, and the external auditors to discuss the internal controls over the financial reporting process, auditing matters and financial reporting issues. The Audit Committee is also responsible for recommending the appointment of the Company's external auditors.

MNP LLP, an independent firm of Chartered Accountants, is appointed by the Shareholders to audit the consolidated financial statements and report directly to them; their report follows. The external auditors have full and free access to, and meet periodically and separately with, both the Audit Committee and management to discuss their audit findings.

Signed "Alex Lemon"	*Signed "Sandra Beaulieu"*
Alex Lemon, President	Sandra Beaulieu, CFO

April 20, 2015

Independent Auditors' Report

To the Shareholders of Mkango Resources Ltd.:

We have audited the accompanying consolidated financial statements of Mkango Resources Ltd. and its subsidiaries, which comprise the consolidated statements of financial position as at December 31, 2014 and 2013, and the consolidated statements of comprehensive loss, changes in equity (deficiency) and cash flows for the years then ended, and notes comprising a summary of significant accounting policies and other explanatory information.

Management's Responsibility for Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with International Financial Reporting Standards, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We conducted our audits in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform an audit to obtain reasonable assurance whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditors' judgment including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained in our audits is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the consolidated financial statements present fairly, in all material respects, the financial position of Mkango Resources Ltd. and its subsidiaries as at December 31, 2014 and 2013, and their financial performance and their cash flows for the years then ended, in accordance with International Financial Reporting Standards.

Emphasis of Matter

Without qualifying our opinion, we draw attention to Note 2 in the consolidated financial statements which indicates the existence of a material uncertainty that may cast significant doubt about the ability of Mkango Resources Ltd. to continue as a going concern.

MNP LLP

April 20, 2015 — Chartered Accountants

Calgary, Alberta

MNP

Consolidated Statements of Financial Position
Reported in US dollars
(Audited)

As at	*Notes*	*December 31, 2014*	*December 31, 2013*
ASSETS			
Current			
Cash and cash equivalents		$161,009	$437,378
Restricted cash		—	2,941
Accounts receivable		7,386	3,475
Prepaid expenses		13,477	58,242
Total currents assets		181,872	502,036
Property and equipment	5	3,806	5,051
Total assets		185,678	507,087
LIABILITIES			
Current			
Accounts payable and accrued liabilities		81,153	177,035
Due to related parties	6	174,334	14,617
Warrants – derivative financial instruments	7(b)	—	18,115
Total current liabilities		255,487	209,767
Long term			
Warrants – derivative financial instruments	7(b)	1,614,013	—
Total liabilities		1,869,500	209,767
EQUITY (DEFICIENCY)			
Share capital	7(a)	7,173,622	7,370,698
Contributed surplus		2,555,367	2,080,195
Accumulated other comprehensive income		53,856	—
Deficit		(11,466,667)	(9,153,573)
Total equity (deficiency)		(1,683,822)	297,320
Total liabilities and equity		$185,678	$507,087
Going concern	2		
Commitments	10		
Subsequent event	12		

Approved on behalf of the Board:

(signed) "William Dawes"
William Dawes, CEO and Director

(signed) "David Berg"
David Berg, Director

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Comprehensive Loss
Reported in US dollars
(Audited)

For the year ended,	*Notes*	*December 31, 2014*	*2013*
Expenses			
General and administrative		$1,200,290	$1,257,192
Mineral exploration expenditures		954,520	773,446
Depreciation	5	1,245	1,262
Share based payments	7(c)	369,827	112,676
		2,525,882	2,144,576
Other items			
Interest income		(346)	(15)
Unrealized gain on revaluation of warrants	7(b)	(238,827)	(317,870)
Foreign exchange loss		26,385	71,202
Net loss		(2,313,094)	$(1,897,893)
Other comprehensive income			
Items that may be reclassified subsequently to net loss			
Exchange difference on translating foreign operations		53,856	—
Total comprehensive loss		$(2,259,238)	$(1,897,893)
Net loss per share – basic and diluted		$(0.03)	$(0.04)
Weighted average shares outstanding basic and diluted		67,950,428	47,415,063

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Cash Flows
Reported in US dollars
(Audited)

For the year ended,	*Notes*	*December 31,* *2014*	*2013*
Cash flow from operating activities			
Net loss for the year		$(2,313,094)	$(1,897,893)
Items not affecting cash:			
Share based payments	7(c)	369,827	112,676
Unrealized gain on revaluation of warrants	7(b)	(238,827)	(317,870)
Depreciation	5	1,245	1,262
Unrealized foreign exchange gain		—	(848)
Change in non-cash operating capital			
Accounts receivable and prepaid expenses		40,854	54,713
Accounts payable, accrued liabilities and due to related parties		63,835	48,845
Cash used by operating activities		(2,076,160)	(1,999,115)
Cash flow from financing activities			
Issue of share capital, net of issue costs	7(a)	1,806,075	2,114,650
Cash provided by financing activities		1,806,075	2,114,650
Effect of exchange rate changes on cash		(6,284)	(43,303)
Change in cash and cash equivalents		(276,369)	115,535
Cash and cash equivalents at the beginning of the year		437,378	324,784
Cash reclassified to restricted cash		—	(2,941)
Cash and cash equivalents at the end of the year		$161,009	$437,378

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Changes in Equity (Deficiency)
Reported in US dollars
(Audited)

	Share Capital	*Contributed Surplus*	*Accumulated Other Comprehensive Income*	*Deficit*	*Total*
Balance at December 31, 2012	$5,632,076	$1,928,324	$—	$(7,255,680)	$304,720
Common shares issued	2,252,209	—	—	—	2,252,209
Share issue costs	(176,754)	39,195	—	—	(137,559)
Warrant valuation	(336,833)	—	—	—	(336,833)
Share based payments	—	112,676	—	—	112,676
Total comprehensive loss	—	—	—	(1,897,893)	(1,897,893)
Balance at December 31, 2013	$7,370,698	$2,080,195	$—	$(9,153,573)	$297,320
Common shares issued	2,046,281	—	—	—	2,046,281
Common shares issued – agent fee	2,184	—	—	—	2,184
Share issue costs	(329,620)	87,230	—	—	(242,390)
Warrant valuation	(1,915,921)	—	—	—	(1,915,921)
Expired warrants	—	18,115	—	—	18,115
Share based payments	—	369,827	—	—	369,827
Total comprehensive income	—	—	53,856	(2,313,094)	(2,259,238)
Balance at December 31, 2014	$7,173,622	$2,555,367	$53,856	$(11,466,667)	$(1,683,822)

Refer to accompanying notes to the consolidated financial statements.

Notes to the Consolidated Financial Statements
For the years ended December 31, 2014 and 2013
(Reported in US dollars unless indicated otherwise)
(Audited)

1. General Information

The principal business of Mkango Resources Ltd (the "Company" or "Mkango") is rare earth element and associated minerals exploration and development with two properties in the Republic of Malawi, Africa, including the Phalombe exploration licence ("Phalombe Licence") and the Thambani exploration licence ("Thambani Licence").

Mkango was originally incorporated under the name Alloy Capital Corp. ("Alloy") on November 13, 2007, under the laws of the Province of Alberta, Canada. On December 20, 2010, Alloy was acquired through a "reverse takeover" by Lancaster Exploration ("Lancaster BVI"). The articles of the Company were amended to change the name of the Company from Alloy Capital Corp. to Mkango Resources Ltd. Mkango's head office is located at 259 Windermere Road SW, Calgary, Alberta Canada, T3C 3L2.

Lancaster BVI was incorporated August 3, 2007 by Memorandum and Articles of Association issued pursuant to the provisions of the British Virgin Islands ("BVI") Companies Act. Lancaster BVI's registered office is located at 56 Administration Drive, Wickhams Cay 1, Road Town, Tortola, British Virgin Islands. Lancaster is a wholly owned subsidiary of Mkango.

On May 19, 2011, a third entity, Lancaster Exploration Limited ("Lancaster Malawi"), was incorporated under the laws of Blantyre, Malawi. Lancaster Malawi is a wholly owned subsidiary of Lancaster BVI.

The consolidated financial statements were authorized for issuance by the Board of Directors of the Company on April 20, 2015.

2. Going Concern

These consolidated financial statements have been prepared on a going concern basis, which contemplates the realization of assets and the payment of liabilities in the ordinary course of business. The Company incurred a net loss of $2,313,094 for the year ended December 31, 2014 (December 31, 2013 – $1,897,893) and has a deficit of $11,466,667 (December 31, 2013 – $9,153,573). These factors indicate material uncertainties which may cast significant doubt on the Company's ability to continue as a going concern. The Company is in the process of acquiring, exploring and developing its mineral interests.

The operations of the Company for the next 12 months will be partially funded by a non-brokered private placement ("Financing"), which closed in two tranches on March 24, 2014 and April 3, 2014 (Note 7) and by future equity placements.

In addition to the equity financing, the Company was approved to receive the South African Department of Trade and Industry ("DTI") grant on May 26, 2014 for an amount of Rand 7,967,804 (USD$689,500) under the Capital Projects Feasibility Program. The grant will be dispersed to the Company as the Company meets certain milestones in relation to a number of activities including environmental and social impact studies, mine planning, design of the processing plant and tailings storage facility, flotation and hydrometallurgical optimization and marketing studies.

Should the Company be unable to continue as a going concern, it may be unable to realize the carrying value of its assets and to meet its liabilities as they become due. These consolidated interim financial statements do not reflect the adjustments or reclassification of assets and liabilities, which would be necessary if the Company were unable to continue its operations.

3. **Basis of Presentation**

(a) ***Statement of compliance***

These consolidated financial statements have been prepared in accordance with International Financial Reporting Standards ("IFRS") as issued by the International Accounting Standards Board ("IASB") and interpretations issued by the International Financial Reporting Interpretations Committee ("IFRIC"), in effect on December 31, 2014.

(b) ***Basis of presentation and measurement***

These consolidated financial statements have been prepared using the historical cost convention, except for certain financial instruments and share based payment transactions measured at fair value.

(c) ***Functional and presentation currency***

The consolidated financial statements are presented in US dollars, which is the functional currency of the Company and its Lancaster BVI subsidiary. Effective January 1, 2014, the functional currency of Lancaster Malawi changed from the US dollar to the local currency, the Kwacha, based upon changes in economic facts and circumstances.

(d) ***Principles of consolidation***

The consolidated financial statements of the Company include the accounts of the Company and its two wholly owned subsidiaries. All intercompany balances and transactions are eliminated upon consolidation.

(e) ***Use of estimates and judgments***

The preparation of the consolidated financial statements in conformity with IFRS requires management to make judgments, estimates and assumptions that affect the application of accounting policies and the reported amounts of assets, liabilities, income and expenses. Actual results may differ from these estimates.

Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the period in which the estimates are revised and in any future periods affected.

Key areas of judgement made in applying the Company's accounting policies are as follows:

(i) *Exploration and evaluation expenditures*

Costs incurred in respect of properties that have been determined to have proved reserves and for which an environmental impact study has been completed, are classified as development and production assets. In such circumstances, technical feasibility and commercial viability are considered to be established. Costs incurred in respect of new prospects with no established development past or present and no proved or probable reserves assigned are classified as exploration and evaluation expenses and are recognized in the statement of comprehensive loss. The decision to transfer assets from exploration and evaluation to property and equipment is subject to management's judgement regarding the project's commercial viability and technical feasibility. As at December 31, 2014, management has determined that the Company has not yet reached the development and production stage.

(ii) *Functional currency*

The functional currency of the Company and its subsidiaries is the currency of the primary economic environment in which each entity operates. Determination of functional currency may involve certain judgments to determine the primary economic environment and the Company reconsiders the functional currency of each entity if there is a change in events and conditions, which determine the primary economic environment.

Key areas of estimation where management has made difficult, complex or subjective assumptions, often as a result of matters inherently uncertain are as follows:

(i) *Measurement of share based payments and warrant valuation (Note 7(b))*

The Company uses an option-pricing model to determine the fair value of share-based payments and warrants. Inputs to the model are subject to various estimates about volatility, interest rates, dividend yields, forfeiture rates and expected life of the equity instruments issued. Fair value inputs are subject to market factors as well as internal estimates. The Company considers historic trends together with any new information to determine the best estimate of fair value at the date of grant.

(ii) *Determination of fair values (Note 9)*

The estimated fair value of financial assets and liabilities, by their very nature, are subject to measurement uncertainty.

(iii) *Taxes (Note 8)*

Provisions for taxes are made using the best estimate of the amount expected to be paid based on a qualitative assessment of all relevant factors. The Company reviews the adequacy of these provisions at the end of the reporting period. However, it is possible that at some future date an additional liability could result from audits by taxing authorities. Where the final outcome of these tax related matters is different from the amounts that were initially recorded, such differences will affect the tax provisions in the period in which such determination is made.

(f) ***New IFRS pronouncements adopted in the current year***

The Company has adopted standards, amendments and interpretations to existing standards that are effective in the current year as follows:

(i) *IAS 32 financial instruments – presentation*

Amendments to IAS 32 provides clarification on the application of the offsetting rules. The amendment was effective and adopted by the Company as of January 1, 2014. The adoption of the standard did not have a material effect on the Company.

(ii) *IAS 36 impairment of assets*

Amendments to IAS 36 require entities to disclose the recoverable amount of an impaired CGU. The amendment was effective and adopted by the Company as of January 1, 2014. The adoption of the standard did not have a material effect on the Company.

(iii) *IFRIC 21 levies*

IFRIC 21 provides an interpretation of IAS 37 which sets out criteria for the recognition of a liability, one of which is the requirement for the entity to have a present obligation as a result of a past event (known as an obligating event). The interpretation clarifies that the obligating event that gives rise to a liability to pay a levy is the activity described in the relevant legislation that triggers payment of the levy. The interpretation did not have a material effect on the Company.

(g) ***New IFRS pronouncements not yet implemented***

The following IFRS pronouncements have been issued by the IASB as at December 31, 2014 but are not yet effective. The Company does not plan to early adopt any of these new or amended standards and interpretations and is currently assessing the impact of these new or amended standards and interpretations. Certain other new standards and interpretations have been issued but are not shown as they are not expected to have a material impact on the Company's financial statements.

(i) *IFRS 9 financial instruments*

IFRS 9 addresses requirements for the classification and measurement of financial instruments, impairment methodology and hedge accounting. The IASB set a mandatory effective date for annual periods beginning on or after January 1, 2018. The Company continues to assess this new standard, but does not expect it to have a significant impact.

(ii) *IFRS 15 revenue from contracts with customers*

IFRS 15 replaces the existing revenue recognition guidance with a new framework to determine the timing and measurement of revenue, providing users of the financial statements more information and relevant disclosures. IFRS 15 is effective for annual periods beginning on or after January 1, 2017, with early adoption permitted. The Company continues to assess this new standard, but does not expect it to have a significant impact.

(iii) *IAS 38 intangible assets*

Amendments to IAS 38 provides clarification of acceptable methods of depreciation and amortization. The amendments were issued in May 2014 and apply to annual reporting periods beginning on or after January 1, 2016, with early adoption permitted. The Company continues to assess this new standard, but does not expect it to have a significant impact.

4. Significant Accounting Policies

The following accounting policies have been applied consistently in dealing with items which are considered material in relation to the Company's consolidated financial statements.

(a) ***Mineral exploration expenditures and property and equipment assets***

(i) *Recognition and measurement*

Exploration and evaluation ("E&E") expenditures

Exploration and evaluation costs which would typically include pre-licensing, preliminary property evaluation, drilling and directly attributable general and administrative costs are recognized in the statement of comprehensive loss as mineral exploration expenditures, including the costs of acquiring licences pending determination of technical feasibility and commercial viability.

The technical feasibility and commercial viability of extracting a resource is considered to be determinable based on several factors including the assignment of proven reserves. Upon determination of technical feasibility and commercial viability, the costs incurred prospectively are capitalized to a separate category within property and equipment referred to as a development mineral property.

Property and equipment ("P&E") expenditures

Items of property and equipment are measured at cost less accumulated depletion and depreciation and accumulated impairment losses. Development and production assets are grouped into CGUs for impairment testing and categorized within property and equipment as mineral interests. Property and equipment is comprised of drilling and mining servicing assets, office equipment and other corporate assets. When significant parts of an item of property and equipment, including mineral interests, have different useful lives, they are accounted for as separate items (major components).

Property and equipment assets, categorized as mineral interests, are assessed for impairment if facts and circumstances suggest that the carrying amount exceeds the recoverable amount.

Gains and losses on disposal of an item of property and equipment, including mineral interests, are determined by comparing the proceeds from disposal with the carrying amount of property and equipment and are recognized within the consolidated statement of comprehensive loss.

(ii) *Subsequent costs*

Costs incurred subsequent to the determination of technical feasibility and commercial viability and the costs of replacing parts of property and equipment are capitalized only when they increase the future economic benefits embodied in the specific asset to which they relate. All other expenditures are recognized in the consolidated statement of comprehensive loss, as incurred. Such capitalized costs generally represent costs incurred in developing proved and/or probable reserves and bringing in or enhancing production from such reserves, and is accumulated on a property-by-property basis. The carrying amount of any replaced or sold component is derecognized. The costs of the day-to-day servicing of property and equipment are recognized in the consolidated statement of comprehensive loss, as incurred.

(iii) *Depletion and depreciation*

The net carrying value of development or production assets will be depleted using the unit of production method by reference to the ratio of production in the year to the related proven and probable reserves, taking into account estimated future development costs necessary to bring those mineral reserves into production. Future development costs are estimated taking into account the level of development required to produce the reserves.

Corporate assets including vehicles are recorded at cost and are depreciated over the estimated useful life of the asset using the declining balance based on a 20 per cent. rate. Depreciation methods, useful lives and residual values are reviewed at each reporting date.

(b) ***Impairment***

(i) *Financial assets*

A financial asset is assessed at each reporting date to determine whether there is any objective evidence that it is impaired. A financial asset is considered to be impaired if objective evidence indicates that one or more events have had a negative effect on the estimated future cash flows of that asset.

An impairment loss in respect of a financial asset measured at amortized cost is calculated as the difference between its carrying amount and the present value of the estimated future cash flows discounted at the original effective interest rate. Individually significant financial assets are tested for impairment on an individual basis. The remaining financial assets are assessed collectively in groups that share similar credit risk characteristics.

All impairment losses are recognized in the consolidated statement of comprehensive loss.

An impairment loss is reversed if the reversal can be related objectively to an event occurring after the impairment loss was recognized. For financial assets measured at amortized cost the reversal is recognized in the consolidated statement of comprehensive loss.

(ii) *Non-financial assets*

The carrying amounts of the Company's non-financial assets are reviewed at each reporting date to determine whether there is any indication of impairment. If any such indication exists, then the asset's recoverable amount is estimated.

For the purpose of impairment testing, assets are grouped together into the smallest group of assets that generates cash inflows from continuing use that are largely independent of the cash inflows of other assets or groups of assets (the "cash generating unit" or "CGU"). The recoverable amount of an asset or a CGU is the greater of its value in use and its fair value less costs to sell.

In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset. Value in use is generally computed by reference to the present value of the future cash flows expected to be derived from production of proven and probable reserves.

Fair value less costs to sell is the amount obtained from the sale of an asset or CGU in an arm's length transaction between knowledgeable, willing parties, less the costs of disposal.

An impairment loss is recognized if the carrying amount of an asset or its CGU exceeds its estimated recoverable amount. Impairment losses are recognized in the consolidated statement of comprehensive loss. Impairment losses recognized in respect of CGU's are allocated first to reduce the carrying amount of any goodwill allocated to the units and then to reduce the carrying amounts of the other assets in the unit (group of units) on a *pro rata* basis.

(c) ***Impairment losses***

Impairment losses are recognized in prior years are assessed at each reporting date for any indications that the loss has decreased or no longer exists. An impairment loss is reversed if there has been a change in the estimates used to determine the recoverable amount. An impairment loss is reversed only to the extent that the asset's carrying amount does not exceed the carrying amount that would have been determined, net of depletion and depreciation or amortization, if no impairment loss had been recognized.

(d) ***Decommissioning obligation***

The Company's activities may give rise to dismantling, decommissioning and site disturbance remediation activities. A provision is made for the estimated cost of site restoration and capitalized in the relevant asset category.

Decommissioning obligations are measured at the present value of management's best estimate of expenditures required to settle the present obligation at the reporting date. Subsequent to the initial measurement, the obligation is adjusted at the end of each period to reflect the passage of time and changes in the estimated future cash flows underlying the obligation. The increase in the provision due to the passage of time is recognized as finance costs whereas increases/decreases due to changes in the estimated future cash flows are capitalized. Actual costs incurred upon settlement of the decommissioning obligations are charged against the provision to the extent the provision was established. As at December 31, 2014, no decommissioning obligation has been recognised.

(e) ***Foreign currency translation***

Foreign currency denominated assets and liabilities are translated at the exchange rate prevailing at the date of the consolidated statement of financial position for monetary items. Non-monetary assets and liabilities are translated at the rates prevailing at the transaction date. Revenues and expenses are translated using exchange rates prevailing at the dates of the transaction. Any exchange gain or loss that arises on translation is included in the consolidated statement of comprehensive loss.

Foreign currency translation adjustments are required each reporting period for Lancaster Malawi, a subsidiary of the Company having a functional currency, which differs from the parent. Assets and liabilities are translated at exchange rates in effect at the date of the consolidated statement of financial position and expenses are translated at the average rate. Gains or losses are recognized in other comprehensive income.

(f) ***Taxation***

Tax expense comprises current and deferred tax. Tax expense is recognized in the consolidated statement of comprehensive loss except to the extent that it relates to items recognized directly in equity, in which case it is recognized in equity.

Current tax is the expected tax payable on the taxable income for the year, using tax rates enacted or substantively enacted at the end of the reporting period, and any adjustment to tax payable in respect of previous years.

Deferred tax is recognized using the liability method, providing for temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for taxation purposes. Deferred tax is not recognized on the initial recognition of assets or liabilities in a transaction that is not a business combination. In addition, deferred tax is not recognized for taxable temporary differences arising on the initial recognition of goodwill. Deferred tax is measured at the tax rates that are expected to be applied to temporary differences when they reverse, based on the laws that have been enacted or substantively enacted by the end of the reporting period. Deferred tax assets and liabilities are offset if there is a legally enforceable right to offset, and they relate to taxes levied by the same tax authority on the same taxable entity, or on different tax entities, but they intend to settle current tax liabilities and assets on a net basis or their tax assets and liabilities will be realized simultaneously.

A deferred tax asset is recognized to the extent that it is probable that future taxable profits will be available against which the temporary difference can be utilized. Deferred tax assets are reviewed at the end of each reporting period and are reduced to the extent that it is no longer probable that the related tax benefit will be realized.

(g) ***Loss per share***

Basic loss per share is calculated by dividing the net loss attributable to common Shareholders of the Company by the weighted average number of common shares outstanding during the year. Diluted loss per share is determined by adjusting the weighted average number of common shares outstanding for the effects of dilutive instruments. All instruments that could have a dilutive effect are considered anti-dilutive when the Company is in a loss position.

(h) ***Share-based payments***

The Company has issued options to Directors, officers, employees and consultants to purchase common shares. The fair value of options determined using the Black-Scholes option-pricing model on the date they are granted to employees is recognized as compensation expense with a corresponding increase in contributed surplus over the vesting period. Options to non-employees are measured at the fair value of the goods or services received, unless the fair value of the options are more reliably determinable, and are recognized each reporting date as compensation expense with a corresponding increase in contributed surplus over the vesting period. A forfeiture rate is estimated on the grant date and is adjusted to reflect the estimated number of options that vest.

(i) ***Cash and cash equivalents***

Cash comprises of cash on hand and term deposits held with banks, maturing in 3 months or less.

(j) ***Financial instruments***

(i) *Non-derivative financial instruments:*

Non-derivative financial instruments comprise cash and cash equivalents, restricted cash, accounts receivable, accounts payable and accrued liabilities and due to related parties. Non-derivative financial instruments are recognized initially at fair value plus, for instruments not at fair value through profit or loss, any directly attributable transaction costs. Subsequent to initial recognition non-derivative financial instruments are measured as described below:

Financial assets at fair value through profit or loss (“FVTPL”)

An instrument is classified at fair value through profit or loss if it is held for trading or is designated as such upon initial recognition. Financial instruments are designated at fair value through profit or loss if the Company manages such investments and makes purchase and sale decisions based on their fair value in accordance with the Company’s risk management or investment strategy. Upon initial recognition, attributable transaction costs are recognized in profit or loss when incurred. Financial instruments at fair value through profit or loss are measured at fair value, and changes therein are recognized in profit or loss. The Company has classified cash and cash equivalents, and restricted cash as fair value through profit or loss.

Loans and receivables

Other non-derivative financial assets classified as loans and receivables include accounts receivable, which are measured at amortized cost using the effective interest method, less any impairment losses.

Other financial liabilities

Accounts payable and accrued liabilities and due to related parties are classified as other financial liabilities and are measured at amortized cost using the effective interest method, less any impairment losses.

(ii) *Derivative financial instruments:*

Warrants denominated in a currency other than the Company's functional currency are derivative financial instruments designated as FVTPL and are measured at fair value with changes in fair value recognized in the consolidated statement of comprehensive loss.

(ii) *Share capital:*

Common shares are classified as equity. Incremental costs directly attributable to the issue of common shares and share options are recognized as a deduction from equity, net of any tax effects.

(k) ***Provisions***

The Company makes a distinction between:

- Provisions: present obligations, either legal or constructive, arising from past events, the settlement of which is expected to give rise to an outflow of resources the amount and timing of which are uncertain; and
- Contingent liabilities: possible obligations that arise from past events and whose existence will be confirmed only by the occurrence or non-occurrence of one or more future events not wholly within the control of the Company, or present obligations arising from past events the amount of which cannot be estimated reliably or whose settlement is not likely to give rise to an outflow of resources.

Provisions are recognized when the liability or obligation, giving rise to the indemnity or payment arises, to the extent that its amount can be reliably estimated and it is probable that the commitment will have to be settled. Contingent liabilities are not recognized in the consolidated financial statements, but rather are disclosed.

5. Property and Equipment

	Cost	*Accumulated Depreciation*	*Net Book Value*
Balance at December 31, 2012	$10,020	$(3,707)	$6,313
Less Depreciation	—	(1,262)	(1,262)
Balance at December 31, 2013	10,020	(4,969)	5,051
Less Depreciation	—	(1,245)	(1,245)
Balance at December 31, 2014	$10,020	$(6,214)	$3,806

6. Related Party Transactions

a) Leo Mining Exploration Ltd. ("Leo Mining") is considered related by virtue of common Directors and officers who have an ownership in and exercise significant influence over both companies. The Company and Leo Mining have formalized their relationship with respect to services provided by Leo Mining. A written agreement sets out the types of services, which may be provided and the costs associated with such services. Generally the Company repays the disbursements made by Leo Mining on its behalf. During the year ended December 31, 2014, the Company had incurred costs of $27,437 (2013 – $6,540) for administrative services. As of December 31, 2014 the Company has an outstanding payable to Leo Mining in the amount of $7,272 (2013 – $6,540). The amount is unsecured and due on demand. Interest of 2 per cent. may be incurred on the outstanding amount annually; however this has been waived in 2014 and 2013.

b) Digby Wells Environmental ("Digby"), by virtue of a common Director, is considered a related party. During the year ended December 31, 2014, the Company has incurred costs of $244,246 (2013 – $169,127) for environmental services. As of December 31, 2014, there was an outstanding payable to Digby for $2,306 (2013 – $nil).

c) A partner of Stikeman Elliott (London) LLP ("Stikeman") became a Director of the Company in 2014. Stikeman is, therefore, considered a related party. During the year ended December 31, 2014, the Company has incurred $132,597 (2013 – $nil) for legal services. As of December 31, 2014, there was an outstanding payable to Stikeman for $108,531 (2013 – $nil).

d) The Company incurred costs of $526,243 (2013 – $466,672) for key management and Director fees and related costs for the year ended December 31, 2014. Included in due to related parties at December 31, 2014, was $56,225 (2013 – $8,077) due to a related party or officer of the Company. The amounts owed are unsecured, due on demand and non-interest bearing.

	2014	*2013*
Salary	$385,235	$410,000
Share based awards	141,008	56,672
Total compensation	$526,243	$466,672

7. Share capital

a) *Common Shares*

The Company is authorized to issue an unlimited number of common and preferred shares without nominal or par value. The Company has not issued any preferred shares to date. The holders of common shares are entitled to one vote for each share on all matters submitted to a Shareholder vote and are entitled to share in all dividends that the Company's Board of Directors, in its discretion, declares from available funds.

	Ref	*Number*	*Amount*
Closing balance December 31, 2012		37,442,855	$5,632,076
Non brokered offering	(i)	4,285,715	730,000
Warrants valuation – March 1, 2013		—	(99,771)
Brokered offering	(ii)	8,836,033	1,522,209
Warrants valuation – April 11, 2013		—	(237,062)
Agent warrants	(ii)	—	(39,195)
Share issue costs	(iii)	—	(137,559)
Closing balance December 31, 2013		50,564,603	$7,370,698
Brokered offering – March 24, 2014	(iv)	16,262,603	1,462,748
Warrants valuation		—	(1,365,728)
Agent warrants		—	(59,363)
Agent shares		24,500	2,184
Brokered offering – April 3, 2014	(v)	6,445,250	583,533
Warrants valuation		—	(550,193)
Agent warrants		—	(27,867)
Share issue costs	(vi)	—	(242,390)
Closing balance December 31, 2014		73,296,956	$7,173,622

(i) On March 1, 2013, the Company issued 4,285,715 units at C$0.175 per unit pursuant to the non-brokered offering to Leo Mining. Each unit consists of one common share and one-half of a common share purchase warrant of Mkango. The C$750,000 (US$730,000) gross proceeds of the non-brokered offering were allocated between common shares

C$647,518 (US$630,229) and warrants C$102,482 (US $99,771) based on the fair value of the warrants using the Black-Scholes option pricing model. All warrants expired on March 1, 2014.

(ii) On April 11, 2013, the Company issued 8,836,033 units at C$0.175 per unit pursuant to the non brokered-offering. Each unit consists of one common share and one-half of a common share purchase warrant of Mkango. The C$1,545,544 (US $1,522,209) gross proceeds of the non-brokered offering were allocated between common shares C$1,304,848 (US $1,285,147) and warrants C$240,696 (US $237,062) based on the fair value of the warrants using the Black-Scholes option pricing model. Agents received 431,266 agents warrants valued at US$39,195. All warrants expired on April 11, 2014.

(iii) Share issue costs of US $137,559 were paid for agent and legal services and regulatory exchange filing fees.

(iv) On March 24, 2014, the Company issued 16,262,603 units at C$0.10 per unit pursuant to the non-brokered offering. Each Unit consists of one common share and one common share purchase warrant of Mkango. The C$1,626,260 (US $1,462,748) gross proceeds of the non-brokered offering were allocated between common shares C$94,323 (US$97,026) and warrants C$1,531,937 (US $1,365,728) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.20 until March 24, 2019. The Corporation issued to the Agent 24,500 Units valued at US $2,184 and 880,782 warrants valued at US $59,363. Each whole warrant entitles the holder to acquire one common share for C$0.10 until March 24, 2016. The securities issued, have a hold period of four months and one day from the date of issue.

(v) On April 3, 2014, the Company issued 6,445,250 units at C$0.10 per unit pursuant to the non-brokered offering. Each Unit consists of one common share and one common share purchase warrant of Mkango. The C$644,525 (US$583,533) gross proceeds of the non-brokered offering were allocated between common shares C$36,791 (US$33,340) and warrants C$607,734 (US$550,193) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.20 until April 3, 2019. The Corporation issued 406,770 agents warrants valued at US$27,867. Each whole warrant entitles the agent to acquire one common share for C$0.10 until April 3, 2016. The securities issued, have a hold period of four months and one day from the date of issue.

(vi) Share issue costs of US $242,390 were paid for agent and legal services and regulatory exchange filing fees.

b) ***Derivative financial instruments***

The exercise price of the share purchase warrants is fixed in Canadian dollars and the functional currency of the Company is the US dollar. Warrants are considered a derivative, as a variable amount of cash in the Company's functional currency will be received on exercise. Warrants issued do not include warrants issued to brokers and agents since they fall under the scope of IFRS 2, "share based payments".

	Exercise Price (CDN$)	*Weighted Average Years Remaining*	*Number of Warrants*	*Amount*
Balance at December 31, 2012	$—	—	—	$—
Warrants issued – March 1, 2013	0.35	0.20	2,142,858	99,771
Warrants issued – April 11, 2013	0.35	0.30	4,418,016	237,062
Fair value change at December 31, 2013	—	—	—	(317,870)
Foreign exchange impact	—	—	—	(848)
Balance at December 31, 2013	—	—	6,560,874	18,115
Warrants expired – March 1, 2014	0.35	—	(2,142,858)	(4,860)
Warrants expired – April 11, 2014	0.35	—	(4,418,016)	(13,255)
Warrants issued – March 24, 2014	0.20	4.25	16,262,603	1,365,728
Warrants issued – April 3, 2014	0.20	4.25	6,445,250	550,193
Foreign exchange effect	—	—	—	(63,081)
Fair value change at December 31, 2014	—	—	—	(238,827)
Balance at December 31, 2014	$0.20	4.25	22,707,853	$1,614,013

The fair value of each warrant issued is determined at each reporting period using the Black-Scholes pricing model. The following assumptions were used in arriving at the fair value estimate for the warrants:

	March 24, 2014 (I)	*April 3, 2014 (II)*	*December 31, 2014 Revaluation*
Risk free interest rate	1.69%	1.67%	1.34 %
Expected volatility	144%	143%	147%
Share price	$0.11	$0.11	$0.10
Foreign exchange rate	1.1217	1.1035	1.1601
Remaining life	5.00	5.00	4.25

	March 1, 2013 (I)	*April 11, 2013 (II)*	*December 31, 2013 Revaluation*
Risk free interest rate	0.94%	0.95%	0.99 %
Expected volatility	141%	142%	204%
Share price	$0.15	$0.16	$0.07
Foreign exchange rate	1.0309	1.0101	1.0636
Remaining life	1.00	1.00	0.24

c) ***Share-based payments***

The Company has a rolling Stock Option Plan (the "Plan") established to recognize contributions made by key personnel, to provide incentive to qualified parties to increase their proprietary interest in the Company and thereby encourage their continued association with the Company. The number of options granted under the Plan is limited to 10 per cent. in the aggregate of the number of issued and outstanding common shares of the Company at the date of the grant of the options.

The share-based payments expense that has been recognized in the consolidated statements of comprehensive loss for the year ended December 31, 2014 was $369,827 (2013 – $112,676). The corresponding amount has been recognized in contributed surplus. The options vest over a term of 24 months.

The following tables provide a summary of the status of the Company's Stock Option Plan:

	Options Issued	*Options Cancelled (1)*	*Options Forfeited (2)*	*Options Expired (3)*	*Adjusted Options Outstanding*	*Weighted Average Exercise Price (CDN$)*	*Options Exercisable*	*Weighted Average Remaining Contractual Life (years)*
Balance at December 31, 2012	2,942,500	(850,000)	—	(62,500)	2,030,000	0.50	2,030,000	6.1
Granted – September 25, 2013	2,030,000	(37,500)	(112,500)	—	1,880,000	0.20	940,000	8.7
Balance at December 31, 2013	4,972,500	(887,500)	(112,500)	(62,500)	3,910,000	0.36	2,970,000	7.8
Granted – May 30, 2014	3,000,000	—	—	—	3,000,000	0.125	750,000	9.4
Balance at December 31, 2014	7,972,500	(887,500)	(112,500)	(62,500)	6,910,000	$0.26	3,720,000	8.3

(1) June 2014 cancelled options:

a) 600,000 vested options issued to Directors on January 17, 2011, were cancelled.

b) 50,000 vested options issued to an employee on January 17, 2011, were cancelled.

c) 200,000 vested options related to a resignation, issued December 11, 2012, were cancelled.

d) 37,500 vested options related to a resignation, issued on September 25, 2013, were cancelled.

(2) In March 2014, 112,500 unvested options related to a resignation, issued on September 25, 2013, were forfeited.

(3) On June 16, 2014, 62,500 options issued to an investor relations firm on June 16, 2011 expired.

	2014		*2013*	
Year ended December 31	*Number of Options*	*Weighted average exercise price*	*Number of Options*	*Weighted average exercise price*
Outstanding, beginning of year	4,972,500	$0.39	2,942,500	$0.50
Granted	3,000,000	$0.13	2,030,000	$0.20
Cancelled (1)	(887,500)	$(0.49)	—	$—
Forfeited (2)	(112,500)	$(0.20)	—	$—
Expired (3)	(62,500)	$(0.50)	—	$—
Outstanding, end of year	6,910,000	$0.26	4,972,500	$0.39

Grant date	*Expiry date*	*Number of options outstanding*	*Number of options exercisable*	*Exercise price*	*Remaining contractual life (years)*
Granted – January 17, 2011	January 16, 2021	1,700,000	1,700,000	$0.50	6.0
Granted – June 29, 2011	June 28, 2021	330,000	330,000	$0.55	6.5
Granted –September 25, 2013	September 24, 2023	1,880,000	940,000	$0.20	8.7
Granted – May 30, 2014	May 29, 2024	3,000,000	750,000	$0.13	9.4
Balance at December 31, 2014		6,910,000	3,720,000	$0.26	8.3

The fair value of each option granted is estimated as of the grant date using the Black-Scholes option-pricing model. The following assumptions were used in arriving at the fair value for the options that were issued during the years ended December 31, 2014 and 2013:

	May 30, 2014	*September 25, 2013*
Risk free interest rate	2.24%	2.57%
Expected life	10 years	10 years
Expected volatility	142%	128%
Dividends	Nil	Nil
Forfeiture rate	5%	5%
Fair value at issuance	$0.12	$0.17

8. Taxes

The differences between the tax provisions calculated using the statutory rates and the reported tax provision are as follows:

For the year ended December 31,	*2014*	*2013*
Net loss before taxes	$(2,313,094)	$(1,897,893)
Statutory tax rate	25.0%	25.0%
Expected tax recovery		
Increase (decrease) in taxes:	(578,274)	(474,473)
Revaluation of warrants	(59,707)	(79,468)
Share based payments	92,457	28,169
Share issue costs	(82,405)	—
Prior estimate adjustment	28,039	(19,033)
Foreign exchange	64,496	—
Tax rate differential between Canada and foreign jurisdictions	(97,571)	(88,175)
Change in deferred tax assets not recognized	632,965	632,980
Tax expense	$—	$—

No deferred tax assets have been recognized as it is not probable that future taxable profit will allow the deferred tax asset to be recovered. The major components of the deferred tax assets are as follows:

For the year ended December 31,	*2014*	*2013*
Deferred tax asset:		
Property and equipment	$1,865	$1,491
Evaluation and exploration costs	1,652,365	1,366,010
Loss carry forwards	1,508,643	1,168,977
Share issue costs	89,461	82,891
Deferred tax assets	3,252,334	2,619,369
Less: Deferred tax assets not recognized	(3,252,334)	(2,619,369)
	$—	$—

As at December 31, 2014, the Company had $3,652,933 (2013 – $2,657,284) in non-capital losses available to claim against future taxable income in Malawi. These non-capital losses do not expire.

As at December 31, 2014, the Company had CDN $1,915,386 (2013 – CDN $1,401,524) in non-capital losses available to claim against future taxable income in Canada. These non-capital losses expire as follows:

	Amount CDN$
2027	$77,375
2028	32,143
2029	30,527
2030	28,468
2031	222,922
2032	428,103
2033	581,986
2034	513,862
	$1,915,386

9. Financial instruments

Determination of fair values

Financial assets and liabilities have been classified into categories that determine their basis of measurement and for items measured at fair value, whether changes in fair value are recognized in the statement of comprehensive loss. Those categories are fair value through profit or loss; loans and receivables; and, for most liabilities, other financial liabilities.

In establishing fair value, the Company used a fair value hierarchy based on levels defined below:

- Level 1 – quoted prices in active markets for identical assets or liabilities;
- Level 2 – inputs other than quoted prices included in Level 1 that are observable for the asset or liability, either directly or indirectly; and
- Level 3 – inputs for the asset or liability that are not based on observable market data.

Cash and cash equivalents and restricted cash are measured at level 1; warrant derivative financial instruments are measured at level 2.

The carrying value of accounts receivable, accounts payable and accrued liabilities and due to related parties approximates the fair value due to their short-term nature and maturity. Warrants with an exercise price in a currency other than the functional currency are to be recorded as a derivative liability and carried at fair value, see Note 7(b).

Financial risk management

The Company's management monitors and manages the financial risks relating to the operations of the Company. These include foreign currency, interest rate, liquidity and credit risks.

Foreign currency rate risk

The functional and reporting currency of the Company is the United States dollar. The Company enters into transactions denominated in the Canadian dollar, the United States dollar, and the local currency in Malawi (Kwacha). The Company raises its equity in the Canadian dollar and then purchases United States dollar and Malawi Kwacha funds to settle liabilities, as required. As at December 31, 2014 and 2013, the following cash balances were held by the Company:

	As at December 31,	
	2014	*2013*
Canadian dollar	$156,598	$433,626
United States dollar	990	3,152
Malawi Kwacha	3,421	3,541
	$161,009	$440,319

A 5 per cent. reduction in the value of the Canadian dollar in comparison to the United States dollar would cause a change in net loss of approximately $7,800. A 5 per cent. change in the value of the Malawi Kwacha in relationship to the United States dollar would not cause a material change in net loss.

Interest rate risk

The Company's exposure to interest rate risk relates primarily to its cash and cash equivalents at banks. However, the interest rate risk is expected to be minimal. The Company does not presently hedge against interest rate movements.

Liquidity risk

Liquidity risk includes the risk that, as a result of the Company's operational liquidity requirements:

a) The Company will not have sufficient funds to settle a transaction on the due date;

b) The Company will be forced to sell financial assets at a value which is less than the fair value; or

c) The Company may be unable to settle or recover a financial asset at all. The Company's operating cash requirements including amounts projected to complete the Company's existing capital expenditure program are continuously monitored and adjusted as input variables change. As these variables change, liquidity risks may necessitate the Company to conduct equity issues or obtain project debt financing.

The Company manages its liquidity risk by maintaining adequate cash and cash equivalents. The Company is actively seeking additional funding to improve its exposure to liquidity risk. The Company continually monitors its actual and forecast cash flows to ensure that there are adequate reserves to meet the maturing profiles of its financial assets and liabilities.

The following table outlines the maturities of the Company's liabilities:

	Contractual Cash Flows	*Less than 1 Year*
Accounts payable and accrued liabilities	$81,153	$81,153
Due to related parties	$174,334	$174,334

Credit risk

The Company's principal financial assets are cash and cash equivalents. The credit risk on cash and cash equivalents is limited because the majority are deposited with banks with high credit ratings assigned by international credit-rating agencies. Accounts receivable consists of GST and interest on investments with a credible financial institution.

10. Commitments

The Company was granted the Phalombe Licence for the Songwe property on January 21, 2010. The licence was issued by the Malawi Government on a three-year basis, originally, and on January 20, 2015 was renewed for an additional two years. The future spending commitments for the exploration rights with the Government of Malawi are 150,000,000 Kwacha (foreign exchange rate MWK464):

Exploration commitments, 2 years	$323,276
Ground rent, 2 years	55,300
Total annual commitment, 2 years	$378,576

On September 10, 2010, the Company was granted an additional exploration licence by the Malawi Minister of Natural Resources, Energy and Environment in respect of an area of 468km^2 in Thambani, Mwanza District, Malawi. The licence was issued on a three-year basis, originally, and

as of September 10, 2013 was renewed for an additional two years. The future spending commitments for exploration expenses with the Government of Malawi are 250,000,000 Kwacha (foreign exchange rate MWK464):

Exploration commitments, 2 years	$538,793
Ground rent, 2 years	20,172
Total annual commitment, 2 years	$558,965

The Company is continuing to meet the terms and conditions of its two exploration licences and provides updates to Malawi's Ministry of Mining on a regular basis regarding progress of its work programs.

11. Capital management

The Company's total capital deficiency for the year ended December 31, 2014 is ($1,683,822), which consists of total deficiency. The operations of the Company for the next 12 months will be partially funded by a non-brokered private placement ("Financing"), which closed in two tranches on March 24, 2014 and April 3, 2014 (Note 7) and by future equity placements.

The Company's objective when managing its capital is to have sufficient capital to maintain its ongoing operations, pursue its strategic opportunities and maintain a flexible capital structure which optimizes the cost of capital at an acceptable risk. The Company manages its capital structure and makes adjustments to it based on the funds available to the Company. The Company does not presently utilize any quantitative measures to monitor its capital. The Company has no externally imposed capital requirements.

12. Subsequent event

On April 16, 2015, the Company announced that it was seeking equity funding in a non-brokered private placement (the "Private Placement").

Under the proposed terms of the Private Placement, the Company would issue up to 10,000,000 Units of the Company at a price of C$0.05 per Unit for gross cash proceeds of C$500,000.

Each Unit will consist of one common share (a "Common Share") and one half Common Share purchase warrant (a "Warrant") of Mkango. Each whole Warrant will entitle the holder to acquire one Common Share for C$0.10 for a period of 18 months following the closing date of the Private Placement.

Consolidated Financial Statements of

MKANGO RESOURCES LTD.

For the years ended December 31, 2015 and 2014

Management's Responsibility

To the Shareholders of Mkango Resources Ltd.

Management is responsible for the preparation and presentation of the accompanying consolidated financial statements, including responsibility for significant accounting judgments and estimates in accordance with International Financial Reporting Standards. This responsibility includes selecting appropriate accounting principles and methods, and making decisions affecting the measurement of transactions in which objective judgment is required.

In discharging its responsibilities for the integrity and fairness of the consolidated financial statements, management designs and maintains the necessary accounting systems and related internal controls to provide reasonable assurance that transactions are authorized, assets are safeguarded and financial records are properly maintained to provide reliable information for the preparation of consolidated financial statements.

The Board of Directors has appointed an Audit Committee, consisting primarily of Directors who are neither management nor employees of the Company. The Audit Committee is responsible for overseeing management in the performance of its financial reporting responsibilities, and for approving the financial information included in the annual report. The Audit Committee has the responsibility of meeting with management, and the external auditors to discuss the internal controls over the financial reporting process, auditing matters and financial reporting issues. The Audit Committee is also responsible for recommending the appointment of the Company's external auditors.

MNP LLP, an independent firm of Chartered Professional Accountants, is appointed by the Shareholders to audit the consolidated financial statements and report directly to them; their report follows. The external auditors have full and free access to, and meet periodically and separately with, both the Audit Committee and management to discuss their audit findings.

(signed) "Alex Lemon"
Alex Lemon, *President*

(signed) "Sandra Beaulieu"
Sandra Beaulieu, *CFO*

April 21, 2016

Independent Auditors' Report

To the Shareholders of Mkango Resources Ltd.

We have audited the accompanying consolidated financial statements of Mkango Resources Ltd., which comprise the consolidated statements of financial position as at December 31, 2015 and 2014, the consolidated statements of comprehensive income (loss), changes in equity (deficit) and cash flows for the years then ended, and notes, comprising a summary of significant accounting policies and other explanatory information.

Management's Responsibility for Consolidated Financial Statements

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with International Financial Reporting Standards, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

Auditors' Responsibility

Our responsibility is to express an opinion on these consolidated financial statements based on our audits. We conducted our audits in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform an audit to obtain reasonable assurance whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on the auditors' judgment including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained in our audits is sufficient and appropriate to provide a basis for our audit opinion.

Opinion

In our opinion, the consolidated financial statements present fairly, in all material respects, the consolidated financial position of Mkango Resources Ltd. as at December 31, 2015 and 2014, and its consolidated financial performance and its consolidated cash flows for the years then ended in accordance with International Financial Reporting Standards.

Emphasis of Matter

Without qualifying our opinion, we draw attention to Note 2 in the consolidated financial statements which indicates the existence of a material uncertainty that may cast significant doubt about the ability of Mkango Resources Ltd. to continue as a going concern.

MNP LLP

April 21, 2016
Calgary, Alberta

Chartered Professional Accountants

Consolidated Statements of Financial Position
Reported in US dollars

As at	*Notes*	*December 31, 2015*	*December 31, 2014*
ASSETS			
Current			
Cash and cash equivalents		$208,161	$161,009
Accounts receivable		2,760	7,386
Prepaid expenses		5,023	13,477
Total currents assets		215,944	181,872
Property and equipment	5	36,991	3,806
Total assets		252,935	185,678
LIABILITIES			
Current			
Accounts payable and accrued liabilities		76,182	81,153
Due to related party	6	298,865	174,334
Total current liabilities		375,047	255,487
Long term			
Warrants			
derivative financial instruments	7(b)	609,700	1,614,013
Total liabilities		984,747	1,869,500
EQUITY (DEFICIENCY)			
Share capital	7(a)	7,399,685	7,173,622
Contributed surplus		2,739,847	2,555,367
Accumulated other comprehensive income		65,029	53,856
Deficit		(10,936,373)	(11,466,667)
Total deficit		(731,812)	(1,683,822)
Total liabilities and deficit		$252,935	$185,678
Going concern	2		
Commitments	10		

Approved on behalf of the Board:

(signed) "William Dawes"
William Dawes, *CEO and Director*

(signed) "David Berg"
David Berg, *Director*

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Comprehensive Income (Loss)
Reported in US dollars

For the year ended:	*Notes*	*December 31, 2015*	*December 31, 2014*
Expenses			
General and administrative		$660,594	$1,200,290
Mineral exploration expenditures		133,949	954,520
Depreciation	5	5,306	1,245
Share-based payments	7(c)	108,442	369,827
		908,291	2,525,882
Other items			
Interest income		(8)	(346)
Unrealized gain on revaluation of warrants	7(b)	(1,290,900)	(238,827)
Loss on sale of asset		951	—
Foreign exchange (gain) loss		(148,628)	26,385
Net income (loss)		$530,294	$(2,313,094)
Other comprehensive income (loss)			
Items that may be reclassified subsequently to net income (loss):			
Exchange difference on translating foreign operations		11,173	53,856
Total comprehensive income (loss)		$541,467	$(2,259,238)
Net income (loss) per share – basic and diluted		$0.01	$(0.03)
Weighted average shares outstanding basic and diluted		89,787,915	67,950,428

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Cash Flows
Reported in US dollars

For the year ended:	*Notes*	*December 31, 2015*	*December 31, 2014*
Cash flow used by operating activities			
Net income (loss) for the period		$530,294	$(2,313,094)
Items not affecting cash:			
Share-based payments	7(c)	108,442	369,827
Unrealized gain on revaluation of warrants	7(b)	(1,290,900)	(238,827)
Loss on disposal of asset		951	—
Depreciation	5	5,306	1,245
Unrealized foreign exchange gain	5	(197,208)	—
Change in non-cash operating capital			
Accounts receivable and prepaid expenses		13,080	40,854
Accounts payable, accrued liabilities and due to related party		119,560	63,835
Cash flow used by operating activities		(710,475)	(2,076,160)
Cash flow provided by financing activities			
Issue of share capital, net of issue costs	7(a)	785,896	1,806,075
Cash flow provided by financing activities		785,896	1,806,075
Cash flow used by investing activities			
Purchase of assets	5	(42,124)	—
Proceeds on sale of assets	5	2,682	—
Cash flow used by investing activities		(39,442)	—
Effect of exchange rate changes on cash		11,173	(6,284)
Change in cash and cash equivalents		47,152	(276,369)
Cash and cash equivalents at the beginning of the year		161,009	437,378
Cash and cash equivalents at the end of the year		$208,161	$161,009

Refer to accompanying notes to the consolidated financial statements.

Consolidated Statements of Changes in Equity (Deficit)
Reported in US dollars

	Share capital (Note 7)	*Contributed Surplus*	*Accumulated Other Comprehensive Income*	*Deficit*	*Total*
Balance at December 31, 2013	$7,370,698	$2,080,195	$—	$(9,153,573)	$297,320
Common shares issued	2,046,281	—	—	—	2,046,281
Common shares issued – agent fee	2,184	—	—	—	2,184
Share issue costs	(329,620)	87,230	—	—	(242,390)
Warrant valuation	(1,915,921)	—	—	—	(1,915,921)
Expired warrants	—	18,115	—	—	18,115
Share based payments	—	369,827	—	—	369,827
Total comprehensive loss	—	—	53,856	(2,313,094)	(2,259,238)
Balance at December 31, 2014	$7,173,622	$2,555,367	$53,856	$(11,466,667)	$(1,683,822)
Common shares issued	863,824	—	—	—	863,824
Common shares issued – agent fee	56,899	—	—	—	56,899
Share issue costs	(134,827)	—	—	—	(134,827)
Warrants issued – agent fee	(76,038)	76,038	—	—	—
Warrant valuation	(483,795)	—	—	—	(483,795)
Share based payments	—	108,442	—	—	108,442
Total comprehensive income	—	—	11,173	530,294	541,467
Balance at December 31, 2015	$7,399,685	$2,739,847	$65,029	$(10,936,373)	$(731,812)

Refer to accompanying notes to the consolidated financial statements.

Notes to the Consolidated Financial Statements
For the years ended December 31, 2015 and 2014
(Reported in US dollars unless indicated otherwise)

1. General information

The principal business of Mkango Resources Ltd ("Mkango") is rare earth element and associated minerals exploration and development with two properties in the Republic of Malawi, Africa, including the Phalombe exploration licence ("Phalombe Licence") and the Thambani exploration licence ("Thambani Licence").

Mkango was originally incorporated under the name Alloy Capital Corp. ("Alloy") on November 13, 2007, under the laws of the Province of Alberta, Canada. On December 20, 2010, Alloy was acquired through a "reverse takeover" by Lancaster Exploration ("Lancaster BVI"). The articles of Mkango were amended to change its name from Alloy Capital Corp. to Mkango Resources Ltd. Mkango's head office is located at 259 Windermere Road SW, Calgary, Alberta Canada, T3C 3L2.

Lancaster BVI was incorporated August 3, 2007 by Memorandum and Articles of Association issued pursuant to the provisions of the British Virgin Islands ("BVI") Companies Act. Lancaster BVI's registered office is located at 56 Administration Drive, Wickhams Cay 1, Road Town, Tortola, British Virgin Islands. Lancaster is a wholly owned subsidiary of Mkango.

On May 19, 2011, a third entity, Lancaster Exploration Limited ("Lancaster Malawi"), was incorporated under the laws of Blantyre, Malawi. Lancaster Malawi is a wholly owned subsidiary of Lancaster BVI.

Mkango and its wholly owned subsidiaries are collectively referred to as the "Company" in these consolidated financial statements.

The consolidated financial statements were authorized for issuance by the Board of Directors of the Company on April 21, 2016.

2. Going concern

These consolidated financial statements have been prepared on a going concern basis, which contemplates the realization of assets and the payment of liabilities in the ordinary course of business. The Company has a working capital deficiency of $159,103 (2014 – $73,615), negative cash flows from operating activities and has a deficit of $10,936,373 (December 31, 2014 – $11,466,667). In addition, the Company has future spending commitments with the Government of Malawi to keep its exploration licences in good standing. If the amount expended is less than the minimum commitment, the shortfall becomes a debt to the Government of Malawi (Note 10). These factors indicate material uncertainties, which may cast significant doubt on the Company's ability to continue as a going concern. The Company is in the process of acquiring, exploring and developing its mineral interests.

The operations of the Company for the next 12 months will be partially funded by cash remaining from a non-brokered private placement, which closed in two tranches on July 31, 2015 and October 20, 2015 (Note 7) and by future equity placements.

Should the Company be unable to continue as a going concern, it may be unable to realize the carrying value of its assets and to meet its liabilities as they become due. These consolidated financial statements do not reflect the adjustments or reclassification of assets and liabilities, which would be necessary if the Company were unable to continue its operations.

3. Basis of presentation

(a) ***Statement of compliance***

These consolidated financial statements have been prepared in accordance with International Financial Reporting Standards ("IFRS") as issued by the International Accounting Standards Board ("IASB") and interpretations issued by the International Financial Reporting Interpretations Committee ("IFRIC"), in effect on January 1, 2015.

(b) ***Basis of presentation and measurement***

These consolidated financial statements have been prepared using the historical cost convention, except for certain financial instruments and share-based payment transactions measured at fair value.

(c) ***Functional and presentation currency***

The consolidated financial statements are presented in US dollars, which is the functional currency of Mkango and its Lancaster BVI subsidiary. Effective January 1, 2014, the functional currency of Lancaster Malawi changed from the US dollar to the local currency, the Kwacha, based upon changes in economic facts and circumstances.

(d) ***Principles of consolidation***

The consolidated financial statements of the Company include the accounts of the Company and its two wholly owned subsidiaries. All intercompany balances and transactions are eliminated upon consolidation.

(e) ***Use of estimates and judgments***

The preparation of the consolidated financial statements in conformity with IFRS requires management to make judgments, estimates and assumptions that affect the application of accounting policies and the reported amounts of assets, liabilities, income and expenses. Actual results may differ from these estimates.

Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the period in which the estimates are revised and in any future periods affected.

Key areas of judgement made in applying the Company's accounting policies are as follows:

(i) *Exploration and evaluation expenditures*

Costs incurred in respect of properties that have been determined to have proved reserves and for which an environmental impact study has been completed, are classified as development and production assets. In such circumstances, technical feasibility and commercial viability are considered to be established. Costs incurred in respect of new prospects with no established development past or present and no proved or probable reserves assigned are classified as exploration and evaluation expenses and are recognized in the statement of comprehensive income (loss). The decision to transfer assets from exploration and evaluation to property and equipment is subject to management's judgement regarding the project's commercial viability and technical feasibility. As at December 31, 2015, management has determined that the Company has not yet reached the development and production stage.

(ii) *Functional currency*

The functional currency of the Company and its subsidiaries is the currency of the primary economic environment in which each entity operates. Determination of functional currency may involve certain judgments to determine the primary economic environment and the Company reconsiders the functional currency of each entity if there is a change in events and conditions, which determine the primary economic environment.

Key areas of estimation where management has made difficult, complex or subjective assumptions, often as a result of matters inherently uncertain are as follows:

(i) Measurement of share-based payments and warrant valuation (Note 7(b))

The Company uses an option-pricing model to determine the fair value of share-based payments and warrants. Inputs to the model are subject to various estimates about volatility, interest rates, dividend yields, forfeiture rates and expected life of the instruments issued. Fair value inputs are subject to market factors as well as internal estimates. The Company considers historic trends together with any new information to determine the best estimate of fair value at the date of grant.

(ii) Determination of fair values (Note 9)

The estimated fair value of financial assets and liabilities, by their very nature, are subject to measurement uncertainty.

(iii) Taxes (Note 8)

Provisions for taxes are made using the best estimate of the amount expected to be paid based on a qualitative assessment of all relevant factors. The Company reviews the adequacy of these provisions at the end of the reporting period. However, it is possible that at some future date an additional liability could result from audits by taxing authorities. Where the final outcome of these tax related matters is different from the amounts that were initially recorded, such differences will affect the tax provisions in the period in which such determination is made.

(f) ***New IFRS pronouncements not yet implemented***

The following IFRS pronouncements have been issued by the IASB as at December 31, 2015 but are not yet effective. The Company does not plan to early adopt any of these new or amended standards and interpretations and is currently assessing the impact of these new or amended standards and interpretations. Certain other new standards and interpretations have been issued but are not shown as they are not expected to have a material impact on the Company's consolidated financial statements.

(i) *IFRS 9 financial instruments (New and Amendment)*

IFRS 9 addresses requirements for the classification and measurement of financial instruments, impairment methodology and hedge accounting. The IASB set a mandatory effective date for annual periods beginning on or after January 1, 2018. The Company continues to assess this new standard, but does not expect it to have a significant impact.

(ii) *IFRS 15 revenue from contracts with customers (New)*

IFRS 15 replaces the existing revenue recognition guidance with a new framework to determine the timing and measurement of revenue, providing users of the financial statements more information and relevant disclosures. IFRS 15 is effective for annual periods beginning on or after January 1, 2018, with early adoption permitted. The Company continues to assess this new standard, but does not expect it to have a significant impact.

(iii) *IFRS 16 leases (New)*

IFRS 16 was issued and IAS 17 "Leases" was amended. IFRS 16 specifies how to recognize, measure, present and disclose leases. The standard provides a single lessee accounting model, requiring the recognition of assets and liabilities for all leases, unless the lease term is 12 months or less or the underlying asset has a low value. Lessor accounting however remains largely unchanged from IAS 17 and the distinction between operating and finance leases is retained. IAS 17, as revised, now prescribes the accounting policies and disclosures applicable to leases, both for lessees and lessors. Management anticipates that this standard will be adopted in the Company's consolidated financial statements for the year beginning January 1, 2019 and has not yet considered the potential impact of the adoption of IFRS 16.

4. Significant accounting policies

The following accounting policies have been applied consistently in dealing with items which are considered material in relation to the Company's consolidated financial statements.

(a) Mineral exploration expenditures and property and equipment assets

(i) *Recognition and measurement*

Exploration and evaluation ("E&E") expenditures

Exploration and evaluation costs which would typically include pre-licensing, preliminary property evaluation, drilling and directly attributable general and administrative costs are recognized in the statement of comprehensive income (loss) as mineral exploration expenditures, including the costs of acquiring licences pending determination of technical feasibility and commercial viability.

The technical feasibility and commercial viability of extracting a resource is considered to be determinable based on several factors including the assignment of proven reserves. Upon determination of technical feasibility and commercial viability, the costs incurred prospectively are capitalized to a separate category within property and equipment referred to as a development mineral property.

Property and equipment ("P&E") expenditures

Items of property and equipment are measured at cost less accumulated depletion and depreciation and accumulated impairment losses. Development and production assets are grouped together into the smallest group of assets that generates cash inflows from continuing use that are largely independent of the cash inflows of other assets or groups of assets (the "cash-generating unit" or "CGU") for impairment testing and categorized within property and equipment as mineral interests. Property and equipment is comprised of drilling and mining servicing assets, office equipment and other corporate assets. When significant parts of an item of property and equipment, including mineral interests, have different useful lives, they are accounted for as separate items (major components).

Property and equipment assets, categorized as mineral interests, are assessed for impairment if facts and circumstances suggest that the carrying amount exceeds the recoverable amount.

Gains and losses on disposal of an item of property and equipment, including mineral interests, are determined by comparing the proceeds from disposal with the carrying amount of property and equipment and are recognized within the consolidated statement of comprehensive income (loss).

(ii) *Subsequent costs*

Costs incurred subsequent to the determination of technical feasibility and commercial viability and the costs of replacing parts of property and equipment are capitalized only when they increase the future economic benefits embodied in the specific asset to which they relate. All other expenditures are recognized in the consolidated statement of comprehensive income (loss), as incurred. Such capitalized costs generally represent costs incurred in developing proved and/or probable reserves and bringing in or enhancing production from such reserves, and is accumulated on a property-by-property basis. The carrying amount of any replaced or sold component is derecognized. The costs of the day-to-day servicing of property and equipment are recognized in the consolidated statement of comprehensive income (loss), as incurred.

(iii) *Depletion and depreciation*

The net carrying value of development or production assets will be depleted using the unit of production method by reference to the ratio of production in the year to the related proven and probable reserves, taking into account estimated future development costs necessary to bring those mineral reserves into production. Future development costs are estimated taking into account the level of development required to produce the reserves.

Corporate assets including vehicles are recorded at cost and are depreciated over the estimated useful life of the asset using the declining balance based on a 20% rate. Depreciation methods, useful lives and residual values are reviewed at each reporting date.

(b) ***Government grants***

Government grants are recognised where there is reasonable assurance that the grant will be received and all attached conditions will be complied with. The Company records grant proceeds received net of mineral exploration expenditures.

(c) ***Impairment***

(i) *Financial assets*

A financial asset is assessed at each reporting date to determine whether there is any objective evidence that it is impaired. A financial asset is considered to be impaired if objective evidence indicates that one or more events have had a negative effect on the estimated future cash flows of that asset.

An impairment loss in respect of a financial asset measured at amortized cost is calculated as the difference between its carrying amount and the present value of the estimated future cash flows discounted at the original effective interest rate. Individually significant financial assets are tested for impairment on an individual basis. The remaining financial assets are assessed collectively in groups that share similar credit risk characteristics.

All impairment losses are recognized in the consolidated statement of comprehensive income (loss).

An impairment loss is reversed if the reversal can be related objectively to an event occurring after the impairment loss was recognized. For financial assets measured at amortized cost the reversal is recognized in the consolidated statement of comprehensive income (loss).

(ii) *Non-financial assets*

The carrying amounts of the Company's non-financial assets are reviewed at each reporting date to determine whether there is any indication of impairment. If any such indication exists, then the asset's recoverable amount is estimated.

For the purpose of impairment testing, assets are grouped together into CGU's. The recoverable amount of an asset or a CGU is the greater of its value in use and its fair value less costs to sell.

In assessing value in use, the estimated future cash flows are discounted to their present value using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the asset. Value in use is generally computed by reference to the present value of the future cash flows expected to be derived from production of proven and probable reserves.

Fair value less costs to sell is the amount obtained from the sale of an asset or CGU in an arm's length transaction between knowledgeable, willing parties, less the costs of disposal.

An impairment loss is recognized if the carrying amount of an asset or its CGU exceeds its estimated recoverable amount. Impairment losses are recognized in the consolidated statement of comprehensive income (loss). Impairment losses recognized in respect of CGU's are allocated first to reduce the carrying amount of any goodwill allocated to the units and then to reduce the carrying amounts of the other assets in the unit (group of units) on a *pro rata* basis.

(d) ***Impairment losses***

Impairment losses recognized in prior years are assessed at each reporting date for any indications that the loss has decreased or no longer exists. An impairment loss is reversed if there has been a change in the estimates used to determine the recoverable amount. An impairment loss is reversed only to the extent that the asset's carrying amount does not exceed the carrying amount that would have been determined, net of depletion and depreciation or amortization, if no impairment loss had been recognized.

(e) ***Decommissioning obligation***

The Company's activities may give rise to dismantling, decommissioning and site disturbance re-mediation activities. A provision is made for the estimated cost of site restoration and capitalized in the relevant asset category.

Decommissioning obligations are measured at the present value of management's best estimate of expenditures required to settle the present obligation at the reporting date. Subsequent to the initial measurement, the obligation is adjusted at the end of each period to reflect the passage of time and changes in the estimated future cash flows underlying the obligation. The increase in the provision due to the passage of time is recognized as finance costs whereas increases/decreases due to changes in the estimated future cash flows are capitalized. Actual costs incurred upon settlement of the decommissioning obligations are charged against the provision to the extent the provision was established. As at December 31, 2015, no decommissioning obligation has been recognised.

(f) ***Foreign currency translation***

Foreign currency denominated assets and liabilities are translated at the exchange rate prevailing at the date of the consolidated statement of financial position for monetary items. Non-monetary assets and liabilities are translated at the rates prevailing at the transaction date. Revenues and expenses are translated using exchange rates prevailing at the dates of the transaction. Any exchange gain or loss that arises on translation is included in the consolidated statement of comprehensive income (loss).

Foreign currency translation adjustments are required each reporting period for Lancaster Malawi, a subsidiary of the Company having a functional currency, which differs from the parent. Assets and liabilities are translated at exchange rates in effect at the date of the consolidated statement of financial position and expenses are translated at the average rate. Gains or losses are recognized in other comprehensive income (loss).

(g) ***Taxation***

Tax expense comprises current and deferred tax. Tax expense is recognized in the consolidated statement of comprehensive income (loss) except to the extent that it relates to items recognized directly in equity, in which case it is recognized in equity.

Current tax is the expected tax payable on the taxable income for the year, using tax rates enacted or substantively enacted at the end of the reporting period, and any adjustment to tax payable in respect of previous years.

Deferred tax is recognized using the liability method, providing for temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for taxation purposes. Deferred tax is not recognized on the initial recognition of assets or liabilities in a transaction that is not a business combination. In addition, deferred tax is not recognized for taxable temporary differences arising on the initial recognition of goodwill. Deferred tax is measured at the tax rates that are expected to be applied to temporary differences when they reverse, based on the laws that have been enacted or substantively enacted by the end of the reporting period. Deferred tax assets and liabilities are offset if there is a legally enforceable right to offset, and they relate to taxes levied by the same tax authority on the same taxable entity, or on different tax entities, but they intend to settle current tax liabilities and assets on a net basis or their tax assets and liabilities will be realized simultaneously.

A deferred tax asset is recognized to the extent that it is probable that future taxable profits will be available against which the temporary difference can be utilized. Deferred tax assets are reviewed at the end of each reporting period and are reduced to the extent that it is no longer probable that the related tax benefit will be realized.

(h) ***Per share amounts***

Basic per share amounts are calculated by dividing the net profit or loss attributable to common Shareholders of the Company by the weighted average number of common shares outstanding during the year. Diluted per share amounts are determined by adjusting the weighted average number of common shares outstanding for the effects of dilutive instruments. All instruments that could have a dilutive effect are considered anti-dilutive when the Company is in a loss position. In addition, options and warrants have a dilutive effect only when the average market price of ordinary during the period exceed the exercise price of the options and warrants (i.e. they are "in the money").

(i) ***Share-based payments***

The Company has issued options to Directors, officers, employees and consultants to purchase common shares. The fair value of options determined using the Black-Scholes option pricing model on the date they are granted to employees is recognized as compensation expense with a corresponding increase in contributed surplus over the vesting period. Options to non-employees are measured at the fair value of the goods or services received, unless the fair value of the options are more reliably determinable, and are recognized each reporting date as compensation expense with a corresponding increase in contributed surplus over the vesting period. A forfeiture rate is estimated on the grant date and is adjusted to reflect the estimated number of options that vest.

(j) ***Cash and cash equivalents***

Cash comprises of cash on hand and term deposits held with banks, maturing in 3 months or less.

(k) ***Financial instruments***

(i) *Non-derivative financial instruments:*

Non-derivative financial instruments comprise cash and cash equivalents, accounts receivable, accounts payable and accrued liabilities and due to related parties. Non-derivative financial instruments are recognized initially at fair value plus, for instruments not at fair value through profit or loss, any directly attributable transaction costs. Subsequent to initial recognition non-derivative financial instruments are measured as described below:

Financial assets at fair value through profit or loss ("FVTPL")

An instrument is classified at fair value through profit or loss if it is held for trading or is designated as such upon initial recognition. Financial instruments are designated at fair value through profit or loss if the Company manages such investments and makes purchase and sale decisions based on their fair value in accordance with the Company's risk management or investment strategy. Upon initial recognition, attributable transaction costs are recognized in profit or loss when incurred. Financial instruments at fair value through profit or loss are measured at fair value, and changes therein are recognized in profit or loss. The Company has classified cash and cash equivalents as fair value through profit or loss.

Loans and receivables

Other non-derivative financial assets classified as loans and receivables include accounts receivable, which are measured at amortized cost using the effective interest method, less any impairment losses.

Other financial liabilities

Accounts payable and accrued liabilities and due to related parties are classified as other financial liabilities and are measured at amortized cost using the effective interest method, less any impairment losses.

(ii) *Derivative financial instruments:*

Warrants denominated in a currency other than the Company's functional currency are derivative financial instruments designated as FVTPL and are measured at fair value with changes in fair value recognized in the consolidated statement of comprehensive income (loss).

(iii) *Share capital:*

Common shares are classified as equity. Incremental costs directly attributable to the issue of common shares and share options are recognized as a deduction from equity, net of any tax effects.

(k) ***Provisions***

The Company makes a distinction between:

- Provisions: present obligations, either legal or constructive, arising from past events, the settlement of which is expected to give rise to an outflow of resources, the amount and timing of which are uncertain; and

- Contingent liabilities: possible obligations that arise from past events and whose existence will be confirmed only by the occurrence or non-occurrence of one or more future events not wholly within the control of the Company, or present obligations arising from past events the amount of which cannot be estimated reliably or whose settlement is not likely to give rise to an outflow of resources.

Provisions are recognized when the liability or obligation, giving rise to the indemnity or payment arises, to the extent that its amount can be reliably estimated and it is probable that the commitment will have to be settled. Contingent liabilities are not recognized in the consolidated financial statements, but rather are disclosed.

5. Property and equipment

	Cost	*Accumulated Depreciation*	*Net Book Value*
Balance at December 31, 2013	$10,020	$(4,969)	$5,051
Depreciation	—	(1,245)	(1,245)
Balance at December 31, 2014	10,020	(6,214)	3,806
Disposal of asset	(9,732)	6,099	(3,633)
Additions	42,124	—	42,124
Depreciation	—	(5,306)	(5,306)
Balance at December 31, 2015	$42,412	$(5,421)	$36,991

6. Related party transactions

a) Leo Mining Exploration Ltd. ("Leo Mining") is considered related by virtue of common Directors and officers who have an ownership in and exercise significant influence over both companies. The Company and Leo Mining have formalized their relationship with respect to services provided by Leo Mining. A written agreement sets out the types of services, which may be provided and the costs associated with such services. Generally the Company repays the disbursements made by Leo Mining on its behalf. During the year ended December 31, 2015, the Company had incurred costs of $53,869 (2014 – $27,437) for administrative services. As of December 31, 2015 the Company has an outstanding payable to Leo Mining in the amount of $29,974 (2014 – $7,272). The amount is unsecured and due on demand. Interest of 2% may be incurred on the outstanding amount annually; however this has been waived since 2013.

b) Digby Wells Environmental ("Digby"), by virtue of a common Director, is considered a related party. During the year ended December 31, 2015, the Company has incurred costs of $8,402 (2014 – $244,246) for environmental services. As of December 31, 2015, there was an outstanding payable to Digby for $6,587 (2014 – $2,306).

c) A partner of Stikeman Elliott (London) LLP ("Stikeman") became a Director of the Company in 2014. The Director ceased to be a partner at Stikeman in July 2015. Therefore, Stikeman is only considered a related party up to July 2015. During the period ended July 31, 2015, the Company incurred $18,295 (2014 – $132,597) for legal services. As of December 31, 2015, there was an outstanding payable to Stikeman for $86,985 (2014 – $108,531).

d) The Company incurred costs of $394,981 (2014 – $526,243) for key management and Director fees and related costs for the year ended December 31, 2015. Included in due to related parties at December 31, 2015, was $175,319 (2014 – $56,225) due to a related parties and officers of the Company. The amounts owed are unsecured, due on demand and non-interest bearing.

	2015	2014
Salary	$302,149	$385,235
Share-based awards	92,832	141,008
Total key management compensation	$394,981	$526,243

7. Share capital

a) *Common Shares*

The Company is authorized to issue an unlimited number of common and preferred shares without nominal or par value. The Company has not issued any preferred shares to date. The holders of common shares are entitled to one vote for each share on all matters submitted to a Shareholder vote and are entitled to share in all dividends that the Company's Board of Directors, in its discretion, declares from available funds.

	Ref	*Number*	*Amount*
Closing balance December 31, 2013		50,564,603	$7,370,698
Brokered offering – March 24, 2014	(i)	16,262,603	1,462,748
Warrants valuation		—	(1,365,728)
Agent warrants		—	(59,363)
Agent shares		24,500	2,184
Brokered offering – April 3, 2014	(ii)	6,445,250	583,533
Warrants valuation		—	(550,193)
Agent warrants		—	(27,867)
Share issue costs	(iii)	—	(242,390)
Closing balance December 31, 2014		73,296,956	$7,173,622
Brokered offering – July 31, 2015	(iv)	30,000,000	578,516
Warrants valuation		—	(318,464)
Agent warrants		—	(52,708)
Agent shares		1,680,000	32,372
Brokered offering – October 20, 2015	(v)	15,000,000	285,308
Warrants valuation		—	(165,331)
Agent warrants		—	(23,330)
Agent shares		1,280,000	24,527
Share issue costs	(vi)	—	(134,827)
Closing balance December 31, 2015		121,256,956	$7,399,685

(i) On March 24, 2014, the Company issued 16,262,603 units at C$0.10 per unit pursuant to the non-brokered offering. Each Unit consists of one common share and one common share purchase warrant of Mkango. The C$1,626,260 (US $1,462,748) gross proceeds of the non-brokered offering were allocated between common shares C$94,323 (US$97,020) and warrants C$1,531,937 (US $1,365,728) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.20 until March 24, 2019. The Corporation issued to the Agent 24,500 Units valued at US $2,184 and 880,782 warrants valued at US $59,363. Each whole warrant entitles the holder to acquire one common share for C$0.10 until March 24, 2016.

(ii) On April 3, 2014, the Company issued 6,445,250 units at C$0.10 per unit pursuant to the non-brokered offering. Each Unit consists of one common share and one common share purchase warrant of Mkango. The C$644,525 (US$583,533) gross proceeds of the non-brokered offering were allocated between common shares C$36,791 (US$33,340) and warrants C$607,734 (US$550,193) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.20 until April 3, 2019. The Corporation issued 406,770 agents warrants valued at US$27,867. Each whole warrant entitles the agent to acquire one common share for C$0.10 until April 3, 2016.

(iii) Share issue costs of US $242,390 were paid for agent and legal services and regulatory exchange filing fees.

(iv) On July 31, 2015, the Company issued 30,000,000 units at C$0.025 per unit pursuant to the non-brokered offering. Each Unit consisted of one common share and one-half common share purchase warrant of Mkango. The C$750,000 (US $578,516) gross proceeds of the non-brokered offering were allocated between common shares C$334,500 (US$260,052) and warrants C$415,500 (US $318,464) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.05 until July 31, 2018. The Corporation issued to the Agents 1,680,000 Units, consisting of 1 common share and one-half common share purchase warrant of Mkango, valued at US $32,372 and 1,820,000 warrants valued at US $52,708. Each whole warrant entitles the holder to acquire one common share for C$0.05 until July 31, 2016.

(v) On October 20, 2015, the Company issued 15,000,000 units at C$0.025 per unit pursuant to the non-brokered offering. ach Unit consisted of one common share and one-half common share purchase warrant of Mkango. The C$375,000 (US $285,308) gross proceeds of the non-brokered offering were allocated between common shares C$160,500 (US$119,977) and warrants C$214,500 (US $165,331) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.05 until October 19, 2018. The Corporation issued to the Agents 280,000 Units, consisting of one common share and one-half common share purchase warrant of Mkango, and 1,000,000 common shares valued at US $24,527 and 980,000 warrants valued at US $23,330. Each whole warrant entitles the holder to acquire one common share for C$0.05 until October 19, 2016.

(vi) Share issue costs of US $134,827 were paid for agent and legal services and regulatory exchange filing fees.

b) ***Derivative financial instruments***

The exercise price of the share purchase warrants is fixed in Canadian dollars and the functional currency of the Company is the US dollar. Warrants are considered a derivative, as a variable amount of cash in the Company's functional currency will be received on exercise. Warrants issued do not include warrants issued to brokers and agents since they fall under the scope of IFRS 2, "share-based payments".

	Weighted Average Exercise Price (CDN$)	*Weighted Average Years Remaining*	*Number of Warrants*	*Amount*
Balance at December 31, 2013	$—	—	6,560,874	$18,115
Warrants expired – March 1, 2014	0.35	—	(2,142,858)	(4,860)
Warrants expired – April 11, 2014	0.35	—	(4,418,016)	(13,255)
Warrants issued – March 24, 2014	0.20	4.25	16,262,603	1,365,728
Warrants issued – April 3, 2014	0.20	4.25	6,445,250	550,193
Foreign exchange effect	—	—	—	(63,081)
Fair value change at December 31, 2014	—	—	—	(238,827)
Balance at December 31, 2014	$0.20	4.25	22,707,853	$1,614,013
Warrants issued – July 31, 2015	0.05	2.58	15,000,000	318,464
Warrants issued – October 20, 2015	0.05	2.80	7,500,000	165,331
Foreign exchange effect	—	—	—	(197,208)
Fair value change at December 31, 2015	—	—	—	(1,290,900)
Balance at December 31, 2015	$0.13	2.95	45,207,853	$609,700

The fair value of each warrant issued is determined at each reporting period using the Black-Scholes pricing model. The following assumptions were used in arriving at the fair value estimate for the warrants:

	July 31, 2015	*December 31 2015 Revaluation*	*October 20, 2015*	*December 31, 2015 Revaluation*
Risk free interest rate	0.50%	0.50 %	0.50%	0.50 %
Expected volatility	217%	261%	241%	254%
Share price	$0.02	$0.02	$0.02	$0.02
Foreign exchange rate	1.3047	1.3840	1.2974	1.3840
Remaining life	3.23	2.58	3.25	2.80

	March 24, 2014	*April 3, 2014*	*December 31, 2014 Revaluation*	*December 31, 2015 Revaluation*
Risk free interest rate	1.69%	1.67%	1.34%	0.50%
Expected volatility	144%	143%	147%	243%
Share price	$0.11	$0.11	$0.10	$0.02
Foreign exchange rate	1.1217	1.1035	1.1601	1.3840
Remaining life	5.00	5.00	4.25	3.25

c) ***Share-based payments***

The Company has a rolling Stock Option Plan (the "Plan") established to recognize contributions made by key personnel, to provide incentive to qualified parties to increase their proprietary interest in the Company and thereby encourage their continued association with the Company. The number of options granted under the Plan is limited to 10% in the aggregate of the number of issued and outstanding common shares of the Company at the date of the grant of the options.

The share-based payments expense that has been recognized in the consolidated statements of comprehensive income (loss) for the year ended December 31, 2015 was $108,442 (2014 – $369,827). The corresponding amount has been recognized in contributed surplus. The options vest over a term of 24 months.

The following tables provide a summary of the status of the Company's Stock Option Plan:

Year ended December 31	*2015*		*2014*	
	Number of Options	*Weighted average exercise price*	*Number of Options*	*Weighted average exercise price*
Outstanding, beginning of year	6,910,000	$0.26	4,972,500	$0.39
Granted	—	—	3,000,000	0.13
Cancelled	(412,500)	(0.18)	(887,500)	(0.49)
Forfeited	(187,500)	(0.16)	(112,500)	(0.20)
Expired	—	—	(62,500)	(0.50)
Outstanding, end of year	6,310,000	$0.27	6,910,000	$0.26

Grant date	*Expiry date*	*Number of options outstanding*	*Number of options exercisable*	*Exercise price*	*Remaining contractual life (years)*
Granted – January 17, 2011	January 16, 2021	1,700,000	1,700,000	$0.50	5.0
Granted – June 29, 2011	June 28, 2021	330,000	330,000	$0.55	5.5
Granted – September 25, 2013	September 24, 2023	1,480,000	1,480,000	$0.20	7.7
Granted – May 30, 2014	May 29, 2024	2,800,000	2,100,000	$0.13	8.4
Balance at December 31, 2015		6,310,000	5,610,000	$0.27	7.2

Grant date	*Expiry date*	*Number of options outstanding*	*Number of options exercisable*	*Exercise price*	*Remaining contractual life (years)*
Granted – January 17, 2011	January 16, 2021	1,700,000	1,700,000	$0.50	6.0
Granted – June 29, 2011	June 28, 2021	330,000	330,000	$0.55	6.5
Granted – September 25, 2013	September 24, 2023	1,880,000	940,000	$0.20	8.7
Granted – May 30, 2014	May 29, 2024	3,000,000	750,000	$0.13	9.4
Balance at December 31,2014		6,910,000	3,720,000	$0.26	8.3

The fair value of each option granted is estimated as of the grant date using the Black-Scholes option-pricing model. The following assumptions were used in arriving at the fair value for the options that were issued during the year ended December 31, 2014. No options were issued during the year ended December 31, 2015.

	May 30, 2014
Risk free interest rate	2.24%
Expected life	10 years
Expected volatility	142%
Dividends	Nil
Forfeiture rate	5%
Fair value at issuance	$0.12

8. Taxes

The differences between the tax provisions calculated using the statutory rates and the reported tax provision are as follows:

For the year ended December 31,	*2015*	*2014*
Net loss before taxes	$530,294	$(2,313,094)
Statutory tax rate	26%	25%
Expected tax expense (recovery)	137,877	(578,274)
Increase (decrease) in taxes:		
Revaluation of warrants	(335,631)	(59,707)
Share-based payments	28,195	92,457
Foreign exchange on revaluation of warrants	(51,274)	64,496
Tax rate differential between Canada and foreign jurisdictions	123,246	(97,571)
Change in deferred tax assets not recognized	97,587	578,599
Tax expense	$—	$—

The statutory rate increased from 25% to 26% due to the increase in the Alberta provincial tax rate on July 1, 2015.

No deferred tax assets have been recognized in respect of the following deductible temporary differences as it is not probable that future taxable profit will allow the deferred tax asset to be recovered.

As at December 31,	*2015*	*2014*
Property and equipment	$12,472	$6,215
Evaluation and exploration costs	5,641,831	5,507,882
Loss carry forwards	6,892,136	6,173,422
Share issue costs	374,186	357,846
	$12,920,625	$12,045,365

As at December 31, 2015, the Company had $3,693,928 (2014 – $3,652,933) in non-capital losses available to claim against future taxable income in Malawi. These non-capital losses do not expire.

As at December 31, 2015, the Company had CDN $2,564,587 (2014 – CDN $2,075,360) in non-capital losses available to claim against future taxable income in Canada. These non-capital losses expire as follows:

	Amount CDN$
2027	$77,375
2028	32,143
2029	30,527
2030	28,468
2031	222,922
2032	428,103
2033	582,721
2034	673,101
2035	489,227
	$2,564,587

9. Financial instruments

Determination of fair values

Financial assets and liabilities have been classified into categories that determine their basis of measurement and for items measured at fair value, whether changes in fair value are recognized in the statement of comprehensive income (loss). Those categories are fair value through profit or loss; loans and receivables; and, for most liabilities, other financial liabilities.

In establishing fair value, the Company used a fair value hierarchy based on levels defined below:

- Level 1 – quoted prices in active markets for identical assets or liabilities;
- Level 2 – inputs other than quoted prices included in Level 1 that are observable for the asset or liability, either directly or indirectly; and
- Level 3 – inputs for the asset or liability that are not based on observable market data.

Cash and cash equivalents are measured at level 1; warrant derivative financial instruments are measured at level 2.

The carrying value of accounts receivable, accounts payable and accrued liabilities and due to related parties approximates the fair value due to their short-term nature and maturity. Warrants with an exercise price in a currency other than the functional currency are recorded as a derivative liability and carried at fair value, see Note 7(b).

Financial risk management

The Company's management monitors and manages the financial risks relating to the operations of the Company. These include foreign currency, interest rate, liquidity and credit risks.

Foreign currency risk

The functional and reporting currency of the Company is the United States dollar. The Company enters into transactions denominated in the Canadian Dollar, the United States dollar, and the local currency in Malawi (Kwacha). The Company raises its equity in the Canadian dollar and then purchases United States dollar and Malawi Kwacha funds to settle liabilities, as required. The Company's exposure to foreign currency risk as at December 31, 2015 and 2014 is most significantly influenced by the following financial instruments denominated in foreign currencies (amounts shown in US dollars):

	As at December 31,	
	2015	*2014*
Cash and cash equivalents:		
Canadian dollars	$205,749	$156,598
Malawi Kwacha	553	3,421
Warrants – derivative financial instruments	(609,700)	(1,614,013)
	$(403,398)	$(1,453,994)

A 5% reduction in the value of the Canadian dollar in comparison to the United States dollar would cause a change in income (loss) of approximately $20,100. A 5% change in the value of the Malawi Kwacha in relationship to the United States dollar would not cause a material change in net income (loss).

Interest rate risk

The Company's exposure to interest rate risk relates primarily to its cash and cash equivalents at banks. However, the interest rate risk is expected to be minimal. The Company does not presently hedge against interest rate movements.

Liquidity risk

Liquidity risk includes the risk that, as a result of the Company's operational liquidity requirements:

a) The Company will not have sufficient funds to settle a transaction on the due date;

b) The Company will be forced to sell financial assets at a value which is less than the fair value; or

c) The Company may be unable to settle or recover a financial asset at all.

The Company's operating cash requirements including amounts projected to complete the Company's existing capital expenditure program are continuously monitored and adjusted as input variables change. As these variables change, liquidity risks may necessitate the Company to conduct equity issuances or obtain project debt financing

The Company manages its liquidity risk by maintaining adequate cash and cash equivalents. The Company is actively seeking additional funding to improve its exposure to liquidity risk. The Company continually monitors its actual and forecast cash flows to ensure that there are adequate reserves to meet the maturing profiles of its financial liabilities.

The following table outlines the maturities of the Company's liabilities as at December 31, 2015:

	Contractual Cash Flows	*Less than 1 Year*
Accounts payable and accrued liabilities	$76,182	$76,182
Due to related parties	$298,865	$298,865

Credit risk

The Company's principal financial assets are cash and cash equivalents. The credit risk on cash and cash equivalents is limited because the majority are deposited with banks with high credit ratings assigned by international credit-rating agencies. Accounts receivable consists of GST and interest on investments with a credible financial institution.

10. Commitments

The Company was granted the Phalombe Licence for the Songwe property on January 21, 2010. The licence was issued by the Malawi Government on a three-year basis, originally, and on January 20, 2015 was renewed for an additional two years. The future spending commitments for the exploration rights with the Government of Malawi are 150,000,000 Kwacha over two years (foreign exchange rate MWK651):

Exploration commitments, 2 years	$230,415
Ground rent, 2 years	26,086
Total commitment, 2 years	$256,501

On September 10, 2010, the Company was granted an additional exploration licence by the Malawi Minister of Natural Resources, Energy and Environment in respect of an area of 468km^2 in Thambani, Mwanza District, Malawi. The licence was issued by the Malawi Government on a three-year basis, originally, and was renewed on September 10, 2015, for an additional two years when the company requested a reduction in the licence area to the current 136.9km^2. The future spending commitments for exploration expenses with the Government of Malawi was renegotiated from 250,000,000 to 25,000,000 Kwacha over two years (foreign exchange rate MWK651):

Exploration commitments, 2 years	$38,402
Ground rent, 2 years	4,206
Total commitment, 2 years	$42,608

The Company is continuing to meet the terms and conditions of its two exploration licences and provides updates to Malawi's Ministry of Mining on a regular basis regarding progress of its work programs. If the amount expended is less than the minimum commitment, the shortfall becomes a debt to the Government of Malawi.

11. Capital management

The Company's total capital consists of Shareholders' equity (deficiency) and amounts to ($731,812) as at December 31, 2015. The operations of the Company for the next 12 months will be partially funded by cash remaining from a non-brokered private placement, which closed in two tranches on July 31, 2015 and October 20, 2015 (Note 7) and by future equity placements.

The Company's objective when managing its capital is to have sufficient capital to maintain its ongoing operations, pursue its strategic opportunities and maintain a flexible capital structure which optimizes the cost of capital at an acceptable risk. The Company manages its capital structure and makes adjustments to it based on the funds available to the Company. The Company does not presently utilize any quantitative measures to monitor its capital. The Company has no externally imposed capital requirements.

B Unaudited consolidated historical financial information on the Group for the three month period ended 31 March 2016

Consolidated Interim Financial Statements of

MKANGO RESOURCES LTD.

For the three months ended March 31, 2016 and 2015

Unaudited consolidated interim financial statements

In accordance with National Instrument 51-102 released by the Canadian Securities administrators, the Company discloses that its auditors have not reviewed these consolidated interim financial statements for the three months ended March 31, 2016 and 2015.

Consolidated Interim Statements of Financial Position
Reported in US dollars

As at	*Notes*	*March 31, 2016*	*December 31, 2015*
ASSETS			
Current			
Cash and cash equivalents		$87,774	$208,161
Accounts receivable		2,310	2,760
Prepaid expenses		8,483	5,023
Total currents assets		98,567	215,944
Property and equipment	5	34,351	36,991
Total assets		132,918	252,935
LIABILITIES			
Current			
Accounts payable and accrued liabilities		179,352	76,182
Due to related party	6	274,275	298,865
Total current liabilities		453,627	375,047
Long term			
Warrants – derivative financial instruments	7(b)	697,061	609,700
Total liabilities		1,150,688	984,747
EQUITY (DEFICIENCY)			
Share capital	7(a)	7,399,685	7,399,685
Contributed surplus		2,748,545	2,739,847
Accumulated other comprehensive loss		(123,515)	65,029
Deficit		(11,042,485)	(10,936,373)
Total deficit		(1,017,770)	(731,812)
Total liabilities and deficit		$132,918	$252,935
Going concern	2		
Commitments	9		
Subsequent events	11		

Approved on behalf of the Board:

(signed) "William Dawes"
William Dawes, CEO and Director

(signed) "David Berg"
David Berg, Director

Refer to accompanying notes to the consolidated interim financial statements.

Consolidated Interim Statements of Comprehensive Income (Loss)
Reported in US dollars

	Notes	*March 31,* *2016*	*2015*
Expenses			
General and administrative		$175,846	$180,993
Mineral exploration expenditures		27,679	(21,530)
Depreciation	5	2,640	6
Share-based payments	7(c)	8,698	63,573
		214,863	223,042
Other items			
Interest income		(2)	(5)
Unrealized gain on revaluation of warrants	7(b)	83,132	15,775
Loss on sale of asset		—	220
Foreign exchange (gain) loss		(3,337)	14,967
Net income (loss)		$(294,656)	$(253,999)
Other comprehensive income (loss)			
Items that may be reclassified subsequently to net income (loss)			
Exchange difference on translating foreign operations		188,544	(15,570)
Total comprehensive income (loss)		$(106,112)	$(269,569)
Net loss per share – basic and diluted		$(0.00)	$(0.00)
Weighted average shares outstanding basic and diluted		121,256,956	73,296,956

Refer to accompanying notes to the consolidated interim financial statements.

Consolidated Interim Statements of Cash Flows
Reported in US dollars

	Notes	March 31, 2016	March 31, 2015
Cash flow used by operating activities			
Net income (loss) for the period		$(294,656)	$(253,999)
Items not affecting cash:			
Share based payments	7(c)	8,698	63,573
Unrealized gain on revaluation of warrants	7(b)	83,132	15,775
Depreciation	5	2,640	6
Unrealized foreign exchange gain		(4,210)	9,615
Change in non-cash operating capital			
Accounts receivable and prepaid expenses		(3,010)	8,102
Accounts payable, accrued liabilities and due to related party		78,580	49,396
Cash flow used by operating activities		(128,826)	(107,532)
Cash flow provided by investing activities			
Disposal of asset		—	2,811
Cash flow provided by investing activities		—	2,811
Effect of exchange rate changes on cash		8,439	6,778
Change in cash and cash equivalents		(120,387)	(97,943)
Cash and cash equivalents at the beginning of the period		208,161	161,009
Cash and cash equivalents at the end of the period		$87,774	$63,066

Refer to accompanying notes to the consolidated interim financial statements.

Consolidated Interim Statements of Changes in Equity (Deficit)
Reported in US dollars

	Share capital	*Contributed Surplus*	*Accumulated Other Comprehensive Income*	*Deficit*	*Total*
Balance at December 31, 2014	$7,173,622	$2,555,367	$53,856	$(11,466,667)	$(1,683,822)
Share based payments		63,573			63,573
Total comprehensive loss			15,570	(253,999)	(238,429)
Balance at March 31, 2015	$7,173,622	$2,618,940	$69,426	$(11,720,666)	$(1,858,678)
Common shares issued	863,824				863,824
Common shares issued – agent fee	56,899				56,899
Share issue costs	(134,827)				(134,827)
Warrants issued – agent fee	(76,038)	76,038			—
Warrant valuation	(483,795)				(483,795)
Share based payments		44,869			44,869
Total comprehensive loss			(4,397)	784,293	779,896
Balance at December 31, 2015	$7,399,685	$2,739,847	$65,029	$(10,936,373)	$(731,812)
Share based payments		8,698			8,698
Total comprehensive loss			(188,544)	(106,112)	(294,656)
Balance at March 31, 2016	$7,399,685	$2,748,545	$(123,515)	$(11,042,485)	$(1,017,770)

Refer to accompanying notes to the consolidated interim financial statements.

Notes to the Consolidated Interim Financial Statements
For the three months ended March 31, 2016 and 2015
(Reported in US dollars unless indicated otherwise)

1. General information

The principal business of Mkango Resources Ltd ("Mkango") is rare earth element and associated minerals exploration and development with two properties in the Republic of Malawi, Africa, including the Phalombe exploration license ("Phalombe License") and the Thambani exploration license ("Thambani License").

Mkango was originally incorporated under the name Alloy Capital Corp. ("Alloy") on November 13, 2007, under the laws of the Province of Alberta, Canada. On December 20, 2010, Alloy was acquired through a "reverse takeover" by Lancaster Exploration ("Lancaster BVI"). The articles of Mkango were amended to change its name from Alloy Capital Corp. to Mkango Resources Ltd. Mkango's head office is located at 259 Windermere Road SW, Calgary, Alberta Canada, T3C 3L2.

Lancaster BVI was incorporated August 3, 2007 by Memorandum and Articles of Association issued pursuant to the provisions of the British Virgin Islands ("BVI") Companies Act. Lancaster BVI's registered office is located at 56 Administration Drive, Wickhams Cay 1, Road Town, Tortola, British Virgin Islands. Lancaster is a wholly owned subsidiary of Mkango.

On May 19, 2011, a third entity, Lancaster Exploration Limited ("Lancaster Malawi"), was incorporated under the laws of Blantyre, Malawi. Lancaster Malawi is a wholly owned subsidiary of Lancaster BVI.

Mkango and its wholly owned subsidiaries are collectively referred to as the "Company" in these consolidated interim financial statements.

The consolidated interim financial statements were authorized for issuance by the Board of Directors of the Company on May 25, 2016.

2. Going concern

These consolidated interim financial statements have been prepared on a going concern basis, which contemplates the realization of assets and the payment of liabilities in the ordinary course of business. The Company has a working capital deficiency of $355,060 (2015 – $159,103), negative cash flows from operating activities and has a deficit of $11,042,485 (December 31, 2015 – $10,936,373). In addition, the Company has future spending commitments with the Government of Malawi to keep its exploration licences in good standing. If the amount expended is less than the minimum commitment, the shortfall becomes a debt to the Government of Malawi (Note 9). These factors indicate material uncertainties, which may cast significant doubt on the Company's ability to continue as a going concern. The Company is in the process of developing its mineral interests.

The operations of the Company for the next 12 months will be partially funded by cash remaining from a non-brokered private placement, which closed in two tranches on July 31, 2015 and October 20, 2015 (Note 7) and by future equity placements including a planned equity placement in June 2016.

Should the Company be unable to continue as a going concern, it may be unable to realize the carrying value of its assets and to meet its liabilities as they become due. These consolidated interim financial statements do not reflect the adjustments or reclassification of assets and liabilities, which would be necessary if the Company were unable to continue its operations.

3. Basis of presentation

(a) ***Statement of compliance***

These consolidated interim financial statements have been prepared in accordance with International Financial Reporting Standards ("IFRS") as issued by the International Accounting Standards Board ("IASB") and interpretations issued by the International Financial Reporting Interpretations Committee ("IFRIC"), in effect on January 1, 2016.

(b) ***Basis of presentation and measurement***

These consolidated interim financial statements have been prepared using the historical cost convention, except for certain financial instruments and share-based payment transactions measured at fair value.

(c) ***Functional and presentation currency***

The consolidated interim financial statements are presented in US dollars, which is the functional currency of Mkango and its Lancaster BVI subsidiary. Effective January 1, 2014, the functional currency of Lancaster Malawi changed from the US dollar to the local currency, the Kwacha, based upon changes in economic facts and circumstances.

(d) ***Principles of consolidation***

The consolidated interim financial statements of the Company include the accounts of the Company and its two wholly owned subsidiaries. All intercompany balances and transactions are eliminated upon consolidation.

(e) ***Use of estimates and judgments***

The preparation of the consolidated interim financial statements in conformity with IFRS requires management to make judgments, estimates and assumptions that affect the application of accounting policies and the reported amounts of assets, liabilities, income and expenses. Actual results may differ from these estimates.

Estimates and underlying assumptions are reviewed on an ongoing basis. Revisions to accounting estimates are recognised in the period in which the estimates are revised and in any future periods affected.

Key areas of judgement made in applying the Company's accounting policies are as follows:

(i) *Exploration and evaluation expenditures*

Costs incurred in respect of properties that have been determined to have proved reserves and for which an environmental impact study has been completed, are classified as development and production assets. In such circumstances, technical feasibility and commercial viability are considered to be established. Costs incurred in respect of new prospects with no established development past or present and no proved or probable reserves assigned are classified as exploration and evaluation expenses and are recognized in the statement of comprehensive income (loss). The decision to transfer assets from exploration and evaluation to property and equipment is subject to management's judgement regarding the project's commercial viability and technical feasibility. As of the date of this report, management has determined that the Company has not yet reached the development and production stage.

(ii) *Functional currency*

The functional currency of the Company and its subsidiaries is the currency of the primary economic environment in which each entity operates. Determination of functional currency may involve certain judgments to determine the primary economic environment and the Company reconsiders the functional currency of each entity if there is a change in events and conditions, which determine the primary economic environment.

Key areas of estimation where management has made difficult, complex or subjective assumptions, often as a result of matters inherently uncertain are as follows:

(i) *Measurement of share-based payments and warrant valuation (Note 7(b))*

The Company uses an option-pricing model to determine the fair value of share-based payments and warrants. Inputs to the model are subject to various estimates about volatility, interest rates, dividend yields, forfeiture rates and expected life of the instruments issued. Fair value inputs are subject to market factors as well as internal estimates. The Company considers historic trends together with any new information to determine the best estimate of fair value at the date of grant.

(ii) *Determination of fair values (Note 8)*

The estimated fair value of financial assets and liabilities, by their very nature, are subject to measurement uncertainty.

(f) ***New IFRS pronouncements not yet implemented***

The following IFRS pronouncements have been issued by the IASB as at March 31, 2016 but are not yet effective. The Company does not plan to early adopt any of these new or amended standards and interpretations and is currently assessing the impact of these new or amended standards and interpretations. Certain other new standards and interpretations have been issued but are not shown as they are not expected to have a material impact on the Company's consolidated interim financial statements.

(i) *IFRS 9 financial instruments (New and Amendment)*

IFRS 9 addresses requirements for the classification and measurement of financial instruments, impairment methodology and hedge accounting. The IASB set a mandatory effective date for annual periods beginning on or after January 1, 2018. The Company continues to assess this new standard, but does not expect it to have a significant impact.

(ii) *IFRS 15 revenue from contracts with customers (New)*

IFRS 15 replaces the existing revenue recognition guidance with a new framework to determine the timing and measurement of revenue, providing users of the financial statements more information and relevant disclosures. IFRS 15 is effective for annual periods beginning on or after January 1, 2018, with early adoption permitted. The Company continues to assess this new standard, but does not expect it to have a significant impact.

(iii) *IFRS 16 leases (New)*

IFRS 16 was issued and IAS 17 "Leases" was amended. IFRS 16 specifies how to recognize, measure, present and disclose leases. The standard provides a single lessee accounting model, requiring the recognition of assets and liabilities for all leases, unless the lease term is 12 months or less or the underlying asset has a low value. Lessor accounting however remains largely unchanged from IAS 17 and the distinction between operating and finance leases is retained. IAS 17, as revised, now prescribes the accounting policies and disclosures applicable to leases, both for lessees and lessors. Management anticipates that this standard will be adopted in the Company's consolidated interim financial statements for the year beginning January 1, 2019 and has not yet considered the potential impact of the adoption of IFRS 16.

4. Significant accounting policies

These consolidated interim financial statements should be read in conjunction with the annual consolidated financial statements for the year ended December 31, 2015. Details outlining the Company's accounting policies are contained in the notes to the financial statements for the year ended December 31, 2015.

5. Property and equipment

	Cost	*Accumulated Depreciation*	*Net Book Value*
Balance at December 31, 2014	$10,020	$(6,214)	$3,806
Disposal of asset	(9,732)	6,099	(3,633)
Additions	42,124	—	42,124
Depreciation	—	(5,306)	(5,306)
Balance at December 31, 2015	$42,412	$(5,421)	$36,991
Depreciation	—	(2,640)	(2,640)
Balance at March 31, 2016	$42,412	$(8,061)	$34,351

6. Related party transactions

a) Leo Mining Exploration Ltd. ("Leo Mining") is considered related by virtue of common directors and officers who have an ownership in and exercise significant influence over both companies. The Company and Leo Mining have formalized their relationship with respect to services provided by Leo Mining. A written agreement sets out the types of services, which may be provided and the costs associated with such services. Generally the Company repays the disbursements made by Leo Mining on its behalf. During the three months ended March 31, 2016, the Company had incurred costs of $9,194 (2015 – $36,007) for administrative services. As of March 31, 2016 the Company has an outstanding payable to Leo Mining in the amount of $34,708 (2015 – $43,279). The amount is unsecured and due on demand. Interest of 2 per cent. may be incurred on the outstanding amount annually; however this has been waived since 2013.

b) Digby Wells Environmental ("Digby"), by virtue of a common director, is considered a related party. During the three months ended March 31, 2016, the Company has incurred costs of $336 (2015 – nil) for environmental services. As of March 31, 2016, there was an outstanding payable to Digby for $3,133 (2015 – nil).

c) The Company incurred costs of $66,274 (2015 – $66,938) for key management and director fees and related costs for the three months ended March 31, 2016. Included in due to related parties at March 31, 2016, was $236,434 (2015 – $66,938) due to a related parties and officers of the Company. Prior to May 12, 2016, the amounts owed were unsecured, due on demand and non-interest bearing. On May 12, 2016, the Corporation entered into arrangements with management whereby a total of £145,620 (approximately C$272,391), comprising deferred salaries for Executive Directors accrued since March 2015 will only become payable on the earlier of, a change of control, termination of the applicable management contract, or May 12, 2018.

7. Share capital

a) ***Common Shares***

The Company is authorized to issue an unlimited number of common and preferred shares without nominal or par value. The Company has not issued any preferred shares to date. The holders of common shares are entitled to one vote for each share on all matters submitted to a shareholder vote and are entitled to share in all dividends that the Company's board of directors, in its discretion, declares from available funds.

	Ref	*Number*	*Amount*
Closing balance December 31, 2013		50,564,603	$7,370,698
Brokered offering – March 24, 2014	(i)	16,262,603	1,462,748
Warrants valuation		—	(1,365,728)
Agent warrants		—	(59,363)
Agent shares		24,500	2,184
Brokered offering – April 3, 2014	(ii)	6,445,250	583,533
Warrants valuation		—	(550,193)
Agent warrants		—	(27,867)
Share issue costs	(iii)	—	(242,390)
Closing balance December 31, 2014		73,296,956	$7,173,622
Brokered offering – July 31, 2015	(iv)	30,000,000	578,516
Warrants valuation		—	(318,464)
Agent warrants		—	(52,708)
Agent shares		1,680,000	32,372
Brokered offering – October 20, 2015	(v)	15,000,000	285,308
Warrants valuation		—	(165,331)
Agent warrants		—	(23,330)
Agent shares		1,280,000	24,527
Share issue costs	(vi)	—	(134,827)
Closing balance December 31, 2015 and March 31, 2016		121,256,956	$7,399,685

(i) On March 24, 2014, the Company issued 16,262,603 units at C$0.10 per unit pursuant to the non-brokered offering. Each Unit consists of one common share and one common share purchase warrant of Mkango. The C$1,626,260 (US $1,462,748) gross proceeds of the non-brokered offering were allocated between common shares C$94,323 (US$97,020) and warrants C$1,531,937 (US $1,365,728) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.20 until March 24, 2019. The Corporation issued to the Agent 24,500 Units valued at US $2,184 and 880,782 warrants valued at US $59,363. Each whole warrant entitles the holder to acquire one common share for C$0.10 until March 24, 2016.

(ii) On April 3, 2014, the Company issued 6,445,250 units at C$0.10 per unit pursuant to the non-brokered offering. Each Unit consists of one common share and one common share purchase warrant of Mkango. The C$644,525 (US$583,533) gross proceeds of the non-brokered offering were allocated between common shares C$36,791 (US$33,340) and warrants C$607,734 (US$550,193) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.20 until April 3, 2019. The Corporation issued 406,770 agents warrants valued at US$27,867. Each whole warrant entitles the agent to acquire one common share for C$0.10 until April 3, 2016.

(iii) Share issue costs of US $242,390 were paid for agent and legal services and regulatory exchange filing fees.

(iv) On July 31, 2015, the Company issued 30,000,000 units at C$0.025 per unit pursuant to the non-brokered offering. Each Unit consisted of one common share and one-half common share purchase warrant of Mkango. The C$750,000 (US $578,516) gross proceeds of the non-brokered offering were allocated between common shares C$334,500 (US$260,052) and warrants C$415,500 (US $318,464) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.05 until July 31, 2018. The Corporation issued to the Agents 1,680,000 Units, consisting of 1 common share and one-half common share purchase warrant of Mkango, valued at US $32,372 and 1,820,000 warrants valued at US $52,708. Each whole warrant entitles the holder to acquire one common share for C$0.05 until July 31, 2016.

(v) On October 20, 2015, the Company issued 15,000,000 units at C$0.025 per unit pursuant to the non-brokered offering. Each Unit consisted of one common share and one-half common share purchase warrant of Mkango. The C$375,000 (US $285,308) gross proceeds of the non-brokered offering were allocated between common shares C$160,500 (US$119,977) and warrants C$214,500 (US $165,331) based on the fair value of the warrants using the Black-Scholes option pricing model. Each Warrant entitles the holder to acquire one Common Share for C$0.05 until October 19, 2018. The Corporation issued to the Agents 280,000 Units, consisting of one common share and one-half common share purchase warrant of Mkango, and 1,000,000 common shares valued at US $24,527 and 980,000 warrants valued at US $23,330. Each whole warrant entitles the holder to acquire one common share for C$0.05 until October 19, 2016.

(vi) Share issue costs of US $134,827 were paid for agent and legal services and regulatory exchange filing fees.

b) ***Derivative financial instruments***

The exercise price of the share purchase warrants is fixed in Canadian dollars and the functional currency of the Company is the US dollar. Warrants are considered a derivative, as a variable amount of cash in the Company's functional currency will be received on exercise. Warrants issued do not include warrants issued to brokers and agents since they fall under the scope of IFRS 2, "share-based payments".

	Weighted Average Exercise Price (CDN$)	*Weighted Average Years Remaining*	*Number of Warrants*	*Amount*
Balance at December 31, 2013	$—	—	6,560,874	$18,115
Warrants expired – March 1, 2013	0.35	—	(2,142,858)	(4,860)
Warrants expired – April 11, 2013	0.35	—	(4,418,016)	(13,255)
Warrants issued – March 24, 2014	0.20	4.25	16,262,603	1,365,728
Warrants issued – April 3, 2014	0.20	4.25	6,445,250	550,193
Foreign exchange effect	—	—	—	(63,081)
Fair value change at December 31, 2014	—	—	—	(238,827)
Balance at December 31, 2014	$0.20	4.25	22,707,853	$1,614,013
Warrants issued – July 31, 2015	0.05	2.58	15,000,000	318,464
Warrants issued – October 20, 2015	0.05	2.80	7,500,000	165,331
Foreign exchange effect	—	—	—	(197,208)
Fair value change at December 31, 2015	—	—	—	(1,290,900)
Balance at December 31, 2015	$0.13	2.95	45,207,853	$609,700
Foreign exchange effect	—	—	—	4,229
Fair value change at March 31, 2016	—	—	—	83,132
Balance at March 31, 2016	$0.13	2.95	45,207,853	$697,061

The fair value of each warrant issued is determined at each reporting period using the Black-Scholes pricing model. The following assumptions were used in arriving at the fair value estimate for the warrants:

	July 31, 2015	*March 31, 2016 Revaluation*	*October 20, 2015*	*March 31, 2016 Revaluation*
Risk free interest rate	0.50%	0.53%	0.50%	0.53%
Expected volatility	217%	449%	241%	449%
Share price	$0.02	$0.02	$0.02	$0.02
Foreign exchange rate	1.3047	1.2971	1.2974	1.2971
Remaining life	3.23	2.33	3.25	2.55

	March 24, 2014	*March 31, 2016 Revaluation*	*April 3, 2014*	*March 31, 2016 Revaluation*
Risk free interest rate	1.69%	0.53%	1.67%	0.53%
Expected volatility	144%	449%	143%	449%
Share price	$0.11	$0.02	$0.11	$0.02
Foreign exchange rate	1.1217	1.2971	1.1035	1.2971
Remaining life	5.00	2.98	5.00	3.01

c) ***Share-based payments***

The Company has a rolling stock option plan (the "Plan") established to recognize contributions made by key personnel, to provide incentive to qualified parties to increase their proprietary interest in the Company and thereby encourage their continued association with the Company. The number of options granted under the Plan is limited to 10 per cent. in the aggregate of the number of issued and outstanding common shares of the Company at the date of the grant of the options.

The share-based payments expense that has been recognized in the consolidated statements of comprehensive income (loss) for the three months ended March 31, 2016 was $8,698 (2015 – $63,573). The corresponding amount has been recognized in contributed surplus. The options vest over a term of 24 months.

The following tables provide a summary of the status of the Company's stock option plan:

Year ended December 31	*2016*		*2015*	
	Number of Options	*Weighted average exercise price*	*Number of Options*	*Weighted average exercise price*
Outstanding, beginning of year	6,310,000	$0.27	6,910,000	$0.26
Cancelled	—	—	(412,500)	(0.18)
Forfeited	—	—	(187,500)	(0.16)
Outstanding, end of year	6,310,000	$0.27	6,310,000	$0.27

Grant date	*Expiry date*	*Number of options outstanding*	*Number of options exercisable*	*Exercise price*	*Remaining contractual life (years)*
Granted – January 17, 2011	January 16, 2021	1,700,000	1,700,000	$0.50	4.8
Granted – June 29, 2011	June 28, 2021	330,000	330,000	$0.55	5.3
Granted – September 25, 2013	September 24, 2023	1,480,000	1,480,000	$0.20	7.5
Granted – May 30, 2014	May 29, 2024	2,800,000	2,100,000	$0.13	8.2
Balance at March 31, 2016		6,310,000	5,610,000	$0.27	7.0

No options were issued during the three months ended March 31, 2016.

8. Financial instruments

Determination of fair values

Financial assets and liabilities have been classified into categories that determine their basis of measurement and for items measured at fair value, whether changes in fair value are recognized in the statement of comprehensive income (loss). Those categories are fair value through profit or loss; loans and receivables; and, for most liabilities, other financial liabilities.

In establishing fair value, the Company used a fair value hierarchy based on levels defined below:

- Level 1 – quoted prices in active markets for identical assets or liabilities;
- Level 2 – inputs other than quoted prices included in Level 1 that are observable for the asset or liability, either directly or indirectly; and
- Level 3 – inputs for the asset or liability that are not based on observable market data.

Cash and cash equivalents are measured at level 1; warrant derivative financial instruments are measured at level 2.

The carrying value of accounts receivable, accounts payable and accrued liabilities and due to related parties approximates the fair value due to their short-term nature and maturity. Warrants with an exercise price in a currency other than the functional currency are recorded as a derivative liability and carried at fair value, see Note 7(b).

Financial risk management

The Company's management monitors and manages the financial risks relating to the operations of the Company. These include foreign currency, interest rate, liquidity and credit risks.

Foreign currency risk

The functional and reporting currency of the Company is the United States dollar. The Company enters into transactions denominated in the Canadian Dollar, the United States dollar, and the local currency in Malawi (Kwacha). The Company raises its equity in the Canadian dollar and then purchases United States dollar and Malawi Kwacha funds to settle liabilities, as required. The Company's exposure to foreign currency risk as at March 31, 2016 and 2015 is most significantly influenced by the following financial instruments denominated in foreign currencies (amounts shown in US dollars):

	As at March 31,	
	2016	*2015*
Cash and cash equivalents:		
Canadian dollars	$81,716	$2,834
United States dollars	2,565	—
Malawi Kwacha	3,493	60,232
Warrants – derivative financial instruments	(697,061)	(1,629,788)
	$(609,286)	$(1,566,722)

A 5 per cent. reduction in the value of the Canadian dollar in comparison to the United States dollar would cause a change in income (loss) of approximately $4,100. A 5 per cent. change in the value of the Malawi Kwacha in relationship to the United States dollar would not cause a material change in net income (loss).

Interest rate risk

The Company's exposure to interest rate risk relates primarily to its cash and cash equivalents at banks. However, the interest rate risk is expected to be minimal. The Company does not presently hedge against interest rate movements.

Liquidity risk

Liquidity risk includes the risk that, as a result of the Company's operational liquidity requirements:

a) The Company will not have sufficient funds to settle a transaction on the due date;

b) The Company will be forced to sell financial assets at a value which is less than the fair value; or

c) The Company may be unable to settle or recover a financial asset at all.

The Company's operating cash requirements including amounts projected to complete the Company's existing capital expenditure program are continuously monitored and adjusted as input variables change. As these variables change, liquidity risks may necessitate the Company to conduct equity issuances or obtain project debt financing

The Company manages its liquidity risk by maintaining adequate cash and cash equivalents. The Company is actively seeking additional funding to improve its exposure to liquidity risk. The Company continually monitors its actual and forecast cash flows to ensure that there are adequate reserves to meet the maturing profiles of its financial liabilities.

The following table outlines the maturities of the Company's liabilities as at December 31, 2015:

	Contractual Cash Flows	*Less than 1 Year*
Accounts payable and accrued liabilities	$179,352	$179,352
Due to related parties	$274,275	$274,275

Credit risk

The Company's principal financial assets are cash and cash equivalents. The credit risk on cash and cash equivalents is limited because the majority are deposited with banks with high credit ratings assigned by international credit-rating agencies. Accounts receivable consists of GST and interest on investments with a credible financial institution.

9. Commitments

The Company was granted the Phalombe Licence for the Songwe property on January 21, 2010. The license was issued by the Malawi Government on a three-year basis, originally, and on January 20, 2015 was renewed for an additional two years. The future spending commitments for the exploration rights with the Government of Malawi are 150,000,000 Kwacha over two years (foreign exchange rate MWK677):

Exploration commitments, 2 years	$221,566
Ground rent, 2 years	25,084
Total commitment, 2 years	$246,650

On September 10, 2010, the Company was granted an additional exploration licence by the Malawi Minister of Natural Resources, Energy and Environment in respect of an area of 468km^2 in Thambani, Mwanza District, Malawi. The license was issued by the Malawi Government on a three-year basis, originally, and was renewed on September 10, 2015, for an additional two years when the company requested a reduction in the license area to the current 136.9 sq km. The future spending commitments for exploration expenses with the Government of Malawi was renegotiated from 250,000,000 to 25,000,000 Kwacha over two years (foreign exchange rate MWK677):

Exploration commitments, 2 years	$36,928
Ground rent, 2 years	4,044
Total commitment, 2 years	$40,972

The Company is continuing to meet the terms and conditions of its two exploration licenses and provides updates to Malawi's Ministry of Mining on a regular basis regarding progress of its work programs. If the amount expended is less than the minimum commitment, the shortfall becomes a debt to the Government of Malawi.

10. Capital management

The Company's total capital consists of shareholders' equity (deficiency) and amounts to ($1,017,770) as at March 31, 2016. The operations of the Company for the next 12 months will be partially funded by cash remaining from a non-brokered private placement, which closed in two tranches on July 31, 2015 and October 20, 2015 (Note 7) and by future equity placements.

The Company's objective when managing its capital is to have sufficient capital to maintain its ongoing operations, pursue its strategic opportunities and maintain a flexible capital structure which optimizes the cost of capital at an acceptable risk. The Company manages its capital structure and makes adjustments to it based on the funds available to the Company. The Company does not presently utilize any quantitative measures to monitor its capital. The Company has no externally imposed capital requirements.

11. Subsequent event

1. On May 12, 2016, the Corporation entered into arrangements with management of the Corporation whereby a total of £145,620 (approximately C$272,391), comprising deferred salaries for Executive Directors accrued since March 2015 and included in short term liabilities, will only become payable on the earlier of, a change of control, termination of the applicable management contract, or May 12, 2018.

2. On May 18, 2016, the Corporation announced that it proposes to raise gross proceeds of £1 million (approximately C$1.87 million) (the "Placing") in conjunction with admission to the AIM market ("AIM") of the London Stock Exchange. In conjunction with and subject to successful completion of both the Placing and admission to AIM, the Corporation proposes to undertake a three to one consolidation (the "Consolidation") on the basis of three (3) pre-Consolidation shares for one (1) post-Consolidation share. The Consolidation would have the effect of reducing the number of shares outstanding prior to the Placing from 121,256,956 to 40,418,985.

Under the terms of the Placing, the Corporation will issue 30,303,030 post-Consolidation units (the “Units”) at a post-Consolidation price of 3.3 pence (C$0.06) per Unit.

Each Unit will consist of one common share of the Corporation (a “Common Share”) and one Common Share purchase warrant (a “Warrant”). Each whole Warrant will entitle the holder to acquire one Common Share at a price of 6.6 pence for a period of 3 years following the closing date of the Placing.

If the closing price of the Common Shares on AIM exceeds 19.8 pence (C$0.37) for at least 20 consecutive trading days following the date that is four months after the date of issuance of the Warrants, the Corporation shall have the right, exercisable within three business days thereafter, to accelerate the expiry of the Warrants to 20 business days after the issuance of a news release announcing the new expiry date.

3. On May 24, 2016, the Corporation announced that over £1 million (approximately C$1.9 million) had been committed to the Placing discussed above in point number two. The successful closing of the Placing is contingent on admission to the AIM market of the London Stock Exchange by June 30, 2016.

PART V

ADDITIONAL INFORMATION

1. Responsibility

The Company and the Directors, whose names and functions are set out in paragraph 2 of this Part V, accept responsibility for all the information contained in this Document. To the best of the knowledge and belief of the Company and the Directors (who have taken all reasonable care to ensure that such is the case), the information contained in this Document is in accordance with the facts and contains no omission likely to affect the import of such information.

2. The Directors

2.1 The Directors and (where applicable) their respective functions are as follows:

- William Dawes (Chief Executive Officer & Executive Director – elected as a Director on 20 December 2010 and appointed as an Officer by the Board on 20 December 2010).
- Alexander Lemon (President & Executive Director – elected as a Director on 20 December 2010 and appointed as an Officer by the Board on 20 December 2010).
- Adrian Reynolds (Non-Executive Director – elected as a Director on 29 June 2011).
- Derek Linfield (Non-Executive Chairman – elected as a Director on 30 January 2014).
- David Berg (Audit Committee Chairman, Corporate Secretary and Non-Executive Director elected as a Director on 13 November 2007).
- Eugene Chen (Non-Executive Director elected as a Director on 13 November 2007).

3. The Company

3.1 The Company was incorporated and registered as Alloy Capital Corp on 13 November 2007 under the laws of the Province of Alberta, Canada under the BCA with corporate access number 2013624792. On 13 December, 2010, the Company changed its name to Mkango Resources Ltd.

3.2 The registered office of the Company is 259 Windermere Road SW, Calgary, Alberta, T3C 3L2, Canada. The Company's office number is: +1 403 444 5979.

3.3 The Company's head corporate office is at 259 Windermere Road SW, Calgary, Alberta, T3C 3L2, Canada.

3.4 The principal legislation governing the Company is the BCA and the regulations made thereunder.

3.5 The business of the Company and its principal activity is that of a holding company of a Group of companies that are involved in mining exploration and development operations.

3.6 The Company's Existing Common Shares are listed under the symbol "MKA" on the TSX-V.

4. Subsidiaries

4.1 The Company has one wholly owned subsidiary, being Lancaster BVI.

4.2 Lancaster BVI has one wholly owned subsidiary being Lancaster Malawi.

5. Share capital

5.1 The authorised share capital of the Company is made up of an unlimited number of Common Shares and an unlimited number of Preferred Shares.

5.2 The securities of the Company are created pursuant to the BCA. The distribution of the securities of the Company is governed by applicable securities laws in Canada and the TSX-V Rules.

5.3 Under the BCA, no Shareholder consent is required to issue shares pursuant to a public or private offering of securities by the Company. However, under the TSX-V Rules, Shareholder approval may be required if the issue results in a change of control (as such term is defined in the TSX-V Rules) or a new control person (being prima facie, a holder of greater than 20 per cent. of the voting shares) is created as a result of the issue.

5.4 The issued share capital of the Company as at 27 May 2016, being the latest practicable date prior to publication of this Document, and immediately following Admission, the Consolidation and completion of the Placing is or will be as follows:

	As at the date of this document	*As at Admission*
Common Shares	121,256,956	71,055,348
Preferred Shares	NIL	NIL

5.5 All of the issued share capital of the Company has been fully paid up.

5.6 The following changes have taken place in the issued share capital of the Company during the three year period to and up to the date of this Document:

Date	*Purpose of Common Share Issue*	*No. of Common Shares issued*	*Price per Common Share*
1 March 2013	Private Placing	4,285,715	0.175
11 April 2013	Private Placing	8,836,033	0.175
24 March 2014	Private Placing	16,262,603	0.10
3 April 2014	Private Placing	6,445,250	0.10
31 July 2015	Private Placing	31,680,000	0.025
20 October 2015	Private Placing	16,280,000	0.025

5.7 The 121,256,956 Common Shares will be consolidated on the basis of 1 new Common Share for each 3 then issued Common Shares into 40,418,985 at Admission.

5.8 As at Admission, Options over a total of 7,000,000 Common Shares will have been granted and held by certain Directors, officers and consultants under the Stock Option Plan, all of which will be outstanding immediately following Admission and the principal terms of which are set out in the table below.

5.9 Further details of Directors' interests in Options are set out in paragraph 11 of this Part V.

Aggregate no. of Options to be granted prior to Admission	*Exercise Price (C$)*	*Lapse Date*
7,000,000	0.06	14 June 2026

Note: Subject to adjustment if the closing price on the TSX-V on the day prior to Admission is greater than C$0.02 pre-consolidation

5.10 Following Admission and Consolidation, the Existing Warrants granted by the Company to investors pursuant to equity financings carried out by the Company will be over a total of 16,337,445 Common Shares (each Existing Warrant being exercisable into one Common Share). Details are set out below:

No. of Existing Warrants following Admission and Consolidation	*Exercise Price (C$)*	*Lapse Date*
606,667	0.15	31 July 2016
326,667	0.15	19 October 2016
5,280,000	0.15	31 July 2018
2,546,667	0.15	20 October 2018
5,429,033	0.60	24 March 2019
2,148,411	0.60	3 April 2019

The Existing Warrants as set forth in the table above are presented on a post-consolidation basis, after adjustment of the number of Common Shares which may be acquired upon exercise and the exercise price pursuant to the anti-dilution and adjustment clauses contained in such Existing Warrants.

5.11 Other than as noted in this paragraph 5, the Company does not have in issue any securities not representing share capital and there are no outstanding convertible securities issued by the Company.

5.12 On Admission and completion of the Placing, the existing Shareholders will suffer a dilution of 42.65 per cent. in their interests in the Company.

5.13 The Common Shares may be held in either certificated form or, through Depositary Interests, under the CREST system.

5.14 Except as disclosed in this paragraph 5, during the three year period to December 31, 2015 and up to the date of this Document there has been no change in the amount of the issued share or loan capital of the Company.

5.15 Except as disclosed elsewhere in this Clause 5 and save for the issue of the Placing Shares and the issue of the Placing Warrants, no share of the Company or any subsidiary is under option or has been agreed conditionally or unconditionally to be put under option.

5.16 To the best of the Directors' knowledge, there is no person who directly or indirectly, jointly or separately, exercises or could exercise control over the Company following Admission.

5.17 During the three year period to December 31, 2015 and up to the date of this Document, not more than 10 per cent. of the share capital of the Company has been paid for with assets other than cash.

5.18 There are no arrangements known to the Company, the operation of which may at a subsequent date result in a change of control of the Company.

6. Articles of Incorporation and By-laws

The following is a summary of the Company's Articles, which were filed on November 11, 2007 and amended on June 19, 2008 and on December 13, 2010 and By-laws, which are the principal governing documents for the Company. At the annual and special meeting of Shareholders of the Company held on November 19, 2015, the Shareholders approved a consolidation of the Company's Common Shares on the basis of one (1) post-consolidation Common Share for every 10 pre-consolidation Common Shares then issued and outstanding, or such lesser number of pre-consolidation Common Shares as may be determined by the Board of Directors of the Company and accepted by the TSX Venture Exchange. The Board of Directors of the Company has determined that the share Consolidation shall be conducted on a 3-to-1 basis. As such, the Company will file Articles of Amendment with the Alberta corporate registry to effect such Consolidation prior to or concurrently with the Admission of the shares on AIM.

Articles of Incorporation

6.1 *Common Shares*

The Company is authorised to issue an unlimited number of Common Shares with the following rights, privileges, restrictions and conditions:

(a) Voting

The holders of Common Shares are entitled to receive notice of, attend at and vote at all meetings of Shareholders of the Company on the basis of one vote for each Common Share held.

(b) Dividends

Subject to the rights of holders of Preferred Shares and other class of shares ranking senior to the Common Shares, holders of Common Shares are entitled to receive and participate rateably in any dividends declared by the Board of Directors of the Company.

(c) Liquidation, Dissolution or Winding-up

Subject to the rights of holders of Preferred Shares and other class of shares ranking senior to the Common Shares in the event of the liquidation, dissolution or winding up of the Company, or any other distribution of the assets of the Company among its Shareholders for the purpose of winding up its affairs, the holders of Common Shares are entitled to share rateably in the distribution of the remaining assets of the Company.

6.2 *Share Transfers*

The Company has no restrictions on share transfers.

6.3 *Directors*

The Company must have a minimum of 3 and a maximum of 12 Directors at all times.

6.4 *Business*

The Company is not restricted from carrying on any type of business.

6.5 *Other Provisions*

The Articles provide that the Directors of the Company may, between annual general meetings, appoint one or more additional Directors of the Company to serve until the next annual general meeting, but the number of additional Directors cannot at any time exceed one-third of the number of Directors who held office at the expiration of the last annual general meeting of the Company.

By-laws

The Company is governed by the provisions of the BCA. Pursuant to the BCA, the Company has enacted By-laws to govern certain business and affairs of the Company. Generally, in the event of a conflict between the BCA and the By-laws, the BCA governs.

6.6 *Voting rights*

Every Shareholder who is present in person or by proxy shall have one vote for every share of which he is the holder. In the case of an equality of votes, the chairman of the meeting does not have a second or casting vote.

6.7 *Directors*

(a) Number of Directors and quorum

The number of Directors shall not be less than the minimum or more than maximum set out in the Articles. At least one quarter of the Directors present at any meeting must be resident Canadians (unless a resident Canadian Director provides written or telephone consent to the business transacted at the meeting).

(b) Election and Term

Directors are to be elected each year at the annual general meeting of Shareholders. Directors continue in office until not later than the close of the next annual general meeting of Shareholders unless they either resign, are disqualified or are replaced following a resolution to such effect by the Shareholders, on an earlier date.

(c) Action by the Board

The Board of Directors shall manage the business and affairs of the Company.

(d) Meetings

Meetings of the Directors may be held in person or via telephone and may take place anywhere in or outside of Alberta. In order to be duly called, 48 hours advance notice must be provided, unless otherwise waived by all Directors.

(e) Remuneration and Expenses

The Directors may be paid such remuneration for their services as the Board may from time to time determine. The Directors may also be entitled to be reimbursed for travelling and other expenses properly incurred by them in attending meetings of the Board or any committee thereof. Upon any change of control of the Company, each member of the Board will be entitled to £1,000 per board meeting commencing in 2016.

(f) Written Resolutions

Resolutions of Directors can be approved in writing, provided that they are signed by all Directors.

6.8 *Borrowing powers*

The Directors may exercise all the powers of the Company to borrow money and to mortgage or charge its undertaking, property and assets and may delegate this power to a Director, a committee of the Board or an officer of the Company.

6.9 *Changes in Shareholder rights*

There are no provision in the Articles or By-laws regarding changes in Shareholder rights as they are contained in the BCA.

6.10 *Officers*

(a) Officers

The Board may designate officers of the Company and appoint individuals to those offices as they consider advisable. The powers and duties of the officers shall be as determined by the Board. Officers may be removed from their roles by Directors.

(b) Protection of Directors and officers

(i) Limited Liability

Except as otherwise provided in the BCA no Director or officer shall be liable for the acts, omissionss or defaults of any other Director, officer or employee of the Company, for any loss, damage or expense incurred by the Company through the insufficiency or deficiency of title to any property acquired for or on behalf of the Company, or for the insufficiency or deficiency of any security in or upon which any of the monies of the Company is invested, or for any loss or damage arising from the bankruptcy, insolvency, tortious or criminal acts of any person with whom any of the Company's money, securities or other property of the Company deposited, or for any loss occasioned by any error of judgment or oversight, or for any other loss, damage or misfortune which occurs in the execution of the duties of his office or in relation thereto subject to the BCA and the regulations thereunder.

(ii) Indemnification

Subject to the BCA, the Company shall indemnify a Director or officer, a former Director or officer, or a person who acts or acted at the Company's request as a Director or officer of a body corporate of which the Company is or was a Shareholder or creditor, and his heirs and legal representatives, against all costs, charges and expenses, including an amount paid to settle an action or satisfy a judgment, reasonably incurred by him in respect of any civil, criminal or administrative action or proceeding to which he is made a party by reason of being or having been a Director or officer of the Company or such body corporate, if (a) he acted honestly and in good faith with a view to the best interests of the Company; and (b) in the case of a criminal or administrative action or proceeding that is enforced by a monetary penalty, he had reasonable grounds for believing that his conduct was lawful. The Company shall also indemnify such person in such other circumstances as the BCA or law permits or requires.

6.11 *Shares and Shareholders*

(a) Allotments

The Board may, subject to the TSX-V Rules, allot shares and grant options at its discretion, provided that any issuance of shares shall be fully paid. In addition, under TSX-V Rules, the maximum number of options that the Company may grant under its Stock Option Plan cannot exceed 10 per cent. of the issued and outstanding Common Shares at any time.

(b) Meetings of Shareholders

The Company shall in each year hold an annual general meeting of its Shareholders, at which time it shall place its financial statements before the Shareholders for consideration and for the purpose of electing Directors, appointing auditors and for such other purposes as may be properly brought before the meeting. Such meetings may be held in the municipality of the registered office unless the Board otherwise determines, in which case they may be held in or outside of Alberta.

(c) Notice of Meetings of Shareholders

Subject to the provisions of the BCA, TSX-V Rules and applicable securities laws, a meeting of Shareholders shall be convened by not less than 21 and not more than 50 clear days' notice in writing.

(d) Quorum

A quorum for the transaction of business at any meeting of Shareholders shall be two persons present in person, each and who hold or represent by proxy in the aggregate not less than 5 per cent. of the total number of shares entitled to be voted at the meeting. being a Shareholder entitled to vote thereat or a duly appointed proxyholder or representative for a Shareholder so entitled.

(e) Shareholder reporting

The amended By-laws state that, subject to the BCA, the Company shall request that all Shareholders interested in three percent (3 per cent.) or more of the Company's Common Shares notify the Company of their holdings (as such term is defined in the AIM Rules) of Common Shares (including all legal and beneficial interests, direct or indirect, of such Shareholder, including all positions in "financial instruments" (as such term is defined in the AIM Rules)) and of any subsequent relevant changes to their holdings (being each one percent (1 per cent.) increment increase or decrease whist the Shareholder's holdings (as defined above) are above the three percent (3 per cent.) threshold) so that these disclosures can be properly notified to the AIM market. This obligation will become effective if the amendment to the By-laws occurs. At the annual special meeting of the Shareholders held on November 19, 2015, the Shareholders approved an amendment to the By-laws of the Company, such amendment to be effective on the day that the Common Shares are admitted to trading on AIM.

7. Effects of Canadian Domicile

The Company is a Canadian company incorporated in the Province of Alberta, Canada under the BCA. There are certain differences between the corporate structure of the Company and that of a public limited company incorporated in the UK under the Act. A description of the principal differences is set out in the sections headed Pre-emption Rights, Takeovers and Disclosure of Interests in shares below.

7.1 *Pre-Emption Rights*

The Company is not required under Canadian law to offer new Common Shares to existing Common Shareholders on a pre-emptive basis as is required of companies incorporated under the Act. As such, it may not be possible for existing Common Shareholders to participate in future share issues, which may dilute an existing Common Shareholder's interest in the Company. However, pursuant to the nominated adviser and broker agreement, details of which are set out in paragraph 14.4(a) of this Part V, the Company and the Directors have undertaken to SP Angel, that for as long as the Common Shares remain quoted on AIM but are no longer listed on the TSX-V or the TSX and as a result, no longer subject to the anti-dilution provisions in the rules of such exchanges, the Company will obtain Shareholder approval by ordinary resolution for any issuance of Common Shares:

(a) for any issuance of Common Shares for cash such that such Common Share issuance would, when taken together with any Common Share issuances for cash in the 12 months prior to such issuance (or from the date the Company shall no longer be listed on the TSX or TSX-V, if such period is shorter than 12 months), exceed 10 per cent. of the issued and outstanding Common Shares on the date of such issuance; or

(b) for any issuance of Common Shares:

   (i) for the acquisition of property or the shares (or similar units of ownership) of another corporate or similar entity (including, but not limited to, partnership interests in a partnership or units of a trust);

   (ii) to settle any outstanding debts of the Company; or

   (iii) as executive compensation.

   such that such Common Share issuance would, when taken together with any Common Share issuances for cash in the 12 months prior to such issuance (or from the date the Company shall no longer be listed on the TSX or TSX-V, if such period is shorter than 12 months), exceed 33 per cent. of the issued and outstanding Common Shares on the date of such issuance.

The said undertaking will not apply to the following issuances of Common Shares:

(a) securities convertible into or exchange for Common Shares; or

(b) Common Shares:

   (i) for the acquisition of property or the shares (or similar units of ownership) of another corporate or similar entity (including, but not limited to, partnership interests in a partnership or units of a trust);

   (ii) to settle any outstanding debts of the Company;

   (iii) as executive compensation;

   (iv) in a rights offering where all Shareholders are offered an equal right per Common Share held to acquire Common Shares in the offering; or

   (v) on the exercise or conversion of any security exchangeable for or convertible into Common Shares.

Further, if on the date of any Common Share issuance, the market capitalisation of the Company does not exceed £5 million based on the closing price of the Common Shares on the day before such Common Share issuance (using the closing price of the Common Shares on AIM on the day previous to such Common Share issuance, or if there was no trade on such date, the simple arithmetic average of the bid and ask prices for such Common Shares on such date), then the Company will be permitted to issue up to 50 per cent. of the then outstanding Common Shares in issue on such date without obtaining the Shareholder approval otherwise required by the respective section.

7.2 ***Takeovers***

Although the Common Shares will be admitted to trading on AIM, the Company will not be subject to take-over regulation in the UK. The City Code will not apply to the Company. However, Canadian laws applicable to the Company provide for early warning disclosure requirements and for takeover bid rules for bids made to security holders in various jurisdictions in Canada. A summary of these rules is set out in paragraph 19 of Part I of this Document.

(a) *Mandatory Takeover*

See paragraph 19 of Part I of this Document for a summary of the circumstances in which an acquirer of shares of the Company may be required under applicable Canadian provincial securities laws to make a formal takeover bid for the shares of the Company in that province.

(b) *Squeeze-out*

Under Alberta corporate law, where an offeror has successfully acquired 90 per cent. of the shares of a company (including those previously held by the offeror) within four months of making the offer to acquire shares of that company, the offeror may, within five months after making such offer, send written notice to any Shareholder who did not accept the offer compelling that Shareholder to sell shares held on the same terms as contained in the original offer, subject to the right of any such Shareholder to make application to court, in which case, the court may set the price and terms of payment and make such other consequential orders and give such directions as it deems appropriate.

(c) *Takeover Bids*

No public takeover bids have been made in relation to the Company during its last financial year or its current financial year.

7.3 ***The Disclosure of Interests in Shares***

(a) As a company incorporated under the laws of the Province of Alberta, the Company is not subject to the provisions of the DTRs and, consequently, Shareholders will not be subject to any UK requirement to disclose to the Company the level of their interests in Common Shares.

(b) Generally, in Alberta there are no statutory obligations on Shareholders (other than insider and early warning reporting obligations) to disclose to the Company the level of their interests in Common Shares, other than under certain securities legislation in Alberta and other jurisdictions in Canada, which require any Shareholder of the Company to make certain disclosures when it acquires ownership or control or direction over voting or equity securities, or any other securities convertible into voting or equity securities, of any class of a public company that constitutes 10 per cent. or more of the outstanding securities of that class and acquisitions or disposition of every 2 per cent. thereafter.

(c) When acquiring shares in the Company, beneficial Shareholders are entitled under Canadian securities laws to categorise themselves either as "objecting" ("Obos") or "non-objecting" ("Nobos"). By registering as such, which they usually do through the entity by which they acquired their shares, Obos are noting that they object to their interest and their details being disclosed to the Company. However, once an Obos beneficial ownership in equal to or more than 10 per cent. under Canadian securities law disclosure of such interests is mandatory; Nobos on the other hand agree that they do not object to their shareholdings and their details being disclosed to the Company. Rule 17 of the AIM Rules requires, *inter alia*, that Shareholders notify an AIM quoted company once their holding is 3 per cent. or more, and changes thereto (movements through a percentage point upwards or downwards).

(d) The Board has approved an amendment of the By-laws, which will become effective on Admission, to include the provisions referred to at paragraph 6.10(e) of this Part V, thereby requiring Shareholders holding 3 per cent. or more of the voting rights in the Company to notify the Company thereof and of subsequent changes thereto which reach, exceed or fall below a 1 per cent. threshold. This conditional amendment to the By-laws was confirmed by the Shareholders at the last annual general meeting of the Company (held on 19 November 2015).

7.4 ***Cancellation of the admission of the Common Shares to trading on AIM***

Under Rule 41 of the AIM Rules, should the Company wish to cancel the admission of its Common Shares to trading on AIM it is required to obtain the consent of not less than 75 per cent. of votes cast by Shareholders at a duly called meeting thereof (unless the London Stock Exchange otherwise agrees in certain circumstances). Accordingly, the Board have approved an amendment of the By-laws to include a provision requiring that any such proposed cancellation shall be conditional upon the consent of not less than 75 per cent. of votes cast by Shareholders at a duly called meeting thereof. This conditional amendment to the By-laws was confirmed by the Shareholders at the last annual meeting of the Company (held on 19 November 2015) and is effective from Admission.

8. UK Taxation

The following paragraphs are intended as a general guide only for Shareholders who are resident and domiciled in the United Kingdom for tax purposes. The statements in this summary only apply to Shareholders who are beneficial owners of Common Shares or Depositary Interests and are not applicable to all categories of Shareholders, and in particular, are not addressed to:

8.1 Shareholders who do not hold their Common Shares or Depositary Interests as capital assets;

8.2 Shareholders who own (directly or indirectly) 10 per cent. or more of the Company's shares or voting power; and

8.3 special classes of Shareholders such as dealers in securities or currencies, broker-dealers, insurance or investment companies, or tax-exempt entities.

The statements in this summary do not purport to be comprehensive or to describe all potential relevant considerations. They are based on current legislation and UK HM Revenue & Customs' practice and are not intended to constitute tax or legal advice to any particular Shareholder. Any Shareholder or prospective purchaser of Common Shares or Depositary Interests should consult their professional advisers on the possible tax consequences of acquisition, ownership and disposition under the laws of their particular citizenship, residence and/or domicile and under UK laws and current HM Revenue & Customs' practice.

Stamp duty and stamp duty reserve tax ("SDRT")

No UK stamp duty or stamp duty reserve tax is payable on the first issue of the Common Shares or the issue of Depositary Interests by the Depositary.

For Common Shares held outside CREST, no UK stamp duty should generally be payable, provided that any instrument of transfer is not executed in the UK and is kept outside the UK and does not relate to any property situated, or to any matter or thing done or to be done in the UK. If this is not the case, the transfer of the Common Shares will generally be subject to UK stamp duty (at the rate of 0.5 per cent. of the amount or value of the consideration given for the transfer, rounded up, where necessary, to the nearest £5). The purchaser usually pays the UK stamp duty.

Provided that any Common Shares held outside CREST are not registered in a register kept in the UK by or on behalf of the Company nor are paired with shares issued by a body corporate incorporated in the UK, no UK SDRT should be generally chargeable in respect of any agreement to transfer Common

Shares. If this is not the case, the agreement to transfer the Common Shares will generally be subject to UK SDRT at the rate of 0.5 per cent. of the amount or value of the consideration payable for the transfer. UK SDRT is, in general, payable by the purchaser.

No stamp duty or SDRT should arise on the transfer of the Common Shares to the Depositary (or one of its subsidiaries), to hold in its capacity as Depositary, nor on the subsequent issue by the Depositary to that transferor of Depositary Interests representing the underlying Common Shares in an uncertificated form (which are eligible for settlement through CREST).

Assuming that transfers of Depositary Interests operate without any written instrument or transfer or written assignment to transfer, no stamp duty will be payable by the purchasers of such Depositary Interests. Further any agreement to transfer Depositary Interests will be exempt from UK SDRT pursuant to the Stamp Duty (UK Depositary Interests in Foreign Securities) Regulations 1999.

Taxation of chargeable gains

A subsequent disposal, whether by sale or gift, of the Common Shares or Depositary Interests or on a liquidation or dissolution of the Company, by persons resident or ordinarily resident in the United Kingdom in a tax year which gives rise to capital gains may be liable to capital gains tax (where the Shareholders are individuals and trustees) or corporation tax (where the Shareholders are companies). Liability to tax and the rate of tax will depend on the Shareholder's circumstances and the availability of exemptions or allowable losses.

The amount of taxable gain will generally be the difference between the acquisition cost of the Common Shares or Depositary Interests and the disposal proceeds. In some circumstances market value may be substituted for actual proceeds. Indexation allowance, which increases the acquisition cost of an asset in line with the rise in the retail price index, is available for UK resident corporate Shareholders during the period of ownership.

For individuals and trustees, entrepreneurs' relief may be available to reduce the amount of capital gains tax payable on the gain, subject to satisfying all of the relevant conditions.

Individuals and some trusts have an annual exemption from capital gains tax for the first £11,100 of chargeable gains in the tax year to 5 April 2017. The majority of trusts have an equivalent exemption of up to £5,550 in the tax year to 5 April 2017. The annual exempt amount is subject to change.

Generally, losses realised on the disposal of Common Shares or Depositary Interests may be set against other gains made during the tax year or carried forward and set against gains in future tax years. Utilisation of losses made on disposals to connected persons is restricted.

Persons who are not resident in the United Kingdom will not normally be liable to tax in the United Kingdom in respect of any gain accruing to them on a disposal of the Common Shares or Depositary Interests unless those persons carry on a trade in the UK through a permanent establishment with which their investment in the Company is connected. The terms of a relevant double taxation treaty may apply to persons with dual residence. Special rules may apply to tax gains arising on the disposal of Common Shares or Depositary Interests by individual Shareholders at a time when they are temporarily non-resident in the UK. For this purpose temporary non-residence is where a person that was UK resident for any part of at least 4 out of the 7 years prior to departure is away from the UK for a period of less than 5 years.

A non-UK tax resident may be subject to foreign taxation on capital gains depending on their personal circumstances.

The above summary applies only to those who hold their Common Shares or Depositary Interests as capital assets or investments; different tax treatment applies to persons who trade in securities.

Taxation of dividends

Any Shareholder who is an individual or settlement resident in the UK, or who carries on a trade, profession or vocation in the UK to which the shares are attributable, will generally be subject to UK tax on income in respect of any dividends paid on the Common Shares or Depositary Interests. A credit may be available for any Canadian Tax withheld from a dividend in computing any liability to UK taxation arising on that dividend.

Overseas dividends received after 1 July 2009 by a UK resident corporate Shareholder may be exempt from UK corporation tax subject to meeting certain conditions.

Individuals who are resident in the United Kingdom should note that section 714 of the Income Tax Act 2007, which contains provisions for preventing the avoidance of income tax through transactions resulting in the transfer of income to persons (including companies) abroad, may render them liable to taxation in respect of any undistributed income and profits of the Company.

These comments are intended only as a general guide to the current tax position in the UK at the date of this Document. The rates and basis of taxation can change and will also be dependent on each Shareholder's personal circumstances.

Neither the Company nor its advisers warrant in any way the tax position outlined above which, in any event, is subject to changes in the relevant legislation and its interpretation and application.

9. Canadian Taxation for Non-Resident of Canada

The following is a general summary of the principal Canadian federal income tax considerations under the Income Tax Act (Canada) ("Canadian Tax Act") generally applicable to a Shareholder who holds Common Shares as capital property and deals at arm's length with, and is not affiliated with, the Company. This summary assumes that, at all relevant times, the Company will be, or will be deemed to be, resident in Canada for purposes of the Canadian Tax Act.

This summary is based upon the current provisions of the Canadian Tax Act, and the Canada-United Kingdom Income Tax Convention (1978) ("Treaty"). This summary also takes into account all specific proposals to amend the Canadian Tax Act publicly announced by or on behalf of the Minister of Finance (Canada) prior to the date hereof ("Tax Proposals") and the current published administrative and assessing policies and practices of the Canada Revenue Agency ("CRA"). This summary is not exhaustive of all possible Canadian federal income tax considerations and, except for the Tax Proposals, does not take into account or anticipate any changes in law, whether by legislative, governmental or judicial decision or action, or any changes in the administrative and assessing policies and practices of CRA. This summary does not take into account tax legislation of any province, territory or foreign jurisdiction. Provisions of provincial income tax legislation vary from province to province in Canada and may differ from federal income tax legislation. No assurances can be given that the Tax Proposals will be enacted as proposed, if at all.

This summary is of a general nature only and is not intended to be, nor should it be, construed to be, legal or tax advice to any particular Shareholder. Accordingly, Shareholders should consult their own tax advisers for advice with respect to the income tax consequences to them of acquiring, holding and disposing of Common Shares having regard to their own particular circumstances.

The following summary is generally applicable to a Shareholder who, at all relevant times, is neither resident, nor deemed to be resident in Canada for purposes of the Canadian Tax Act, and who does not use or hold, and is not deemed to use or hold Common Shares in the course of carrying on a business in Canada ("Non-Resident Holder"). This summary does not apply to a Non-Resident Holder that is an insurer that carries on business in Canada and elsewhere. Non-Resident Holders should consult their own tax advisers for advice with respect to any foreign tax consequences applicable to them from holding and disposing of Common Shares. Non-Resident Holders that are resident or ordinarily resident in the United Kingdom for domestic United Kingdom tax purposes should also refer to the discussion in paragraph 8 above under the heading "UK Taxation".

Disposal of Common Shares

A Non-Resident Holder will not be subject to tax under the Canadian Tax Act on any capital gain realised on the disposition or deemed disposition of such Common Shares, unless the Common Shares are, or are deemed to be, "taxable Canadian property" (within the meaning of the Canadian Tax Act) and the gain is not otherwise exempt from taxation in Canada under the terms of an applicable income tax convention or treaty. Generally, Common Shares will not be taxable Canadian property to a Non-Resident Holder at a particular time provided that (i) the Common Shares are listed on a designated stock exchange (which currently includes the TSX-V) at that time and at no time during the 60 month period immediately preceding the date of disposition of the Common Shares did the Non-Resident Holder, persons with whom the Non-Resident Holder did not deal at arm's length, or such holder together with such persons, own 25 per cent. or more of the issued shares of any class or series of the Company, or (ii) at no time during such 60-month period did the Common Shares derive more than 50 per cent. of their value from any combination of: (a) real property situated in Canada, (b) "timber resource property" (as defined in the Canadian Tax Act), (c) "Canadian resource property" (as defined in the Canadian Tax Act), or (d) Options in respect of, or interests in, or for civil law, rights in any of the foregoing, whether or not the property exists.

If Common Shares constitute or are deemed to constitute taxable Canadian property to a particular Non-Resident Holder, on the disposal or deemed disposal thereof, such holder will realise a capital gain (or capital loss). Any such capital gain may be exempt from tax under the Canadian Tax Act under the terms of an income tax treaty or convention between Canada and the country in which the Non-Resident Holder resides. Non-Resident Holders whose Common Shares are taxable Canadian property should consult their own tax advisers for advice having regard to their particular circumstances.

Dividends on Common Shares

Dividends on Common Shares paid or credited or deemed to be paid or credited to a Non-Resident Holder will be subject to non-resident withholding tax under the Canadian Tax Act at the rate of 25 per cent. of the gross amount of the dividend, subject to reduction under the provisions of an applicable income tax treaty or convention and the Company will be required to deduct such amount from any such dividends and remit the amount to the appropriate Canadian tax authority on behalf of the Non-Resident Holder. Pursuant to the Treaty, the rate of withholding tax applicable to dividends paid or credited or deemed to be paid or credited to a Non-Resident Holder who is resident in the United Kingdom for purposes of the Treaty will generally be reduced to 15 per cent. of the gross amount of the dividend, or 5 per cent. where the beneficial owner is a company which controls, directly or indirectly, at least 10 per cent. of the voting power in the Company.

10. Substantial Shareholders

10.1 As a company incorporated under the laws of the Province of Alberta, the disclosure requirements for shareholding thresholds for the Company are different than for a company incorporated in the United Kingdom. Details of the shareholding threshold disclosure requirements applicable to the Company under Canadian law are set out in paragraph 7.3 of this Part V. Subject to those legal requirements, except for the interests of the Directors, which are set out in paragraph 11 of this Part V, and those persons set out in this paragraph, the Directors are not aware of any interest which, as at the date of this Document and immediately following Admission and Consolidation, would amount to 3 per cent. or more of the Company's issued share capital:

	As at the date of this document		**On Admission and post Consolidation**	
Name	*No of Common Shares*	*Percentage of Existing Common Shares*	*No of Common Shares*	*Percentage of Enlarged Shares Capital*
Leo Mining and Exploration Ltd	25,638,614	21.14%	8,546,205	12.03%
Resources Early Stage Opportunity Company Ltd	16,690,000	13.76%	6,472,423	9.11%
Christopher Williams*	12,100,000	9.98%	12,063,636	16.98%

* In accordance with TSX-V policy requiring all 10 per cent. Shareholders to submit a Personal Information Form ("PIF") to the TSX-V for its review and approval, Mr. Christopher Williams has submitted such a form to the TSX-V. However, given the extended periods required by the TSX-V to review such forms when the person is not a Canadian resident, formal permission has not yet been granted for Mr. Christopher Williams to hold 10 per cent. or more of the Company's shares. In order to close the financing and effect the Admission without delay, the TSX-V has agreed with Mr. Christopher Williams that he will sell down his holding in the Company to less than 10 per cent. if, after review of the PIF the TSX-V does not approve of Mr. Christopher Williams as a 10 per cent. Shareholder in the Company. While such review is ongoing, Mr. Christopher Williams has agreed not to vote his shares in excess 10 per cent.

10.2 No major holder of Common Shares, either as listed above, or as set out in paragraph 11.1 of this Part V, has voting rights different from other holders of Common Shares.

11. Directors

11.1 The interests of the Directors, their immediate families, civil partners (as defined in the Civil Partnership Act 2004) (if any), and persons connected with them, within the meaning of sections 252 – 254 of the Act, in the share capital of the Company at the date of this Document and immediately following Admission and Consolidation, all of which are beneficial, are:

	As at the date of this document		**On Admission and post Consolidation**	
Name	*No of Common Shares*	*Percentage of Existing Common Shares*	*No of Common Shares*	*Percetnage of Enlarged Share Capital*
William Dawes*+	26,164,329	21.58%	8,721,443	12.27%
Alexander Lemon*	25,650,614	21.15%	8,550,205	12.03%
Derek Linfield++	4,062,954	3.35%	1,354,319	1.91%
David Berg	340,000	0.28%	113,333	0.16%
Adrian Reynolds	192,912	0.16%	64,304	0.09%
Eugene Chen	160,000	0.13%	53,333	0.08%

++ Derek Linfield will also own 866,666 warrants following Admission and Consolidation

* William Dawes and Alexander Lemon are Shareholders in (holding 17.3 per cent. and 17.3 per cent. respectively) and Directors of Leominex, which holds 8,546,205 Common Shares in the Company, representing 12.03% of the Common Shares in issue following Admission and Consolidation

\+ 175,238 Common Shares are held through the JP Morgan 1998 Employee Trust of which William Dawes is beneficiary post Consolidation

11.2 Additionally, the Directors will hold at Admission the following Options over Common Shares pursuant to the Stock Option Plan:

Director	*Aggregate no. of Options granted*	*Exercise Price (C$)*	*Lapse Date*
William Dawes	1,750,000	0.06	14 June 2026
Alexander Lemon	1,750,000	0.06	14 June 2026
Derek Linfield	1,050,000	0.06	14 June 2026
David Berg	630,000	0.06	14 June 2026
Adrian Reynolds	630,000	0.06	14 June 2026
Eugene Chen	630,000	0.06	14 June 2026
Total	5,780,000		

Note: The exercise price is subject to adjustment if the closing price on the TSX-V on the day prior to Admission is greater than C$0.02 pre-Consolidation

11.3 Except as disclosed in paragraphs 11.1 and 11.2 above, the Directors have no interest (including in related financial products referenced to the Common Shares) which would, and the Directors are not aware of any interests (including in related financial products referenced in the Common Shares) of persons connected with them which, if such connected person were a Director, would be required to be notified to the Company pursuant to Chapter 3 of the DTRs as if the DTRs applied to the Company and could be required to be entered in the register of Directors' interests pursuant to section 809 of the Act if it applied to the Company.

11.4 There are no outstanding loans granted by any member of the Group to any Director, nor has any guarantee been provided by any member of the Group for their benefit.

11.5 The Company has entered into the following arrangements with its Directors:

(a) By way of a consultancy letter agreement dated 26 May 2016 from the Company to William Dawes it was agreed that Mr Dawes would continue to act as a consultant to the Company upon the following terms:

(i) the agreement dated 1 October 2014 between the Company and Mr Dawes be terminated in its entirety;

(ii) the term of the agreement be one of three years commencing on the 26 May 2016 and shall thereafter continue unless terminated by either party giving 6 months notice save that Mr Dawes may give 6 months notice at any time;

(iii) Mr Dawes will devote such number of hours a day or days a week in rendering the services under the agreement as are reasonably necessary to fulfil his obligations but shall not be required to devote all his time and attention to rendering the services;

(iv) Mr Dawes will be paid a consulting fee of £84,000 per annum such amount to be increased to £150,000 per annum in the event that the Company secures sufficient financing, either in full or under a staged payment or joint venture structure, to complete a Feasibility Study for the Songwe Hill REE Project;

(v) sums accrued by way of fees due but not paid to Mr Dawes by the Company in the sum of £87,652.70 (save for the sum of £14,842.96) will be paid only the earlier of:

a. a Change in Control;

b. termination of the agreement; or

c. 12 May 2018.

(vi) All amounts payable under Clause 11.5(a)(iv) above that are unpaid going forward shall be accrued monthly but shall not be payable until the earlier of (a) a Change of Control; (b) any termination of the agreement; (c) 12 May 2018; or (d) such time that funds are reasonably available for such purpose from funds raised from whatever source (whether by debt, equity or by grant) in excess of the £1,000,000 raised in connection with admission to AIM.

(vii) in the event of a Change in Control Mr Dawes will be entitled to be paid, as a lump sum, an amount equivalent to 1.5 times his annual fee under the agreement together with interest at 15 per cent. on any amounts still owing to him;

(viii) in the event that the agreement is terminated by the Company without Just Cause (as defined in the consultancy letter) Mr Dawes will be paid, as a lump sum, an amount equivalent to his annual fee under the agreement together with interest at 15 per cent. on any amounts still owing to him;

(ix) Mr Dawes will be entitled to participate in the Stock Option Plan.

In addition the agreement includes the usual provisions as to confidentiality.

(b) By way of a consultancy letter agreement dated 26 May 2016 from the Company to Alexander Lemon it was agreed that Mr Lemon would continue to act as a consultant to the Company upon the following terms:

(i) the agreement dated 1 October 2014 between the Company and Mr Lemon be terminated in its entirety;

(ii) the term of the agreement be one of three years commencing on the 26 May 2016 and shall thereafter continue unless terminated by either party giving 6 months notice in writing save that Mr Lemon may give 6 months notice at any time;

(iii) Mr Lemon will devote such number of hours a day or days a week in rendering the services under the agreement as are reasonably necessary to fulfil his obligations but shall not be required to devote all his time and attention to rendering the services;

(iv) Mr Lemon will be paid a consulting fee of £84,000 per annum such amount to be increased to £150,000 per annum in the event that the Company secures sufficient financing, either in full or under a staged payment or joint venture structure, to complete a Feasibility Study for the Songwe Hill REE Project;

(v) sums accrued by way of fees due but not paid to Mr Lemon by the Company in the sum of £ 82,809.74 (save for the sum of £10,000) will be paid only the earlier of:

a. a Change in Control;

b. termination of the agreement; or

c. 12 May 2018.

(vi) All amounts payable under Clause 11.5(b)(iv) above that are unpaid going forward shall be accrued monthly but shall not be payable until the earlier of (a) a Change of Control; (b) any termination of the agreement; (c) 12 May 2018; or (d) such time that funds are reasonably available for such purpose from funds raised from whatever source (whether by debt, equity or by grant) in excess of the £1,000,000 raised in connection with admission to AIM.

(vii) in the event of a Change in Control Mr Lemon will be entitled to be paid, as a lump sum, an amount equivalent to 1.5 times his annual fee under the agreement together with interest at 15 per cent. on any amounts still owing to him;

(viii) in the event that the agreement is terminated by the Company without Just Cause (as defined in the consultancy letter) Mr Lemon will be paid, as a lump sum, an amount equivalent to his annual fee under the agreement together with interest at 15 per cent. on any amounts still owing to him;

(ix) Mr Lemon will be entitled to participate in the Stock Option Plan.

In addition the agreement includes the usual provisions as to confidentiality.

(c) For the purposes of this paragraph 11.5 "**Change in Control**" shall have occurred if:

(i) a person, or persons acting jointly or in concert, beneficially holds more than 50 per cent. of the voting securities of the Company and, as a result, can exercise the right to elect a majority of the members of the Board of Directors;

(ii) any merger or consolidation of the Company with, or sale of all or substantially all of the Company's assets or business to, another person (other than an affiliate of the Company);

(iii) there is a sale of ownership of 50 per cent. or more of the voting securities of the Company to another person (other than to an affiliate or subsidiary of the Company); or

(iv) any similar transaction or combination of the foregoing which would have substantially the same effect as any of the foregoing.

11.6 The aggregate remuneration paid and benefits in kind granted to the Directors for the period from 1 January 2016 to Admission, under the arrangements in force at the date of this Document, amount to approximately £24,843. It is currently estimated that the aggregate remuneration payable to the Directors from the date of Admission to 31 December 2016 under arrangements that are in force and that will come into effect on Admission will amount to approximately £nil.

11.7 Except as disclosed in paragraph 11.6 above, there are no liquidated damages or other compensation payable by the Company upon early termination of the contracts of the Directors.

11.8 Except as disclosed in paragraphs 11.5 and 11.6 above, the total emoluments of the Directors will not be varied as a result of Admission.

11.9 Except as disclosed in this paragraph 11, there are no existing or proposed service contracts between the Company and any of the Directors which are not terminable on less than 12 months' notice.

11.10 In addition to their Directorships of the Company, the Directors are or have been members of the administrative, management or supervisory bodies or partners of the following companies or partnerships within the five years prior to the publication of this Document:

Name	*Past Directorships*	*Present Directorship*
William Dawes	Theia Property Investment Limited	Leo Mining & Exploration Limited Lancaster BVI Lancaster Exploration Limited (Malawi)
Alexander Lemon		Epping Sanitary Steam Laundry Company Limited Leo Mining & Exploration Limited Lancaster BVI 65 Fitzjohns Avenue RTM Company Limited 67 Fitzjohns Avenue RTM Company Limited Lancaster Exploration Limited (Malawi)
Derek Linfield	Canada Day In London Limited Cotton Tree Foundation Canada-United Kingdom Chamber of Commerce Limited Stikeman Elliott London LLP Vougeot Finco Limited Vougeot Midco Limited Foundation For Canadian Studies In The UK	Sound Diplomacy Holdings Limited MUN (UK) Limited Harlow Scholarship Trust Linfield Consulting Limited Letz Inc
Adrian Reynolds	N/A	Aureus Mining Inc Digby Wells & Associates Geodrill Limited
David Berg	Potash One Inc	Essex Angel Capital Inc Lancaster Exploration Limited (Malawi) Harvest One Capital Inc
Eugene Chen	Poynt Corporation Firesteel Resources Inc	Blacksteel Energy Inc CapGain Properties Inc Lancaster Exploration Limited (Malawi) Wedge Networks Inc

11.11 Save as disclosed, no Director has:

(a) had any convictions in relation to fraudulent offences or unspent convictions in relation to indictable offences;

(b) had a bankruptcy order made against him or entered into an individual voluntary arrangement;

(c) been a Director of any company or been a member of the administrative, management or supervisory body of an issuer or a senior manager of an issuer which has been placed in receivership, compulsory liquidation, creditors' voluntary liquidation, administration, or company voluntary arrangement or which entered into any composition or arrangement with its creditors generally or any class of its creditors whilst he was acting in that capacity for that company or within the 12 months after he ceased to so act;

(d) been a partner in any partnership placed into compulsory liquidation, administration or partnership voluntary arrangement where such Director was a partner at the time of or within the 12 months preceding such event;

(e) been subject to receivership in respect of any asset of such Director or of a partnership of which the Director was a partner at the time of or within 12 months preceding such event; or

(f) been subject to any official public criticisms by any statutory or regulatory authority (including designated professional bodies) nor has such Director been disqualified by a court from acting as a Director of a company or from acting as a member of the administrative, management or supervisory bodies of an issuer or from acting in the management or conduct of the affairs of any issuer.

11.12 Eugene Chen was a Director of Poynt Corporation until 31 October 2012. At this time of his resignation the company was insolvent and the Board had been trying for several months to restructure the company.

11.13 No Director has been interested in any transaction with the Group which was unusual in its nature or conditions or significant to the business of the Group during the current financial year which remains outstanding or unperformed.

11.14 Save as set out below, and save for the Service Provision Agreement (Leominex being a related party as a Shareholder of the Company by virtue of William Dawes and Alexander Lemon being Shareholders and Directors thereof), the Company has not entered into any related party transactions which are material to the Company in any of the three financial periods ended on 31 December 2015 and up to the date of this Document:

(a) Digby Wells Environmental ("Digby"), by virtue of a common Director, is considered a related party. During the year ended December 31, 2015, the Company has incurred costs of $8,402 (2014 – $244,246) for environmental services. As of December 31, 2015, there was an outstanding payable to Digby for $6,587 (2014 – $2,306).

(b) A partner of Stikeman Elliott (London) LLP ("Stikeman") became a Director of the Company in 2014. The Director ceased to be a partner at Stikeman in July 2015. Therefore, Stikeman is only considered a related party up to July 2015. During the period ended July 31, 2015, the Company incurred $18,295 (2014 – $132,597) for legal services. As of December 31, 2015, there was an outstanding payable to Stikeman for $86,985 (2014 – $108,531).

11.15 The Directors are elected at the annual meeting for a one year term.

12. Stock Option Plan

12.1 The Company has established a Stock Option Plan, which was initially approved by the Board on September 27, 2010 and is annually approved by Shareholders (as required by the TSX-V Rules), in order to assist the Company in attracting, retaining and motivating Directors, key officers, employees and consultants of the Company and its subsidiaries and to closely align the personal interests of those persons with those of Shareholders by providing them with the opportunity to acquire, through Options, Common Shares. The most recent approval by Shareholders of the Stock Option Plan was in 19 November 2015.

12.2 The following is a summary of the material terms of the Stock Option Plan.

(a) A maximum number of Common Shares equal to 10 per cent (10 per cent.) of the issued and outstanding Common Shares of the Company, from time to time, shall be reserved, set aside and made available for issuance in accordance with the Stock Option Plan.

(b) In no event shall Options be granted without regulatory and/or disinterested Shareholder approval: (i) entitling any single individual to purchase in excess of five per cent (5 per cent.) of the then outstanding Common Shares in the Company in any 12 month period; (ii) entitling any one consultant to acquire more than two per cent (2 per cent.) of the then outstanding shares in any 12 month period; (iii) entitling any person who is a Director, officer, employee or consultant of the Company, who is an employee conducting investor relations activities, to acquire more than two per cent (2 per cent.) of the then outstanding shares in the Company in any 12 month period; and (iv) any Options granted to a participant performing investor relations activities must vest in stages over twelve months with no more than one-quarter of the Options vesting in any three month period.

(c) The exercise price for Options granted under the Stock Option Plan is determined by the Board but in no event shall the price be less than the market price of the Common Shares of the Company on the TSX-V, or such other exchange on which the Common Shares are listed at the time of the grant of the Option, less the maximum discount permitted under the policies of the TSX-V or such other exchange on which the Common Shares are listed, or such other price as may be agreed to by the Company and approved by the TSX-V or such other exchange on which the Common Shares are listed.

(d) All Options granted under the Stock Option Plan shall expire not later than the tenth anniversary of the date such Options were granted or such other length of time as maybe permitted under the policies of the stock exchange on which the Common Shares are listed.

(e) An Option granted under the Stock Option Plan shall not be transferable or assignable (whether absolutely or by way of mortgage, pledge or other charge) by a participant other than by will or other testamentary instrument or the laws of succession and may be exercisable during the lifetime of the participant and only by the participant.

12.3 As at the date of this Document there are 6,310,000 and on Admission, there will be 7,000,000 Options issued and outstanding under the Stock Option Plan. Further details of the Options outstanding under the Stock Option Plan are set out in paragraph 5.9 of this Part V.

13. Employees

13.1 The Group employed 7 employees as at December 2013 and December 2014. As at December 2015 and at the date of this document the Company has no employees, although it retained consultants from time to time including its senior management team. All regular personnel are retained as independent contractors via consulting agreements.

13.2 Company receives management advice and services from its senior management team pursuant to various consultancy agreements.

14. Material contracts

The following contracts (i) (not being contracts entered into in the ordinary course of business) have been entered into by the Company or any member of the Group in the two years immediately preceding the date of this Document or which contain any provision under which any member of the Group has any obligation or entitlement which is material to the Group as at the date of this Document, or (ii) are subsisting agreements which are included within, or which relate to, the mining assets and liabilities of the Company or other members of the Group (notwithstanding whether such agreements are within the ordinary course or were entered into outside of the two years immediately preceding the publication of this Document) and are, or may be material:

14.1 ***Contracts relating to the acquisition of mining assets***

(a) *The Thambani Licence*

A licence agreement granted to Lancaster BVI on 10 September 2010 by the Government of Malawi in respect of the Thambani project. Lancaster BVI holds 100 per cent. interest in the licence. The licence covers an area of 136.9km^2. The original licence was for a period of 3 years and has been renewed twice since, currently expiring on 10 September 2017. Under the terms of the Thambani Licence Lancaster BVI is obliged to *inter alia* (i) carry out a prescribed programme of prospecting operations; (ii) employ and train citizens of Malawi; use and purchase goods produced or manufactured in Malawi; (iii) indemnify the Government of Malawi; and (iv) submit quarterly reports.

(b) *The Phalombe Licence*

A licence agreement granted to Lancaster BVI on 21 January 2010 by the Government of Malawi in respect of the Songwe Hill project. Lancaster BVI holds 100 per cent. interest in the licence. The licence covers an area of 849.1km^2. The original licence was for a period of 3 years and has been renewed twice since, currently expiring on 21 January 2017. Under the terms of the Phalombe Licence Lancaster BVI is obliged to *inter alia* (i) carry out a prescribed programme of prospecting operations; (ii) employ and train citizens of Malawi; use and purchase goods produced or manufactured in Malawi; (iii) indemnify the Government of Malawi; and (iv) submit quarterly reports.

14.2 ***Service Provision Agreement***

A service provision dated 20 September 2010 pursuant to which Leominex provides expertise and resources to assist the Company with the provision of administration equipment, technical and other services relating to the operation and administration of the Company in consideration for which the Company shall reimburse Leominex for the portion of the fees, salaries and costs of the employees of Leominex, or independent contractors engaged by Leominex and allocated to the Company. Alternatively, Leominex shall be entitled to charge the Company for the provision of Services based on the prevailing per diem market rate. Leominex shall be entitled to recover disbursements, overhead costs and a handling fee of 15 per cent. of any amounts invoiced from the Company. The agreement can be terminated on 90 days notice by either party. In connection with this agreement Mkango have entered a promissory note with Leominex, dated May 10, 2016, £24,888.98 remains outstanding under this promissory note.

14.3 ***Agreements relating to recent fundraisings***

(a) An agreement dated 14 February 2014 and amended 3 April 2014 between the Company and Sprott Global Resource Investment Ltd. ("Sprott") pursuant to which Sprott agreed to provide services of a finder in respect of a private placing of Common Shares with a warrant attaching (each such Common Share with warrant attached being a "Unit") undertaken by the Company to raise up to C$1.5 million in consideration for which the Company will pay to Sprott a fee equal to 7.0 per cent. of the proceeds of the placing attributable to investors introduced by Sprott ("Sprott Investors") or, at Sprott's option, issued to Sprott that number of Units as is equal to 7.0 per cent. of the number of Units sold to Sprott Investors (or a combination of the both); and (b) issued that number of non-transferable warrants as is equal to 7.0 per cent. of the number of Units sold to Sprott Investors, each such warrant entitling Sprott to purchase one Common Share at price of C$0.10 for two years.

(b) Pursuant to an agreement with Jub Capital dated 15 July 2015, Jub received on 19 October 2015 1,000,000 Common Shares in connection with the financing of the Company. In addition Jub Capital has received C$11,900 1,960,000 Common Shares 980,000 warrants exercisable at 5c for 3 years and 2,436,000 additional warrants exercisable at 5c over 1 year.

(c) *Finder's Fee Agreement with Cormel Capital SARL ("Cormel")*

An agreement dated March 24, 2014 between the Company and Cormel pursuant to which Cormel agreed to act as finders in respect of a private placing. In consideration for the services, Cormel was issued 24,500 units and 24,500 finders' warrants.

(d) *Finder's Fee Agreement with Haywood Securities Inc. ("Haywood")*

An agreement dated March 20, 2014 between the Company and Haywood pursuant to which Haywood agreed to act as finders in respect of a private placing. In consideration for the services, Haywood was paid a cash fee of $41,300 and issued 413,000 finders' warrants.

(e) *Finder's Fee Agreement with Merlin Partners LLP ("Merlin")*

An agreement dated March 24, 2014 between the Company and Merlin pursuant to which Merlin agreed to act as finders in respect of a private placing. In consideration for the services, Merlin was paid a cash fee of $6,605.22 and issued 66,052 finders' warrants.

(f) *Finder's Fee Agreement between Canaccord Genuity Corp. ("Canaccord")*

An agreement dated March 31, 2014 between the Company and Canaccord pursuant to which Canaccord agreed to act as finders in respect of a private placing. In consideration for the services, Canaccord was paid a cash fee of $1,400 and issued 14,000 finders' warrants.

(g) *Finder's Fee Agreement between Investec Wealth and Management ("Investec")*

An agreement dated July 24, 2015 between the Company and Investec pursuant to which Investec agreed to act as finders in respect of the 2015 private placement. In consideration for the services, Investec was paid $3,500 and issued 140,000 finder's warrants.

(h) *Finder's Fee Agreement between Haywood Securities Inc. ("Haywood")*

An agreement dated October 15, 2015 between the Company and Haywood pursuant to which Haywood agreed to act as finders in respect of the 2015 Private Placement. In consideration for the services, Haywood was paid $5,600 and issued 224,000 finder's warrants.

14.4 ***Agreements relating to Admission and the Placing***

(a) On 25 August 2015, the Company and SP Angel entered into a nominated adviser and broker agreement pursuant to which SP Angel agreed to act as the Company's Nominated Adviser and Broker on an ongoing basis following Admission, for an annual fee of £50,000 plus any applicable VAT and expenses. The agreement is for an initial term of 12 months terminating on the first anniversary of Admission but may be otherwise terminated by either party giving not less than 3 months written notice, or immediately in the event of *inter alia* breach. The agreement contains standard warranties and indemnities given by the Company to SP Angel and the usual provision as to confidentiality. The agreement contains the anti-dilution undertaking referred to in paragraph 7.1 of this Part V.

(b) By way of an Engagement Letter sent to the Company on 19 March 2016 Jub Capital agreed to act as a corporate finance advisor to the Company and to provide on-going direction to the Company by assisting with the Placing and Admission in consideration of which the Company agreed as follows:

(i) in the event that Jub Capital successfully helps facilitate Admission, to issue and allot to Jub Capital 1,000,000 nil paid shares (333,333 shares based on a 3:1 Consolidation);

(ii) on the first anniversary of Admission to either:

a. issue and allot to Jub Capital 2,000,000 nil paid shares (666,666 shares based on a 3:1 Consolidation); or

b. in the event that 2,000,000 shares (666,666 shares based on a 3:1 Consolidation) does not exceed an equivalent value of £20,000 then a number of shares equivalent to such an amount;

(iii) a commission of 10 per cent. of the aggregate value of funds raised pursuant to the Placing by Placees introduced by Jub Capital, payable in either cash or Common Shares and Investor Warrants.

The arrangement is to continue for a period of 12 months where after, unless otherwise extended or renewed, it will terminate automatically but may also be terminated by Jub Capital in the event of a change in control of the Company. It contains the usual provisions as to confidentiality.

(c) On 31 May 2016, the Placing Agreement was entered into between the Company, SP Angel and Jub Capital pursuant to which SP Angel and Jub Capital each agreed to use their respective reasonable endeavours to procure subscribers for the Placing Shares at the Placing Price, and SP Angel agreed to use its reasonable endeavours to procure Admission. The Placing Agreement is conditional *inter alia* on Admission. Placees who subscribe for Placing Shares pursuant to the Placing will also receive Placing Warrants on a one for one basis. The Company has agreed to pay the following fees (in addition to any costs (including those of the legal advisers to SP Angel and Jub Capital) and expenses ancillary to the Placing and Admission):

(i) to SP Angel:

a. a corporate finance fee of £108,000; and

b. a commission of five per cent. of the Placing Price multiplied by the total number of Placing Shares placed by SP Angel.

(ii) to Jub Capital a commission of ten per cent of the Placing Price multiplied by the total number of Placing Shares placed by Jub Capital.

The Placing Agreement is conditional upon, among other things, Admission having occurred and applications having been received from persons in respect of all the Placing Shares and Placing Warrants on or before 30 June 2016. The Placing Agreement contains certain warranties and indemnities given by the Company in favour of SP Angel. It also contains provisions entitling SP Angel to terminate the agreement prior to the completion of the Placing if, among other things, a breach of any of the warranties occurs or on the occurrence of an event fundamentally and adversely affecting the position of the Company.

(d) Under the lock in and orderly market agreements dated 31 May 2016 each of the Locked In Persons have agreed with the Company and SP Angel not to dispose of any shares in the capital of the Company for a period of one year from Admission subject to certain limited exceptions (such as disposals pursuant to a court order or takeover). The Locked In Persons have also agreed that for a further period of 12 months, any disposal of their Common Shares will be through SP Angel (or the Company's broker from time to time) in such orderly manner as they shall reasonably determine. The lock in and orderly market agreement is conditional upon Admission having occurred prior to 30 June 2016.

(e) A relationship agreement dated 31 May 2016 and entered into between the Company, SP Angel, Jub Capital and Christopher Williams ("CW") pursuant to which CW has given certain undertakings to the Company, SP Angel and Jub Capital that for as long as he (together with persons connected with him) holds not less than 15 per cent. of the entire issued share capital of the Company he will conduct his relationship with the Company on an arms length basis so as not to abuse his position as a substantial Shareholder. CW has also agreed to enter into an orderly market arrangement for a period of 2 years commencing on Admission, during which time he has undertaken that any disposal of Common Shares held by him will be through either SP Angel or Jub Capital so as to maintain an orderly market. The relationship agreement is conditional on Admission occurring prior to 30 June 2016.

(f) The Placing Warrants will be issued to the Placees conditional upon Admission. Each Placing Warrant will entitle the holder to acquire one Common Share at a price of £0.066 for a period of 3 years following Admission provided that if, after four months from Admission, the closing price of the Common Shares on AIM exceeds £0.198 for a period of 20 consecutive trading days (where "trading days" shall be days upon which the Common Shares trade on the London Stock Exchange), the Company may, within three business days thereof, accelerate the expiry of the Placing Warrants to 20 business days after the issuance of a news release announcing the new expiry date. The Placing Warrants may be subject to adjustments in the event of any reorganisations of the Company's share capital. The Placing Warrant Certificates will be construed in accordance with the laws of the Province of Alberta and the federal laws of Canada.

14.5 ***South African Department of Trade and Industry ("DTI") Grant***

The Company was approved to receive the South African Department of Trade and Industry ("DTI") grant on May 26, 2014 for an amount of Rand 7,967,80 under the Capital Projects Feasibility Program. To date, Rand 4,421,182 has been refunded to the Company. Mkango is in the process of requesting the South African Department of Trade and Industry to extend the grant time period.

15. Working capital

The Directors are of the opinion, having made due and careful enquiry, that the Group will have sufficient working capital for its present requirements, that is, for at least 12 months from the date of Admission.

16. Litigation

The Group has not been involved in any governmental, legal or arbitration proceedings in the 12 months preceding the date of this Document which may have, or have had in the recent past, a significant effect on the Group's financial position or profitability nor, so far as the Directors are aware, are any such proceedings pending or threatened by or against the Group.

17. Intellectual property

The Company is not dependent on any patents, intellectual property licences, industrial, commercial or financial contracts or new manufacturing processes which have a material effect on the Company's business or profitability.

18. Property

Save as disclosed in this Document, the Company is not aware of any material environmental issues or risks affecting the utilisation of the Group's tangible fixed assets or its operations.

19. CREST and Depositary Interests

19.1 *Deed Poll*

On 20 November 2015 the Deed Poll was executed by the Depositary.

The Depositary Interests will be created pursuant to and issued on the terms of the Deed Poll. The Deed Poll is executed by the Depositary, in favour of the holders of the Depositary Interests from time to time. Prospective holders of Depositary Interests should note that they will have no rights against Euroclear or its subsidiaries in respect of the underlying Common Shares or the Depositary Interests representing them. Common Shares will be transferred to an account of the Depositary or its nominated custodian ("Custodian") and the Depositary will issue Depositary Interests to participating members.

Each Depositary Interest will be treated as one Common Share for the purposes of determining, for example, eligibility for any dividends. The Depositary will pass on to holders of Depositary Interests any stock or cash benefits received by it as holder of Common Shares on trust for such Depositary Interest holder. Depositary Interest holders will also be able to receive from the Depositary notices of meetings of holders of Common Shares and other information to make choices and elections issued by the Company to the Shareholders.

In summary, the Deed Poll contains, amongst other things, provisions to the following effect:

(a) the Depositary will hold (itself or through the Custodian), as bare trustee, the underlying securities issued by the Company and all and any rights and other securities, property and cash attributable to the underlying securities for the time being held by the Depositary or Custodian pertaining to the Depositary Interests for the benefit of the holders of the Depositary Interests. The Depositary will re-allocate securities or distributions allocated to it or the Custodian *pro rata* to the Common Shares held for the respective accounts of the holders of Depositary Interests but will not be required to account for fractional entitlements arising from such re-allocation;

(b) holders of Depositary Interests warrant, amongst other things, that the securities in the Company transferred or issued to the Depositary or Custodian for the account of the Depositary Interest holder are free and clear of all liens, charges, encumbrances or third party interests and that such transfers or issues are not in contravention of the Company's By-laws or any contractual obligation, or applicable law or regulation binding or affecting such holder;

(c) the Depositary and any Custodian must pass on to Depositary Interest holders, or exercise on their behalf, all rights and entitlements received by the Depositary or the Custodian in respect of the underlying securities. Rights and entitlements to cash distributions, to information, to make choices and elections and to attend and vote at meetings shall, subject to the Deed Poll, be passed on in the form which they are received, together with amendments and additional documentation necessary to effect such passing-on, or exercised in accordance with the Deed Poll. If arrangements are made which allow a holder to take up rights in the Company's securities requiring further payment, the holder must put the Depositary or its appointed agent in cleared funds before the relevant payment date or other date notified by the Depositary if it wishes the Depositary to exercise such rights;

(d) the Depositary will be entitled to cancel Depositary Interests and treat the holders as having requested a withdrawal of the underlying securities in certain circumstances including where a Depositary Interest holder fails to furnish to the Depositary such certificates or representations as to material matters of fact, including his identity, as the Depositary deems appropriate;

(e) the Deed Poll contains provisions excluding and limiting the Depositary's liability to a maximum of £10 million. For example, the Depositary shall not be liable to any Depositary Interest holder or any other person for liabilities in connection with the performance or non-performance of obligations under the Deed Poll or otherwise, except as may result from its negligence or willful default or fraud or that of any person for whom it is vicariously liable, provided that the Depositary shall not be liable for the negligence, willful default or fraud of any Custodian or agent which is not a member of its Group unless it has failed to exercise reasonable care in the appointment and continued use and supervision of such Custodian or agent;

(f) the Depositary is entitled to charge holders of Depositary Interests fees and expenses for the provision of its services under the Deed Poll;

(g) the holders of Depositary Interests are required to agree and acknowledge to the Depositary that it is their responsibility to ensure that any transfer of Depositary Interests by them which is identified by the CREST system as exempt from stamp duty reserve tax is so exempt, and to notify the Depositary if this is not the case, and to pay to Euroclear any interest, charges or penalties arising from non-payment of stamp duty reserve tax in respect of such transaction;

(h) the Depositary is entitled to make deductions from any income or capital arising from the underlying securities, or to sell such underlying securities and make deductions from the sale proceeds therefrom, in order to discharge the indemnification obligations of Depositary Interest holders;

(i) the Depositary may terminate the Deed Poll by giving 30 days' notice. During such notice period holders are obliged to cancel their Depositary Interests and withdraw their deposited property and, if any Depositary Interests remain outstanding after termination, the Depositary must, among other things, deliver the deposited property in respect of the Depositary Interests to the relevant Depositary Interest holders or, at its discretion, sell all or part of such deposited property. It shall, as soon as reasonably practicable, deliver the net proceeds of any such sale, after deducting any sums due to the Depositary, together with any other cash held by it under the Deed Poll *pro rata* to holders of Depositary Interests in respect of their Depositary Interests; and

(j) the Depositary or the Custodian may require from any holder information as to the capacity in which Depositary Interests are or were owned and the identity of any other person with or previously having any interest in such Depositary Interests and the nature of such interest, and evidence or declarations of nationality or residence of the legal or beneficial owners of Depositary Interests and such information as is required for the transfer of the relevant Common Shares to the holders. Holders agree to provide such information requested and consent to the disclosure of such information by the Depositary or Custodian to the extent necessary or desirable to comply with their legal or regulatory obligations. Furthermore, to the extent that the Company's constitutional documents require disclosure to the Company of, or limitations in relation to, beneficial or other ownership of the Company's securities, the holders of Depositary Interests are to comply with the Company's instructions with respect thereto.

It should also be noted that holders of Depositary Interests may not have the opportunity to exercise all of the rights and entitlements available to holders of the Common Shares including, for example, the ability to vote on a show of hands. In relation to voting, it will be important for holders of Depositary Interests to give prompt instructions to the Depositary to vote the underlying shares on their behalf.

19.2 ***Depositary Services Agreement***

The Company has entered into a depositary services agreement dated 12 May 2016 between the Company and the Depositary ("***Depositary Agreement***"). The Depositary Agreement relates to the Depositary's appointment as Depositary in relation to the Common Shares, including the issue and cancellation of Depositary Interests and maintaining the Depositary Interests register. The Company has agreed to indemnify the Depositary in relation to losses suffered by the Depositary as a result of any claim made by any Depositary Interest holder against the Depositary.

The Depositary's aggregate liability to the Company over any 12 month period shall in no circumstances whatsoever exceed twice the amount of the Fees payable in any 12 month period in respect of a single claim or in the aggregate. Depositary Agreement is for an initial term of 12 months after which it is terminable by the Company on 6 months by either party.

20. Significant changes

Except for the transactions and agreements referred to in this Document, there has been no significant change in the financial or trading position of the Group since 31 December 2015, the date to which the most recent published interim financial statements have been prepared.

21. General

21.1 No exceptional factors have influenced the Company's activities.

21.2 Except as disclosed in this Document, there have been no significant authorised or contracted capital commitments at the date of publication of this Document.

21.3 The expenses of Admission and the Placing are estimated at £455,000 and are payable by the Company.

21.4 The Company's audit committee comprises David Berg (Chairman), Eugene Chen and Adrian Reynolds. The audit committee is to meet at such time as shall be determined by the audit committee and consider the integrity of the financial statements of the Company, including its annual and interim accounts; the effectiveness of the Company's internal controls and risk management systems; auditor reports; and terms of appointment and remuneration for the auditor.

21.5 The Company's remuneration committee comprises Eugene Chen (Chairman), Adrian Reynolds, David Berg and Derek Linfield. The remuneration committee is to meet at such times as shall be determined by the remuneration committee and has as its remit the determination and review of, amongst others, the remuneration of executives on the Board and any benefit plans of the Company.

21.6 Except as disclosed in this Document and the advisers named on pages 5 and 6 of this Document, no person has received, directly or indirectly, from the Company within the 12 months preceding the date of this Document or has entered into any contractual arrangements to receive, directly or indirectly, from the Company on or after Admission, fees totaling £10,000 or more or securities in the Company with a value of £10,000 or more calculated by reference to the Placing Price or any other benefit with a value of £10,000 or more at the date of Admission.

21.7 SP Angel has given and not withdrawn its written consent to the issue of this Document with references to its name in the form and context in which it appears.

21.8 BDO LLP is a member firm of the Institute of Chartered Accountants in England and Wales. BDO LLP has no material interests in the Company.

21.9 The Competent Person has given and not withdrawn its written consent to the issue of this Document with the inclusion in it of its report and references to it in the form and context in which they appear. The Competent Person is a member of the South African Institute of Mining and Metallurgy (SAIMM), Membership No. MSA001.

21.10 The Competent Person has confirmed to the Company and SP Angel that it has reviewed the information in this document which relates to information contained in the CPR, which has been extracted from the CPR and that such information is accurate, balanced and complete and not inconsistent with the CPR.

21.11 The Competent Person has no material interests in the Company.

21.12 Where information contained in this Document has been sourced from a third party, the Company confirms that such information has been accurately reproduced and, so far as the Company is aware and is able to ascertain from the information published by that third party, no facts have been omitted which would render the reproduced information inaccurate or misleading.

21.13 The Company's accounting reference date is 31 December in each year.

21.14 The financial information relating to the Company contained in this Document does not comprise statutory accounts for the purposes of section 434(3) of the Act.

21.15 The Placing Shares and Placing Warrants will be issued and allotted under the laws of the Province of Alberta. The Placing will be conducted in Sterling. As the Common Shares are of no par value, they have no currency.

21.16 The Placing Shares only will be admitted to trading on AIM. The Placing Warrants will not be quoted, listed or traded on any investment exchange.

21.17 The auditors for the period covered by the historical financial information set out in Part IV of this Document were MNP LLP, a member of Praxity, whose address is set out on page 5 of this Document.

21.18 It is expected that CREST accounts will be credited as applicable on the date of Admission. Share certificates will be dispatched by first-class post within 14 days of the date of Admission.

21.19 As the Company is not yet producing, there have been no significant trends in production, sales, costs and selling prices since the end of the last financial year to the date of Admission.

21.20 No shares are held by or on behalf of the Company in itself or by any of its subsidiaries.

Dated: 31 May 2016