THE MSA GROUP

Specialist Consultants to the Mining Industry

# Mothae Diamond Project in Lesotho

## JORC Mineral Resource Statement and Competent Persons Report

**Prepared by The MSA Group (Pty) Ltd for:**

**Lucapa Diamond Company Limited**



**Prepared By:**

Dr Friedrich Johannes Reichhardt Pr.Sci.Nat., FGSSA
Dr Johannes Ferreira Pr.Sci.Nat.


**Report Date:** 15 September 2017
**Effective Date:** 8 September 2017

**MSA Project No.:** J3586

## *Terms of Reference*

*This Competent Persons Report ("CPR") was requested by Lucapa Diamond Company Limited ("Lucapa") on Lucapa's Mothae Diamond Project and has been prepared by The MSA Group (Pty) Limited ("MSA"), South Africa.*

*The specific instructions to MSA were to deliver a CPR on Lucapa's material assets and liabilities with respect to the Mothae Diamond Project in accordance with:*

- *the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (2012) published by the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, the Australian Institute of Geoscientists and Minerals Council of Australia ("JORC Code")*

*The quality of information, conclusions and estimates contained in this CPR is consistent with the level of effort involved in MSA's services, based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. Except for the purposes legislated under Australian Securities Exchange ("ASX"), any other uses of this report by any third party is at that party's sole risk.*

*Neither MSA, nor the authors of the Report, have or have previously had any material interest in Lucapa or the mineral properties in which Lucapa has an interest. MSA's relationship with Lucapa is solely one of professional association between client and independent consultant. The Report is prepared in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the findings of the Report.*

*MSA accepts responsibility for the CPR and the authors have endeavoured, by making all reasonable enquiries, to confirm the authenticity and completeness of the technical data upon which the Report is based. A final draft of the Report was provided to Lucapa, along with a written request to identify any material errors or omissions prior to finalisation.*

*The Consent Forms for the Competent Persons are included as Appendix 2. MSA is not aware of any material changes since the effective date of the CPR.*

## *Normative References*

*Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia. (20 December, 2012). http://www.jorc.org/docs/jorc_code2012.pdf*

# TABLE OF CONTENTS

# LIST OF TABLES

## LIST OF FIGURES

## LIST OF APPENDICES

# 1 SUMMARY

The MSA Group (Pty) Ltd ("MSA") has been commissioned by Lucapa Diamond Company Limited ("Lucapa") to provide an updated Independent Technical Report ("the Report") on its' Mothae Diamond Project, located in the highlands of Lesotho. This Report includes additional information on Lucapa's planned mining and processing activities and replaces the CPR compiled by MSA for Lucapa in March 2017 for release on the Australian Securities Exchange ("ASX").

Lucapa Diamond Company Limited ("Lucapa") holds a 70% interest in Mothae Diamonds (Pty) Limited ("Mothae Diamonds") which has a 100% interest in the Mothae Diamond Project (the "Project"). The remaining 30% of Mothae Diamonds is held by the Government of Lesotho ("GoL"). Lucapa is currently funding 100% of Project costs. Mothae Diamonds is the operator of the Project. The Mothae Mining Lease is valid for ten years until 28 January 2027 and is renewable for an additional period of 10 years (Table 1-1).

MSA is of the opinion that the Project has reasonable prospects for eventual economic extraction and an Indicated and Inferred Diamond Resource has been estimated for the Mothae Project, which is presented in this Report. The current economic viability of the Diamond Resource has not yet been demonstrated in a Pre-Feasibility or Feasibility Study but MSA believe that the Project has sound technical merits and sufficient potential to warrant such studies.

**Table 1-1**

**Summary Table of Lucapa's Assets**

| Asset | License Holder | Lucapa's Interest | Status | License expiry date | Mining Lease area | Comments |
|---|---|---|---|---|---|---|
| Mothae kimberlite project in Lesotho | Mothae Diamonds (Pty) Limited | 70 % | Development | Mining Lease, 28 January, 2027 | 20.52 $km^2$ | Diamond Resource and grade established from bulk sampling |

## 1.1 Locality and Access

The Mothae kimberlite is situated at an altitude of 2,900 m above sea level ("mamsl") in the highlands of Lesotho, approximately 135 km east-northeast of the capital Maseru and less than 7 km northwest of the Letseng diamond mine. Access is by tar road from Butha-Buthe, which is near a border crossing with South Africa, and then by 5 km of gravel road to the Project site.

## 1.2 Geology

The Mothae kimberlite is situated on the southern edge of the Kaapvaal Craton, which extends through central, eastern and north-eastern South Africa, into southern Zimbabwe and south-eastern Botswana, and incorporates most of Swaziland. The Kaapvaal Craton is host to numerous important diamondiferous kimberlites of various ages, including the Mesoproterozoic Premier kimberlite (Cullinan Mine), the Cambrian Venetia kimberlites, the Middle Triassic Jwaneng kimberlites, and the Cretaceous Kimberley, and Finsch kimberlites.

As the diamondiferous Northern Lesotho Kimberlite Field is in the Kaapvaal Craton, it conforms to 'Clifford's Rule', which states that diamondiferous kimberlites tend to occur in geological regions that have been tectonically stable since the Archaean.

The Archaean basement in Lesotho is entirely covered by the flat-lying Paleozoic to Mesozoic Karoo Supergroup which reaches a thickness of approximately 4 km in Lesotho.

The surface geology within the Mothae license area comprises amygdaloidal and non-amygdaloidal Mesozoic (180 Ma) Drakensberg Group flood basalt, into which the Mothae kimberlite has intruded. The average elevation of the Mothae kimberlite is approximately 2,900 mamsl and the thickness of the basalt into which it is emplaced is estimated to be of the order of 1,000 m, although basalt thickness on the property may locally reach up to 1,400 m. Basalts are underlain by Beaufort Group sediments of the Karoo Supergroup.

Kimberlite emplacement during the Cretaceous Period was widespread throughout southern Africa and was probably associated with tectonic triggers during the break-up of Gondwana (Bailey, 1992).

The Mothae kimberlite consists of a main southern pipe-like lobe (South Lobe) connected to a smaller northern lobe (North Lobe) by an elongate central kimberlite body (Neck). The South Lobe has a surface expression of 5.05 ha and the three areas combined form a total surface area of 8.81 ha. Wall rock contacts for the North and South Lobes have been delineated by geophysical data, mapping and drill core intercepts. The contact between the kimberlite and the basalt is typically sharp and steep with localised zones of wall rock breccia.

The kimberlite itself comprises almost entirely of massive volcaniclastic kimberlite ("VK") of different types. The different kimberlite types have been 'fingerprinted' in terms of their Kimberlite Indicator Mineral ("KIM") content and petrographic characteristics as a control on bulk sampling; this being important as each has a different diamond grade and revenue.

### 1.3 Exploration

Lucara Diamond Corporation ("Lucara"), who were the previous owner of the Project, appointed Mineral Services Canada Inc. ("MSC") to undertake geological exploration and evaluation of the Mothae kimberlite, with on-site work undertaken by Remote Exploration Services ("RES"), a member of the Mineral Services Group of companies and an affiliate of MSC. At an early stage in the programme, MSC and RES applied a variety of exploration techniques in order to provide an indication of the extent of the pipe and internal geological variation as a control on subsequent delineation drilling and sampling. This included ground-based geophysical surveys, core drilling (8,085 m), petrographic analysis and KIM analysis.

The exploration data, including information obtained from drilling and previous bulk sampling, were used to guide subsequent bulk sampling. Bulk sampling of the kimberlite was undertaken in three phases between 2008 and 2012. A total of 603,819 dry metric tonnes of bulk sample material was processed and 23,446 ct were recovered with an average stone size of 0.45 cps.

### 1.4 Diamond Resource Statement

The Diamond Resource in this Report was first reported in February 2013 by MSA in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM") and Guidelines for Reporting of Diamond Exploration Results (CIM, 2010) and was published by Lucara in a report titled "NI 43-101 Technical Report and Mineral Resource Estimate for the Mothae Diamond Project, Lesotho". There being no new technical information pertinent to the Diamond Resource estimate, this Report presents the same Diamond Resource stated in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code"), 2012 Edition. The Diamond Resource estimate is presented in Table 1-2.

The Diamond Resource has been classified according to the degrees of uncertainty with respect to the confidence level for each of the components according to JORC guidelines. The overall resource classification for each domain is based on the highest risk component. In general, diamond value estimates are considered to have the highest degree of uncertainty, followed by grade and then kimberlite tonnage.

**Table 1-2**

**Diamond Resource Estimate for Mothae (2.0 mm bottom screen), as at 8 September 2017**

| Resource Domain | Volume ($Mm^3$) | Bulk Density ($g/cm^3$) | Tonnes (Mt) | Grade (cpht) | Average Revenue (USD/ct) | Average rock value (USD/t) | Total Resource (Mct) |
|---|---|---|---|---|---|---|---|
| | | | **INDICATED** | | | | |
| SW_WX | 0.37 | 2.02 | 0.75 | 2.6 | 1,310 | 34 | 0.02 |
| SW_50 | 0.43 | 2.52 | 1.08 | 2.5 | 1,364 | 34 | 0.03 |
| SC_WX | 0.11 | 2.11 | 0.23 | 4.6 | 695 | 32 | 0.01 |
| SC_50 | 0.14 | 2.47 | 0.33 | 4.4 | 737 | 32 | 0.01 |
| **Total Indicated** | **1.04** | **2.29** | **2.39** | **3.0** | **1,196** | **34** | **0.07** |
| | | | **INFERRED** | | | | |
| SW_300 | 7.39 | 2.62 | 19.35 | 2.5 | 1,364 | 34 | 0.48 |
| SC_300 | 1.52 | 2.55 | 3.88 | 4.4 | 737 | 32 | 0.17 |
| SE-WX | 0.14 | 2.04 | 0.29 | 2.8 | 578 | 16 | 0.01 |
| SE_50 | 0.24 | 2.39 | 0.56 | 2.6 | 615 | 16 | 0.01 |
| SE_300 | 2.39 | 2.48 | 5.94 | 2.6 | 615 | 16 | 0.15 |
| N_WX | 0.29 | 2.07 | 0.59 | 2.5 | 737 | 19 | 0.01 |
| N_300 | 2.39 | 2.49 | 5.96 | 2.4 | 780 | 19 | 0.14 |
| **Total Inferred** | **14.37** | **2.55** | **36.57** | **2.7** | **1,053** | **28** | **0.97** |
| **Total Diamond Resource*** | **15.41** | **2.53** | **38.96** | **2.7** | **1,063** | **28** | **1.04** |

***Note:*** *Table contains rounded figures*

*WX indicates 'weathered material' (depth of ±20 m) and SW_50 and SW_300 indicate a 50 m and a 300 m depth*

*SW = southwest domain; SC = south centre domain; SE = southeast domain (all in South Lobe); N = North Lobe*

*The grade figures are based on recovery factors derived from total content curves for each geological domain, and the actual plant recoveries achieved*

*The Diamond Resource estimate was originally reported in accordance with CIM in 2013 and has been re-stated in 2017 in accordance with JORC 2012 guidelines*

** Note that 70% of the reported Diamond Resource is net attributable to Lucapa*

The total Diamond Resource and the net Diamond Resource directly attributable to Lucapa are summarized in Table 1-3.

**Table 1-3**

**Summary of Diamond Resource Estimate by Status, as at 8 September 2017**

| Category | Gross | | | Net Attributable | | | Operator |
|---|---|---|---|---|---|---|---|
| **Diamond Resource per asset** | **Tonnes (millions)** | **Grade (cpht)** | **Total Resource Mct** | **Tonnes (millions)** | **Grade (cpht)** | **Total Resource Mct** | |
| Measured | - | - | - | - | - | - | Lucapa |
| Indicated | 2.39 | 3.0 | 0.07 | 1.67 | 3.0 | 0.05 | Lucapa |
| Inferred | 36.57 | 2.7 | 0.97 | 25.60 | 2.7 | 0.68 | Lucapa |
| **Total Indicated and Inferred** | **38.96** | **2.7** | **1.04** | **27.27** | **2.7** | **0.73** | **Lucapa** |

**Note:** *Table contains rounded figures*

*The grade figures are based on recovery factors derived from total content curves for each geological domain, and the actual plant recoveries achieved*

*The Diamond Resource estimate was originally reported in accordance with CIM in 2013 and has been re-stated in 2017 in accordance with JORC 2012 guidelines*

## 1.5 Risks and Opportunities

A summary of the key risks identified for the Mothae Diamond Project is shown in Table 1-4.

**Table 1-4**

**Summary of key risks identified for the Mothae Diamond Project**

| Area | Risk/Opportunity | Mitigation |
|---|---|---|
| Diamond Resource | Projection of grade and revenue to depth | This risk has been partially mitigated by detailed geological work on drill core from depth. However, almost no diamond data is available beyond a vertical depth of 50 m |
| Diamond Resource | Diamond revenue model | There is upside potential for the average diamond value based on the model value of large stones |
| Mining | The kimberlite lies in a valley | The financial model will have to cater for a higher stripping ratio than would otherwise exist for a mine on flat ground |
| Plant | Breakage of large diamonds in the plant | The bulk sample plant broke some large diamonds. A trade-off study is required to determine the optimum bottom and top cut-offs for a production plant |
| Environmental | Fines escaping into the local fresh water system | Tailings management will need to prevent fines escaping into local streams and potentially impacting on Lesotho's fresh water exports |

## 1.6 Recommendations

On the basis of the Diamond Resource estimate, and the potential upside with respect to the average revenue per carat for each of the geological domains within the Mothae kimberlite, MSA recommends that a Pre-Feasibility Study or Feasibility Study is undertaken for Phase 2 (mining of the unweathered kimberlite). The Study would be aimed at establishing realistic estimates of the key parameters of optimum open pit dimensions, waste stripping ratio, operating costs, optimum plant configuration including top and bottom size cut-offs and capital costs to arrive at an economic model and to confirm that the current Diamond Resource has the potential to be mined economically.

It is recommended to conduct processing studies including 3 mm and 4 mm bottom size cut-off test work on existing Mothae drill cores and use the results to optimise plant parameters.

It is also recommended to carry out total diamond liberation (microdiamond / MiDA) studies on selected drill cores from the South Lobe to assess diamond content and size frequency at depths from approximately 20 m (below weathered zone) to approximately 150 m. If this method is successful in constraining the diamond grade, size frequency and diamond characteristics it should be extended to the North Lobe and the Neck.

The estimated costs for the recommended work are shown in Table 1-5. The costs do not include any costs related to Phase 1 production.

**Table 1-5**

**Summary of estimated costs for recommended work programmes**

| Activity | Cost (USD) |
|---|---|
| Pre-Feasibility or Feasibility Study for Phase 2 (mining of unweathered kimberlite) | 180,000 |
| Processing studies on existing core (four domains) | 40,000 |
| Total diamond liberation (MiDA) on existing core | 60,000 |

If it is established that the existing Diamond Resource cannot support mine development, then the Project will need to establish what diamond revenue could potentially make the project economic. Based on the work that has been completed to date, a reduction in the level of uncertainty associated with Diamond Resource tonnage and grade is unlikely to have a major impact on the overall Project revenue. Average diamond revenue (expressed as USD/ct) may change slightly with further bulk sampling and a greater number of very large stones on which to base an improved average diamond revenue estimate. However, the main factor which is likely to change over time (based on published forecasts) is the diamond market. All recent published analyses of the diamond market project an increase in demand and a decrease in supply over the next 10 years, which has the potential to drive rough diamond prices up. Therefore the Project economics may improve over time.

# 2 INTRODUCTION

## 2.1 Scope of Work

The MSA Group (Pty) Ltd ("MSA") has been commissioned by Lucapa Diamond Company Limited ("Lucapa") to provide an updated Independent Technical Report ("the Report") on its' Mothae Diamond Project located in the highlands of Lesotho. This Report includes additional information on Lucapa's planned mining and processing activities and replaces the CPR compiled by MSA for Lucapa in March 2017 for release on the Australian Securities Exchange ("ASX"). The Mothae Diamond Project comprises a single Mining Lease covering an area of 20.52 $km^2$ in which Lucapa holds a 70% interest. The Report may be used by Lucapa for public or private fundraising for the continued evaluation and development of the Mothae Project.

The Diamond Resource in this Report was first reported in February 2013 by MSA in accordance with the Canadian Institute of Mining, Metallurgy and Petroleum ("CIM") and Guidelines for Reporting of Diamond Exploration Results (CIM, 2010) and was published by Lucara Diamond Corporation ("Lucara") in a report titled "NI 43-101 Technical Report and Mineral Resource Estimate for the Mothae Diamond Project, Lesotho". There being no new technical information pertinent to the Diamond Resource estimate, this Report presents the same Diamond Resource stated in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code"), 2012 Edition.

All monetary figures expressed in this report are in United States of America dollars ("USD") unless otherwise stated. A glossary of all technical terms and abbreviations is attached as Appendix 1.

## 2.2 Principal Sources of Information

MSA has based its review of the Mothae Diamond Project on information provided by Lucara and Lucapa, as well as other relevant published and unpublished data. A large proportion of this information is recorded in reports and spreadsheets prepared by the geological contractor Mineral Services Canada Inc. ("MSC") which was appointed in 2012 by Lucara. Work on site was undertaken by Remote Exploration Services ("RES"), a member of the Mineral Services Group of companies and affiliate of MSC. Some of the content of the report has been taken directly from the report by Mineral Services (2013) and where this is the case, it is indicated at the beginning of the relevant section. A list of the principal sources of information is included in Section 27 of the Report. The authors have endeavoured, by making all reasonable enquiries, to confirm the authenticity and completeness of the technical data upon which the Report is based. A final draft of the Report was provided to Lucapa, along with a written request to identify any material errors or omissions prior to finalisation.

An inspection of the Mothae Diamond Project was undertaken by the Competent Person Dr Friedrich Reichhardt on 1 February 2017. The site visit included an assessment of access routes and infrastructure within and proximal to the Mothae Diamond Project, examination of geological exposures within the kimberlite pipe, and an inspection of drill core and core storage facilities. Also inspected were the dense media separation ("DMS") plant, the containerised diamond recovery facilities, tailings from the DMS plant and dumps from the surface material stripped from the kimberlite prior to the bulk sampling exercise conducted between June 2010 and October

2012. Figure 2-1 shows the topographic setting of the Mothae Project and the current kimberlite processing and final diamond recovery facilities.

**Figure 2-1**

**Infrastructure and processing facilities at the Mothae Kimberlite Project**


***Source:*** *Reichhardt, 2017 and Lucapa, 2016*

The Report has been prepared on the basis of information available up to and including 15 September 2017.

## 2.3 Qualifications, Experience and Independence

The MSA Group is an independent provider of exploration, evaluation and environmental consulting and contracting services, which has been providing services and advice to the international minerals industry and financial institutions since 1983. The Report has been compiled by Dr Friedrich Reichhardt and Dr Johannes Ferreira.

Dr Friedrich Reichhardt is a professional geologist with over 25 years' experience in the field of diamond exploration throughout Africa. Dr Reichhardt is Principal Consultant with MSA, a Professional Natural Scientist (Pr. Sci. Nat.) registered with the South African Council for Natural Scientific Professions, and a Fellow of the Geological Society of South Africa. Dr Reichhardt has the appropriate relevant qualifications, experience, competence and independence to act as a 'Competent Person' as that term is defined by JORC. Dr Reichhardt is responsible for all Sections of the Report except Section 14 which was compiled in collaboration with Dr Ferreira.

Dr Johannes Ferreira is a professional geostatistician with 35 years' experience of geostatistical modelling of diamond deposits worldwide. He is a member of the Geological Society of South

Africa, a member of the Canadian Institute of Mining, Metallurgy and Petroleum and a Professional Natural Scientist (Pr. Sci. Nat.) registered with the South African Council for Natural Scientific Professions. Dr Ferreira has the appropriate relevant qualifications, experience, competence and independence to act as a 'Competent Person' as that term is defined by JORC. Dr Ferreira is responsible for Section 14 of the Report which was compiled by both authors.

Neither MSA, nor the authors of the Report, have or have previously had any material interest in Lucapa or the mineral properties in which Lucapa has an interest. MSA's relationship with Lucapa is solely one of professional association between client and independent consultant. The Report is prepared in return for professional fees based upon agreed commercial rates and the payment of these fees is in no way contingent on the findings of the Report.

# 3 RELIANCE ON OTHER EXPERTS

The authors have not independently verified, nor are they or MSA qualified to verify, the legal status of the licence that forms the subject of this Report and are reliant on the information provided by Lucara and Lucapa. The reported status of the Mining Lease is based on information supplied by Lucapa and copies of documents provided by Lucapa to MSA and this Report has been prepared on the assumption that the Mining Lease is as reported by Lucapa.

No warranty or guarantee, be it expressed or implied, is made by MSA with respect to the completeness or accuracy of the legal aspects reported in this document. MSA does not undertake or accept any responsibility or liability whatsoever to any person or entity in respect of those parts of this document, or any errors in or omissions from it, whether arising from negligence or any other basis in law whatsoever.

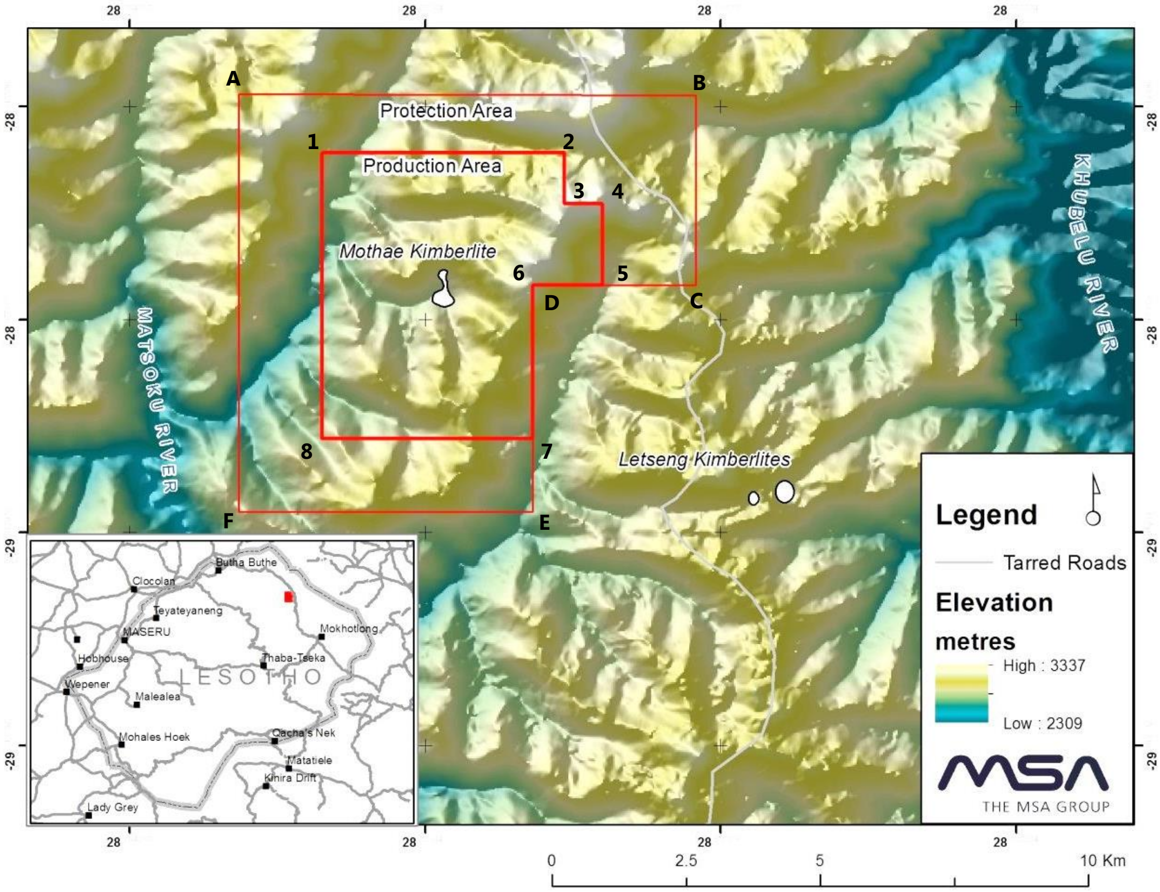
Mr Michael Lynn, together with Dr Ferreira, compiled the Technical Report titled "NI 43-101 Technical Report and Mineral Resource Estimate for the Mothae Diamond Project, Lesotho" with an effective date of 28 February 2013. At that time Mr Lynn was a Principal Diamond Consultant for MSA and as 'Qualified Person' conducted a site visit in September 2012 as part of the NI 43-101 requirements. The findings of his site review and other information relevant to the Mothae Project are referenced in this Report where appropriate.

# 4 PROPERTY DESCRIPTION AND LOCATION

## 4.1 Location

A new Mining Lease (“ML”; lease number 001-16/17) was granted to Mothae Diamonds (Pty) Ltd in January 2017 for 10 years. The ML is located in the highlands of Lesotho (Figure 4-1) and the ML coordinates are listed in Table 4-1. The ML has a ‘Production area’ of 20.52 km$^2$ and a further zone (26.33 km$^2$) partially surrounding the production area known as a ‘Protection area’ or Infrastructure area”, where no mining is allowed, bringing the total area to 46.85 km$^2$.

**Figure 4-1**
**Locality map of the Mothae Mining Lease in north-eastern Lesotho**




***Source:*** *Lynn and Ferreira, 2013*

**Table 4-1**
**Licence details and coordinates (DD - decimal degrees) WGS 84**

| Mining Lease | Point | Latitude (DD) | Longitude (DD) |
|---|---|---|---|
| Production Area | 1 | -28.948610 | 28.786390 |
| Production Area | 2 | -28.948610 | 28.826920 |
| Production Area | 3 | -28.957270 | 28.826920 |
| Production Area | 4 | -28.957270 | 28.833340 |
| Production Area | 5 | -28.970830 | 28.833340 |
| Production Area | 6 | -28.970830 | 28.821670 |
| Production Area | 7 | -28.996670 | 28.821670 |
| Production Area | 8 | -28.996670 | 28.786390 |
| Protection Area | A | -28.938967 | 28.772256 |
| Protection Area | B | -28.938967 | 28.849136 |
| Protection Area | C | -28.970833 | 28.849136 |
| Protection Area | D | -28.970833 | 28.821667 |
| Protection Area | E | -29.009028 | 28.821667 |
| Protection Area | F | -29.009028 | 28.772256 |

***Source:*** *Lynn and Ferreira, 2013*

## 4.2 Mineral Tenure, Permitting, Rights and Agreements

Table 4-2 summarises the three types of rights applicable to the mining industry in Lesotho. The ML that constitutes the Mothae Project is registered in the name of Mothae Diamonds (Pty) Limited ("Mothae Diamonds"; Company registration number I2008/1177). Mothae Diamonds is a Lesotho registered company.

According to the Mines and Minerals Act No 4 of 2005, all rights to minerals are vested in the Basotho Nation. Mineral rights may only be granted to a Lesotho registered company or Lesotho nationals.

Exploration work is normally performed under a Prospecting Licence ("PL"), with a maximum area of 25 $km^2$, which is valid for two years and renewable for one year thereafter. The renewal may be extended at the discretion of the Minister if proper evaluation work is being undertaken.

There is no automatic right to convert a PL to a ML, although the record indicates that the Ministry of Mines has not unreasonably withheld this transfer in the past. A ML is issued for a maximum of 10 years and is renewable for a further 10 years. The Government of the Kingdom of Lesotho ("GoL") retains the right to negotiate with a company regarding its shareholding, and all technical, commercial and financial aspects of a diamond mining operation, before issuing a ML. The work at Mothae has been done under a Mining Lease as it involved bulk sampling, which, in terms of the mining law, is viewed as trial mining.

A royalty is payable to the government of 10% for precious stones and 3% for other minerals. This percentage is based upon the gross sale value receivable at the mine gate and, in the case of diamond projects, is negotiable. Lucapa negotiated an initial royalty of 4% for Phase 1 of mining (weathered kimberlite material) and the royalty for Phase 2 will be re-negotiated with the GoL.

**Table 4-2**

**Types of Rights Applicable to the mining industry in Lesotho**

| Type of Right | Validity | Renewal Period | Size of Area | Rights | Obligations |
|---|---|---|---|---|---|
| Prospecting License | Maximum of 2 years | Maximum of 1 year | <25.0 $km^2$. Reduced to between 12.5- 25.0 $km^2$ upon renewal. | • to prospect for the specified mineral;<br>• drill, excavate and erect temporary structures, and<br>• to transfer, with Government approval | • to carry out prospecting according to a works programme;<br>• notify Commissioner of the discovery of all minerals;<br>• annually submit an audited report on expenditure;<br>• maintain full & accurate results of prospecting. These must be submitted to the officials on a quarterly basis; and<br>• not to remove minerals without permission. |
| Mining Lease | Maximum of 10 years | Maximum of 10 years | Not specified, but may be enlarged contiguous to existing area. | • to mine the specified mineral;<br>• erect the necessary plant and equipment;<br>• prospect within the lease area and dump waste;<br>• dispose of the mineral product; and<br>• to transfer, with Government approval. | • to provide the Government with a share of at least 20% in the mine. In the case of diamonds, this shareholding, along with other financial, technical and commercial aspects, will be negotiated with the applicant according to Section 44;<br>• that a Government representative must be on site at diamond mines at all times;<br>• must carry out mining according to the programme of works and in accordance with good mining & environmental practices;<br>• notify the Commissioner when mining becomes profitable;<br>• keep (in the Kingdom of Lesotho) all technical and financial records; and<br>• furnish audited financial records to the Government biannually. |
| Mining Permit | Maximum of 1 year | Maximum of 1 year | Maximum of 100 $m^2$. | • to conduct small scale mining for a specified mineral (except diamonds);<br>• to erect temporary structures;<br>• to dispose of the mineral; and<br>• to transfer, with Government approval. | • to carry out activities using good mining and environmental practices;<br>• submit production and financial reports annually;<br>• submit a description of plant, equipment and number of employees annually; and<br>• not to carry out mining below a depth of 2m and using explosives or powered machinery (except for material loading purposes). |

***Source:*** *Lynn and Ferreira, 2013*

The Mining Department requires that an Environmental Impact Assessment ("EIA") and an Environmental Management Programme Report ("EMPR") be submitted prior to commencement of mining operations.

The surface rights for the Project have been ceded to Mothae Diamonds in terms of the ML.

The Mothae ML is valid until 28 January 2027 and may be renewed for a maximum of 10 years.

## 4.3 Payments

Table 4-3 summarises the payments by Lucapa to the government of Lesotho to acquire the Mothae project. Instalment payments from October 2017 are still to be made by Lucapa.

**Table 4-3**

**Summary of payments by Lucapa to Government of Lesotho**

| Date | Detail | USD |
|---|---|---|
| 9 March 2017 | Mothae purchase price - 1st instalment (deposit) | 400,000 |
| 16 May 2017 | Mine rental (annual payment) [1] | 87,000 |
| September 2017 | Mothae purchase price - instalment | 4.100,000 |
| October 2017 | Mothae purchase price - instalment* | 562,500 |
| November 2017 | Mothae purchase price - instalment* | 562,500 |
| December 2017 | Mothae purchase price - instalment* | 562,500 |
| January 2018 | Mothae purchase price - instalment* | 562,500 |
| February 2018 | Mothae purchase price - instalment* | 562,500 |
| March 2018 | Mothae purchase price - instalment* | 562,500 |
| April 2018 | Mothae purchase price - instalment* | 562,500 |
| May 2018 | Mothae purchase price - instalment* | 562,500 |
| **Total** | | 9.087,000 |

[1] = *amount is yearly adjusted in accordance with the consumer price index or the governing law to the Government for use of the Production Area*

* = *payment still to be made and date subject to change;* ***Source****: Lucapa, 2017*

## 4.4 Environmental Liabilities

The authors are not qualified to provide comment on environmental issues associated with the Mothae Diamond Project. No guarantee, be it express or implied, is made by MSA with respect to the completeness or accuracy of the environmental aspects of this document. MSA does not undertake or accept any responsibility or liability in any way whatsoever to any person or entity in respect of this part of this document, or any errors in or omissions from it, whether arising from negligence or any other basis in law whatsoever.

MSA has been provided with documentary evidence of the Environmental Management Programme and Environmental Impact Assessment for the Mothae Diamond Project. In addition, Lucapa continues an ongoing public participation process. To MSA's knowledge, there are no environmental impediments to the project continuing to the development stage.

The financial guarantee for a sudden and unforeseen mine closure (rehabilitation provision) has been estimated by Lucapa to amount to approximately USD 8 million.

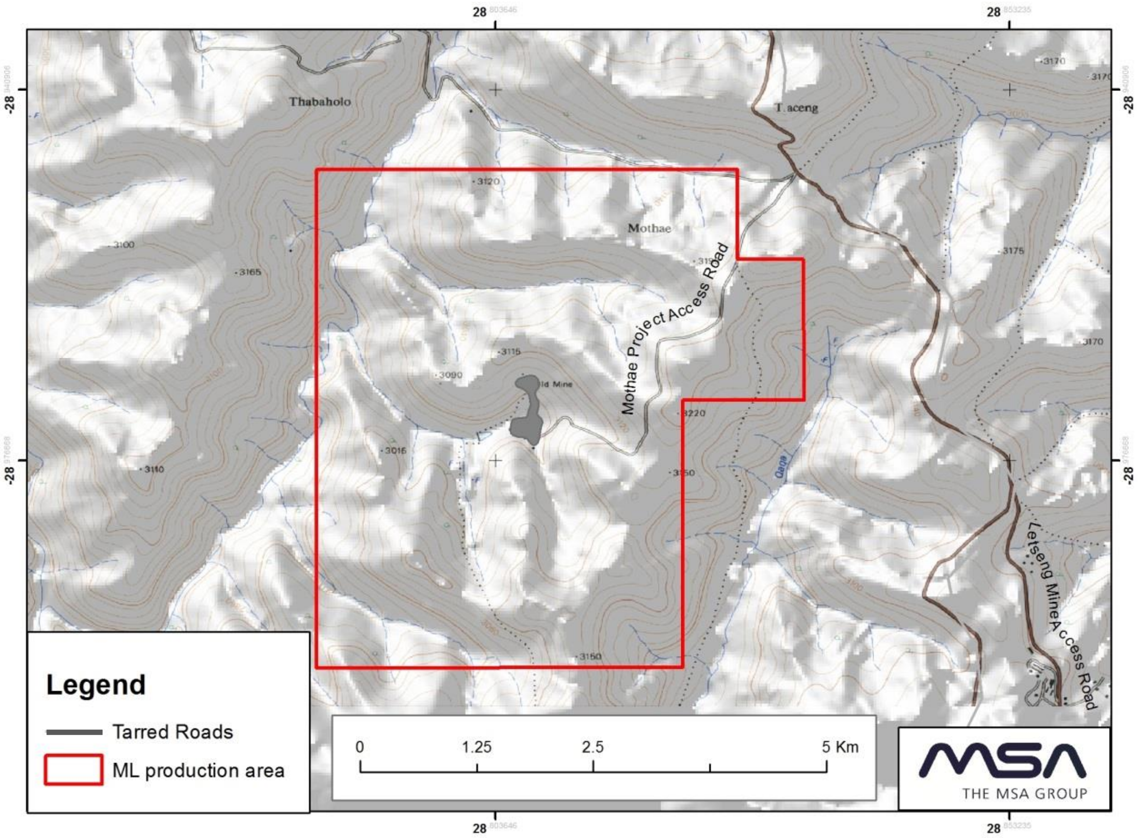
Further information on environmental matters is provided in Section 20.

## 5 ACCESSIBILITY, CLIMATE, LOCAL RESOURCES, INFRASTRUCTURE AND PHYSIOGRAPHY

### 5.1 Accessibility

The Mothae Kimberlite Project is located in north-eastern Lesotho approximately 150 km northeast of Maseru, the capital of Lesotho. It's approximate altitude is 2,900 m above mean sea level ("mamsl"), latitude is 28°58'S and longitude 28°48'E. Access is by tar road from Butha-Buthe and then along the Mothae Project access road (Figure 5-1) which is an approximately 4.5 km long, well-maintained gravel track.

**Figure 5-1**
**Map of the access road to the Mothae Project**




***Source:*** *Lynn and Ferreira, 2013*

### 5.2 Climate and Physiography

The landscape of Lesotho is divided into two major regions; the lowlands, which make up less than 20% of the country and occupy a narrow strip along the western edge of the country at an elevation below approximately 1,800 m, and the highlands, which rise to their highest point at Thabana Ntlenyana (3,482 m).

The Mothae Kimberlite Project is situated on the undulating highland plateau of Lesotho, with the altitude of the plateau being approximately 3,000 m. The climate is continental and temperate, moderated by the altitude. The winter months from April to September are cold and generally dry while the summer months from October to March are milder and wetter. Average precipitation may exceed 1,000 mm per annum and the temperature only rarely exceeds 25°C in summer. The weather is unpredictable and may change rapidly from sunny to cloudy, dry to rainy, and calm to windy. Winters are generally dry, however precipitation that can occur in winter usually occurs as snow, which may lie on southward facing slopes for several months into late spring. Winter night-time temperatures may drop as low as -20°C and frost may occur over nearly six months of the year. Mining operations can normally continue year round although the climate can occasionally impact on mine production. For example, snow at the adjacent Letseng Mine stopped mining production for 30 days in 2012, and problems occurred in the plant due to freezing pipes during mid-winter (M. Lynn pers. comm. with Letseng mine staff).

The vegetation is classified as Lesotho Highland Basalt Grassland, consisting of grasses with minor shrubs (especially Passerina Montana and Chrysocoma ciliate) and localised marshes known as Lesotho Mires, which act as water reservoirs. These vegetation types are classified as 'Least Threatened' but are 'Poorly Protected' (Mucina and Rutherford, 2006). There is no crop farming at this altitude.

## 5.3 Local Resources and Infrastructure

The Mothae Kimberlite Project is served by a modest infrastructure. A small airstrip at the Letseng Diamond Mine is available by special arrangement. The only tarred road follows a winding course up the Moteng (2,820 m) and Mahlasela passes (3,222 m) from the lowlands into the mountains and may be subject to temporary closure due to landslides, winter snow, erosion or frost heave. The final 4.5 km follows a steep gravel road which was resurfaced by Lucapa in 2017.

Power for the Project can be provided by diesel generators, although Lucapa is considering a connection to the national power grid over the next few years. Surface and underground water is abundant in the area and a dam has been constructed to provide water to the plant.

There is a connection to the national cell phone network on site.

Electricity is supplied to the adjacent Letseng Mine from the Lesotho national grid. A high voltage line was constructed specifically to supply the mine. Back-up electricity is ensured through a series of diesel generators. The electricity power grid in Lesotho is connected to the Eskom (the South African national electricity supply company) power grid in South Africa. Major power lines pass within 5 km of the Mothae Project.

The area has a history of diamond mining dating to the late 1950s when a number of kimberlite discoveries were declared government diggings. Currently only the Letseng diamond mine (Gem Diamonds) and the Liqhobong mine (Firestone Diamonds Ltd) are in production while the Kao kimberlite (Namakwa Diamonds Ltd) is at the final stages of development and construction. In 2015 Paragon Diamonds Ltd reported plans to conduct a Pre-Feasibility Study on their Lemphane kimberlite project.

The Letseng Mine lies less than 7 km southeast of Mothae and obtains process water from an existing dam located on the mine's property. All rain water run-off generated on site is diverted into this dam, in addition to return water from the slimes dam and water from open pit dewatering. The dam also supplies the potable water treatment plant with raw water.

The majority of mine employees at the Letseng Mine are resident on site during their shift cycle in a series of accommodation units. Site services (cleaning, catering, etc.) are outsourced. Due to the relative remoteness of the operation, an onsite sewage treatment plant, a domestic and industrial waste separation facility and an incinerator are utilized to manage waste. Similar infrastructure would be required at Mothae should it develop into a mine.

At the Liqhobong kimberlite, some 21 km west of Mothae, Firestone reported that the grid power project has been completed with the connection to the national grid along a 28 km-long purpose-built power line through the Malibomatso River valley.

# 6 HISTORY

## 6.1 History of Diamond Exploration in Lesotho

Kimberlite occurrences were first recorded in Lesotho by Stockley (1947). Between 1957 and 1963, geological mapping by Leeds University researchers and a Lesotho-wide exploration programme by Basutoland Diamonds Limited ("BDL"), added to the number of known kimberlites. These programmes brought the number of known kimberlite pipes and dykes in the country to 135, the most important of which were the Letšeng-la-Terae ("Letseng") kimberlites (the Main and Satellite pipes), Kao, Liqhobong, Mothae and Lemphane. These pipes were declared government diggings, and by 1967 there were up to 6,000 local diggers on site at Letseng. The Letseng pipes are estimated to have produced 63,000 carats between 1959 and 1967, including the 601-carat Lesotho Brown diamond.

A second phase of exploration was undertaken by the United Nations Development Programme ("UNDP") between 1971 and 1974, which brought the total number of recorded kimberlites to 249. The later discoveries included a further 4 pipes and 2 'blows', the most important of which is Pipe 200.

Historically, only the Letseng and Liqhobong pipes have been mined. The Letseng pipes were originally mined by De Beers, and more recently by Letseng Diamonds (Pty) Ltd. Four other pipes in Lesotho have been subject to investigation and project development in recent years, namely Mothae, Kao, Kolo and Lemphane.

Rio Tinto Exploration (Pty) Ltd was awarded the exploration license for the Letseng pipes in 1968 and was tasked with undertaking a feasibility study to mine. Although grades of the Letseng pipes were found to be low (less than 4 cpht), many large high-quality stones were recovered. Rio Tinto abandoned the deposit in 1972 because of the low grade and associated economics at the time, which militated against further development. Lesotho's government then asked De Beers to re-evaluate the Letseng kimberlites, which led to the opening of the Letseng Mine in November 1977. The mine was closed after 5 years in 1982 having produced 272 840 carats from 9.4 Mt of kimberlite (mostly from the Main pipe) at an average grade of 2.9 cpht.

Lesotho's government investigated ways to reopen the Letseng Mine in the 1990s. Letseng Diamonds (Pty) Ltd (a Lesotho-registered company) was formed in 1995 as a partnership between industry investors (76 percent) and the Lesotho Government (24 percent). The mining rights for the Letseng Mine were acquired by Letseng Diamonds (Pty) Ltd in 1999. The reconstruction of the mine's infrastructure commenced in 2003 and production at two alluvial deposits associated with the Main and Satellite Pipes started in November 2003. Production at the Satellite Pipe resumed in March 2004 and the mine was acquired by Gem Diamonds Limited in 2006, since which time production has continued almost uninterrupted.

## 6.2 History of Exploration of the Mothae Kimberlite

The Mothae kimberlite was discovered in 1961 by Basutoland Diamonds Ltd, following up the occurrence of kimberlitic garnets and ilmenites downstream of the pipe in the Mothae River. The pipe was reported to cover an area of approximately 8.8 ha at surface, comprising two lobes joined by an irregular dyke-like body (Nixon, 1973).

Initial reports on grade are provided in a British Overseas Geological Report entitled 'Reconnaissance Mineral Survey of Basutoland' by Bleackley and Workman (1964). They distinguished the northern and southern lobes as two separate bodies, named Motaenyane and Mothai respectively. The brown weathered kimberlite capping the bodies was reported to be much richer than the underlying massive kimberlite. Grades varied from 16 ct per 100 loads (approximately 22 cpht from a small sample of 136 loads) in the weathered material to 0.72 ct per 100 loads (approximately 1 cpht from a sample of 206 loads) in the massive kimberlite. It is likely that this material was processed through a pan plant and it is uncertain whether a crushing circuit was used. These historical results do not comply with modern reporting codes and should not be relied upon.

More comprehensive prospecting on Mothae was undertaken by Scott, and later by Lonrho Ltd. Between 1969 and 1971, a total of 12 pits of 6 m diameter were excavated to 24 m depth (Nixon, 1973). The excavated material was processed using a Dense Media Separation ("DMS") plant (MSA, 2007) with an upper and lower size cut-off of 12 and 1 mm respectively, yielding a diamond parcel of approximately 350 ct and an overall sample grade of 2.28 cpht. The reported grades for individual pit samples vary significantly, ranging from 0.27 to 4.95 cpht. The highest grades and best quality stones were reportedly recovered from the south-eastern portion of the pipe. The evaluation work was conducted to establish the grade of the Mothae pipe, and diamond values were not reliably recorded. Diamond shapes were reportedly similar to those recovered at Letseng, i.e. highly resorbed with a small population of macles and fragments. Size distribution was not recorded although the plant was only designed to recover diamonds less than 12 mm in size, limiting the maximum recoverable stone size to approximately 13 ct. The diamond parcel is reported to have comprised pale yellow, brown and grey stones and was interpreted to lack the sub-population of high quality stones which occur in the nearby Letseng kimberlite. These historical results do not comply with international codes and should not be relied upon.

Mr Keith Whitlock undertook core drilling with a portable core rig, on behalf of Lonrho Ltd, and commented that the Mothae pipe contact with basalt is steep-sided at 82 to 86 degrees and that there is no marked decrease in the area of the pipe down to 150 m depth.

A magnetic survey undertaken in 1962 identified the main kimberlite zone as a dipolar magnetic anomaly. A concurrent resistivity survey showed a high conductivity contrast between the weathered montmorillonite-bearing kimberlite and the adjacent basalt country rock. Three lithostratigraphic units were delineated by this survey; an overburden layer having a resistivity range of 100 Ωm to 200 Ωm and lying between 1 m and 5 m; a relatively conductive second layer (10 Ωm to 20 Ωm) between 13 m to 19 m; and a more resistive, unweathered kimberlite layer extending to greater depth. Gravimetric data showed a negative response of a few tenths of a milligal superimposed on an extensive positive anomaly of about 1.5 milligals. Based on these results the unweathered kimberlite was inferred to be denser than basalt and more extensive than observed at surface.

Artisanal miners worked at Mothae from the mid 1970's to 2006 when Motapa Exploration Limited ("Motapa") was awarded tenure. Work by the artisanal miners focussed on processing alluvial material directly downstream of Mothae, as well as the residual gravels and weathered kimberlite that is exposed at surface in the southwestern portion of the pipe. Anecdotal accounts indicate recovery by the artisanal workers of a 30 ct diamond as well as a number of good quality 5 ct stones.

The most recent phase of prospecting was initiated by Motapa in 2006. Motapa entered into an option agreement with Lucara to secure funding for a bulk sampling programme in 2007 and Lucara earned an equity interest in the project. Lucara later bought Motapa and registered a subsidiary company in Lesotho called Mothae Diamonds (Pty) Ltd in 2009.

In January 2017 Lucapa was awarded the Mothae Project through an international tender process by the Lesotho authorities following Lucara's withdrawal from the Project.

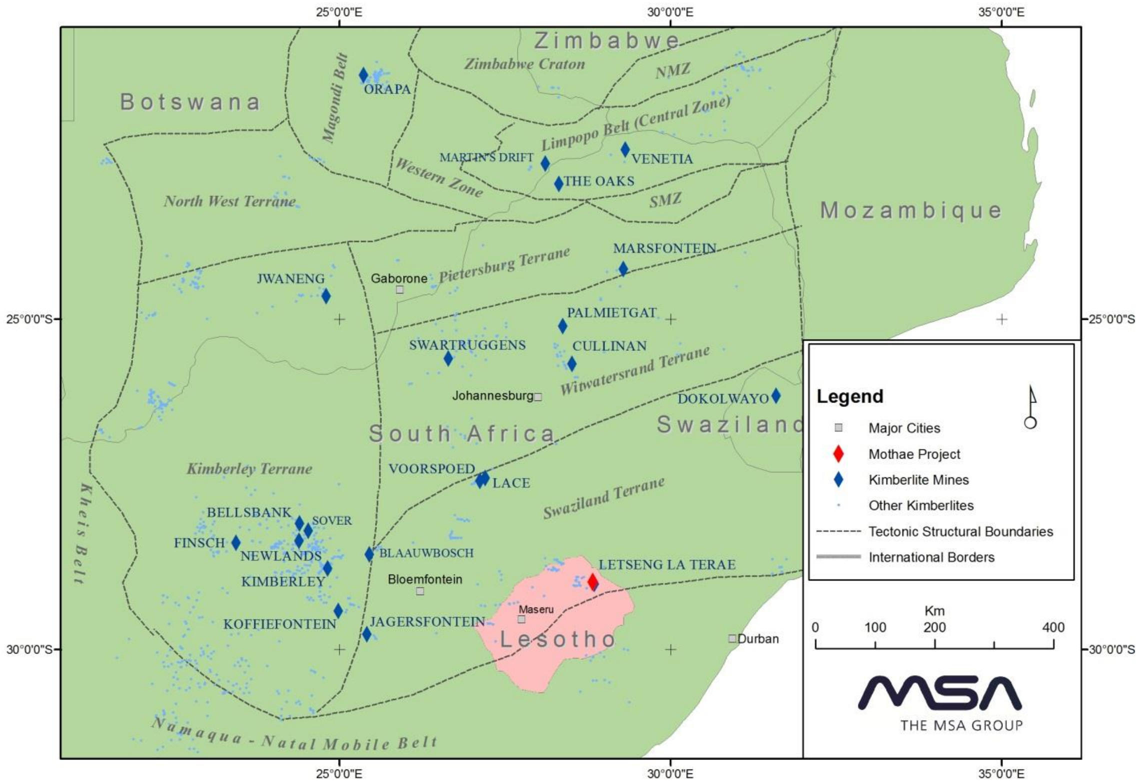
# 7 GEOLOGICAL SETTING AND MINERALIZATION

## 7.1 Regional Geology

Lesotho is situated on the southern edge of the Kaapvaal Craton, which extends through central, eastern and north-eastern South Africa, into southern Zimbabwe and south-eastern Botswana, and incorporates most of Swaziland (Figure 7-1). The Kaapvaal Craton is host to numerous important diamondiferous kimberlites of various ages, including the Mesoproterozoic Premier kimberlite (Cullinan Mine), the Cambrian Venetia kimberlites, the Middle Triassic Jwaneng kimberlites, and the Cretaceous Kimberley and Finsch kimberlites.

**Figure 7-1**

**Tectonic Setting of the Mothae Kimberlite Project**




***Source:*** *Lynn and Ferreira, 2013*
***Note:*** *domain nomenclature after Eglington et al., 2009*

The geological history and structure of the Kaapvaal Craton have been discussed by various authors (e.g. de Wit *et al.*, 1992, James *et al.*, 2001, Begg *et al.*, 2009, Eglington *et al.*, 2009, Jones et al., 2009[1]&[2]). The Northern Lesotho Kimberlite Cluster lies on the Swaziland Terrane of Eglington *et al.*, (2009). The basement rocks are not exposed in Lesotho, but further to the southeast in the Kwazulu Natal Province of South Africa, the basement sequence includes the Archaean Natal granite greenstone terrane (3.4 to 3.2 Ga). De Wit *et al.* (1992) suggested that the Swaziland Terrane and Witwatersrand Terrane to the north had combined and stabilised by about 3.2 Ga during the formation of the Kaapvaal Craton. The diamondiferous Northern Lesotho Kimberlite Field therefore conforms to 'Clifford's Rule', which states that diamondiferous kimberlites tend to occur in geological regions that have been tectonically stable since the Archaean (Clifford, 1966).

The Archaean basement in Lesotho is entirely covered by the flat-lying Palaeozoic to Mesozoic Karoo Supergroup, which reaches a thickness of approximately 4 km in Lesotho (Figure 7-2, Figure 7-3 and Figure 7-4). Its strata, mostly shales and sandstones, record an almost continuous sequence of marine glacial to terrestrial deposition from the Late Carboniferous to the Early Jurassic, a period of about 100 Ma. These accumulated in the main Karoo Basin, which has been interpreted as a retroarc foreland basin formed by the subduction and orogenesis along the southern boundary of the Gondwana supercontinent (Catuneanu *et al*., 2005).

The basalts of the Drakensberg Group were erupted within a very short period at about 180 Ma (Jurassic Period) and consist of a monotonous pile of compound basalt lava flows, which lacks significant palaeosols or persistent sedimentary intercalations. Geochemical analysis by Marsh *et al*. (1997) demonstrates that the stratigraphic sequence in Lesotho closely resembles that in a thinner sequence of basalts some 400 km to the north. This in turn indicates the widespread nature of the Karoo continental flood basalt event.

Kimberlite emplacement during the Cretaceous Period was widespread throughout southern Africa and was probably associated with tectonic triggers during the break-up of Gondwana (Bailey, 1992).

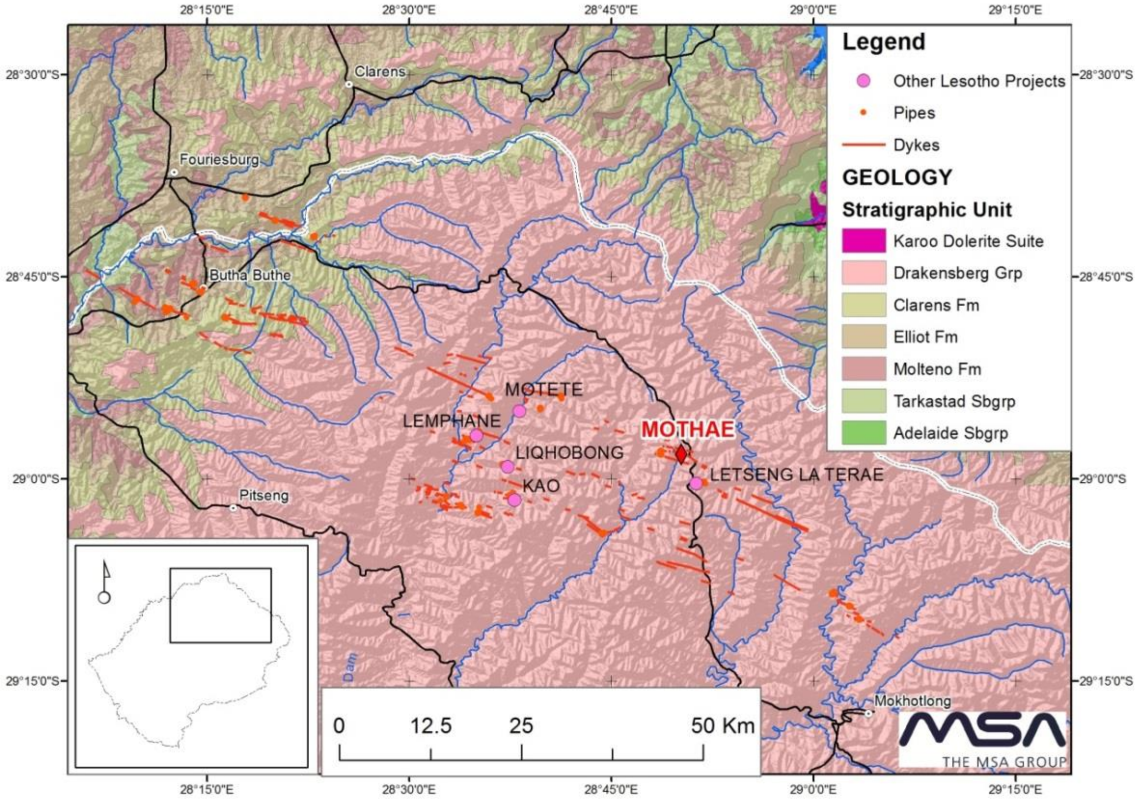
**Figure 7-2**
**Stratigraphy of the Mothae Project Area**

| Period / Eon | Supergroup | Intrusives | Group | Subgroup | Formation | Lithology |
|---|---|---|---|---|---|---|
| Cretaceous | | Lesotho Kimberlites | | | | Kimberlite |
| ~~~Unconformity~~~ | | | | | | |
| Jurassic | Karoo Supergroup | Karoo Dolerite Suite | Drakensberg Gp | | | Flood basalts and intrusive dolerite dykes and sills |
| Triassic | | | Stormberg Gp | | Clarens Fm | Fine grained aeolian sandstone |
| | | | | | Elliot Fm | Limestone, mudstone and sandstone |
| | | | | | Molteno Fm | Sandstone |
| | | | Beaufort Gp | Tarkastad Sbgp | | Sandstone, red mudstone |
| Permian | | | | Adelaide Sbgp | | Mudstone, shale, sandstone |
| | | | Ecca Gp | | Madzaringwe Fm | Sandstone, siltsone, shale |
| | | | | | Pietermaritzburg Fm | Shale, siltsone |
| | | | Dwyka Gp | | | Diamictite, shale |
| ~~~Unconformity~~~ | | | | | | |
| Archaean | | | | | | Gneiss, amphibolite |

***Source:*** *Lynn and Ferreira, 2013*
***Note:*** *Units shown as per Figure 7-3*

**Figure 7-3**

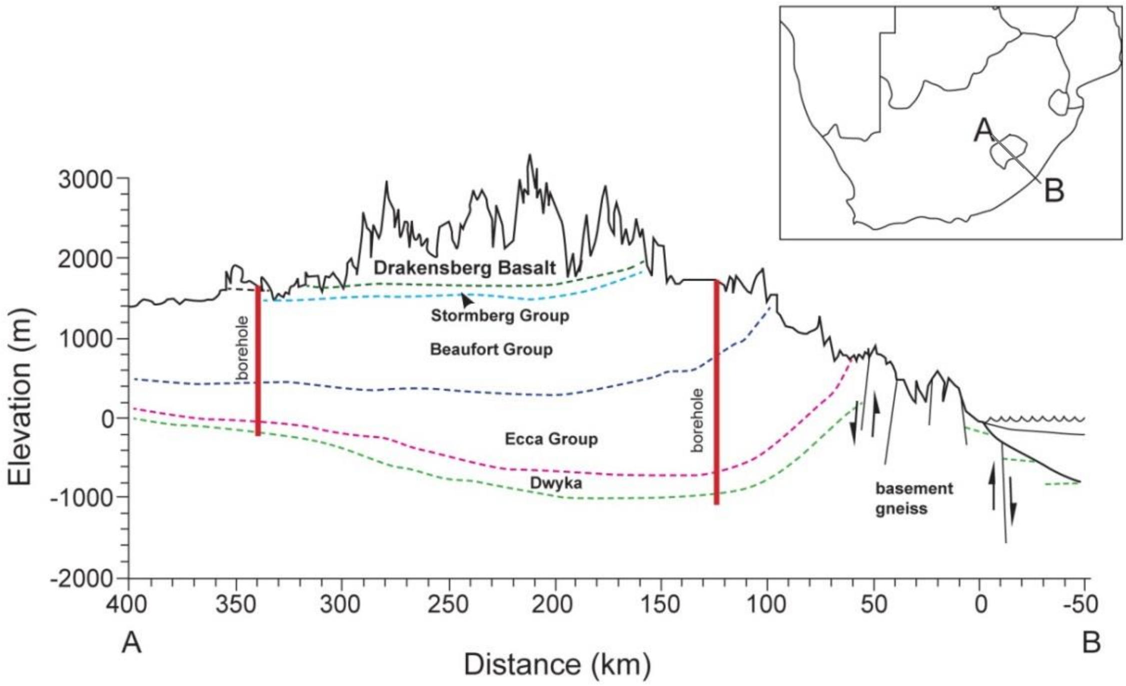
**Geological map of the Northern Lesotho Kimberlite Field**




***Source:*** *Lynn and Ferreira, 2013*

**Figure 7-4**

**Section through the Karoo Basin from Lesotho to the coast in South Africa**




***Source:*** *Lynn and Ferreira, 2013*
***Note:*** *Modified after Brown et al., 2002*

## 7.2 Local Geology

The entire Karoo sequence has been intersected in stratigraphic boreholes (Figure 7-4), but none of the stratigraphic units below the Beaufort Group outcrop in Lesotho. The geology of northern Lesotho comprises sediments of the upper Karoo Supergroup, (Molteno, Elliot and Clarens Formations) in the western lowlands, overlain by the basaltic lavas of the Drakensberg Group which form the Lesotho Highlands. The sediments, and to a lesser extent the lavas, are extensively intruded by dykes and sills of dolerite, which decrease in frequency upwards in the succession. Normal faulting occurs occasionally and resulted in minor displacement of Karoo sediments and lavas. The base of the lava sequence lies at an elevation of approximately 1,600 m.

The youngest structural trend in Lesotho is dominantly WNW-ESE and is manifested by regional faults, zones of fracturing, brecciation and jointing. Kimberlite dykes and pipes are commonly located in portions of these regional structures (Figure 7-3).

## 7.3 Property Geology

This description of the property geology is from Mineral Services (2013). The surface geology within the Mothae license area comprises amygdaloidal and non-amygdaloidal Mesozoic (180 Ma) Drakensberg Group flood basalt, into which the Mothae kimberlite has intruded. The average elevation of the Mothae kimberlite is approximately 3,000 mamsl and the thickness of the basalt into which it is emplaced is estimated to be of the order of 1,000 m. Basalt thickness on the property may locally reach up to 1,400 m. Basalts are underlain by Beaufort Group sediments of the Karoo Supergroup.

The Mothae kimberlite consists of a main southern pipe-like lobe (South Lobe) with a surface expression of 5.05 ha connected to a smaller northern lobe (North Lobe) by an elongate central kimberlite body (Neck), resulting in a total surface area of 8.81 ha. Wall rock contacts for the Neck are not exposed and are only poorly constrained by geophysics and limited wall rock intersections in drill core. The Neck is thought to represent a separate intrusion coalescing with the South Lobe at surface but separate at depth. The kimberlite / basalt contact is typically sharp and steep walled, with only localized zones of wall rock breccia.

Early geological and evaluation work on the Mothae kimberlite are discussed in Nixon (1973). It was noted at an early stage that ground geophysical methods (magnetics, resistivity and gravity) were useful for delineating the kimberlite, and two separate bodies (North and South Lobes) were recognised.

Prior to initiation of the work documented in this Report, the entire Mothae pipe was buried under 1.5 m to 8 m of overburden, comprising a layer of peat and / or black organic-rich soil, underlain by reddish brown, clay-rich soil and, in places, residual gravels overlying the kimberlite. The bulk of this overburden was stripped off the kimberlite during the different phases of the bulk sampling programme.

# 8 DEPOSIT TYPES

The Mothae kimberlite intrusion is a kimberlite diatreme, or pipe, which was the feeder to a now eroded kimberlite volcano. Kimberlite is by far the most important primary source of diamonds.

Diamonds are a high pressure (~50 Kbar) and temperature (~1,200°C) variety of carbon, which form at depths of at least 150 km below the earth's surface. Kimberlite is a volcanic rock, which originates at great depths of 150 km to 300 km in the earth's asthenosphere. Rapidly ascending kimberlite magma entrains diamonds together with other rocks and minerals present at those depths.

Kimberlite is named after the diamond-mining centre of Kimberley, South Africa, where the diamond-bearing rock type was first discovered and described. Prior to the Kimberley discoveries, all world diamond production had been from alluvial placer deposits and the primary sources were not known or recognised.

Globally, only a small minority of kimberlite bodies (<1%) contain diamonds in sufficient concentrations to be considered as 'diamond ore'. The great majority of kimberlites (>90%) contain no diamonds or have a very low diamond content. It has been found that those which do have elevated diamond concentrations usually occur in areas of old and stable crust, which are typically found in the Archaean cratonic cores of continental blocks. Kimberlites within younger orogenic belts usually contain few or no diamonds. Cratonic areas are characterised by thick crust and low geothermal gradients.

The transportation of entrained diamonds to the surface must be rapid in order to prevent their resorption or retrogression to graphite as pressure is released. Kimberlite magma is very rich in volatiles, notably $CO_2$, which makes this rapid ascent possible. The explosive breakthrough to the surface may start at depths of 2 km to 3 km, giving rise to the characteristic carrot shaped pipe, or diatreme.

Determination of the presence or absence of Type IIa diamonds at Mothae may be important in assessing the deposit's economic potential. Moore (2009) has described the characteristics of Type IIa diamonds. They were originally distinguished on the basis of their infra-red ("IR") spectra, with Type IIa stones characterised by their very low (<20 ppm) nitrogen content. The Type IIa stones often have top quality white colours (D-G), a consequence of their low nitrogen content. They include the largest gem diamond ever found, the 3,106 ct Cullinan, recovered in 1905 from the Premier Mine, South Africa, as well as gems like the legendary Koh-i-noor, from India. The presence of an unusually high proportion of Type IIa stones at Letseng results in this locality having the world's highest average diamond value (USD 2,299/ct; Gem Diamonds, 2016) for a kimberlite, but also being the lowest grade (< 2ct/100t) pipe ever mined economically.

Type IIa diamonds have the following general characteristics (Moore, 2009):

- Morphology is typically irregular and stones are often elongated and distorted. They are described as being highly resorbed. Very rarely, primary crystal faces are preserved
- They can be almost any colour except yellow (reflecting the absence of nitrogen). Many are of top white colour (D, E, F or G), but they also occur in shades of brown. At Letseng, most pink and brownish-pink stones are Type IIa varieties

- Silicate, oxide and sulphide inclusions are either very rare or absent in Letseng Type IIa stones, and where "flaws" are observed these are invariably graphite
- Unlike Type I diamonds, which cleave in steps, the Type IIa stones often show excellent planar cleavage – a characteristic linked to their low nitrogen content
- With rare exceptions, Type IIa stones do not fluoresce
- The proportion of Type IIa stones at Letseng increases with diamond size, constituting 13% of the population in the 0.05 ct to 0.15 ct range, but 38% (in carat terms) of the +10.8 ct stones in the Main Pipe and 69% of the stones of this size category in the Satellite Pipe. They thus show a bias towards large stone size.

The paragenesis of Type IIa diamonds does not appear to be linked to either the peridotitic or eclogitic suites. The presence or absence of peridotitic pyrope or eclogitic garnets does not therefore provide a direct indication of the presence or absence of Type IIa diamonds.

# 9 EXPLORATION

Lucara appointed Mineral Services Canada Inc. ("MSC") in 2009 to undertake geological exploration and evaluation of the Mothae kimberlite. Work on site was undertaken by Remote Exploration Services ("RES"), a member of the Mineral Services Group of companies and affiliate of MSC. MSC and RES applied a variety of exploration techniques at an early stage to provide an indication of the extent of the pipe and internal geological variation as a control on subsequent delineation drilling and sampling. The exploration data, as well as information obtained from drilling (Section 10) and previous bulk sampling were used to guide subsequent bulk sampling. A summary of all work undertaken, methods used and the results for each component of exploration is provided below and is taken from Mineral Services (2013).

## 9.1 Ground Geophysics

High resolution ground magnetic, gravity and electromagnetic surveys were carried out by MSC on behalf of Motapa in 2006 to obtain a reliable indication of the pipe margin and make an initial assessment of the variability of physical properties within the pipe that could possibly indicate lithological variation. The geophysical work program was designed and implemented by RES (Mineral Services, 2013).

The magnetic survey was completed with GEM Overhauser Magnetometers. Continuous magnetic data were collected at one second intervals along 500 m N-S oriented lines initially spaced 50 m apart. One field magnetometer was used in conjunction with a fixed base magnetometer to record and correct for diurnal variations. Infill lines were surveyed between the initially-planned survey lines where it was deemed necessary, so as to clearly define magnetic features of interest. Spatial positioning of field data was accomplished with the use of a Garmin handheld GPS accurately time-synchronized with the field magnetometer.

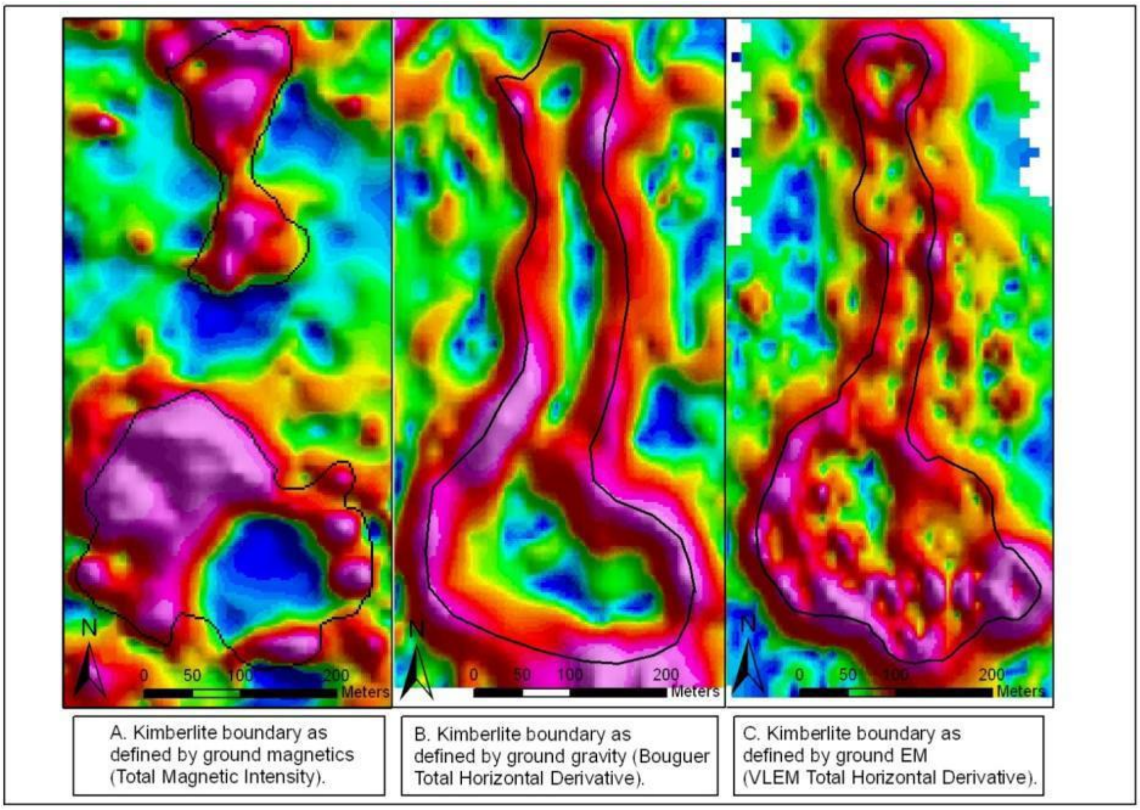
A Scintrex CG3 Autograv was used for the gravimetric survey. Data were collected at 25 m station spacing along 500 m N-S oriented lines, spaced 50 m apart. Elevation control and spatial positioning was carried out with a Leica Differential GPS system. A Bouguer density of 2.8 (estimated basalt density in the area) was used to obtain Bouguer gravity values.

The Frequency Domain Electromagnetics ("FDEM") survey was carried out using an EM34-3 system using a 40 m coil separation. Conductivity data were collected at 10 m station intervals along line lengths of 400 m within the South Lobe and 250 m in the North Lobe and Neck. Survey line spacing was 50 m. Data were collected in both the vertical and horizontal loop mode in order to reduce noise associated with surface basalt rubble.

Ground geophysical images and their respective interpreted kimberlite outlines are shown in Figure 9-1 below. All three methods were effective in mapping out the pipe margins, and the magnetic survey was effective in discriminating most of the internal pipe geology.

**Figure 9-1**

**Images illustrating the results of ground geophysical surveys and the inferred pipe outlines**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

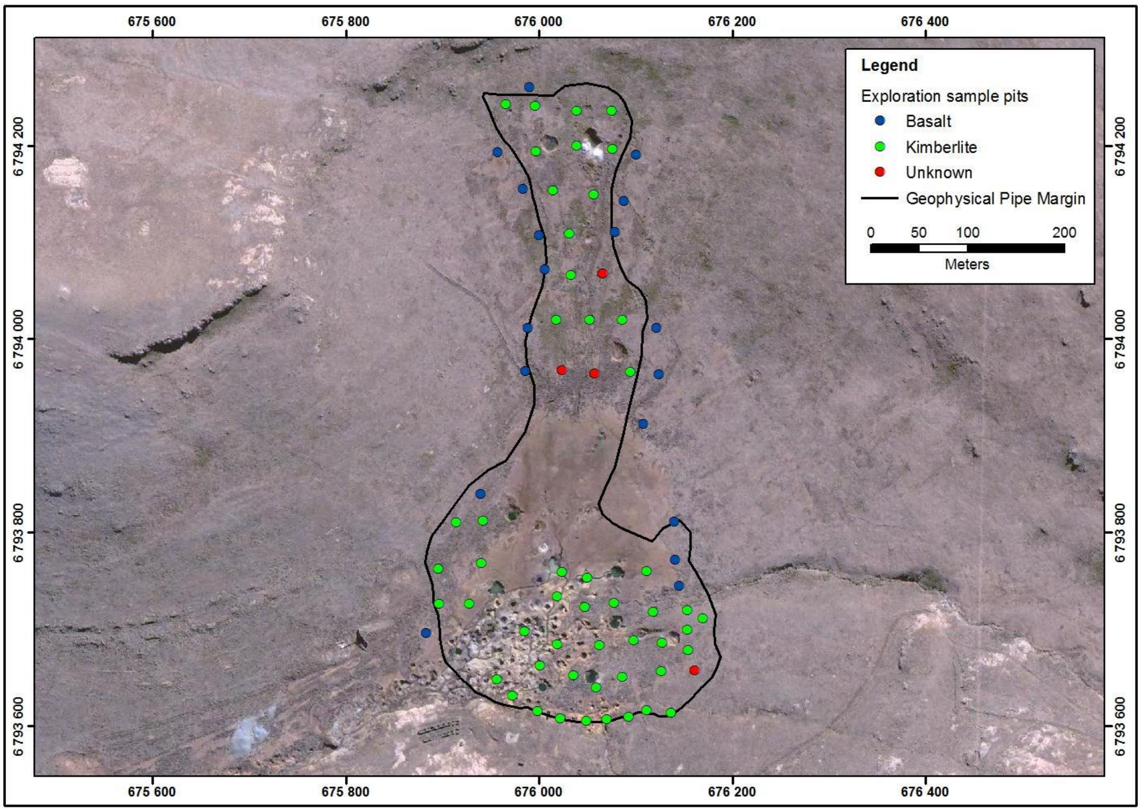
## 9.2 Surface Pitting

During 2007, a series of surface pits was excavated on a rough grid over the pipe, as well as a single trench along the southern boundary of the kimberlite. The excavations were undertaken using a Bell HD1023 track-mounted excavator. The purpose of this exercise was to establish overburden thickness and to obtain spatially representative kimberlite samples for further assessment.

A total of 73 pits were completed, 51 of which intersected kimberlite (Figure 9-2). The remainder either intersected basalt bedrock or were not able to reach bedrock. No pitting was carried out in the northern part of the South Lobe and in the southern part of the Neck due to unstable ground conditions.

**Figure 9-2**

**Exploration pit locations and bedrock intersections**




**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Note:** *Unknown refers to pits where no bedrock was intersected due to thick overburden. Pits are shown on a backdrop of Quickbird imagery and the outline of the pipe as defined by geophysics. North is up.*

## 9.3 Petrographic Sampling and Analysis

Petrographic samples were collected by MSC in 2007 in order to characterise the kimberlite in different parts of the pipe.

Due to accessibility, excavated kimberlite from the base of each pit was piled next to the hole at surface. Material was examined and the most consolidated representative piece of kimberlite was selected for petrographic work. Kimberlite was reported in 51 of the 73 pits excavated. No petrographic sample could be collected from nine of the 51 pits in kimberlite where material was completely disaggregated and weathered. A total of 42 rock samples were retained for macroscopic petrographic descriptions and thin section preparation for microscopic petrographic analysis. Thin sections were prepared at the University of Cape Town, South Africa. Petrographic observations were made to include descriptions of the kimberlite texture, the presence and nature of magma clasts, country rock xenolith type, size and abundance, mantle xenolith content, Kimberlitic Indicator Mineral ("KIM") content and olivine size and abundance. On the basis of preliminary macroscopic petrography and description, the majority of the samples were broadly grouped into seven apparent kimberlite types, which displayed good spatial association throughout the pipe. A summary of the characteristics of these different kimberlite types is provided in Table 9-1.

**Table 9-1**

**Exploration pit sample petrography. Summary of the main features of the seven kimberlite types initially recognised from macroscopic observation of highly weathered kimberlite**

| Type | Texture | Colour | Magma clasts | CRX % | Mantle xenolith | % olivine | KIMs |
|---|---|---|---|---|---|---|---|
| I | MVK | Grey-blue | Abundant (< 3 cm) | 15 – 25 | Common (< 15 cm) | 20 – 30 | Rare |
| II | MVK | Grey-blue | Common (< 2 cm) | 10 - 15 | Present (< 5 cm) | 20 – 30 | Rare |
| II | MVK | Grey-green | Common (< 4 cm) | 15 – 25 | Present (< 3 cm) | 30 – 40 | Common |
| IV | MVK | Grey-green | None | 30 – 40 | Rare | Unk[1] | Common |
| V | MVK | Brown-grey | None | 20 – 50 | Rare | 15 – 20 | Common |
| VI | MVK | Yellow-brown | None | 10 – 20 | Common (< 30 cm) | 20 – 30 | Very common |
| VII | MVK | Green-yellow | Abundant (< 3 cm) | 10 - 15 | Rare | Unk[1] | Unk[1] |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *[1] Observation not possible due to the poor quality of the hand specimen*

## 9.4 Kimberlitic Indicator Mineral (KIM) Sampling and Analysis

A total of 49 representative 5 kg kimberlite samples from the pits described in Section 9.2 were collected by MSC for Kimberlitic Indicator Mineral ('KIM") analysis in Cape Town in 2007. The material was crushed to maximize liberation of discrete minerals. Heavy mineral concentration was carried out by Scientific Services (Pty) Ltd using tetrabromoethane ("TBE") at an SG of 2.85. For each sample, a single representative split of heavy mineral concentrate was sieved into +300 µm, +425 µm, +710 µm and +1000 µm screen fractions, and stripped of KIMs by skilled mineral sorting staff at Mineral Services Laboratories ("MSL") in Cape Town using binocular microscopes with standardised plain light sources.

The absolute number of each KIM type recovered in the +300 µm fraction of each representative split was used to calculate its abundance per kilogram of original sample. These samples provided a quantitative indication of the amount and nature of mantle material contained within the material sampled, and served to fingerprint different domains within the pipe.

## 9.5 Total Diamond Liberation Sampling and Analysis

Total diamond liberation (microdiamond) test work was carried out by MSC in 2008 to evaluate the potential effectiveness of microdiamond data as a means of confirming grade continuity at depth within each of the geological domains defined at Mothae. The low grade of Mothae (varying from 2 cpht to 6 cpht) suggested that very large sample sizes would likely be necessary to obtain statistically meaningful microdiamond populations. Test work was therefore carried out to assess whether the required populations of diamonds could be recovered from large samples and whether these diamond populations correlated, in terms of size distribution trends and/or grade, with the recovered macrodiamond populations from the corresponding bulk samples. The work is reported by Mineral Services (2013).

Bulk samples C7A and G2B were selected for microdiamond test work, representing the South West and South Centre Domains, respectively. Large representative samples were obtained from each of these bulk sample sites by means of compositing multiple well-distributed smaller samples. Total final weights for the composite microdiamond samples were 462.90 kg for the sample representing bulk sample G2B (Sample 14/1/3/G2B-MD1) and 428.88 kg for the sample representing C7A (Sample 14/1/3/C7A-MD2).

Each sample was spiked with 40 synthetic diamonds for quality control purposes. Synthetic diamonds used were intense yellow in colour with cubo-octahedron forms, ensuring no confusion between the spikes and the naturally occurring microdiamonds. Twenty synthetics of each of two sizes (approximately 0.3 mm and 0.6 mm) were added to each microdiamond sample. Samples were exported to SGS Laboratory in Johannesburg, South Africa ("SGS") for processing. Samples were subdivided by SGS into aliquots of 5 kg to 8 kg each and dissolved in molten caustic soda in stainless steel fusion pots heated in kilns to between 500 and 600 degrees centigrade. The molten mix was screened to retain the + 0.105 mm portion and was washed and treated with acids to yield a final concentrate for each sample.

Final concentrates were couriered to MSL for "grain picking" under binocular microscope. The laboratory is not ISO 17025 accredited for this type of work. Both concentrates underwent a complete second quality control pick, in addition to the initial picking, to ensure a complete strip of all microdiamonds. Recovered diamonds were individually weighed and described. Synthetic tracers were picked at the same time, and a 95% total recovery efficiency was returned, with four of the synthetics (all 0.3 mm) being lost, comprising two from each microdiamond sample. Microdiamond recoveries are discussed in Section 14.3.2 and shown in Table 14-7.

The low diamond count in size classes was considered ineffective for diamond content modelling and the method was abandoned for the Project.

## 9.6 Geochemistry

In 2007, a total of 48 samples, each comprising approximately 200 g of weathered kimberlite, were collected from exploration pits (Figure 9-2). The samples were submitted for quantitative major and trace element analysis using a combination of ICP-MS and ICP-AES. Samples were analysed by ALS-Chemex Vancouver, Canada using their ME-ICP06 and ME-MS81 methods, which include assay for 13 major elements, 38 trace elements and loss on ignition. The objective of the geochemical analysis was to fingerprint different domains within the pipe. However, the method was found to be a poor discriminant and was discontinued.

## 9.7 Bulk Sampling and Trial Mining

The Mothae bulk sampling program was undertaken by MSC in three phases. Phase 1 (completed in August 2008) involved excavating and processing approximately 30,000 tonnes of weathered, near-surface kimberlite in order to recover a targeted initial parcel of at least 750 ct. The primary goal was to identify the potential for an ultra-coarse diamond size distribution and hence for the presence of very large, potentially high-value diamonds similar to those recovered at the Letseng Mine. The overall sampling program and provisional budget for Phase 1, originally developed by Motapa, was independently reviewed by MSA who prepared a NI 43-101 report (MSA, 2007).

Positive results from Phase 1 provided the basis for the decision to commence with Phase 2, which involved taking an additional ±70,000 tonne bulk sample to provide more robust constraints on grade and diamond value, as well as a limited core drilling program to provide an initial indication of rock volumes present and preliminary information on the internal geology of the pipe. Phase 2 began in August 2008 and was completed in April 2009.

Positive results from Phase 2 provided justification for the implementation of Phase 3, which involved collection of a ±600,000 tonne sample in conjunction with more extensive delineation drilling to define the grade, value and distribution of different kimberlite types present within the Mothae pipe for incorporation into a Diamond Resource estimate.

A summary of the bulk samples completed by MSC during the three phases of the Mothae evaluation program is provided in Table 9-2.

**Table 9-2**

**Summary data for bulk samples completed during the three phases of the Mothae evaluation program**

| Phase | Bulk sample | Geological Domain | Start date | Finish date | Wet tonnes | Moisture % | Dry tonnes |
|---|---|---|---|---|---|---|---|
| 1 | C1A | SW | 2008/02/25 | 2008/03/12 | 2,035 | 9.7 | 1,837 |
| 1 | C2A | SW/SC | 2008/03/13 | 2008/03/26 | 5,023 | 17.1 | 4,164 |
| 1 | C2B | SC | 2008/06/10 | 2008/06/17 | 1,936 | 16.5 | 1,617 |
| 1 | G1 | SC/SE | 2008/04/07 | 2008/06/09 | 7,341 | 15.6 | 6,199 |
| 1 | F1 | SC | 2008/03/29 | 2008/05/23 | 7,470 | 16.0 | 6,274 |
| 1 | A1A | SE | 2008/04/18 | 2008/05/01 | 5,341 | 14.5 | 4,565 |
| **1** | **Total Phase 1** | | **2008/02/25** | **2008/06/17** | **29,146** | **15.4** | **24,655** |
| 2 | C2C | SC | 2008/09/19 | 2008/10/24 | 9,965 | 17.8 | 8,193 |
| 2 | C3A | SW | 2008/11/03 | 2008/12/03 | 9,569 | 18.7 | 7,782 |
| 2 | G1C | SC/SE | 2009/01/10 | 2009/02/21 | 27,163 | 19.1 | 21,970 |
| 2 | F1C | SC | 2009/03/03 | 2009/04/01 | 18,753 | 17.9 | 15,390 |
| 2 | E1A | N | 2008/12/14 | 2009/01/07 | 5,363 | 19.1 | 4,338 |
| **2** | **Total Phase 2** | | **2008/09/19** | **2009/04/01** | **70,813** | **18.6** | **57,673** |
| 3 | F1D | SC | 2010/06/04 | 2010/06/11 | 1,771 | 10.0 | 1,594 |
| 3 | C4A | SW | 2010/06/12 | 2010/08/08 | 33,833 | 12.3 | 29,558 |
| 3 | C6A | SW | 2010/08/09 | 2010/08/24 | 8,344 | 10.4 | 7,497 |
| 3 | C5A | SW | 2010/08/25 | 2010/10/22 | 58,262 | 15.1 | 49,486 |
| 3 | C8A | SW | 2010/10/23 | 2010/12/29 | 58,475 | 15.4 | 49,443 |
| 3 | C9A | SC/SW | 2010/12/29 | 2011/03/09 | 47,844 | 14.5 | 40,923 |
| 3 | G2A | SC | 2011/03/10 | 2011/05/03 | 40,154 | 15.3 | 34,005 |
| 3 | F2A | SC | 2011/05/04 | 2011/07/31 | 59,663 | 15.0 | 50,692 |
| 3 | G2B | SC | 2011/08/01 | 2011/09/07 | 25,932 | 12.6 | 22,656 |
| 3 | G3A | SC | 2011/09/08 | 2011/10/21 | 34,462 | 11.4 | 30,523 |
| 3 | C7A | SW | 2011/10/22 | 2011/11/15 | 21,288 | 13.4 | 18,426 |
| 3 | C6B | SW | 2011/12/02 | 2011/12/20 | 11,309 | 13.6 | 9,773 |
| 3 | E2A | N | 2011/12/27 | 2012/01/17 | 18,119 | 13.2 | 15,725 |
| 3 | C11A | SW | 2012/01/17 | 2012/04/24 | 75,689 | 9.7 | 68,367 |
| 3 | F3A | SC | 2012/05/27 | 2012/06/08 | 8,498 | 9.9 | 7,660 |
| 3 | C11C | SW | 2012/04/25 | 2012/07/12 | 29,058 | 6.9 | 27,041 |
| 3 | CD1B | SC | 2012/07/13 | 2012/09/16 | 57,312 | 8.3 | 52,559 |
| 3 | CD1C | SC | 2012/09/16 | 2012/09/28 | 5,964 | 6.7 | 5,563 |
| **3** | **Total Phase 3** | | **2010/06/04** | **2012/09/28** | **595,978** | **12.5** | **521,491** |
| | | **Total** | | | **695,938** | **13.2** | **603,819** |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *SW = South West; SC = South Centre; SE = South East; N = North.*

### 9.7.1 Sample layout

Bulk sampling of the Mothae kimberlite was initially planned by MSC on the basis of the preliminary exploration work described in Sections 9.1 to 9.5 (Mineral Services, 2013). Results from this work were integrated to provide an interpretation of the outline of the body and to define internal domains that may represent different geological units or kimberlite types. Initial work carried out in Phase 1 defined six domains (termed A, C, E, F, G, and H). Subsequent to this, the internal subdivisions of the pipe were iteratively refined, based on drilling, petrography and KIM abundance studies carried out during Phases 2 and 3. The number of domains and the location of the boundaries were adjusted with time, resulting in the final definition of five geological domains termed South West (original domain C), South Centre (original domains F and G), South East (original domain A), North (original domain E) and Neck (original domain H). As a result, some bulk sample locations transgress final interpreted domain boundaries. However, the majority fall mainly within, and are considered representative of, individual geological domains.

The locations of the bulk sample excavations are shown in relation to the original and final geological domain boundaries at surface in Figure 9-3 to Figure 9-7. Phase 1 pits F1, G1 and C2 were extended laterally into their corresponding Phase 2 sample excavations. Phase 3 excavation extended bulk sampling laterally and with depth.

All geological domains were sampled by MSC during Phases 1 to 3 of the bulk sampling programme with the exception of the Neck domain, which was considered low priority due to its relatively small size and inferred high degree of dilution by wall rock basalt. Bulk sampling focussed predominantly on in situ highly weathered friable kimberlite directly underlying and to a depth of approximately 20 m below surface overburden and residual kimberlite soils. In addition, two bulk samples of unweathered (hard) kimberlite (C11C and CD1C; Figure 9-7) were excavated and processed to quantify the effect of reduced liberation of diamonds from consolidated material for estimation of run of mine grade for the bulk of the Mothae kimberlite. These samples were positioned in areas with the shallowest weathering horizon, as defined by drilling in the South West and South Centre domains. Material was observed to transition over a depth interval of less than one metre from friable material that could be disaggregated by hand, into consolidated dark grey unweathered kimberlite. Weathered samples C11A and CD1B were excavated down to depths of approximately 22 m and 25 m below original ground surface respectively. Corresponding unweathered samples C11C and CD1C extended a further 9 m and 6 m down into unweathered kimberlite, respectively.

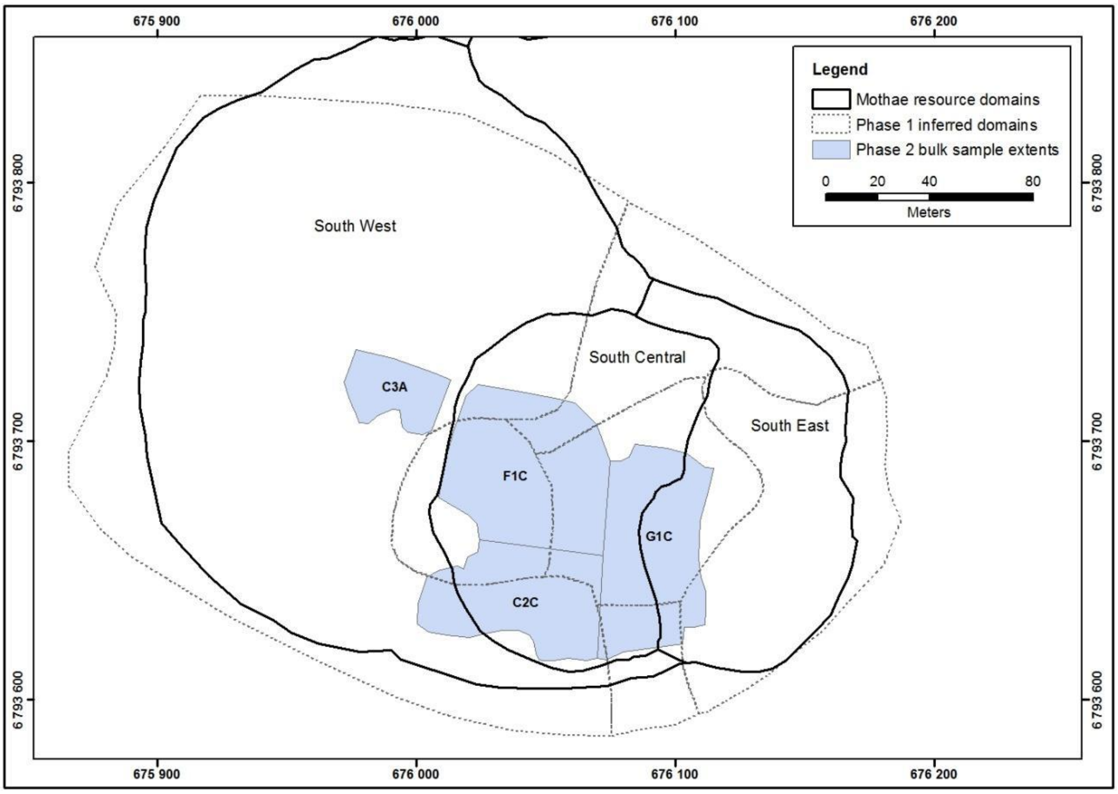
**Figure 9-3**

**Phase 1 bulk sample pit locations in the South Lobe**


***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013* ***Note:*** *North is up*

**Figure 9-4**

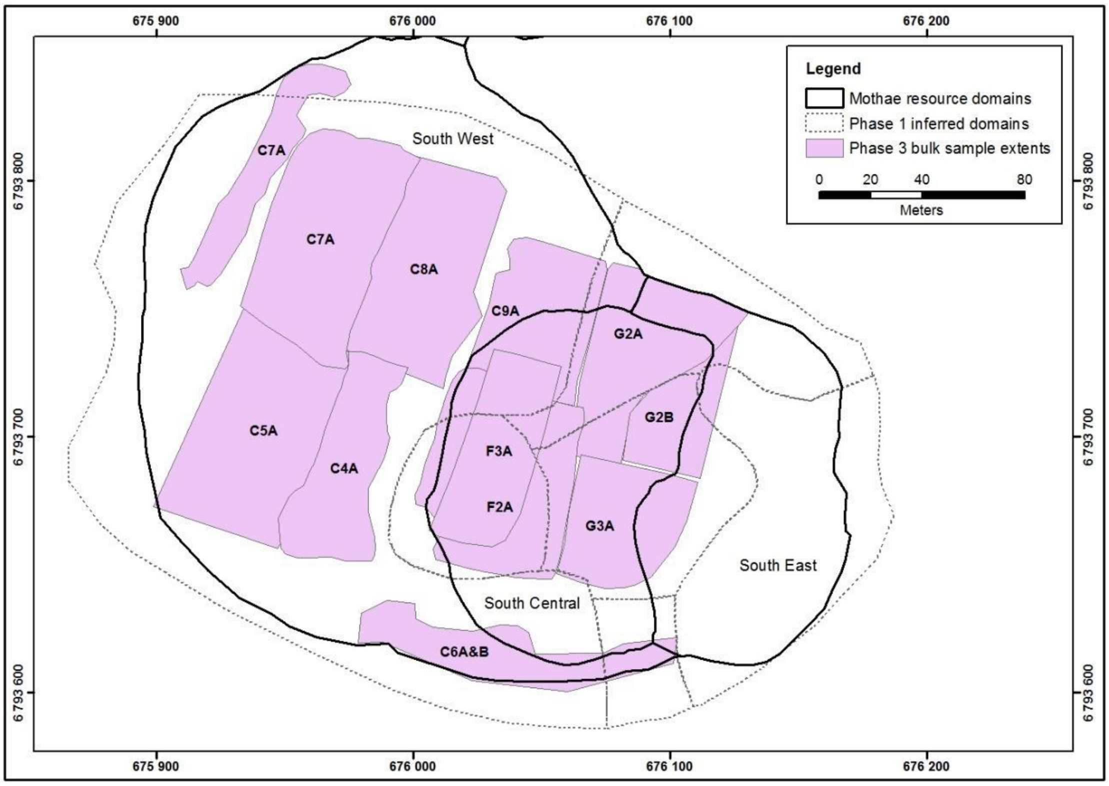
**Phase 2 bulk sample pit locations in the South Lobe**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013* ***Note:*** *North is up*

**Figure 9-5**

**Distribution of Phase 3 bulk sample pits in South Lobe**

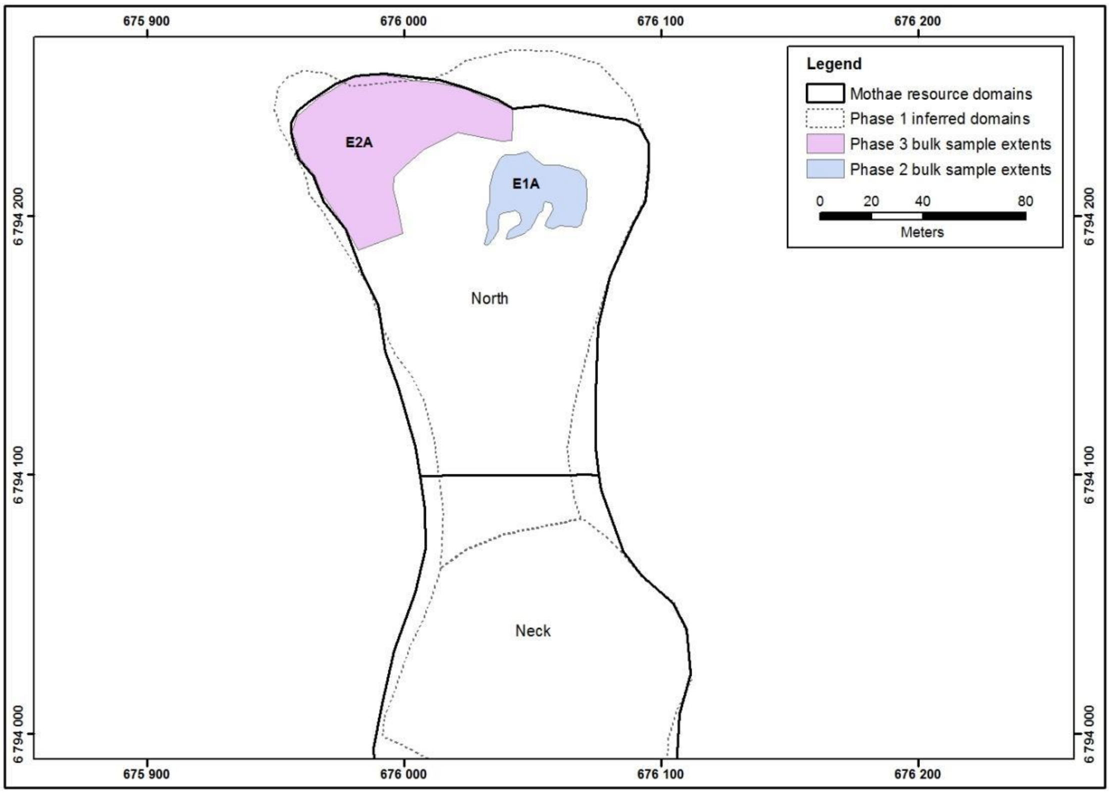



***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013* ***Note:*** *North is up*

***Note****: Bulk sample F3A overlaps the larger and broader area of the F2A (and partially C9A) sample areas*

**Figure 9-6**

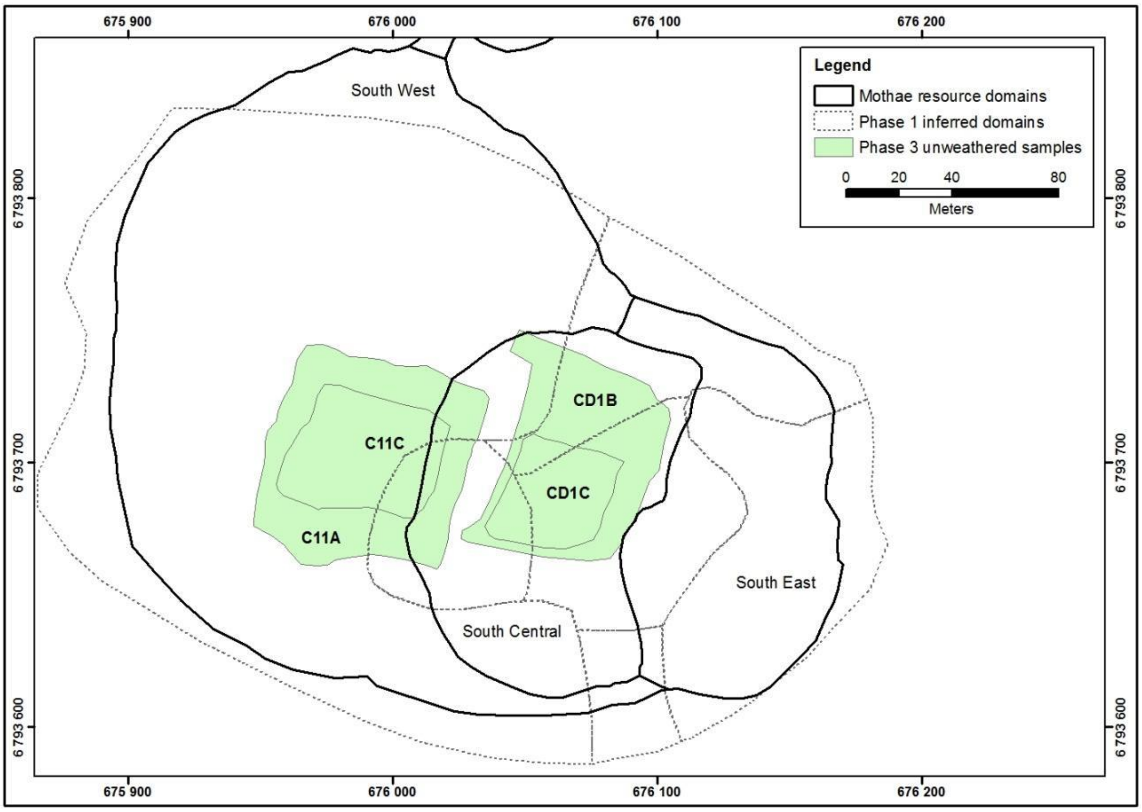
**Location of Phase 2 (E1A) and Phase 3 (E2A) bulk sample pits**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013* ***Note:*** *North is up*

**Figure 9-7**

**Location of deep bulk samples pits C11C and CD1C, blasted and mined from unweathered material exposed through removal of weathered kimberlite from pits C11A and CD1B, respectively**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *North is up*

### 9.7.2 Sample excavation and survey

Bulk sample excavation and civil work on site was carried out by Thotanyana Mining and Civil Works of Maseru, Lesotho under the supervision of MSC (Mineral Services, 2013). Because the sample medium was predominantly limited to near-surface weathered kimberlite, bulk sampling operations were mostly carried out using conventional free-dig truck and shovel mining methods. Limited excavation of unweathered hard kimberlite during Phase 3 required blasting prior to excavation.

Topsoil and overburden were stripped and stockpiled for future rehabilitation work. Residual kimberlite material was stripped and stockpiled separately for later processing, as this material has the potential to be enriched in diamonds relative to the underlying in situ kimberlite.

Independent surveyors conducted ad hoc surveys during Phase 1 and Phase 2 to establish sample volumes at various stages of excavation. During Phase 3, daily survey work was carried out to monitor sample excavation progress and to calculate the in situ volumes of excavated bulk samples. Real time kinematic surveying was conducted using a Trimble R6 GPS receiver with a single fixed base station. Initially these daily survey results were verified weekly and then monthly by audit surveys conducted by Survey & Resource Management, an independent professional mine survey company based in South Africa.

### 9.7.3 Bulk density sampling and analysis

Wet and dry bulk density measurements for Phase 3 bulk sample excavations were obtained by MSC using the Water Displacement Method as described for core samples (Section 11.3; Mineral Services, 2013). No bulk sample density measurements were collected during Phases 1 and 2. Phase 3 measurements were carried out on large consolidated pieces of kimberlite collected during the course of bulk sample excavation. Samples were carefully immersed in water and the mass captured as quickly as possible to reduce measurement error associated with disaggregation of samples in water or ingress of water into the sample itself. A total of 543 surface sample bulk density measurements were captured during Phase 3 and the results are summarised in Table 9-3.

**Table 9-3**
**Summary of bulk density measurements carried out during excavation of Phase 3 bulk samples**

| Bulk sample | Count | Wet mass (kg) | Volume (l) | Wet bulk density (g/cm$^3$) | Dry mass (kg) | Dry bulk density (g/cm$^3$) | Moisture % |
|---|---|---|---|---|---|---|---|
| C4A | 43 | 95.69 | 42.66 | 2.24 | 82.27 | 1.93 | 14.0 |
| C4B | 4 | 11.93 | 5.30 | 2.25 | 10.26 | 1.94 | 14.0 |
| C6A | 15 | 40.27 | 17.88 | 2.25 | 34.81 | 1.95 | 13.5 |
| C5A | 37 | 78.49 | 36.43 | 2.15 | 65.85 | 1.81 | 16.1 |
| C8A | 42 | 102.21 | 46.25 | 2.21 | 87.08 | 1.88 | 14.8 |
| C9A | 27 | 61.32 | 27.84 | 2.20 | 52.94 | 1.90 | 13.7 |
| G2A | 32 | 72.58 | 31.15 | 2.33 | 65.38 | 2.10 | 9.9 |
| F2A | 43 | 112.97 | 49.05 | 2.30 | 100.78 | 2.05 | 10.8 |
| G2B | 34 | 95.51 | 42.05 | 2.27 | 85.78 | 2.04 | 10.2 |
| G3A | 33 | 74.55 | 32.23 | 2.31 | 67.80 | 2.10 | 9.1 |
| C7A | 18 | 39.39 | 18.01 | 2.19 | 35.32 | 1.96 | 10.3 |
| E2A | 13 | 22.91 | 10.05 | 2.28 | 21.36 | 2.13 | 6.8 |
| C11A | 74 | 189.11 | 77.32 | 2.45 | 177.00 | 2.29 | 6.4 |
| C11C1 | 35 | 83.68 | 32.04 | 2.61 | 80.13 | 2.50 | 4.3 |
| F3A | 14 | 35.97 | 15.44 | 2.33 | 33.25 | 2.15 | 7.6 |
| CD1A | 13 | 27.31 | 11.69 | 2.34 | 25.15 | 2.15 | 7.9 |
| CD1B | 55 | 122.24 | 52.32 | 2.34 | 111.24 | 2.13 | 9.0 |
| CD1C1 | 11 | 24.57 | 9.78 | 2.51 | 23.29 | 2.38 | 5.2 |
| **All** | **543** | **1,290.69** | **557.46** | **2.32** | **1,159.69** | **2.08** | **10.1** |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

### 9.7.4 Bulk sample pit geology and petrography

Summary petrographic descriptions were collected by MSC during excavation of Phase 3 bulk samples (Mineral Services, 2013). The objective of this work was to characterise the sampled kimberlite and confirm its association with a particular geological domain. Observations were made of the kimberlite texture, olivine size and abundance, country rock xenolith size and abundance, KIM size and abundance, as well as the presence and nature of magma clasts.

Petrographic work in weathered surface material was challenging due to the altered nature of the material and observations could only be made along freshly excavated walls.

A total of 252 point observations were collected. These results were integrated with petrographic analyses from drill core and KIM abundance results to derive the final geological domain boundaries at surface (Section 14.1).

### 9.7.5 KIM sampling and analysis

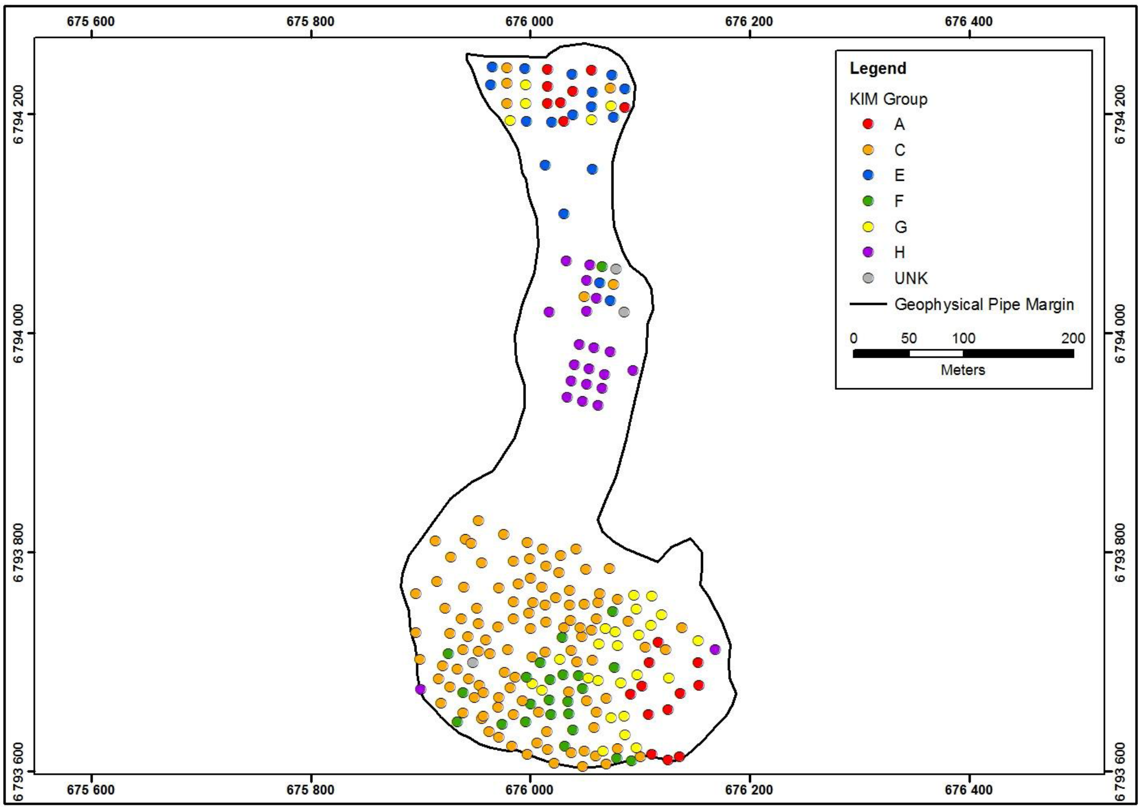
Preliminary exploration work, as described in Section 9, showed that various kimberlite types could be recognised within the Mothae kimberlite, based on quantitative KIM abundances (see also Section 14.1). Closely spaced point KIM samples, comprising approximately 10 kg of kimberlite each, were therefore collected by MSC over all areas targeted for bulk sampling to allow for KIM characterisation of the material being excavated (Mineral Services, 2013).

Samples were collected on the pre-excavation surface as representative composites from shallow sample pits dug with a TLB or by hand to ensure collection of in situ material. A total of 233 surface delineation KIM samples were collected. The locations of these samples are shown in Figure 9-8.

Representative KIM samples were also collected by MSC at regular intervals from headfeed material during bulk sample processing in order to confirm the KIM signature of the material excavated and processed. This was to allow a correlation of the bulk sample material (and its associated diamond recoveries) with the surface delineation and drill core KIM abundance results. Samples were collected approximately every 4,000 tonnes during bulk sample processing. Samples were derived from the active ROM headfeed stockpile and comprised four separate 10 kg aliquots. These were collected at regular intervals during the day as composites of small pieces of kimberlite spatially representative of the headfeed stockpile material that the plant headfeed was being derived from at the time. The four aliquots collected were each split down twice through a riffle splitter to obtain a final representative 10 kg composite headfeed KIM sample. Oversize material that would not fit through the riffle splitter was retained and exported with the sample for subsequent crushing and splitting, and was added back to the sample prior to processing. A total of 139 headfeed KIM samples were collected from which 118 were processed.

**Figure 9-8**

**Location of all surface KIM delineation samples collected for the purpose of constraining KIM abundances in bulk-sampled material**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *The samples are classified by KIM Group based on relative abundance of key minerals. North is up*

### 9.7.6 Processing and diamond recovery

Phases 1 and 2 process plant design work was contracted to the Gemcore Group ("Gemcore") of Kimberley, South Africa. Gemcore's plant design was independently reviewed by Hatch Engineering of Montreal, Quebec. Plant fabrication and engineering works were completed by Dynamic Engineering of Klerksdorp, South Africa, under the supervision of Gemcore. The processing plant was operated by Gemcore (Mineral Services, 2013).

Phase 3 process plant modification was designed and supervised by Paradigm Project Management (Pty) Ltd from Germiston, South Africa. The processing plant was operated by Minopex (Pty) Ltd of Johannesburg, South Africa (Mineral Services, 2013).

Descriptions of the plant arrangement for each of the bulk sampling phases are summarised below and are taken from Mineral Services (2013).

#### *9.7.6.1 Phase 1*

A summary of the Phase 1 processing methodology is shown as a flow chart in Figure 9-9. The process plant targeted a recoverable size range of 2 mm to 18 mm. No headfeed crusher was required, as only highly weathered kimberlite was mined and processed during this Phase and it disaggregated completely in the headfeed scrubber. Undersize material (-2 mm) was pumped to the slimes dam. Oversize material (+18 mm) was diverted through a jaw crusher and fed back to the scrubber.

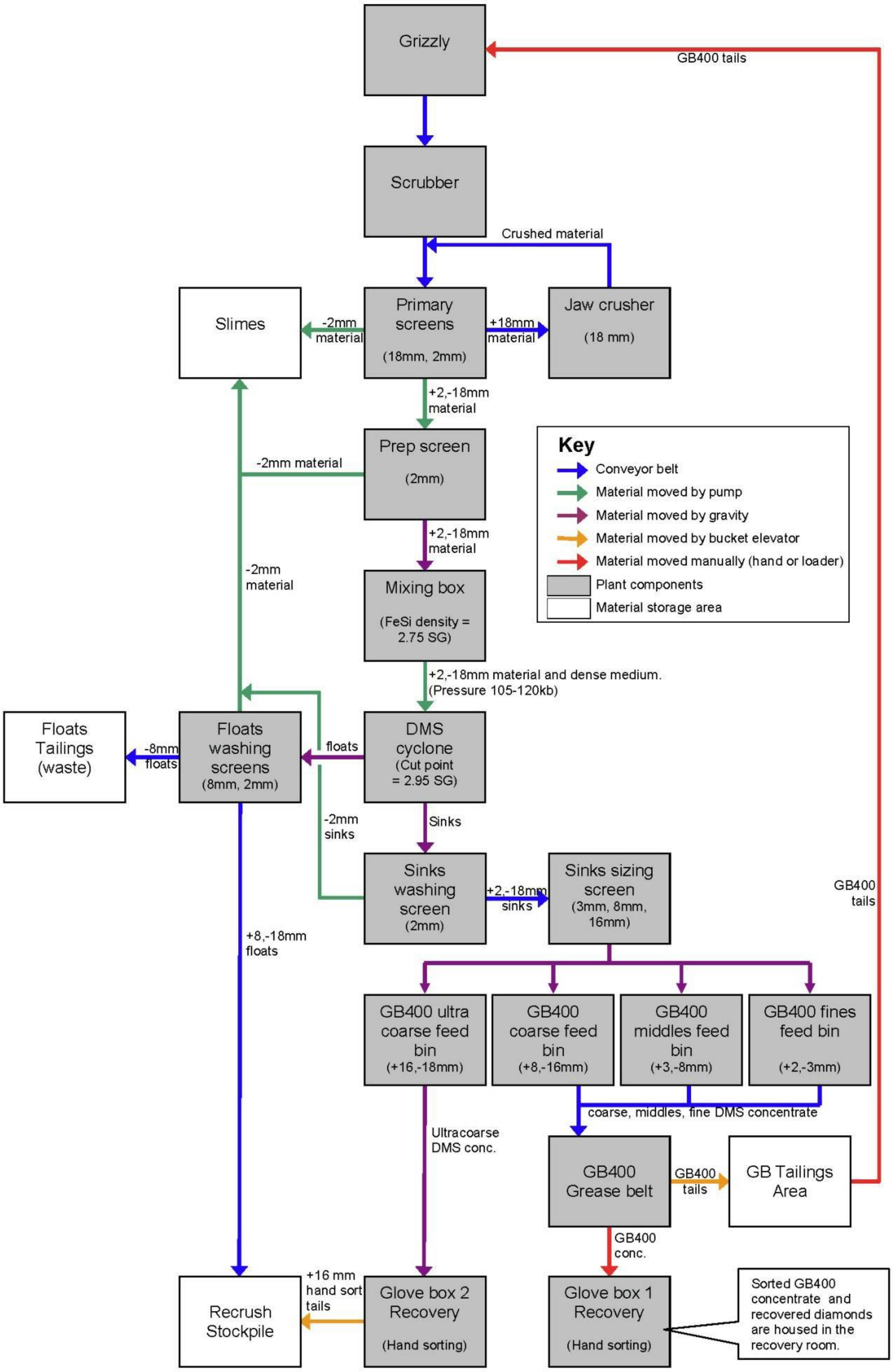
Heavy mineral concentrates were derived by dense media separation ("DMS"). Prepared 2-18 mm material was mixed into ferrosilicon slurry with a density of 2.70 g/cm$^3$ and passed through a cyclone set at a cut point of 2.90 g/cm$^3$. DMS sink material was conveyed to the recovery sizing screens, where material was collected in storage bins in the 2-3 mm, 3-8 mm, 8-16 mm and +16 mm fractions. Oversize (+16 mm) DMS sink material was displaced via a vibrating conduit to a storage bin within the sorting room, from where it was hand sorted in a glove box on a conveyor belt. The remaining size fractions were conveyed to an Oblique Engineering GB400 continuous grease belt unit for diamond recovery.

Grease was selected as the primary recovery method, as this was considered the most reliable method for recovering Type IIa (low luminescent) diamonds. Tailings from the GB400 were retained in polyurethane bags in a secure storage area.

Visual auditing of grease belt tailings generated during Phase 1 suggested that the diamond recovery circuit had been less than 50% effective. Specific factors believed to have contributed to poor diamond recovery include the presence of very fine coatings on diamonds that reduced their hydrophobicity, and the presence of dispersed fines within process water (resulting from disaggregation in the storage bins and en route to the GB400) that compromised the ability of the grease to retain diamonds. The poor performance of the GB400 is also partially attributed to the complexity of keeping it within its working specifications in terms of temperature and thickness of grease application to the recovery belt. However these factors were proactively addressed.

As a result of this poor recovery efficiency, a full audit of all Phase 1 tailings was carried out upon completion of Phase 1. All sample tailings were subjected to a further two passes over the grease belt, with a final pass through a vertical ejection ("VE") X-ray recovery unit temporarily installed at the plant. The four grease and final X-ray recovery passes are considered to have achieved recovery efficiencies in excess of 95% in terms of carats and the number of diamonds recovered.

**Figure 9-9**
**Phase 1 process flow sheet**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

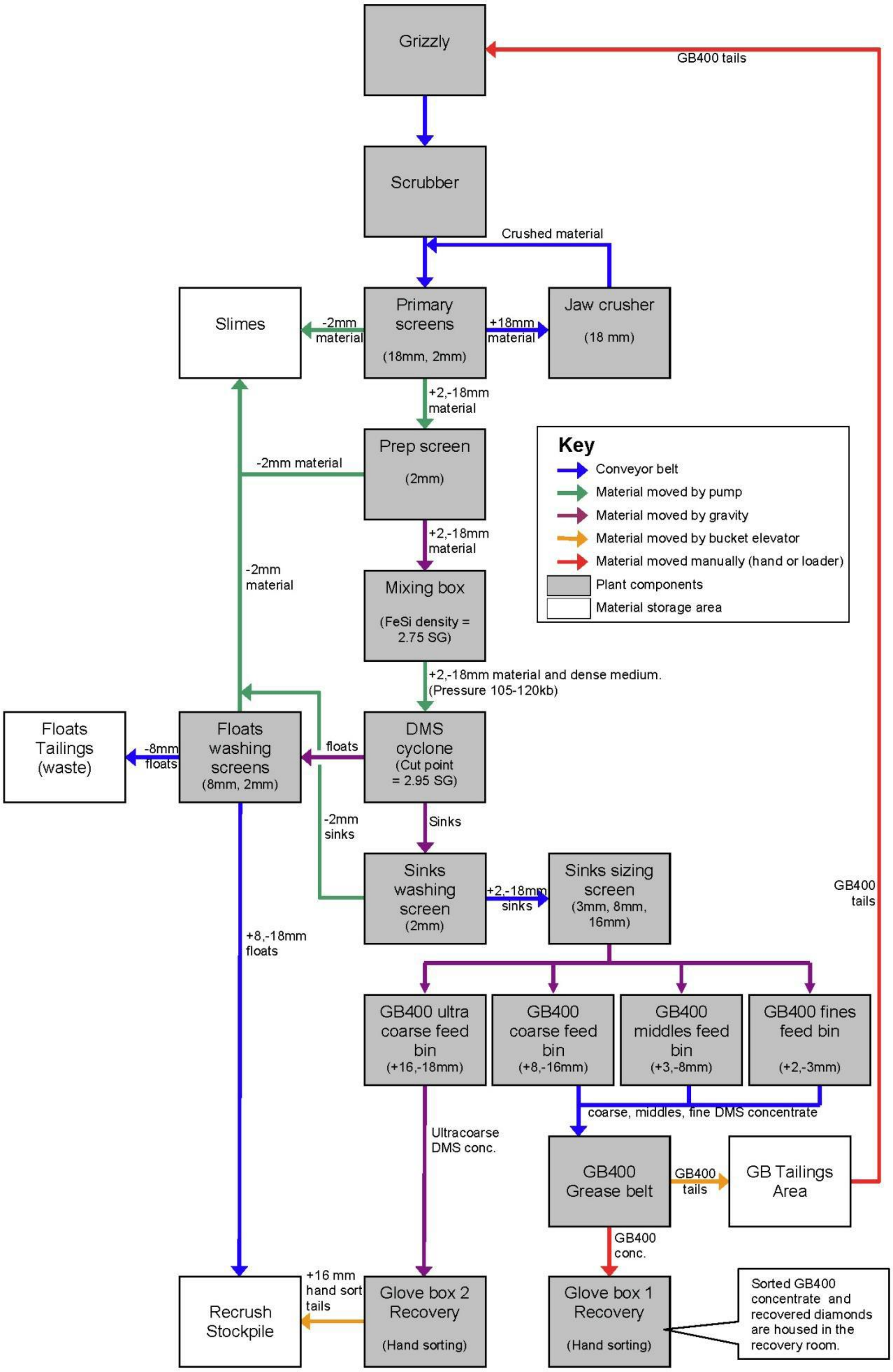
#### 9.7.6.2 Phase 2

A summarised Phase 2 plant process flow sheet is provided in Figure 9-10. Significant scope changes made for Phase 2 included:

- Complete removal of the Westcone cone crushers from the process system. DMS float oversize material was originally scoped for re-crushing and reintroduction to the headfeed, however the continual failure of the crushers resulted in this material being conveyed directly into the plant re-crush tailings area, from where it was removed and stockpiled manually. Approximately 400 tonnes of this material were later processed and confirmed to have a very low diamond content. Remaining material was therefore not processed
- A de-grit screen on the slimes system was installed to decrease the volume of fine material being fed into the slimes dam and to increase the capacity of the plant to remove slimes. All of the process slimes material (-2 mm) was diverted onto a de-grit screen for scalping of the +0.5 mm material
- GB400 tailings material was subjected to two additional recovery passes subsequent to completion of headfeed processing for each sample. These tailings were then subjected to a single recovery pass through the VE X-ray recovery unit
- To improve first pass diamond recoveries the GB400 tailings generated during treatment of headfeed for the final two samples (G1C and F1C) were added to the kimberlite headfeed during standard processing.

A final audit of recovery tailings was not carried out as the recovery protocols had been amended based on the results of Phase 1 audit work to include repeated recovery passes over the grease belt and a VE X-ray unit. Results by recovery pass suggest that the final Phase 2 recovery efficiency was approximately 95% effective in terms of carats and more than 85% effective in terms of the number of diamonds.

**Figure 9-10**
**Phase 2 process flow sheet**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

#### 9.7.6.3 Phase 3

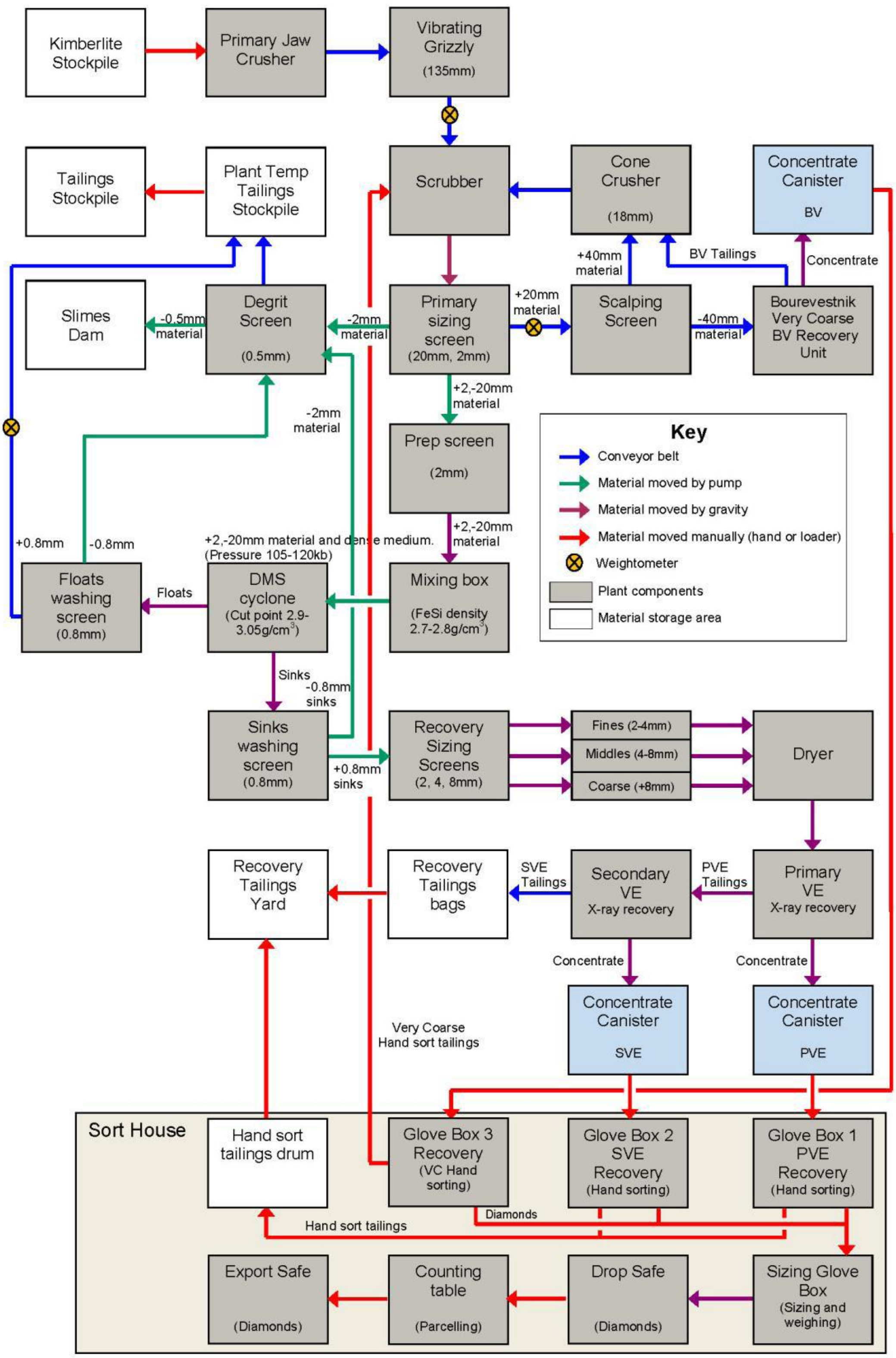
The Mothae processing and recovery circuit was significantly upgraded between Phases 2 and 3 to facilitate greater and more consistent throughput and more efficient first pass recovery. Process design and implementation of these improvements was carried out by Paradigm Project Management (Pty) Ltd. The final Phase 3 process flow sheet is summarised in Figure 9-11. The overall process parameters prior to recovery remained essentially consistent, however major upgrades to the headfeed system and the fines-slimes removal systems were implemented. The most fundamental changes to the process parameters were the insertion of a large diamond recovery circuit and the switch from grease to X-ray technology as the diamond recovery methodology. A Flowsort X-ray diamond recovery unit was put in place to recover large (+20 mm) diamonds from the primary sizing screen oversize material prior to this material passing through a crusher for circulation back into the headfeed scrubber. Sized DMS sink material was passed through a drying system and through a primary vertical ejection ("VE") X-ray recovery unit. Tailings from the primary VE unit were passed through a secondary VE unit. Modifications made to the plant process during the course of Phase 3 included the following:

- The Flowsort large diamond recovery unit was removed and replaced with a Bourevestnik X-ray luminescence sorter (June 2011)
- The re-crush circuit jaw crusher was removed and replaced with a cone crusher to increase capacity (June 2011)
- In the late stages of Phase 3 (November 2011) a headfeed primary jaw crusher was installed to provide capacity for treatment of unweathered kimberlite as a test of recoverable grade from hard rock kimberlite.

A range of audit work was carried out during Phase 3 to assess recovery tailings for unrecovered diamonds. A summary of the work carried out and the associated diamond recoveries is presented in Table 9-4. Work included:

- Visual sorting of recovery tailings in the sort house. Tailings were visually sorted and then passed through a Bourevestnik Polus-M X-ray sorter installed in the recovery room, for quality control picking of resultant concentrates
- Grease audit by external operator. A total of 18.2 tonnes of material of various size fractions was exported from site in two batches for external audit. The first batch of 12.3 tonnes was exported to Oblique Engineering (Pty) Ltd in Johannesburg, South Africa for audit on a GB400 continuous grease belt. A single 37.24 ct Type IIa diamond was recovered during this process. The second batch of 5.9 tonnes was exported to Kimberley in South Africa for grease audit carried out by Gondwanaland Diamonds ("Gondwana") from Kimberley
- Grease audit by Mothae Diamonds. An Armstrong Grease Table, manufactured and installed as an external modular unit by Gondwana was installed at Mothae for grease audit of recovery tailings. An estimated total of 215 polyurethane recovery tailings bags were audited. No coarse recovery tailings were audited
- Audit of tailings with a Bourevestnik X-ray luminescence sorter. This unit was used in a standalone capacity to audit approximately 980 polyurethane tailings bags.

**Figure 9-11**
**Phase 3 process flow sheet**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Table 9-4**
**Summary of audit work carried out during Phase 3 and associated diamond recoveries**

| | Size Fraction | Mass (t) / number of bags | Diamonds | Carats |
|---|---|---|---|---|
| Visual (Sort Room) | Fine | 15.6 t | 62 | 10.29 |
| | Medium | 15.4 t | 9 | 5.73 |
| | Coarse | 13.5 t | 0 | 0.00 |
| Grease – External Operator | Fine | 5.4 t | 5 | 0.35 |
| | Medium | 6.3 t | 10 | 1.39 |
| | Coarse | 6.5 t | 7 | 38.29[1] |
| Mothae Diamonds Grease Table | Unknown | 16 Bags | 91 | 23.30 |
| | Fine | 17 Bags | | |
| | Medium | 182 bags | | |
| | Coarse | None | | |
| Bourevestnik X-ray Sorter | Unknown | 45 Bags | 131 | 58.00 |
| | Fine | 222 Bags | | |
| | Medium | 378 Bags | | |
| | Coarse | 380 Bags | | |

**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
**Note:** *[1] includes a 37.24 ct brown Type IIa diamond*

A complete audit of all Phase 3 recovery tailings with the large diamond recovery Bourevestnik X-ray luminescence sorter was completed in 2012. A total of 105 stones weighing 86.55 ct were recovered in the audit.

Due to the limited amount of material audited by grease recovery during Phase 3, it is not possible to quantify the extent to which low- or non-fluorescent diamonds may have been missed during X-ray sorting. Grade data for bulk sampling in Phases 2 and 3 do not provide any indication of consistently lower recoveries during the latter and hence, if the loss of low-fluorescence diamonds is a factor, it does not appear to have had a significant impact on grade. However, because the stones most likely to be lost are Type IIa diamonds, it is possible that relatively minor losses of such stones could impact average diamond value. It is therefore recommended that a more comprehensive grease-recovery audit be undertaken at some point to evaluate this further.

In an effort to optimise the process, the primary sizing undersize screens were changed from 2 mm to 1.4 mm during processing of bulk sample C11A. This modification remained in place from 10 March 2012 to 24 April 2012 and resulted in an over-recovery of fine diamonds during this period. This has compromised the degree to which the C11A sample results can be correlated with the hard rock C11C sample results for derivation of a liberation correction factor for the weathered bulk sample results.

### 9.7.7 Diamond sorting and characterisation

The final recovery of diamonds was undertaken by qualified mineral sorters during all bulk sampling phases. The following summary of the process is taken from Mineral Services (2013).

During Phase 1, diamond recoveries were sized with Canadian Institute of Mining ("CIM") standard square aperture sieves. A Diamond Trading Company ("DTC") sieve set was obtained at the end of Phase 1, and standard DTC sizes were recorded for all diamonds recovered during and subsequent to the Phase 1 audit. Individual diamond weights were captured for every diamond recovered from Phases 1 and 2. During Phase 3, diamond recoveries smaller than DTC13 were weighed together by DTC size class, while individual stone weights were captured for all diamonds of size DTC13 and larger.

Diamond descriptions were captured for all Phase 1 and the Phase 1 audit diamonds, all Phase 2 +1 ct diamonds, and all Phase 3 DTC13 and larger diamonds. Diamond descriptions included observations of:

- Individual stone weight in carats, accurate to 2 decimal places. During Phases 1 and 2, weights were recorded using a Tanita 1230 portable diamond scale with a precision of 2 mg (0.01 ct). During Phase 3, weights were recorded with a Mettler Toledo JL-1503/C with a precision of 1 mg (0.005 ct)
- Form of diamonds; in terms of the relative length of major axes (equant to elongate)
- Colour
- Colour intensity on a scale ranging from 1 (colour visible) to 5 (colour intense)
- Clarity on a scale ranging from 0 (no visible inclusions) to 5 (heavily included)
- Resorption on a scale from 0 (no resorption) to 3 (highly resorbed – no primary faces remaining)
- Whether the diamond has a broken surface or not. If broken, an interpretative observation was made as to whether the break was fresh (possibly process or recovery related) or old (likely incurred during kimberlite emplacement).

Limited testing for Type IIa diamonds was carried out during the course of Phases 1 and 2, including a systematic study on a diamond parcel of approximately 750 ct carried out in February 2009. The diamonds were tested using a frequency specific (3,000 angstrom) ultraviolet light Type IIa tester developed by the Swiss Gemmological Institute. During Phase 3, all DTC13 and larger diamonds were tested with this instrument.

Diamonds recovered during Phase 1 that were sized using CIM sieves were allocated to appropriate DTC classes based on individual stone weights.

The diamond description data indicate that 43% of 8,650 individual stones that were observed for breakage have some form of breakage surface. In most cases comment was made as to whether the break appeared fresh or not, but this was not quantitatively or systematically evaluated.

A diamond simulant breakage test was carried out during Phase 2 bulk sample processing using 6 mm cylindrical ceramic De Beers diamond simulants. The results of this test are summarised in Table 9-5. The test involved adding 40 white simulants to the process at the scrubber feed conveyer, while 40 blue simulants were added at the DMS mixing box. This was done during the tailings re-treat of bulk sample G1C. The results suggest significant potential for breakage in the scrubber section of the plant. No simulant tests were undertaken during Phase 3.

**Table 9-5**

**Results of simulant tests of potential diamond breakage in Phase 2 bulk sample processing**

| Simulant | # Added | Passes through scrubber | Exposed to headfeed | # Recovered whole | % Recovered whole | # Recovered broken | % Recovered broken | # Lost | % Lost |
|---|---|---|---|---|---|---|---|---|---|
| White | 40 | 2 | No | 22 | 55 | 15 | 37.5 | 3 | 7.5 |
| Blue | 40 | 1 | No | 38 | 95 | 0 | 0 | 2 | 5 |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

In three cases during the processing of Mothae kimberlite, multiple fragments from large diamonds were recovered at approximately the same time, indicating probable breakage of the diamond in the plant. In two instances, it was possible to reconstitute at least part of the broken diamond from the recovered fragments:

1. During processing of bulk sample C2C in Phase 2, a Type IIa diamond weighing 44.9 ct was reconstituted from six fragments (Table 9-6, Figure 9-12) and it was noted that additional fragments from the same diamond were present indicating that the stone was likely significantly larger
2. During Phase 3, two fragments of a cleanly broken 82.34 ct diamond were recovered during processing of bulk sample C9A. The pieces of this diamond (weighing 48.54 ct and 33.80 ct) and the reconstructed single stone are shown in Figure 9-13. No additional fragments were considered to be missing as the two fragments produced a well-formed slightly resorbed octahedron.

**Table 9-6**

**Fragments included in reconstructed 44.9 ct Type IIa stone**

| Fragment number | Size fraction | Carats | Cumulative carats |
|---|---|---|---|
| 1 | +10.8 ct | 23.40 | 23.40 |
| 2 | 9 ct | 8.91 | 32.31 |
| 3 | 6 ct | 6.24 | 38.55 |
| 4 | 8 grn | 2.45 | 41.00 |
| 5 | 8 grn | 1.89 | 42.89 |
| 6 | 8 grn | 2.01 | 44.90 |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Figure 9-12**

**Reconstructed 44.9 ct white Type IIa diamond from bulk sample C2C**

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Figure 9-13**

**Two fragments comprising an 82.34 ct yellow octahedron recovered from bulk sample C9A**

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

In addition to the two reconstituted diamonds, multiple fragments of a boart diamond were recovered during processing of sample CD1B. The total weight of these fragments is 254.04 ct and they are considered to have been derived from a single very large diamond.

In addition to the three diamonds described above, several of the large (+10 ct) stones recovered, including the majority of Type IIa diamonds, exhibit large fresh breakage surfaces.

# 10 DRILLING

Drilling of the Mothae kimberlite was undertaken under the supervision of MSC, the geological contractor appointed by Lucara. This summary is taken from Mineral Services (2013).

## 10.1 Drilling Programs and Methods

Core drilling campaigns were carried out on the Mothae kimberlite in 2008/2009 and 2011/2012. Altogether, 43 holes were completed for a total drill length of 8,085 m ranging in borehole length from 51 m to 382 m with the deepest kimberlite intersection being at a vertical depth of approximately 300 m in the South Lobe. All drilling was undertaken by Remote Drilling Services (Pty) Ltd using Boart Longyear LF90D core rigs. During 2008 and 2009, all drill holes commenced with HQ diameter and telescoped down to NQ diameter when stable unweathered ground was intersected. During 2011 and 2012, selected holes commenced with PQ diameter to provide samples for ore dressing studies ("ODS"), after which holes telescoped down through HQ to NQ. Where no ODS sampling was required, the 2011 and 2012 holes began with HQ as in 2008 and 2009. All core recovered (except for the core removed from site for sample purposes) is stored on site at Mothae in a secure dedicated core storage and logging facility. A summary of each of the two core drilling campaigns is provided in Table 10-1 and details of individual holes are provided in Table 10-2. The locations and traces of all core drill holes are shown in relation to the Mothae pipe outline in Figure 10-1.

**Table 10-1**
**Summary of delineation and geotechnical drilling**

| Campaign | Holes | Length (m) | PQ (m) | HQ (m) | NQ (m) |
|---|---|---|---|---|---|
| 2008-2009 | 15 | 2,455 | 0 | 453 | 2,002 |
| 2011-2012 | 28 | 5,630 | 815 | 1,880 | 2,935 |
| **TOTAL** | **43** | **8,085** | **815** | **1,880** | **4,937** |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Table 10-2**
**Collar and drilling information for all delineation and geotechnical drilling carried out at Mothae**

| Hole ID | X UTM35S | Y UTM35S | Z | AZI | Dip | Length (m) | Total K[1] (m) | HQ (m) | NQ (m) | PQ (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| MOT08/01 | 675966 | 6793933 | 3031 | 90 | -60 | 261 | 133 | 42 | 219 | 0 |
| MOT08/02 | 675995 | 6794093 | 3056 | 90 | -59 | 153 | 30 | 21 | 132 | 0 |
| MOT08/03 | 676007 | 6794216 | 3081 | 293 | -60 | 130 | 91 | 40 | 90 | 0 |
| MOT08/04 | 676047 | 6794189 | 3075 | 68 | -65 | 105 | 72 | 30 | 75 | 0 |
| MOT08/05 | 676034 | 6794180 | 3075 | 0 | -65 | 164 | 128 | 30 | 134 | 0 |
| MOT08/06 | 676098 | 6793671 | 3004 | 135 | -60 | 152 | 121 | 15 | 137 | 0 |
| MOT08/07 | 676024 | 6793691 | 3001 | 290 | -55 | 251 | 225 | 24 | 227 | 0 |
| MOT09/01 | 675959 | 6793675 | 3003 | 225 | -55 | 95 | 72 | 24 | 71 | 0 |
| MOT09/02 | 676020 | 6793770 | 3012 | 10 | -49 | 221 | 188 | 39 | 182 | 0 |
| MOT09/03 | 676125 | 6793740 | 3020 | 90 | -70 | 105 | 65 | 36 | 69 | 0 |
| MOT09/04 | 676069 | 6793782 | 3013 | 75 | -60 | 51 | 14 | 15 | 36 | 0 |

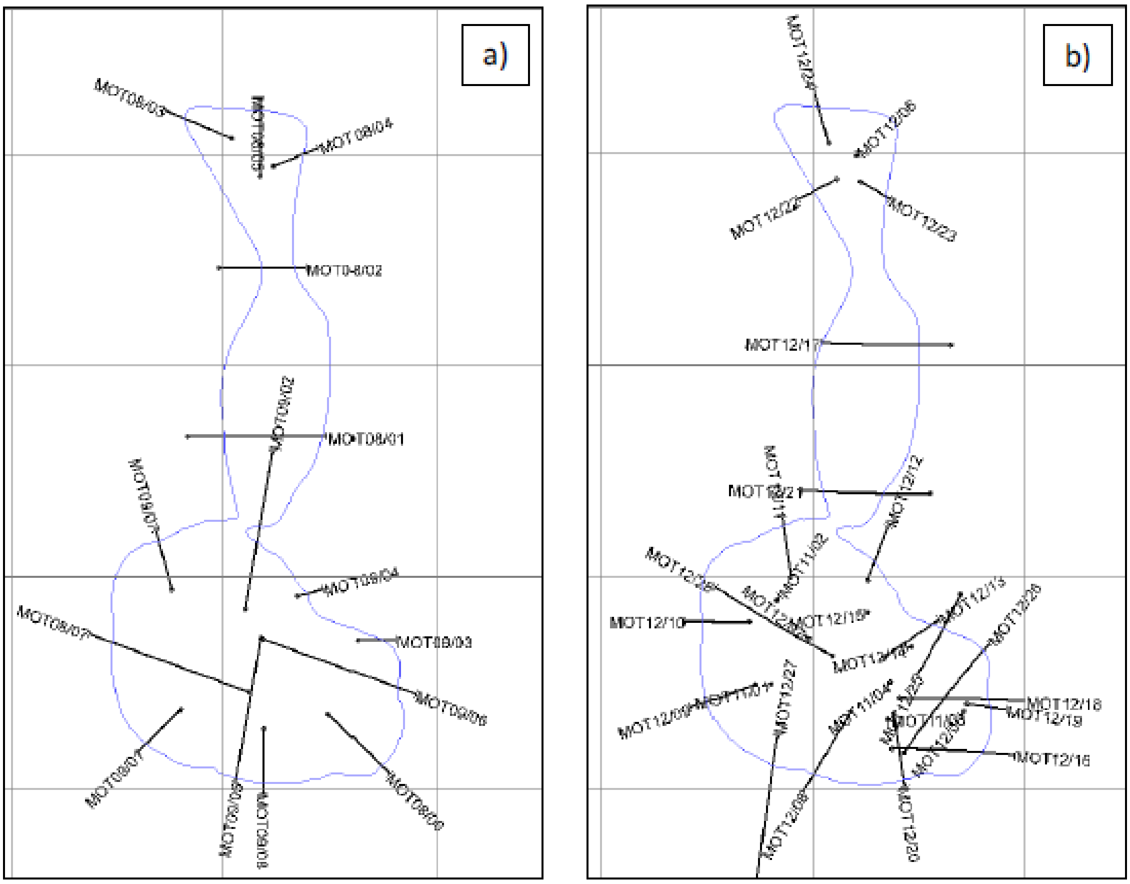
| Hole ID | X UTM35S | Y UTM35S | Z | AZI | Dip | Length (m) | Total K[1] (m) | HQ (m) | NQ (m) | PQ (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| MOT09/05 | 676035 | 6793742 | 3014 | 190 | -59 | 251 | 211 | 44 | 207 | 0 |
| MOT09/06 | 676037 | 6793741 | 3014 | 110 | -59 | 272 | 264 | 39 | 233 | 0 |
| MOT09/07 | 675951 | 6793788 | 3013 | 345 | -70 | 152 | 115 | 27 | 125 | 0 |
| MOT09/08 | 676038 | 6793657 | 3002 | 180 | -50 | 92 | 68 | 27 | 65 | 0 |
| MOT11/01 | 675960 | 6793699 | 2992 | - | -89 | 301 | 296 | 151 | 0 | 150 |
| MOT11/02 | 675964 | 6793778 | 3002 | - | -89 | 301 | 301 | 168 | 0 | 133 |
| MOT11/03 | 676069 | 6793666 | 2994 | - | -89 | 302 | 302 | 201 | 0 | 101 |
| MOT11/04 | 676072 | 6793701 | 2998 | - | -89 | 301 | 301 | 201 | 0 | 100 |
| MOT12/05 | 676142 | 6793674 | 3011 | - | -89 | 298 | 298 | 147 | 0 | 151 |
| MOT12/06 | 676040 | 6794198 | 3073 | - | -89 | 191 | 191 | 51 | 0 | 140 |
| MOT12/07 | 675995 | 6793742 | 2992 | - | -88 | 200 | 200 | 15 | 185 | 0 |
| MOT12/08 | 676035 | 6793673 | 2994 | 210 | -59 | 177 | 126 | 15 | 162 | 0 |
| MOT12/09 | 675944 | 6793698 | 2992 | 250 | -58 | 123 | 79 | 15 | 108 | 0 |
| MOT12/10 | 675938 | 6793758 | 3002 | 270 | -59 | 111 | 79 | 21 | 90 | 0 |
| MOT12/11 | 675978 | 6793800 | 3001 | 350 | -59 | 114 | 84 | 21 | 93 | 0 |
| MOT12/12 | 676051 | 6793797 | 3005 | 20 | -65 | 93 | 58 | 21 | 72 | 0 |
| MOT12/13 | 676067 | 6793725 | 2997 | 55 | -65 | 146 | 116 | 15 | 131 | 0 |
| MOT12/14 | 676092 | 6793734 | 2998 | - | -89 | 300 | 288 | 300 | 0 | 0 |
| MOT12/15 | 676051 | 6793767 | 2999 | - | -88 | 102 | 102 | 102 | 0 | 0 |
| MOT12/16 | 676073 | 6793638 | 3003 | 90 | -56 | 200 | 162 | 21 | 179 | 0 |
| MOT12/17 | 676129 | 6794019 | 3046 | 270 | -54 | 210 | 140 | 0 | 195 | 15 |
| MOT12/18 | 676081 | 6793686 | 2994 | 90 | -53 | 200 | 155 | 0 | 200 | 0 |
| MOT12/19 | 676145 | 6793680 | 3011 | 95 | -61 | 74 | 45 | 0 | 74 | 0 |
| MOT12/20 | 676075 | 6793671 | 2993 | 170 | -60 | 140 | 109 | 15 | 125 | 0 |
| MOT12/21 | 676110 | 6793879 | 3025 | 270 | -56 | 222 | 82 | 0 | 207 | 15 |
| MOT12/22 | 676022 | 6794176 | 3073 | 245 | -71 | 120 | 67 | 30 | 90 | 0 |
| MOT12/23 | 676044 | 6794174 | 3073 | 120 | -74 | 113 | 83 | 36 | 77 | 0 |
| MOT12/24 | 676013 | 6794210 | 3076 | 345 | -64 | 120 | 76 | 21 | 99 | 0 |
| MOT12/25 | 676139 | 6793784 | 3020 | 207 | -55 | 150 | 85 | 0 | 145 | 5 |
| MOT12/26 | 676085 | 6793634 | 3003 | 35 | -63 | 288 | 262 | 24 | 264 | 0 |
| MOT12/27 | 675942 | 6793486 | 3028 | 8 | -65 | 382 | 51 | 274 | 103 | 5 |
| MOT12/28 | 676017 | 6793726 | 2990 | 300 | -68 | 351 | 333 | 15 | 336 | 0 |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *Total K[1] = total metres of kimberlite intersected in borehole*

**Figure 10-1**

**Plan showing the location and traces of all Mothae core drill holes in relation to the pipe shell model: a) 2008-2009 program; b) 2011-2012 program**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *North is up*

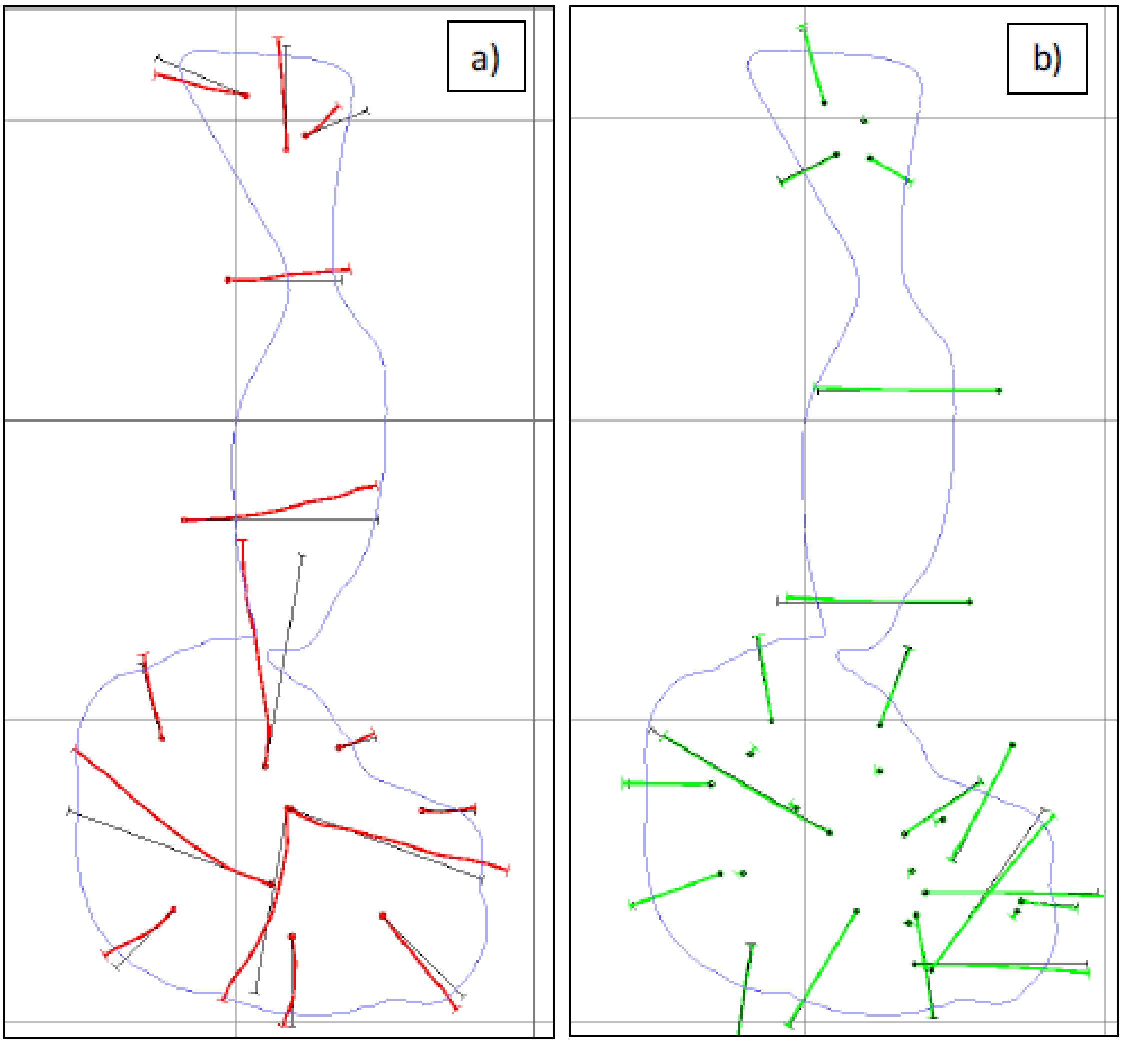
## 10.2 Drill Hole Surveys

Positions of 2008-2009 drill holes were initially captured using a Garmin handheld GPS set to record the position by averaging the reading over 1 minute. Positions were later confirmed by DGPS survey conducted by a subcontracted surveyor, the resident mine surveyor from Letseng, Mr. Taelo Maleka. Positions of 2011-2012 drill holes were captured to sub-centimetre level accuracy with a Trimble R6 GPS receiver surveying in real time kinematic mode with a single fixed base station.

For the 2008-2009 drilling campaign, drill hole orientation and azimuth was measured using a Reflex EZ-shot survey tool. Significant azimuth errors were encountered with this tool (attributed to instrument drift and interference from magnetic bedrock) resulting in unacceptable apparent spatial deviations of drill holes (Figure 10-2). Starting azimuths were therefore used as a basis for plotting the drill holes in three-dimensions. During 2011 and 2012, drill hole orientation and azimuth was captured using a Reflex GYRO survey tool. No significant measurement errors were incurred with this system.

**Figure 10-2**

**Plan illustrating the effect of down-hole survey azimuth readings undertaken for: (a) the 2008-2009 drilling program; and (b) the 2011-2012 drilling program**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *The black drill traces illustrate planned azimuths and the coloured traces represent azimuth data generated by down-hole surveys (red = Reflex EZ-shot; green = Gyro). North is up*

## 10.3 Drill Hole Logging

Core was received from the drill contractor and logged at Mothae in the core storage facility on site. All core was photographed at high resolution. Core run lengths were measured and recorded to provide a complete record of core return. Magnetic susceptibility measurements were captured at 1 m increments down-hole on all 2011-2012 drill cores (not measured on 2008-2009 drill cores).

Geological logging was conducted in two stages: primary field logging and secondary interpretive logging. Primary field logging involved recording the depth of all kimberlite-wall rock contacts, preliminary subdivision of the kimberlite intersections based on textural and component variations, preliminary assignment of model codes to these subdivisions, recording the location and size of all large (> 10 cm) country rock and mantle xenoliths, and conducting systematic detailed observations (carried out with binocular microscope) of the following parameters within standardised surface areas on the drill core at regular spaced intervals (every 5 m or 10 m) down-hole:

- Visual estimate of the total olivine and olivine macrocryst content, and the sizes of the five largest olivine crystals
- The type of magma clasts, specifically the relative proportion of cored and uncored varieties, and the maximum magma clast size
- The size and number of country rock xenoliths (measured over 1 m interval)
- KIM abundance counts over a ±3 cm by 20 cm area (KIM data systematically recorded for 2008-2009 drill holes; for 2011-2012 drill holes, KIM counts were undertaken during the secondary logging stage to confirm kimberlite types).

Secondary interpretive logging involved verifying the kimberlite-wall rock contacts, internal subdivisions and model codes assigned during the primary logging. The nature of and variations in rock texture and components (juvenile, country rock and mantle) were assessed to establish the major kimberlite types and the variability within them. The internal subdivisions derived from this higher-level stage of logging were then composited into geological domains based on their lithological characteristics and spatial distribution for the purpose of geological modelling (Section 14.1.3). The five-tier geological coding system applied to the Mothae drill cores is outlined below.

### 10.3.1 Geological coding system

Five tiers of geological coding have been applied at Mothae (Table 10-3), representing progressively higher levels of interpretation: (1) Lithology; (2) Pipe Zone; (3) KIMB Texture; (4) Model Code; and (5) Geological Domain.

**Table 10-3**

**Example of the five-tier geological coding system applied to the Mothae drill cores**

| HOLE-ID | Depth from (m) | Depth to (m) | Lithology | Pipe Zone | KIMB Texture | Model Code | Geological Domain |
|---|---|---|---|---|---|---|---|
| DH001 | 256.30 | 298.50 | kimberlite | P | PK | KIMB2 | NORTH |
| DH001 | 197.60 | 302.20 | basalt | EP | n/a | CR BST | CR BST |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

The first tier - Lithology - records whether the unit is kimberlite or country rock and also denotes the type of country rock. This is typically the first observation made on any drill core.

The second tier - referred to as Pipe Zone - was used to distinguish material interpreted to represent pipe infill (potential 'mineralisation') from material interpreted to occur outside the pipe (potential 'waste'). The Pipe Zone division includes: main pipe infill (P = Pipe), un-brecciated in situ country rock (EP = Extra-Pipe) and marginal pipe zone (MPZ).

The third tier - KIMB Texture - was used to assign a textural classification to kimberlite intersections (e.g. CK for coherent kimberlite or PK for pyroclastic kimberlite), which facilitates the description of specific rock types in drill cores.

The fourth tier - Model Codes - are non-genetic, body-specific codes (e.g. KIMB1) which are applied to volumetrically significant rock types that have been identified in multiple drill cores and that may have different diamond grades. An intersection coded with a specific Model Code can be correlated with other intersections of the same Model Code in other drill cores. Model Codes are consecutively numbered in each body or at each locality. Kimberlite and country rock intersections that cannot be classified or correlated with existing Model Codes may be assigned the code 'RFW' which highlights that further work is required before a specific Model Code can be assigned. In cases where more than one contrasting RFW interval occurs in a drill hole they are assigned hole-specific consecutive numbers, e.g. RFW1, RFW2.

The fifth tier - Geological Domain - represents the highest level of interpretation applied to a single intersection or series of intersections of one or more Model Codes. These divisions are used for generating internal geology solids in three-dimensional geological models. The modelled solids are typically defined by pierce points in multiple drill holes and are dominated by a single rock type that has been assigned a specific Model Code. More than one Model Code (rock type) may be incorporated into a Geological Domain in a geological model, particularly when limited data are available for one or all of the Model Codes, or where portions of a body comprise complex mixtures of multiple rock types that cannot be reliably modelled in three dimensions.

# 11 SAMPLE PREPARATION, ANALYSES AND SECURITY

Sampling of the Mothae kimberlite was undertaken by MSC, the geological contractor appointed by Lucara. This summary is taken from Mineral Services (2013).

## 11.1 Bulk Sampling Plant Security

The bulk sampling plant is a restricted area which is fenced off separately from the rest of the Project site. There is access control limited to authorised persons. A security contractor was appointed to manage the plant security. The plant and recovery section are monitored by cameras and the footage is recorded and stored for reference if required. Access to high risk areas such as DMS concentrate is prevented by the design of the plant and by protective covers.

Despite the level of security, a confirmed incident of diamond theft took place on the 19$^{th}$ June 2012 during processing of bulk sample C11C. Diamonds that had been picked and placed into the recovery canister were noted as missing when recoveries were weighed and recorded at the end of the day. Review of security footage confirmed the theft had taken place during the movement of the canister by a security staff member from the picking glove box to the diamond handling glove box. Four diamonds weighing 9.07 ct were subsequently recovered. There is no confirmation that additional diamond theft had taken place prior to this incident. However, the size-frequency distribution data for the C11C diamond parcel prior to the 19$^{th}$ June 2012 does appear to be under-represented in the DTC12 to DTC17 categories relative to the C11C parcel recovered subsequent to the 19$^{th}$ June 2012. It is therefore considered likely that this was not an isolated incident.

## 11.2 Petrography Sampling and Sample Preparation

Petrography samples, comprising approximately either 15 cm of PQ, 20 cm of HQ or 30 cm of NQ core, were collected at regular 10 m spaced intervals down-hole in kimberlite intersections for all drill holes. A total of 579 petrography samples were collected. Based on preliminary field logs, a total of 437 samples were selected for processing under the “dry” petrographic sample preparation method of Vancouver Petrographics Ltd. A polished petrographic slab preserved with epoxy and two thin sections (standard and wedged) were produced for each sample, for examination under binocular and petrographic microscopes.

## 11.3 Bulk Density Sampling and Analysis

Wet and dry bulk density measurements were obtained using the “Water Displacement Method 6” from Lipton (2001), whereby sample volumes are obtained by measuring the increased mass of a water container system when the sample is suspended into it and completely submerged. During 2008 and 2009 all samples were dried in metal pots over gas flames for 110 minutes prior to determination of dry mass. The optimal drying duration was determined empirically by measuring weight decrease with time while drying. During 2011 and 2012 samples were dried for 24 hours in metal pans in the metallurgical laboratory drying oven at a set temperature of 120°C.

A total of 785 drill core bulk density (”BD”) measurements were captured, targeting a 10 m interval down-hole in all lithologies. The drill core on which these measurements were carried out was well consolidated and did not disaggregate upon immersion in water. Nonetheless, samples were immersed for only a few seconds to avoid any ingress of water that could cause inaccuracy in the sample volume determination. The mass of the combined sample and water system was captured to an accuracy of 1 g. Based on initial wet sample masses (ranging from 143 g to 2.87 kg) a density measurement accuracy for this method of better than 3% for the smallest sample and better than 1% for the dataset average is implied. Drill core bulk density results are summarised by geological domain in Table 11-1.

**Table 11-1**

**Summary of drill core bulk density measurements by geological domain**

| Geological Domain | Count | Average BD | Minimum BD | Maximum BD | Standard deviation |
|---|---|---|---|---|---|
| BASALT | 149 | 2.65 | 2.26 | 2.84 | 0.12 |
| | | | | | |
| NORTH_WX | 18 | 2.02 | 1.68 | 2.24 | 0.15 |
| SOUTH CENTRE_WX | 25 | 2.21 | 1.88 | 2.59 | 0.18 |
| SOUTH EAST_WX | 5 | 1.97 | 1.69 | 2.20 | 0.23 |
| SOUTH WEST_WX | 18 | 2.15 | 1.63 | 2.61 | 0.27 |
| **All weathered kimberlite** | **66** | **2.17** | **1.63** | **2.61** | **0.22** |
| | | | | | |
| NORTH | 51 | 2.49 | 2.28 | 2.61 | 0.07 |
| NECK | 49 | 2.44 | 1.94 | 3.02 | 0.24 |
| SOUTH CENTRE | 118 | 2.54 | 2.30 | 2.73 | 0.08 |
| SOUTH EAST | 148 | 2.47 | 1.93 | 2.68 | 0.09 |
| SOUTH WEST | 201 | 2.61 | 2.31 | 2.84 | 0.09 |
| **All hard kimberlite** | **567** | **2.55** | **1.93** | **3.02** | **0.13** |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *The "WX" suffix indicates the weathered portion of the domain. Bulk density (BD) represented in g/cm*$^3$

## 11.4 Drill Core KIM Sampling and Analysis

KIM abundance samples were collected from selected intersections of each of the main kimberlite types present in order to assess variations in mantle mineral abundance between and within kimberlite types. Samples comprising 10 kg of regularly spaced ±5 cm to 10 cm long pieces of core were collected with no bias towards lithology (i.e. kimberlite was not preferentially sampled over basalt), thus ensuring the samples were as representative as possible of the selected intervals. A total of 75 samples were collected from drill core. Partial processing of these samples was carried out to provide quantitative counts of KIMs per kilogram of original sample material.

# 12 DATA VERIFICATION

MSA has reviewed the information provided by Lucara and Lucapa and is confident that the quantity and quality of data generated on the Project are of a high standard and appropriate for the declaration of an Indicated and Inferred Diamond Resource as stated in Section 14. This opinion has been arrived at on the basis of the following:

- Lucara appointed MSC to undertake geological exploration and evaluation work on the Project. MSC is a highly respected company in the field of kimberlite exploration and evaluation, with very experienced geologists. Their work on the Project has been well documented
- The work was completed according to written Standard Operating Procedures ("SOP"). Some of these were reviewed by Mr Michael Lynn (former Principal Consulting Geologist for MSA and author of the 2013 CPR for Lucara) during his site visit undertaken in September 2012 and he reported that the SOPs were appropriate and being adhered to
- The exploration programme is comprehensive, commencing with geophysical and geological studies to delineate the Mothae kimberlite, followed by well-planned and properly executed evaluation of the kimberlite using experienced contractors
- The Diamond Resource estimate has been reviewed in detail and found to have been carried out according to best practice principles, excluding data where appropriate, and following strict protocol. MSA remodelled the Diamond Resource and the results were very similar to the MSC results
- During the February 2017 site visit by Dr Reichhardt and the September 2012 visit by Mr Lynn, the following aspects of the programme were reviewed:
    - The core logging was found by Mr Lynn to have been completed to a very high standard. Some of the core was re-logged by Mr Lynn and found to correspond closely with the original logging
    - The core storage is excellent, and all cores are available for re-examination except for small sections that have been removed for sampling
    - The open pit was visited in September 2012 by Mr Lynn and the different geological domains observed in outcrop. The South Lobe pit was flooded during the February 2017 visit and only the North Lobe and Neck were examined by Dr Reichhardt
    - The bulk sampling plant and final diamond recovery facilities were visited and the equipment, process design and layout were found to conform with industry standard.

## 12.1 Sample Tonnage Verification

All bulk sample tonnages for the Mothae resource evaluation are based on corrected weightometer measurements (Mineral Services, 2013). Correction factors applied were derived from the headfeed quality control measures. Dry tonnage figures were calculated by applying daily headfeed moisture measurements as provided by Gemcore (Phases 1 and 2) and Minopex (Phase 3). The following summary of sample tonnage verification for each bulk sampling phase is derived from Mineral Services (2013).

### 12.1.1 Phase 1

Sample tonnages were initially determined by a Process Automation single idler weightometer. Due to less than ideal installation parameters this instrument did not operate to its specified accuracies, which resulted in a calibration factor being calculated and applied by the installer. In addition to this, regular belt cut load testing and bulk bag testing (running a known weight of approximately 10 tonnes over the weightometer) was carried out to closely monitor the accuracy of the weightometer. Correction factors were applied to daily tonnages based on these results. An additional quality control measure involved manual counting of the headfeed front end loader buckets (or parts thereof) added to the grizzly, from which headfeed figures were calculated using average bucket weights. While this is not considered to be a precise measure of headfeed tonnes, results were typically within approximately 10% of corrected weightometer tonnes.

Detailed processing reports were produced by Gemcore upon completion of each individual Phase 1 sample.

### 12.1.2 Phase 2

As for Phase 1, the final Phase 2 sample tonnages were based on weightometer measurements with correction factors applied. All headfeed quality control measures from Phase 1 were maintained for Phase 2, including belt cut testing, bulk bag testing and headfeed bucket counting. In addition to this, a Loadrite load cell system was installed on the CAT938G front end loader, which collected data from 4 November 2008 to 25 January 2009. During the period in which the load cell system was operational, the corrected plant headfeed based on the weightometer amounted to 21 847 tonnes, while the load cell system indicated 21,699 tonnes. This indicates an error of less than 1% over an extended time span.

Sample tonnages calculated on the basis of grizzly feed counts in conjunction with average bucket weights for individual bulk samples imply errors on bulk sample tonnages varying from approximately +2% to -17%. Given the close correlation obtained between load cell data and corrected weightometer tonnes, as well as the inherent uncertainty associated with assumed load volumes and tonnes, it is likely that the bulk of the variance is related to poorly constrained average bucket weights. Nonetheless, the overall broad agreement (-4% variance) provides some support for the reliability of the corrected weightometer data.

### 12.1.3 Phase 3

Plant modifications at the beginning of Phase 3 included installation of a 3-idler weightometer on a newly constructed headfeed conveyor belt. Subsequent to the initial commissioning of the plant (samples F1D and C4A), this instrument appears to have operated at an excellent level of consistency. Headfeed quality control data captured during Phase 3 included: load cell and grizzly bucket feed measurements, daily belt cut testing and volumetric bulk sample tonnage calculations based on daily survey data of excavations and stockpiles in conjunction with the bulk density measurement results. Quality control data are summarised in Table 12-1. The volumetrically derived dry tonnage for the total Phase 3 bulk sample shows a variance of 2% from the corresponding corrected weightometer dry tonnage which is regarded as negligible.

**Table 12-1**

**Summary of headfeed verification and quality control data for Phase 3**

| Measurement | Total | Unit |
|---|---|---|
| Uncorrected Weightometer | 610,253 | Wet tonnes |
| Load cell[1] | 589,420 | Wet tonnes |
| Load cell Variance | -3.5 | % |
| Average Correction Factor[2] | -2.6 | % |
| Corrected Weightometer | 594,207 | Wet tonnes |
| Average Headfeed Moisture Content | 12.5 | % |
| Corrected Weightometer Dry Tonnes | 519,897 | Dry tonnes |
| Volumetric Wet Tonnes | 593,264 | Wet tonnes |
| Volumetric Dry Tonnes | 530,094 | Dry tonnes |
| Variance Wet | 0.2 | % |
| Variance Dry | -2.0 | % |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *These figures omit the commissioning sample (F1D) for which no volumetric tonnage calculations were obtained*

*[1] Load cell data corrected with grizzly bucket feed results when the system was not operational*

*[2] Belt cut measurements were used to correct daily weightometer tonnage measurements*

# 13 MINERAL PROCESSING AND METALLURGICAL TESTING

No specific mineral processing and metallurgical testing has been reported for the Project apart from that described in Section 9 for the bulk sampling programme.

The potential impact on diamond grade and revenue by using a 3 mm bottom cut-off size (instead of a 2 mm) for the SW and SC domains has been assessed by consulting company Foundation Resources (Pty) Ltd in Perth, Australia and is shown in Table 13-1.

**Table 13-1**

**Estimated impact of 2 mm versus 3 mm bottom cut-off size on grade and revenue**

| Geological domain | Grade factor (3 mm versus 2 mm) | Revenue factor (3 mm versus 2 mm) |
|---|---|---|
| SW | 75% | 132% |
| SC | 74% | 131% |

***Source:*** *Foundation Resources, 2017*

**Note:** *SW = southwest; SC = south central; Total carats recovered from the southeast and north domains are not sufficient for this type of calculation, but the limited data suggests that the factors could be similar to the SC domain (Foundation Resources, 2017)*

The above calculations are based on the actual diamond size distribution and diamond parcel prices obtained from the bulk sampling campaigns (Section 9 and 14.1). The figures imply that an increase in the bottom cut-off size from 2 mm to 3 mm would result in a decrease of approximately 25% in the estimated Diamond Resource grade (see Section 14.5.3) and an increase of approximately 32% in the USD/ct value. The effect of a 3 mm bottom cut-off on grade and revenue has been independently assessed by MSA in 2015 and the estimated percentages agree within reasonable margins of error with the results reported by Foundation Resources.

# 14 DIAMOND RESOURCE ESTIMATES

MSC estimated a Diamond Resource from the data it generated during the three phases of bulk sampling of the Mothae kimberlite (Mineral Services, 2013). MSA reviewed the data, methodology and estimation process and found it to be a well-executed and thorough piece of work.

MSA restated the Diamond Resource based on its own estimation of the data provided in 2013 by Lucara from the work undertaken by MSC. MSA accepted the geological model as well as the volumes and tonnages of the different geological domains as provided by Lucara, based on a review of the methodology followed by MSC and from a review of the geological wireframe model. Because no bulk sampling for diamonds was conducted at depth, the Diamond Resource estimate relies on a very robust geological model to project grade and revenue to depth. A detailed summary of the work completed is therefore included in this Report.

The results obtained from MSA's Diamond Resource estimation were found to be comparable to the results obtained by MSC in terms of tonnage, grade and revenue. The Diamond Resource estimation is described below. The sections on the geological model (Section 14.1), bulk density and tonnage estimates (Section 14.2), diamond revenue estimation (Section 14.4) and most of the sections on resource classification (Section 14.5) are taken directly from Mineral Services (2013). The sections on SFD and grade modelling (Section 14.3.4 to 14.3.6) and on uncertainty of revenue estimates (Section 14.5.1.4) have been modified from Mineral Services (2013) based on MSA's review.

## 14.1 Geological Model

The three-dimensional geological model of the Mothae kimberlite consists of two main components: (1) the pipe shell model; and (2) the internal geological domain model. The data and methods used to construct the Mothae geological model are described below. The Mothae kimberlite consists of three bodies termed the South Lobe, North Lobe and Neck, and collectively referred to as 'the pipe'.

### 14.1.1 Surface geology

The results of the exploration work described in Section 9 above were used as a basis for mapping the outline of the Mothae pipe and defining zones within the pipe that have distinctive geophysical and geological characteristics, potentially representing different kimberlite types.

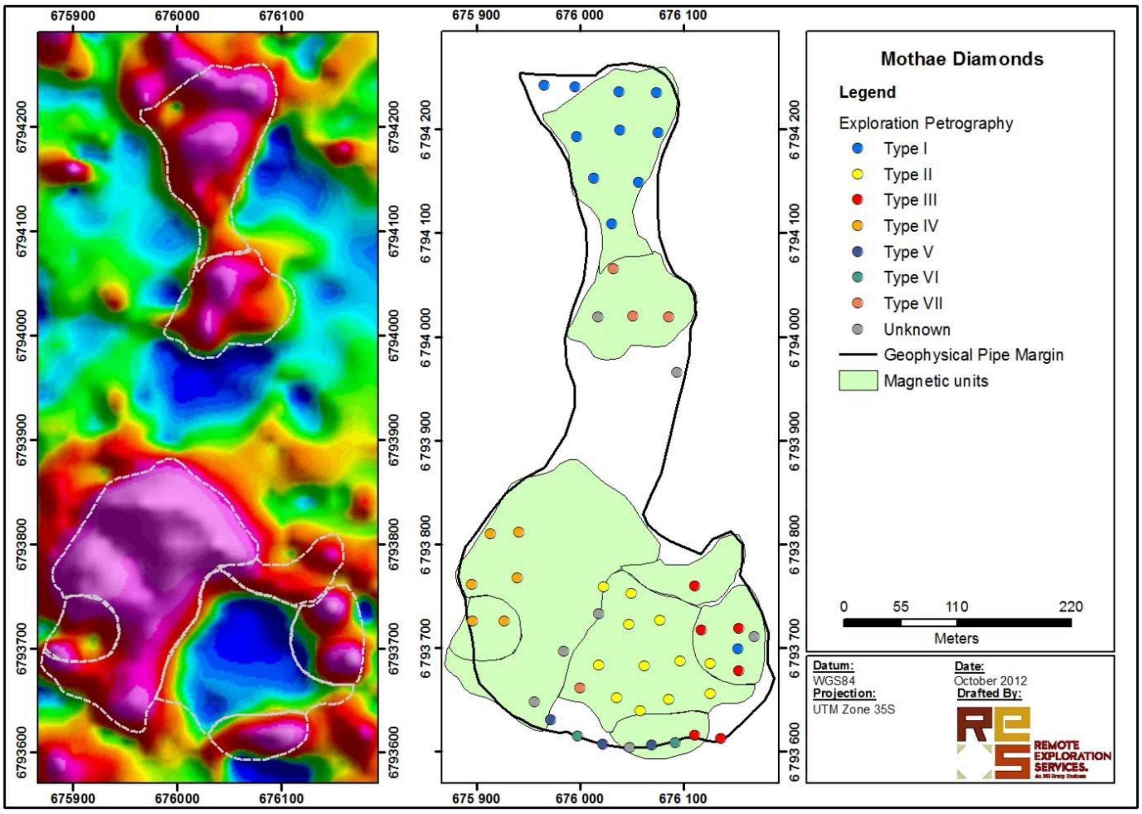
The model for the pipe margin is shown in Figure 14-1 and was derived primarily from the ground magnetic and gravity surveys. The ground magnetic survey also revealed a varying magnetic response within the pipe that can be related to lithological differences. Various magnetic units were mapped within the pipe, as shown in Figure 14-1. These show a strong correlation with the inferred kimberlite Types I to VII as defined from the macroscopic petrographic description of rock samples derived from exploration pits. Results for the KIM samples taken from exploration pits also provided a basis for the definition of potentially different internal units within the pipe based on mantle mineral abundance. Samples were assigned to "KIM Group" classifications based on the relative and absolute concentration of the various KIM types (Figure 14-2). On the basis of these results, the pipe was subdivided into "KIM Domains" (Figure 14-3). These broadly correlate with the subdivisions based on magnetic and petrographic information, providing encouragement that the subdivisions reflect real geological variations.

The KIM domains were used as the primary basis for the initial definition of internal kimberlite zones within the Mothae pipe. The main reasons for this include:

- Severe weathering largely obscures the petrographic characteristics of the kimberlite at surface and therefore precludes reliable definition of kimberlite types on that basis
- KIM abundances are quantitatively determined and relatively insensitive to weathering
- Of the geological parameters measureable at surface, KIM abundance is considered to be most relevant to the potential diamond content of the kimberlite.

The pipe outline and internal domains based on initial exploration results were updated by a revised pipe shell model and internal domains based on geological and KIM data obtained from mining and the delineation core drilling programs undertaken in 2008-2009 and 2011-2012. The development of these models is discussed below.

**Figure 14-1**
**Pipe outline and internal subdivisions based on geophysics shown in relation to surface petrography**

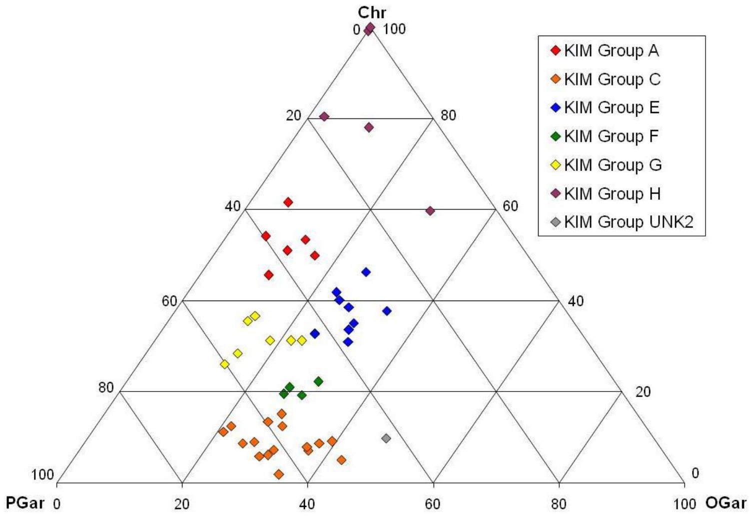



**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Note:** *Total magnetic intensity (TMI) results are shown in the left inset with the outlines of the magnetic units mapped. The right inset shows the geophysical pipe margin as inferred from a combination of the ground magnetic, gravity and electromagnetic survey work. Results of preliminary macroscopic petrographic description of rock samples from exploration pits are plotted in the right inset, showing the distribution of inferred kimberlite "types" within the pipe. North is up.*

## Figure 14-2

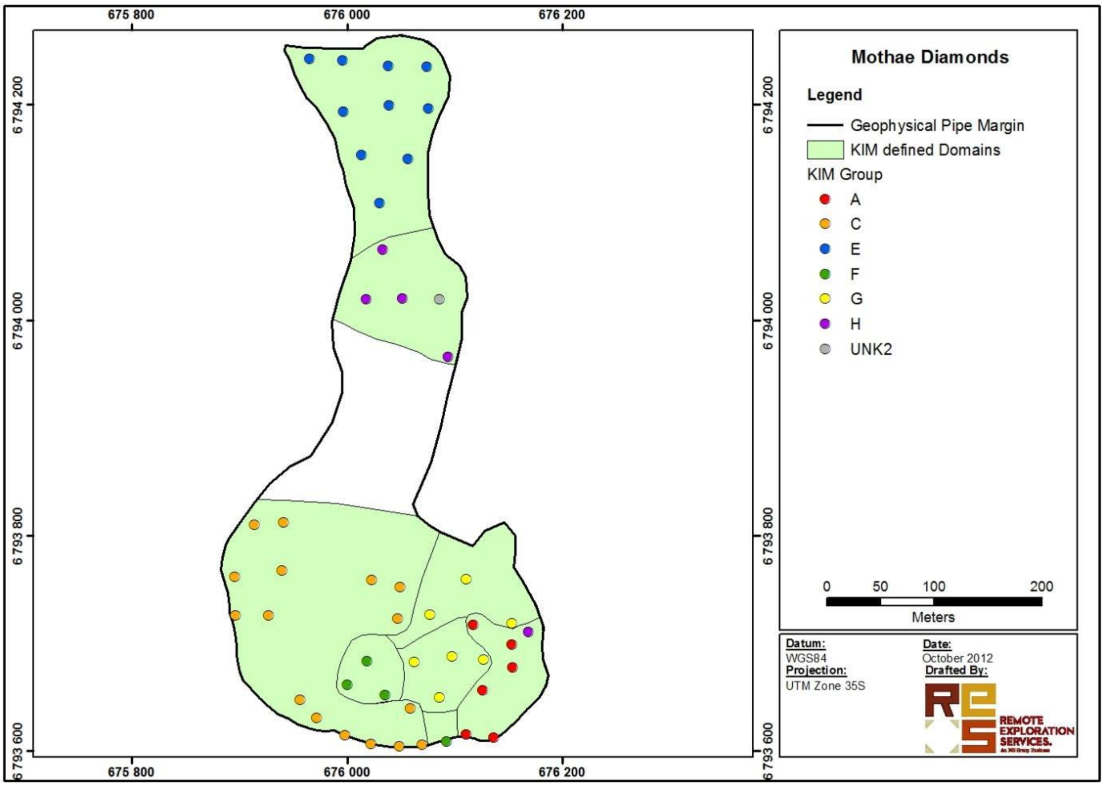
## Ternary plot showing the relative abundance of PGar, OGar and Chr in KIM samples from surface pits used as a basis for initial mapping of internal geology




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *The samples were assigned to KIM Groups based on apparent distinct populations that appear to correlate with the spatial location of the samples.*

## Figure 14-3

## Distribution of KIM samples classified into KIM Groups on the basis of relative and absolute abundances of different KIM types




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *The spatial domains defined on the basis of these results are shown as grey lines. These domains were defined from the early geophysically defined pipe margin. No domains were defined within the Neck area where no sample coverage was obtained. North is up.*

### 14.1.2 Pipe shell model

#### *14.1.2.1 Surface outline of pipe*

Approximately 46% of the Mothae kimberlite pipe margin (850 m of the total inferred 1,850 m pipe perimeter) has been exposed by bulk sampling excavations. Where exposed, the contact was accurately surveyed with a Trimble R6 GPS receiver using the RTK technique with a single fixed base station. The remaining 54% of the pipe margin at surface has been inferred on the basis of geophysics.

#### *14.1.2.2 Pipe contacts at depth*

The pipe contacts and geometry of the South Lobe, North Lobe and Neck at depth are defined by twenty-four, six and nine kimberlite-to-country rock drill hole pierce points, respectively (Table 14-1). In the case of the South Lobe, 20 of the total 24 pierce points (83%) lie above at approximately 180 m depth (2,820 mamsl), and only one below 300 m depth. The pierce points are well distributed across the pipe (Figure 14-4). In contrast, all pierce points in the North Lobe lie above at approximately 110 m depth (2,950 mamsl), and the northern portion of the pipe is better defined than the south. The Neck is comparatively poorly constrained with the western and eastern flanks of the body each being defined by only four pierce points (all above ~190 m depth; 2,830 mamsl) and its southern extent defined in one drill hole.

The pipe contacts in all areas are sharp and readily identified with little to no alteration or brecciation of the basalt country rock. Minor fracturing and carbonate veining are present in some cases. The kimberlite directly adjacent to pipe contacts typically shows a slight increase in alteration intensity and/or a change in alteration style (e.g. increased clay alteration or carbonate replacement of olivine and/or matrix), but rarely displays a significant decrease in competence or hardness. With the exception of drill holes exiting the pipe in KIMB5b (in the South West domain), there is no notable increase in country rock xenolith content along pipe contacts of the South and North Lobes. The Neck is very diluted by basalt xenoliths in all intersections of KIMB1, including adjacent to the pipe contacts.

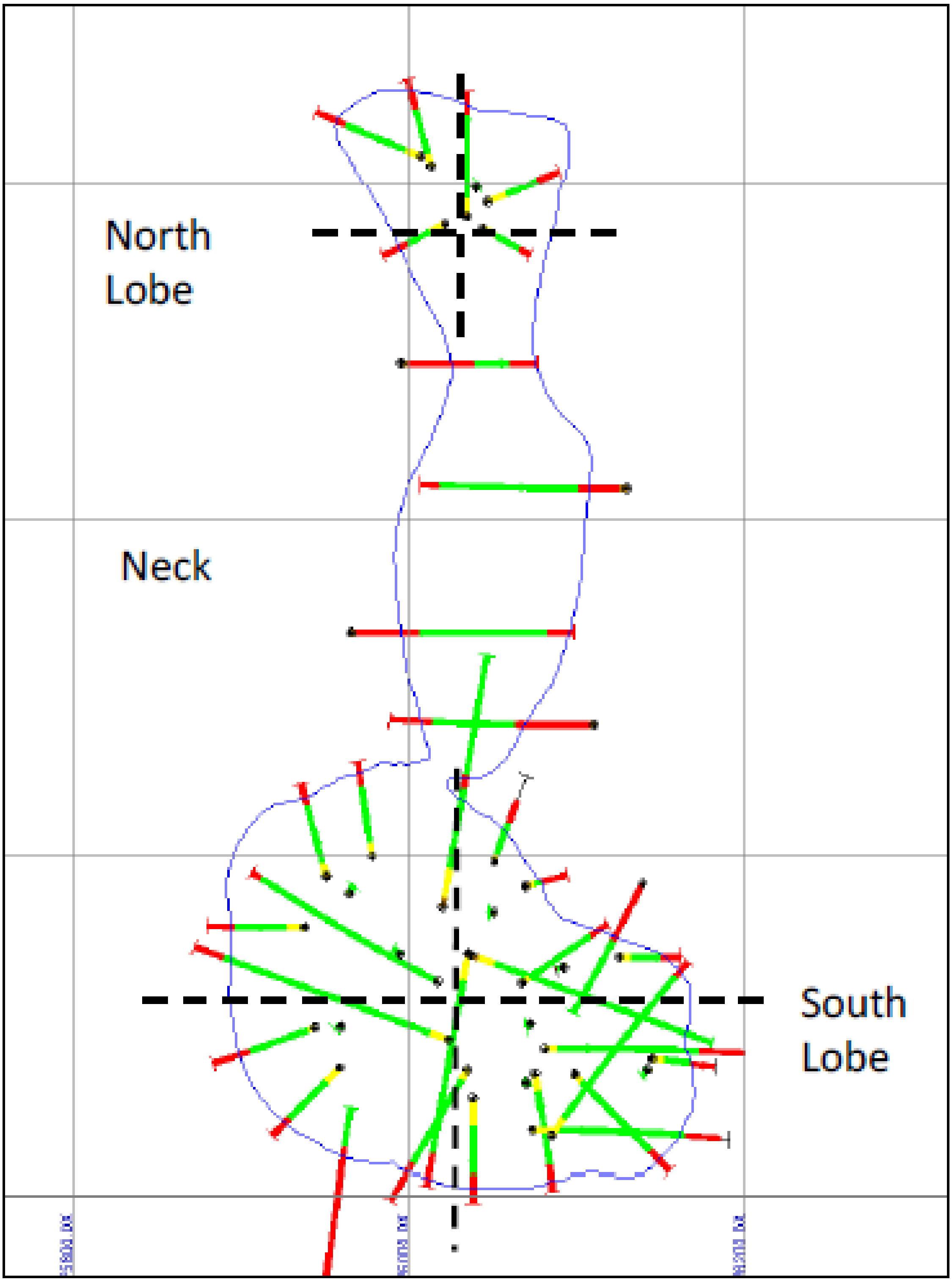
**Table 14-1**

**Pipe contacts (drill hole pierce points) per body and resource domain**

<table>
<tr><th>Resource Domain</th><th>0-50 m</th><th>50-300 m</th><th>300-500 m</th><th>Total</th></tr>
<tr><td>SOUTH</td><td>2</td><td>21</td><td>1</td><td>24</td></tr>
<tr><td>NORTH</td><td colspan="2">6</td><td>0</td><td>6</td></tr>
<tr><td>NECK</td><td colspan="2">9</td><td>0</td><td>9</td></tr>
</table>

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Figure 14-4**
**Plan view of the Mothae pipe shell model (at 3,000 mamsl) illustrating drill hole pierce point distribution**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *Drill hole traces are projected to surface to illustrate the distribution of drill hole pierce points defining the pipe shell model across different 'quadrants' or portions of each body (defined by dotted black lines). Grid = 200 m. North is up.*

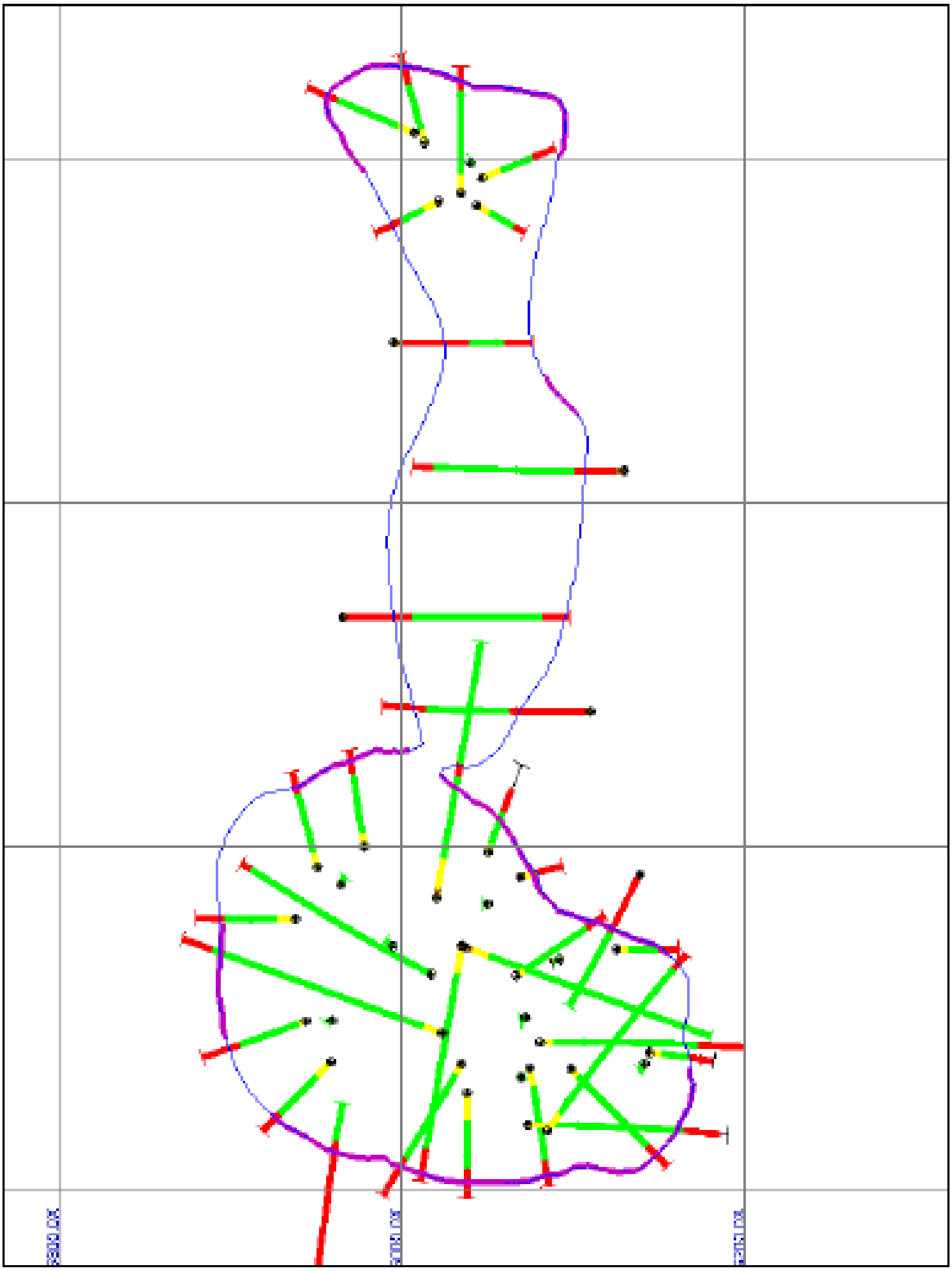
#### 14.1.2.3 *Three-dimensional model of pipe shell*

The three-dimensional ("3D") pipe shell model was constructed using GEMS® software. Polylines were produced on 20 m spaced plan levels using the pipe contacts in all available drill holes (P to EP contacts in drill hole logs). The uppermost portion of the model was defined using a combination of contacts mapped in surface excavations and drill hole intersections (Figure 14-5). At the time the surface mapping was completed, parts of the kimberlite pipe margin were not exposed. In these areas the modelled location of the contact was interpreted based on a combination of interpolation from surveyed contacts, interpolation from drill hole pierce points and the geophysically defined pipe margins. The initial pipe shell was extrapolated upwards as required to allow clipping. Below the deepest kimberlite intersections, the pipe model was extended using consistent contact angles to just below 500 m depth. A pit surface from the 25th September 2012 was used to clip the upper part of the model to produce the present surface of the pipe model. From this, a small portion of remaining overburden was subsequently removed from the North Lobe.

The 3D pipe shell model suggests the Mothae pipe contacts are steep-sided and broadly regular in shape (Figure 14-6). The South Lobe occurs as a sub-circular (plan), semi-cylindrical steep-sided pipe, which is larger in the west than the east. The North Lobe has a roughly oval surface expression and forms a slightly asymmetric (flared to northwest), steep-sided pipe.

**Figure 14-5**

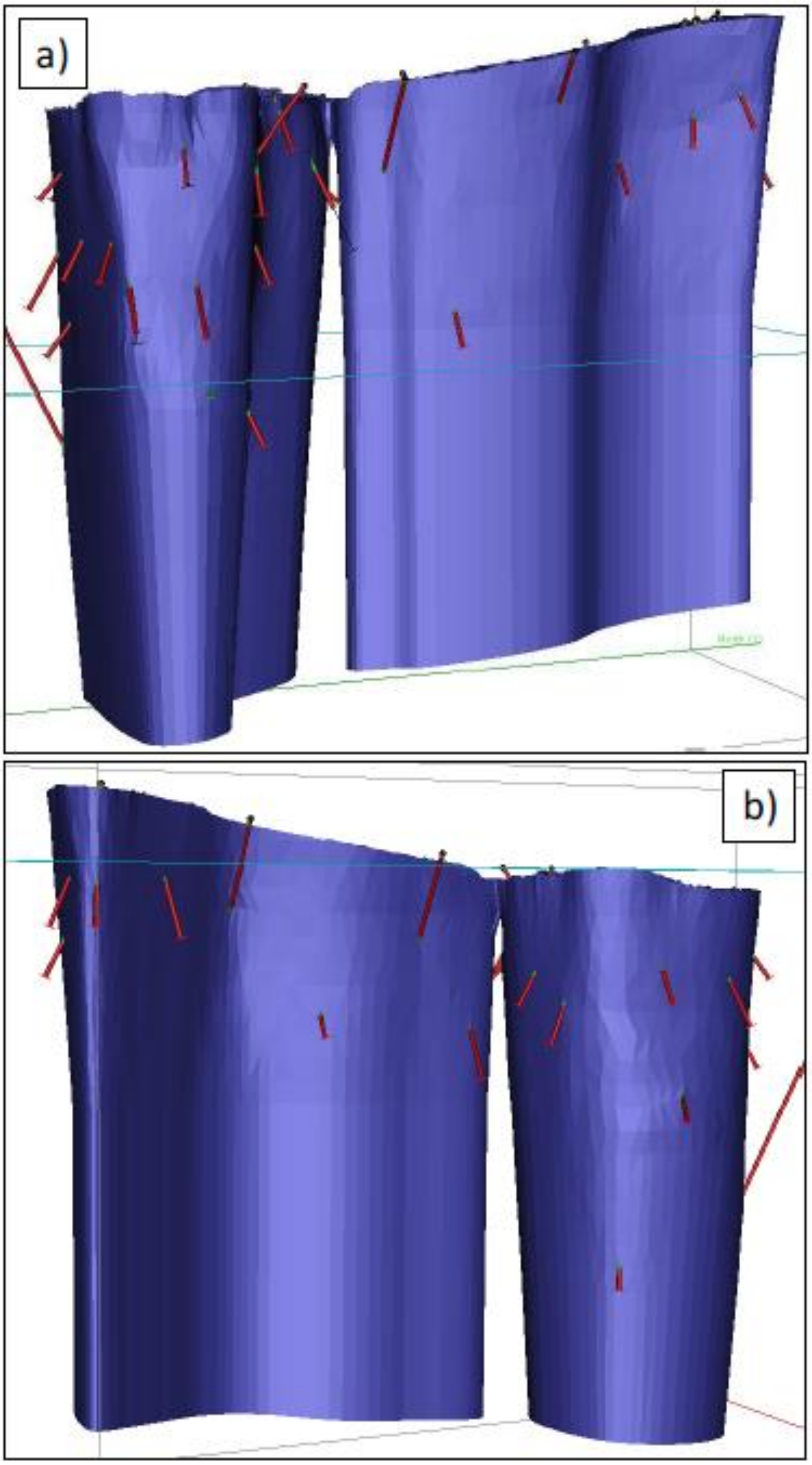
**Plan view of the Mothae pipe shell model showing the modelled pipe outline at surface (blue) in relation to drill holes (red = country rock, green = kimberlite) and surveyed surface contact points (purple)**



***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *North is up*

**Figure 14-6**

**Inclined views of the Mothae pipe shell model looking west (a) and looking east (b)**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *Above figures show the distribution of drill holes (red = country rock, green = kimberlite) used to construct the model and the nature of the pipe contacts and pipe geometry*

### 14.1.3 Internal geology

#### *14.1.3.1 Geology model codes*

Twenty-one model codes (Table 14-2) were assigned to the various rock types identified in the 43 drill cores and the 437 petrography samples examined (87 in Phase 2 and 350 in Phase 3). These include 19 kimberlite model codes representing five main kimberlite types, their textural variants and mixtures thereof.

**Table 14-2**
**Model codes applied to the Mothae drill cores and samples**

| Model Code | # DH[1] | Definition |
|---|---|---|
| KIMB1 | 4 | VK, major pipe infill of Neck |
| RFW1-NECK | 1 | VK, single intersection distinct from kimb1 in Neck |
| KIMB2 | 7 | PK, major pipe infill of North Lobe |
| KIMB3 | 8 | PK, major pipe infill of South Lobe (south east domain) |
| KIMB3a | 6 | textural variant of KIMB3 intersected in north of south east domain |
| KIMB3X | 1 | apparently localized textural variant of KIMB3 |
| KIMB3a+KIMB4 | 2 | KIMB3a mixed with KIMB4 |
| KIMB4 | 13 | PK, major pipe infill of South Lobe (south centre domain) |
| KIMB4a | 3 | PK, textural variant of KIMB4 intersected below 180 m depth |
| KIMB4+KIMB5 | 4 | KIMB4 mixed with KIMB5 |
| KIMB4+KIMB3 | 2 | KIMB4 mixed with KIMB3 |
| KIMB4X | 3 | apparently localized textural variant of KIMB4 |
| KIMB4X+KIMB5 | 1 | KIMB4X mixed with KIMB5 |
| KIMB5 | 20 | PK, major pipe infill of South Lobe (south west domain); 4 sub-units |
| KIMB5a | 16 | KIMB5 occurring in the upper portion of most drill holes |
| KIMB5a/b | 8 | KIMB5 with minor thin finer-grained intervals; underlies KIMB5a |
| KIMB5b | 7 | apparently localized basalt xenolith rich KIMB5 |
| KIMB5c | 15 | KIMB5 with oxide > garnet indicator counts; underlies other KIMB5 |
| KIMB | 1 | CK, single intersection at 280 m depth apparently beyond pipe contact |
| KDYKE-INT | 1 | CK, kimberlite dyke within the pipe |
| XENO-BST | 7 | basalt xenoliths > 1m in length |
| CR BST | 34 | in situ basalt country rock |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *[1] #DH refers to the number of drill hole intersections*

The diffuse apparent layering (2 m to 15 m scale) observed in drill core intersections of KIMB2 in the North Lobe is confirmed petrographically to relate to subtle differences in olivine and country rock xenolith size and abundance, packing density and proportion of very fine juvenile ash in the matrix. These differences are recorded on a per sample basis (as textural types 1 or 2) in the petrography dataset for Phase 3 drill holes.

KIMB3 and KIMB4 both comprise three textural variants that are recognized in drill core and petrographically. In each case, two of the variants are denoted as textural types 1 and 2 in the petrography dataset and in the model codes by either KIMB3 or KIMB3a respectively and similarly KIMB4 or KIMB4a. The third textural variant in each case is denoted by the model codes KIMB3X and KIMB4X.

In the case of KIMB5, parameters defined during core logging were used to define four broad sub-units, as reflected in the model codes KIMB5a, KIMB5a/b, KIMB5b and KIMB5c. Three textural types (1-3) are recognized in KIMB5 petrographically; these are not restricted to any one of the sub-units (although each is typically more common in a particular unit) and are not reflected in the model codes. The KIMB5 textural types are shown in the petrography datasets for Phases 2 and 3.

**KIMB1** is characterised by a high proportion of basalt xenoliths that are generally fresher than those in the other kimberlite types and range widely in size from <1 cm to >1 m. Magma clasts are abundant, readily discerned macroscopically and varied in shape, size and internal structure. KIMB1 has the lowest KIM abundance of all the major kimberlite types. KIMB1 is classified as massive, fine or fine to medium grained olivine macrocryst-poor, magma clast- and basalt xenolith-rich, very KIM-poor volcaniclastic kimberlite.

The 140 m intersection of RFW1-NECK in MOT12/17 in the north-central portion of the Neck differs from KIMB1, mainly in terms of its country rock xenolith population (basalt and notable amounts of basement gneiss not seen in KIMB1) and content (significantly lower than the majority of KIMB1), and KIM abundance (higher than KIMB1 but lower than KIMB2 and other KIMB types). Further work (drilling, KIM sampling, petrography) is required to determine the extent of this material and its relationship to the surrounding KIMB1.

**KIMB2** is characterised by a high proportion of basalt xenoliths <1 cm in size and an overall restricted country rock xenolith size range (typically <10 cm). Magma clasts are abundant but variably discerned macroscopically due to variations in the alteration style (and hence colour) of the rock matrix from medium to dark grey-green. Basalt xenoliths similarly vary from pale and distinct to darker grey and less readily discerned. KIMB2 is classified as massive to diffusely layered, fine or fine to medium grained olivine macrocryst-rich, magma clast- and basalt xenolith-rich, KIM-poor pyroclastic kimberlite.

**KIMB3** is characterised by an abundance of magma clasts including a notable population of diagnostic and readily discerned uncored or cored (symmetrical thick to very thick rims) round (spherical) magma clasts up to 40 mm in size. Basalt xenoliths commonly have ragged or elongate shard-like shapes, not typically seen in the other kimberlite types. The presence of common perovskite mantles on olivine, which can be readily discerned under the binocular microscope, is also diagnostic, in addition to the low KIM abundance. KIMB3 is classified as massive to diffusely layered, fine or fine to medium grained olivine macrocryst-poor, magma clast- and basalt xenolith-rich, KIM-poor pyroclastic kimberlite.

**KIMB4** is characterised by three main magma clast types (ranging from sub-round, uncored and cored, ultra-thin rimmed clasts to larger, sub-round or sub-irregular uncored clasts), the smallest of which can be discerned under the binocular microscope. The proportion of 'melt' in the rock is higher than in KIMB5 (in which most magma clasts are ultra-thin or thin rimmed) and the abundance of melt-free olivine is higher than in KIMB3, which is similarly 'melt'-rich. KIMB4 also differs from KIMB3 in terms of the lack or rarity of perovskite mantles on olivine. KIMB4 displays a restricted country rock xenolith size range, similar to that in KIMB2, and a low to moderate KIM abundance. KIMB4 is classified as massive to diffusely layered, fine or fine to medium grained, olivine macrocryst-poor, magma clast- and basalt xenolith-rich, moderately KIM-rich pyroclastic kimberlite.

KIMB4X is thickly layered, texturally diverse, magma clast-, country rock xenolith- and mantle xenolith-rich volcaniclastic kimberlite associated with KIMB4. Magma clasts are similar in character but more abundant, closer packed and better sorted than those in KIMB4. Magma clasts and country rock xenoliths commonly have thick reaction (or possible ash) rims and resemble accretionary (armoured) clasts.

**KIMB5** consists of four broad sub-units defined during logging as follows: KIMB5a occurs in the upper portions of most drill cores; KIMB5a/b is similar to and underlies KIMB5a but is characterised by the presence of minor thin (<20 cm) finer-grained intervals (textural type 3); KIMB5b is country rock xenolith-rich (50-80%) with a variable kimberlite or carbonate matrix; it appears to occur sporadically in the South West domain, commonly along or close to the pipe margin; KIMB5c is texturally similar to KIMB5a and KIMB5a/b but is characterised by higher oxide to garnet ratios in visual counts conducted on the drill core. Current data suggest that KIMB5c is more dominant at depth than at surface, although it reaches surface in the northern portion of the South West domain.

The majority of KIMB5a, KIMB5a/b and KIMB5c is comprised of textural type 1, which is characterised by variably homogeneous component distribution, a high proportion of ultra-thin rimmed magma clasts (which are not readily discerned even with a binocular microscope and hence the rock can appear coherent) and abundant coarse perovskite attached to olivine in magma clasts or melt-free. KIMB5a and KIMB5c locally include minor amounts of textural type 2, which is characterised by more uniform component distribution, notably coarser perovskite and more common thicker-rimmed and uncored magma clasts.

All KIMB5 sub-units have high basalt xenolith contents (greater than other KIMB types in South Lobe) with a significant proportion of the population being <1 cm in size. The KIM and mantle xenolith abundance of KIMB5 is higher than all other KIMB types and the olivine is coarser-grained overall. KIMB5 is classified as massive to diffusely layered, fine to medium or medium grained olivine macrocryst-rich, ultra-thin rimmed, cored magma clast- and basalt xenolith-rich, mantle xenolith- and KIM-rich pyroclastic kimberlite.

#### *14.1.3.2 Geological domains*

- The various rock types encountered at Mothae have been composited into six major geological domains (Table 14-3) for the purpose of three-dimensional modelling. Five of the six geological domains are kimberlite domains: South West, South Centre, South East, North and Neck and the sixth domain is country rock
- Each kimberlite domain consists mainly or entirely of a single kimberlite type, including any sub-units and/or textural variants as described above. The three South Lobe geological domains also comprise minor amounts of other kimberlite types as a result of mixing along contacts and/or irregular contacts between adjacent major pipe infills. The general rule of thumb applied to mixed lithology drill core intersections involved assigning the domain based on the dominant rock type present in the interval (as established during logging and/or from petrography)

- The South East, South Centre and South West domains constitute the main pipe infill of the South Lobe and consist mainly of pyroclastic kimberlites KIMB3, KIMB4 and KIMB5, respectively
- The North domain constitutes the main pipe infill of the North Lobe and consists of pyroclastic kimberlite KIMB2
- The Neck domain constitutes the main infill of the Neck between the South and North Lobes and consists of the volcaniclastic kimberlite KIMB1 and a high abundance of basalt xenoliths ranging up to several metres in size. A single intersection of as yet uncorrelated volcaniclastic kimberlite (RFW1-NECK) which is distinct from KIMB1 (at least in terms of its country rock xenolith and KIM content) has been included in the Neck domain
- The CR BST domain (not modelled) consists mainly of in-situ host rock basalt. The intersection of coherent kimberlite in MOT12/14, which based on current data appears to lie beyond the pipe margins, has been grouped into this domain
- Internal domain boundaries from drilling were projected to surface and further constrained where necessary by pit geology and KIM data. Surface KIM data were used to define domain boundaries in the absence of any drill hole data (e.g. between the South West and South East domains)
- Definition of the kimberlite domains based on rock type has been verified by spatial assessment of absolute KIM abundances in surface and drill samples, and to a lesser extent by component or textural data (e.g. maximum olivine size), as discussed and illustrated below.

The absolute abundances per kilogram of purple garnet and ilmenite per major sampled kimberlite type and textural variant are shown in Figure 14-7. The data clearly define distinct abundance ranges and support the distinction between rock types established based on drill core and pit geology and petrography. The abundances of purple garnet and ilmenite increase from KIMB3 to KIMB4 to KIMB5. The KIMB2 median abundances of both minerals lie within the KIMB3 abundance ranges but higher than the KIMB3 median abundances. KIMB1 has the lowest KIM abundance.

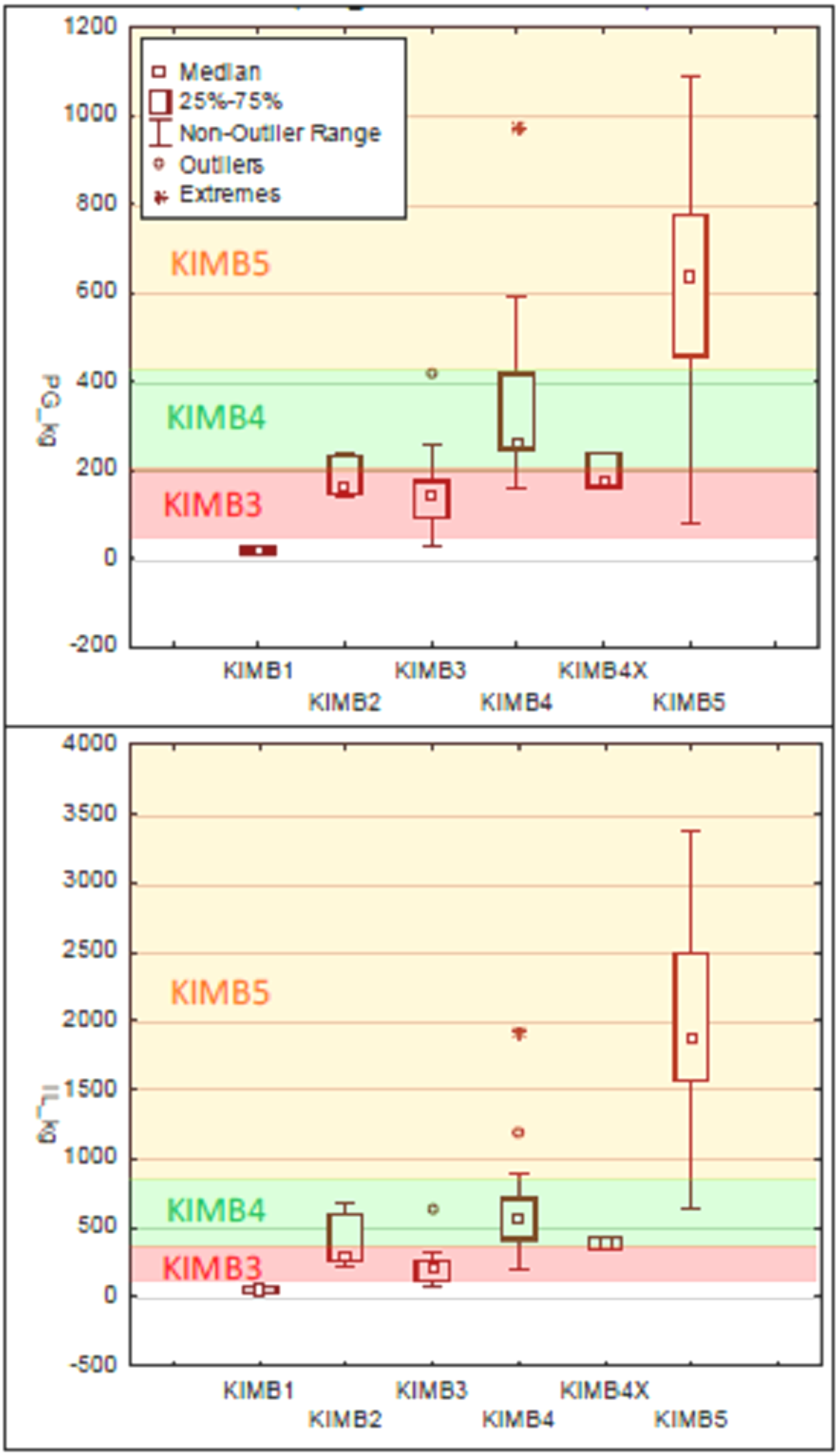
**Table 14-3**
**Geological codes applied to the Mothae drill cores and samples**

| | Kimb Texture | Model Code | Geological Domain |
|---|---|---|---|
| Pipe | VK | KIMB1 | Neck |
| | VK | RFW1-NECK | |
| | N/A | XENO-BST | |
| Pipe | PK | KIMB2 | NORTH |
| | N/A | XENO-BST | |
| Pipe | PK | KIMB3 | SOUTH EAST |
| | PK | KIMB3a | |
| | PK | KIMB3a+KIMB4 | |
| | VK | KIMB3X | |
| | VK | KIMB4X | |
| | N/A | XENO-BST | |
| Pipe | PK | KIMB4 | SOUTH CENTRE |
| | PK | KIMB4a | |
| | PK | KIMB4+KIMB3 | |
| | PK | KIMB4+KIMB5 | |
| | VK | KIMB4X | |
| | VK | KIMB4X+KIMB5 | |
| | PK | KIMB5a | |
| Pipe | PK | KIMB5a | SOUTH-WEST |
| | PK | KIMB5a/b | |
| | VK | KIMB5b | |
| | PK | KIMB5c | |
| | CK | KDYKE-INT | |
| | N/A | XENO-BST | |
| Extra-Pipe (country rock and kimberlite dykes) | N/A | CR BST | CR-BST |
| | CK | KIMB | |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Figure 14-7**

**Box and whisker plots illustrating the range in purple garnet ("PG") and ilmenite ("IL") abundance in drill core KIM samples per major sampled kimberlite type and textural variant (KIMB4X). The data define distinct abundance ranges**

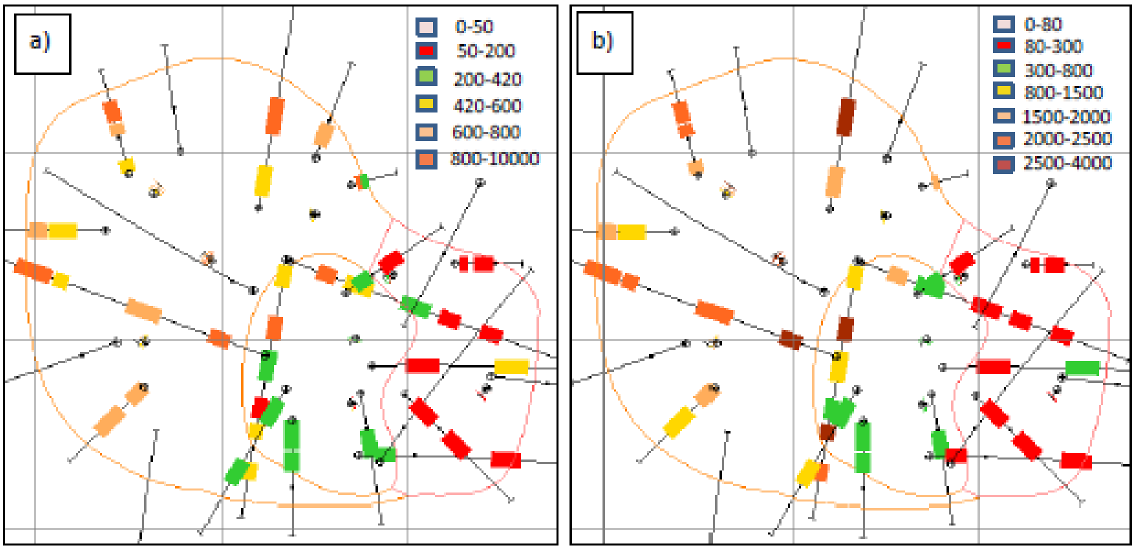



***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

A spatial assessment of the absolute abundances per kilogram of purple garnet and ilmenite in drill samples from the South Lobe further supports the definition of the South Lobe geological domains on the basis of rock type, as shown in Figure 14-8 to Figure 14-10. The abundance ranges are the same as those shown in Figure 14-7 (defined and colour-coded by kimberlite type), with additional categories for greater resolution of the higher abundances observed in KIMB5. The data indicate that the majority of samples within each domain have similar purple garnet and ilmenite abundances, and that these are distinct from samples in the other domains. The data also support the geological evidence for mixed or irregular contacts between domains, e.g. between the South West and South Centre domains where some samples having abundances characteristic of KIMB5 fall within the KIMB4-dominated South Centre domain.

**Figure 14-8**

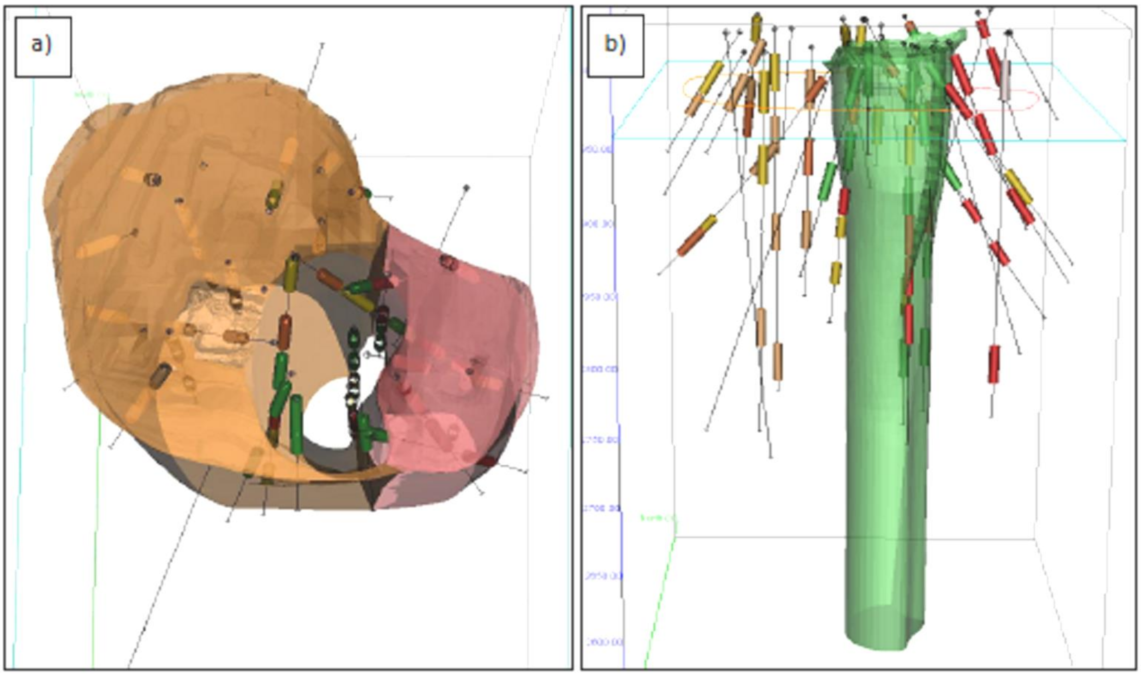
**Plan views of the South Lobe showing the absolute abundances per kilogram of purple garnet (a) and ilmenite (b) in drill core KIM samples**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *North is up*

**Figure 14-9**

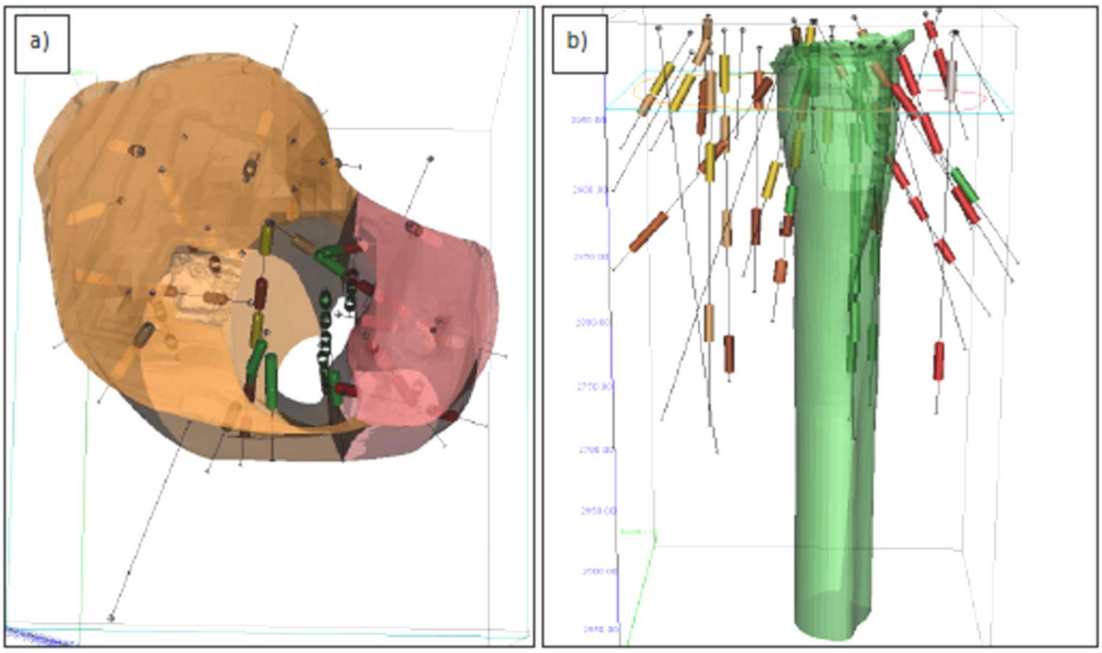
**Three-dimensional views illustrating the variation in purple garnet abundance in drill core KIM samples from the South Lobe**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Figure 14-10**

**Three-dimensional views illustrating the variation in ilmenite abundance in drill core KIM samples from the South Lobe**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *The distribution of different abundance ranges supports the geological domains defined on the basis of rock type. The data also support the geological evidence for mixed or irregular contacts between the domains. (a) view from above showing the South West and South East domains with the South Centre domain removed, (b) view facing north showing the South Centre domain with the South West and South East domains removed*

#### 14.1.3.3 *Three dimensional model and definition of resource domains*

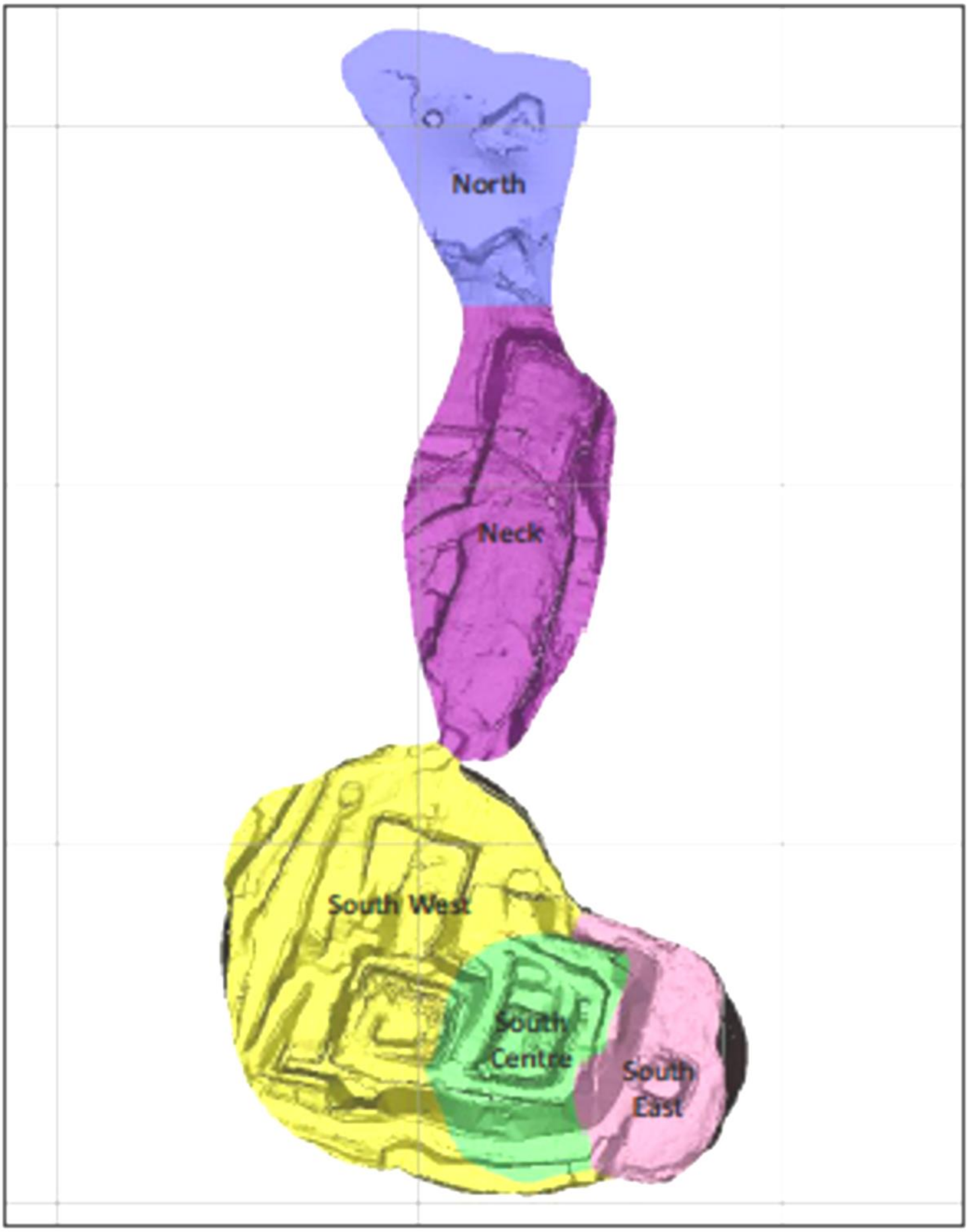
The pipe shell model has been subdivided into five internal geological domains: the North and Neck and three South Lobe domains (South West, South Centre and South East) as described above and shown in Figure 14-11 to Figure 14-13. A single drill hole defines the gap between the Neck and South West domain at a depth of approximately 75 m. By extrapolating the model upwards based on surrounding data, it is assumed that the Neck and South Lobe coalesce near the present surface although there are no drill hole contacts or surface mapping data that show this relationship. A simple vertical plane has been used to separate the Neck and South Lobe. Similarly, a vertical plane through the narrowest part of the pipe in the north has been used to separate the North from the Neck domain in the absence of any drill hole contacts.

The South Lobe has been subdivided into three domains: South West, South Centre and South East based on geological domain codes assigned to the drill cores. The boundaries between the South Centre and South East domains and between the South Centre and South West domains are each defined by six drill hole contacts. There are no drill hole contacts between the South West and South East domains. This boundary was produced as a vertical plane defined by surface KIM data.

For each of the five modelled geological domains, a surface representing the base of the weathered kimberlite was produced by interpolating the weathered (WX)-to-unweathered contacts in drill holes. Clipping above and below this surface produced two solids representing the weathered kimberlite zone and the harder, fresher kimberlite below which constitutes the bulk of the pipe infill. The unweathered (hard) kimberlite was then subdivided by a series of sub-horizontal planes representing various depths below a reference surface. A plane that approximates the present surface (the 'reference surface') was produced first and then copied to 50 m, 300 m and 500 m depth below surface. Clipping above and below each of these planes created the domains SC_50 (below weathered, above 50 m depth), SC_300 (between 50 m and 300 m depth) and SC_500 (between 300 m and 500 m depth) for the South Centre domain, and similarly for the South West (SW) and South East (SE) domains, as well as the North and Neck (300 m and 500 m only for both). These depth domains and the weathered kimberlite zone in each case (e.g. SC_WX) comprise the resource domains used in the Diamond Resource estimate. The remaining portion of the original pipe shell below 500 m depth is not included in the final domain model.

**Figure 14-11**

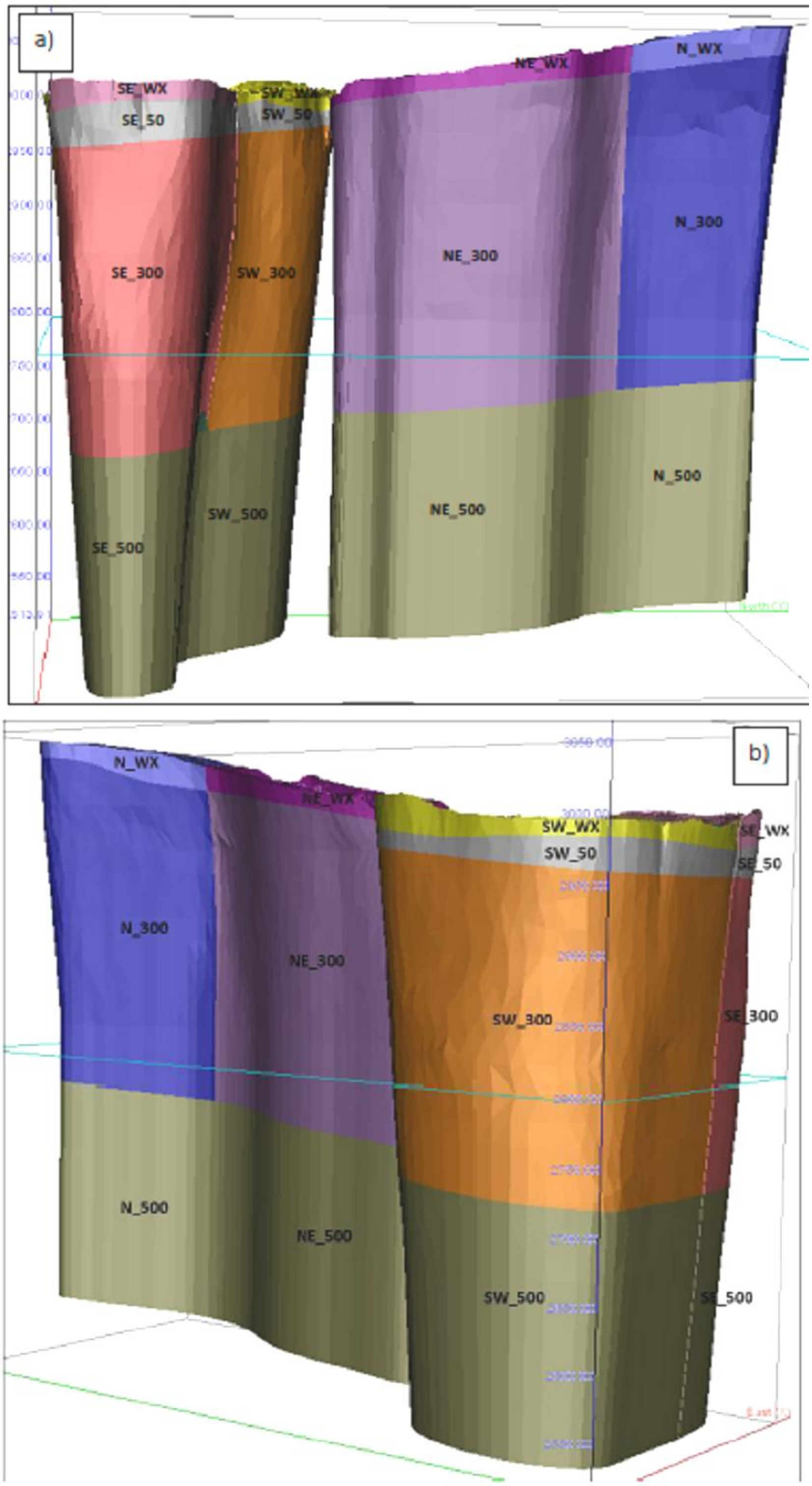
**Plan view of the Mothae three-dimensional geological model at surface showing the five major internal geological kimberlite domains**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *Grid = 200 m and north is up*

**Figure 14-12**

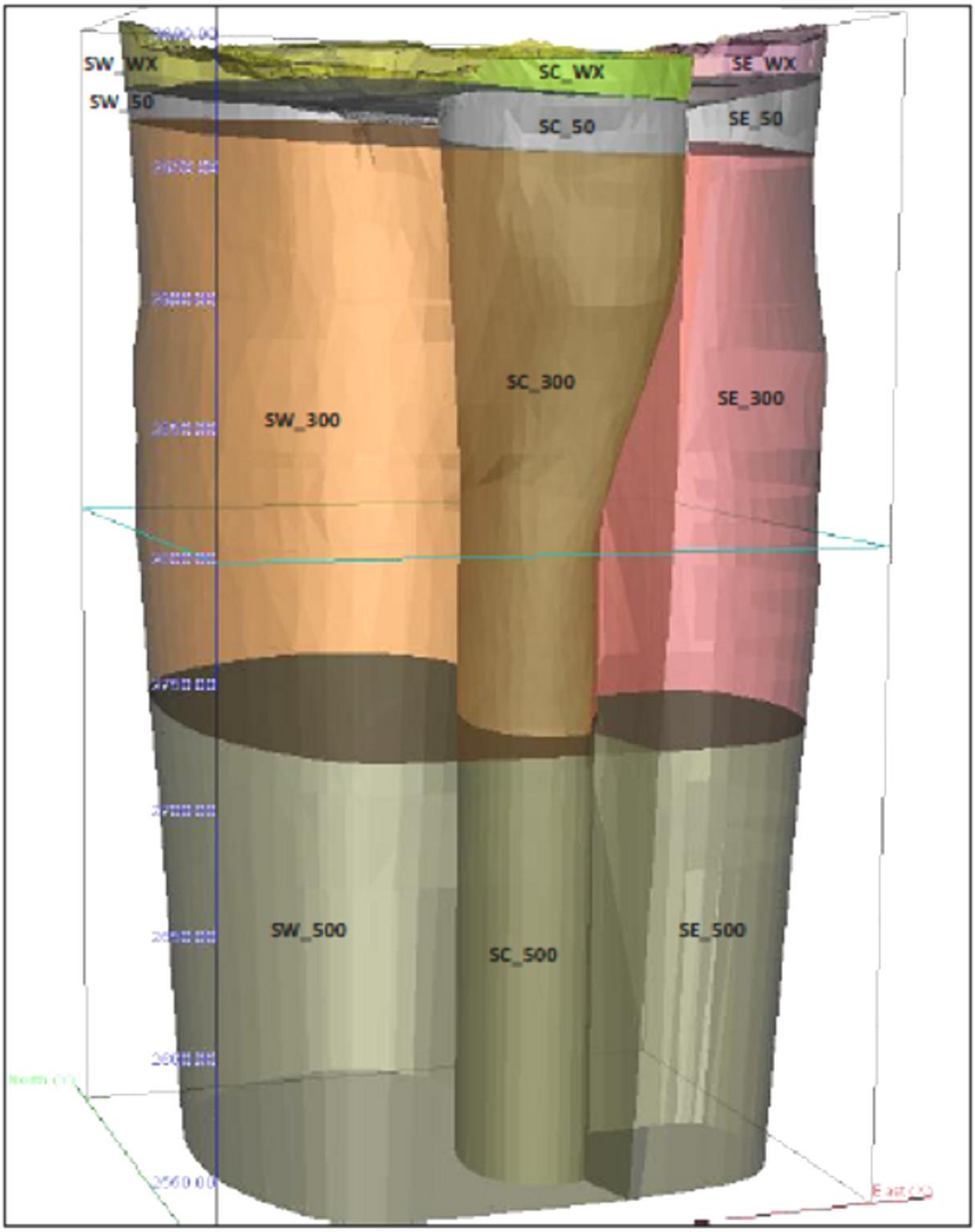
**Inclined views of the Mothae three-dimensional geological model looking west (a) and northeast (b) showing the five major kimberlite domains and the subdivision of these into resource domains based on weathering (WX) and depth from the reference surface (50 m, 300 m, 500 m)**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *SW = South West, SC = South Centre, SE = South East, N = North, and Ne = Neck*

**Figure 14-13**

**Inclined view (looking northeast) of the South Lobe geological model showing the internal geological and resource domains, with the South West and South East domains rendered transparent to show the geometry of the South Centre domain**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *WX = weathered, SW = South West, SC = South Centre, SE = South East, N = North, Ne = Neck, and 50, 300, 500 = depth in meters below the reference surface*

#### *14.1.3.4 Geological continuity*

Each of the major kimberlite types making up the Mothae geological domains displays some degree of internal textural and component variation. However, based on the current data two key conclusions can be drawn:

- There are distinct and consistent differences in several key variables between geological domains
- The variability observed within each domain does not appear to change with depth, i.e. there are no consistent spatial trends in any of the key measured variables.

Figure 14-14 to Figure 14-16 graphically display selected textural and component parameters measured on the drill cores to demonstrate the overall geological homogeneity observed within the domains, particularly in the vertical direction. The olivine size data shown in Figure 14-14 indicates that: (1) there is no notable change in olivine size with depth or across each of the South Lobe domains; (2) olivine is generally coarser-grained in the South West domain than the South Centre and South East domains (confirming the distinction between the major rock types based on other parameters); and (3) the single vertical drill hole in the North Lobe suggests olivine grain size decreases with depth, but further data are required to verify this observation.

The large country rock xenolith data (>10 cm in down-hole length) plotted in Figure 14-15 reveal that: (1) the abundance and distribution of these xenoliths do not vary significantly within the domains; and (2) the Neck has a notably higher abundance of large xenoliths than the other domains. The average size and total number of xenoliths >5 mm measured down-hole (Section 4.3) are plotted in Figure 14-16 and further serve to indicate a lack of significant consistent variation in country rock xenolith size and content within the major geological domains of the South and North Lobes.

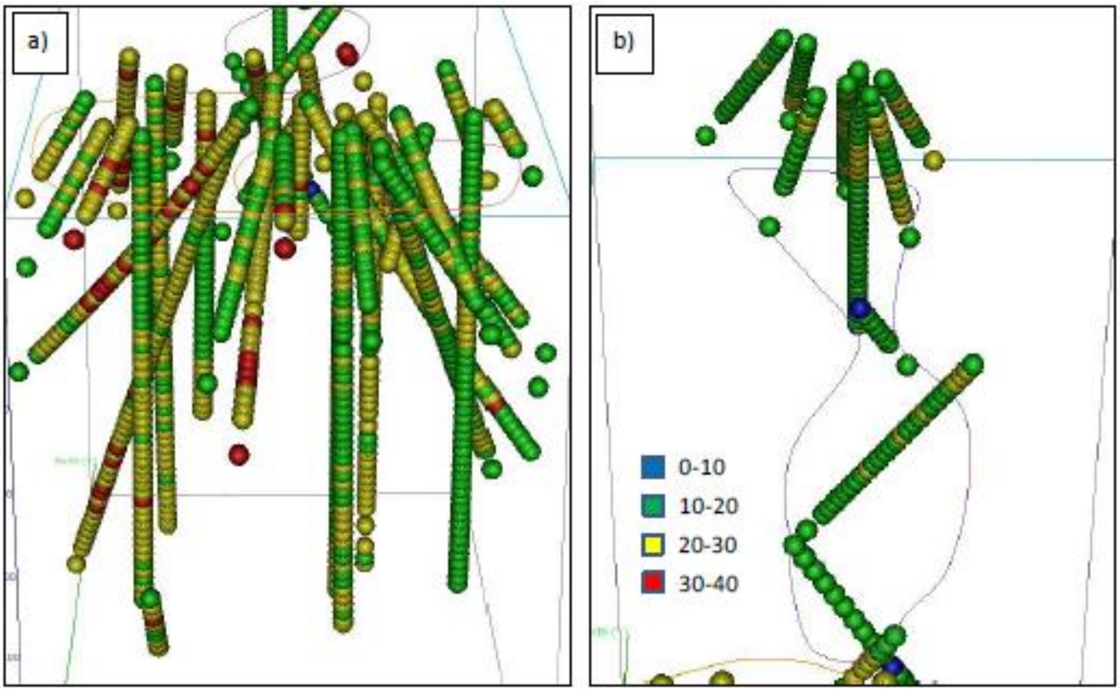
The drill sample KIM data suggest that the mantle sample of each domain is relatively consistent across and with depth in each domain, as shown in Figure 14-8 to Figure 14-10 This is further demonstrated in Figure 14-17 where the absolute abundances per kilogram of purple garnet and ilmenite in samples of KIMB3, KIMB4 and KIMB5 are plotted against sample elevation.

KIMB5 in the South West domain comprises four sub-units made up of three textural variants. One of these sub-units (KIMB5c) appears, based on the drill holes logged to date, to be more dominant at depth than at surface. However, this unit is defined entirely on the basis of visual observations made on drill core that suggest a higher proportion of oxides than in other KIMB5 sub-units. For reasons that are not clearly understood at this point, this variation is not evident in the quantitative KIM abundance data generated by analysis of drill core samples. The drill sample KIM data indicate relative consistency in the mantle sample across all the KIMB5 sub-units and on this basis, in conjunction with consistency in the textural and mineralogical features of KIMB5, it is inferred that the grade variability with depth in the South West domain is not likely to exceed that observed at surface.

In the case of the South Centre domain, the textural variations observed in KIMB4 (mainly textural type 1 with minor sporadic type 2) do not appear to have influenced the mantle sample which appears relatively consistent (and different to KIMB3 and KIMB5). Textural variant KIMB4X that occurs mainly in two vertical drill holes in the centre of the South Centre domain has a similar but slightly lower ilmenite and purple garnet abundance than KIMB4 (Figure 14-17).

**Figure 14-14**

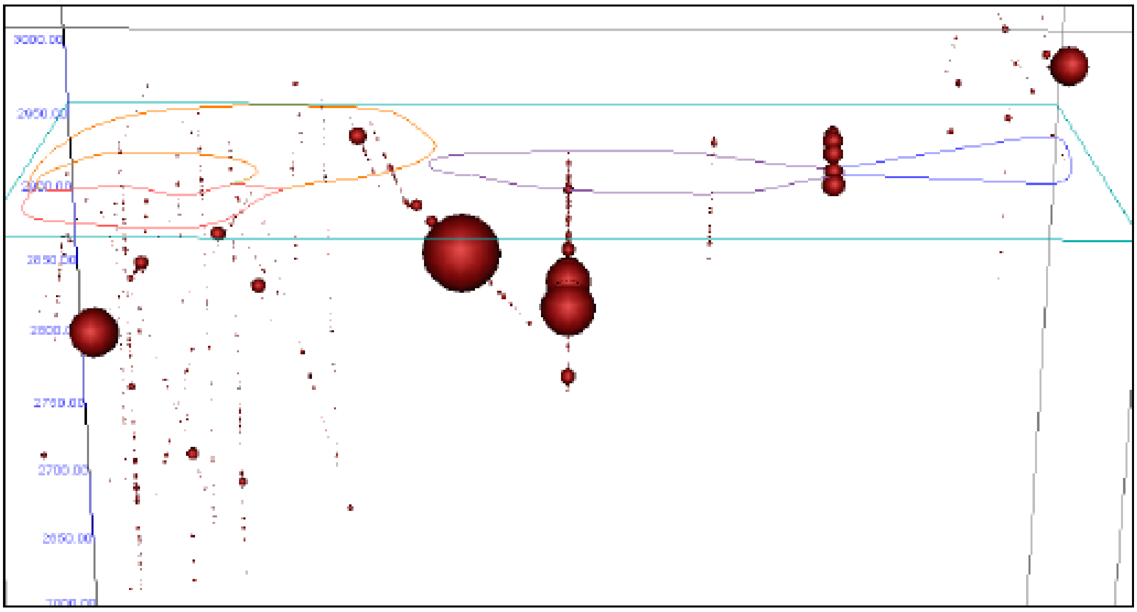
**Inclined views of the South Lobe (a) and North Lobe (b), both facing north, showing the range in olivine size (sum of the size (mm) of the five largest olivine grains measured systematically at 5 or 10 m spacing down all drill holes) within and between the geological domains**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Figure 14-15**

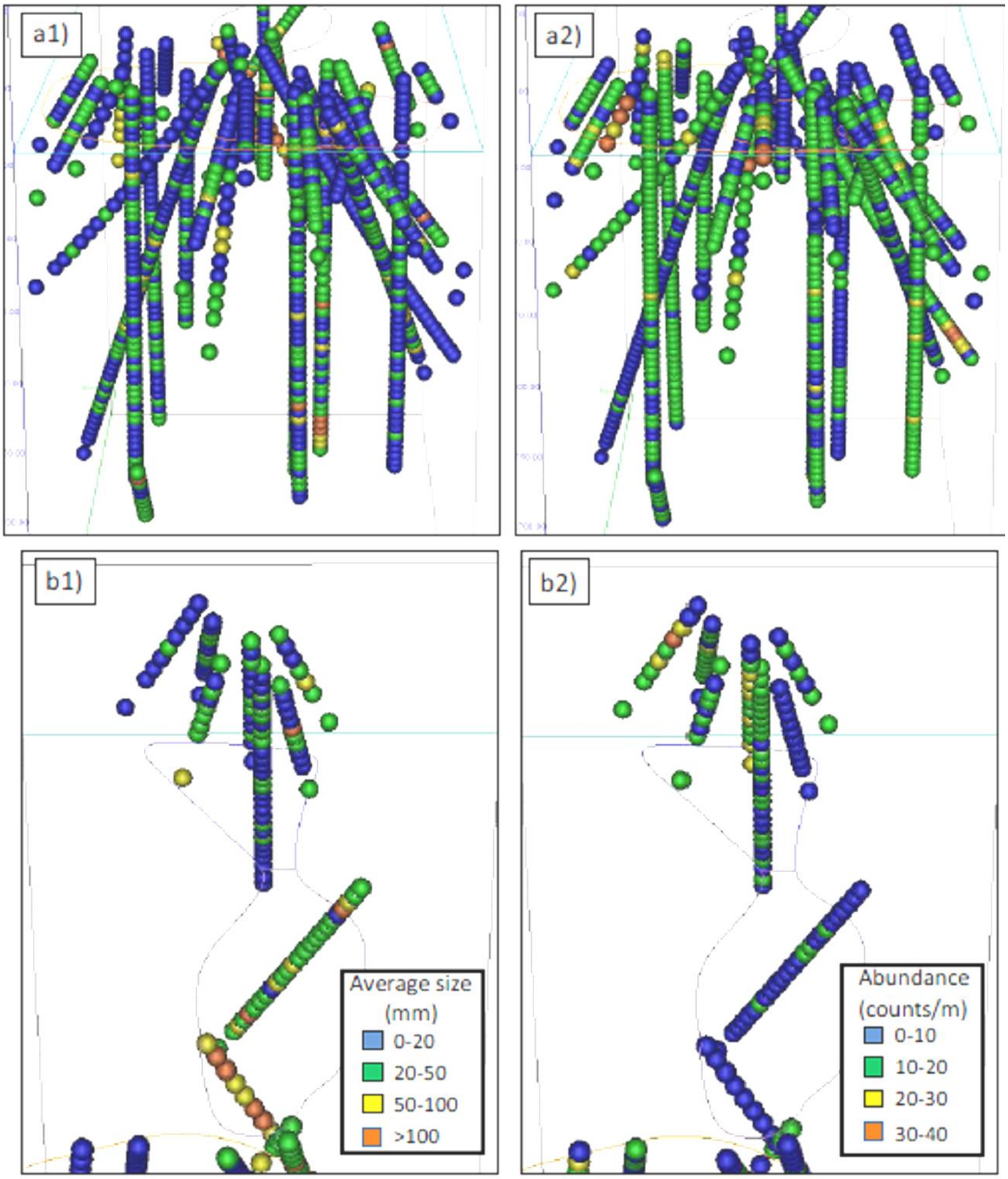
**Inclined view facing west of the Mothae geological model showing the range in large country rock xenolith size (all country rock xenoliths > 10 cm in down-hole length measured in drill holes) within and between the geological domains**



***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013* ***Note:*** *Note the larger xenolith size range of KIMB1 in the Neck*

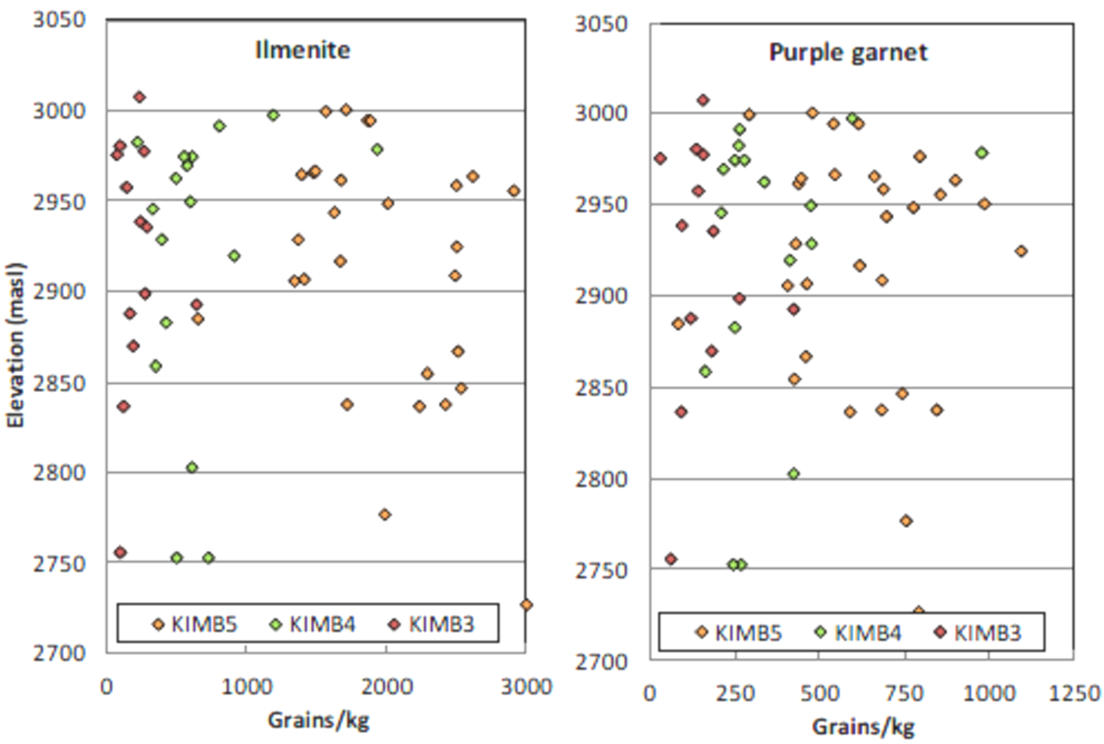
**Figure 14-16**

**Inclined views (facing north) of the South Lobe (a) and North Lobe (b) illustrating the variation in average size (a1, b1) and content (a2, b2) of country rock xenoliths >5 mm**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *Xenoliths are measured along a 1 m long line on the core every 5 to 10 m down hole*

**Figure 14-17**
**Absolute abundances per kilogram of ilmenite and purple garnet in drill core KIM samples from the South Lobe plotted against sample elevation showing the difference in mineral abundances between the major kimberlite types and the consistency in the data with depth in the pipe**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

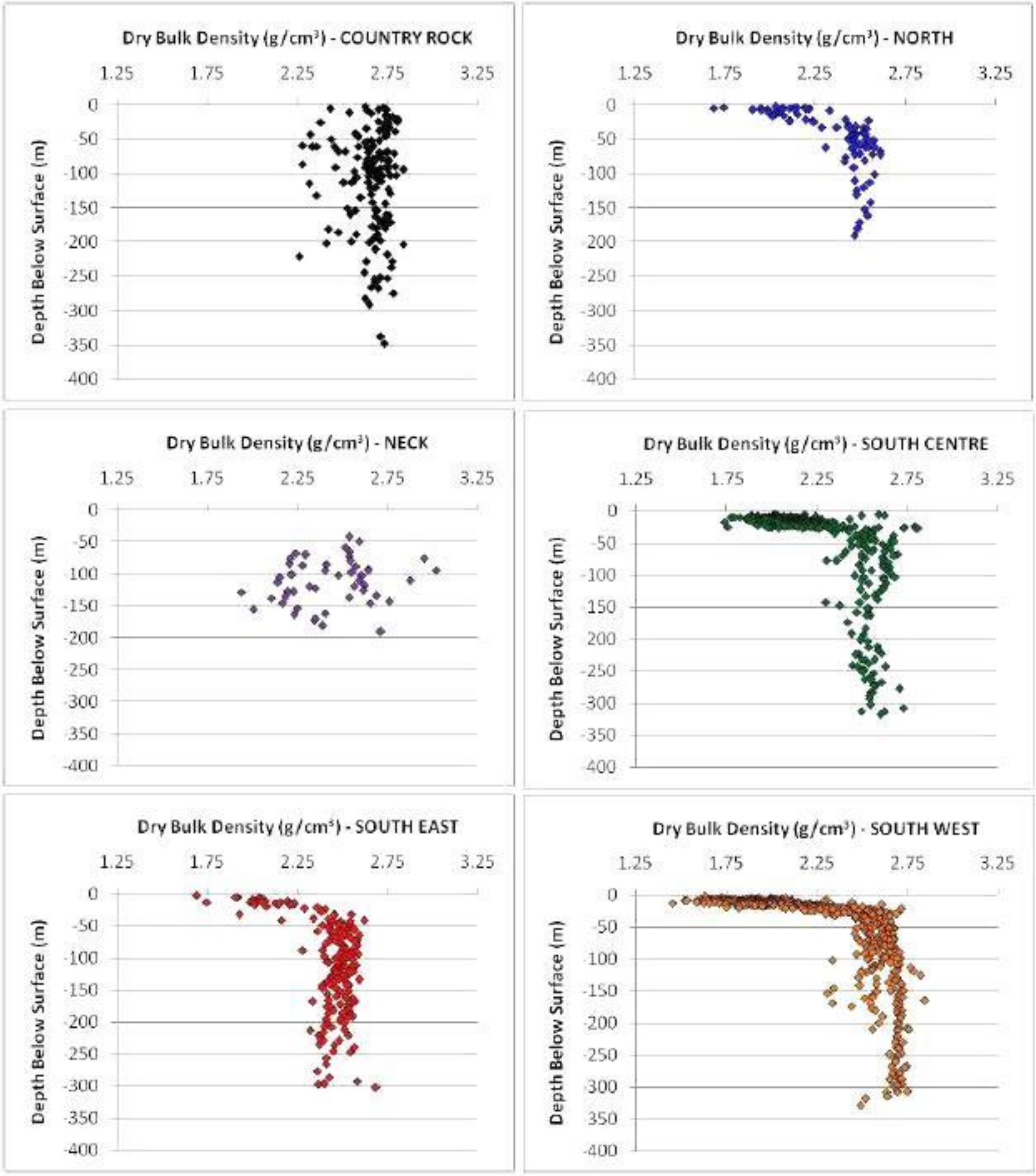
## 14.2 Bulk Density and Tonnage Estimates

### 14.2.1 Bulk density results

All down-hole drill core (n = 785) and surface bulk sample (n = 543) bulk density data were collated into a final bulk density database (total 1,328 measurements). The bulk density data are represented as depth profiles by geological domain in Figure 14-18. There is a significant variation in bulk density with depth, reflecting the high degree of weathering of near-surface material. Most of the variability occurs within the first 25 m below surface, after which there is only a very minor gradual overall increase in bulk density with depth.

**Figure 14-18**

**Mothae bulk density data represented in g/cm$^3$ plotted against depth below surface for each modelled geological domain as well as for country rock basalt (CR BST)**




***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

### 14.2.2 Bulk density data analysis and estimation

Summary statistics of bulk density data by resource domain are presented in Table 14-4. This includes a distinction between the weathered surface portion of each geological domain and deeper portions subdivided into specific depth zones relevant to the resource. Statistically representative data have been obtained for most resource domains. However due to the paucity of deep drilling, the deeper zones (300 m – 500 m) are poorly represented.

Geological domains have been subdivided into the weathered zone at surface (WX in Table 14-4), and thereafter into hard kimberlite zones extending to 50 m, 300 m and 500 m below surface. On average, bulk density increases by 19.5%, 4.5% and 2.2% progressively from weathered surface material to the zone from 300 m to 500 m below surface.

**Table 14-4**

**Summary statistics for Mothae dry bulk density data by resource domain**

| Geological domain | Resource domain | Number of measurements | Average | Maximum | Minimum | Standard deviation |
|---|---|---|---|---|---|---|
| CR BST | All | 149 | 2.65 | 2.84 | 2.26 | 0.12 |
| North | N_WX | 31 | 2.07 | 2.33 | 1.68 | 0.14 |
| | N_300 | 51 | 2.49 | 2.61 | 2.28 | 0.07 |
| | N_500[1] | 0 | 2.53 | N/A | N/A | N/A |
| Neck | Ne_WX[2] | 0 | 2.06 | N/A | N/A | N/A |
| | Ne_500 | 49 | 2.44 | 3.02 | 1.94 | 0.24 |
| South Centre | SC_WX | 246 | 2.11 | 2.81 | 1.74 | 0.16 |
| | SC_50 | 26 | 2.47 | 2.79 | 2.15 | 0.15 |
| | SC_300 | 97 | 2.55 | 2.71 | 2.30 | 0.08 |
| | SC_500 | 6 | 2.59 | 2.73 | 2.50 | 0.08 |
| South East | SE_WX | 24 | 2.04 | 2.23 | 1.69 | 0.13 |
| | SE_50 | 16 | 2.39 | 2.62 | 1.93 | 0.16 |
| | SE_300 | 130 | 2.48 | 2.59 | 2.28 | 0.06 |
| | SE_500 | 2 | 2.52 | 2.68 | 2.37 | 0.22 |
| South West | SW_WX | 262 | 2.02 | 2.72 | 1.45 | 0.25 |
| | SW_50 | 54 | 2.52 | 2.69 | 2.32 | 0.08 |
| | SW_300 | 168 | 2.62 | 2.84 | 2.31 | 0.09 |
| | SW_500 | 14 | 2.66 | 2.75 | 2.49 | 0.07 |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *Bulk density values are in g/cm$^3$. CR BST = country rock basalt*

*The table excludes 2 samples of kimberlite from an interpreted peripheral dyke and one sample of basalt from overburden*

*[1] No measurements captured – used % change for South West domain to calculate from N_300*

*[2] No measurements captured – used average for all weathered material*

### 14.2.3 Volume and tonnage estimates

Volumes for the resource domains were generated from the solid models in GEMS® software. Average dry bulk densities were applied to these solid volumes to derive final dry tonnage estimates for each resource domain (Table 14-5). The total modelled volume of rock in the Mothae kimberlite to a depth of 500 m below surface is 30.6 million m$^3$, corresponding to an estimated 77.4 million tonnes.

**Table 14-5**

**Volume and tonnage estimates for Mothae resource domains**

| Geological domain | Resource domain | Volume ($Mm^3$) | Bulk density ($g/cm^3$) | Tonnes (Mt) |
|---|---|---|---|---|
| South West | SW_WX | 0.37 | 2.02 | 0.75 |
| | SW_50 | 0.43 | 2.52 | 1.08 |
| | SW_300 | 7.39 | 2.62 | 19.35 |
| | SW_500 | 4.82 | 2.66 | 12.82 |
| South Centre | SC_WX | 0.11 | 2.11 | 0.23 |
| | SC_50 | 0.14 | 2.47 | 0.33 |
| | SC_300 | 1.52 | 2.55 | 3.88 |
| | SC_500 | 0.79 | 2.59 | 2.05 |
| South East | SE_WX | 0.14 | 2.04 | 0.29 |
| | SE_50 | 0.24 | 2.39 | 0.56 |
| | SE_300 | 2.39 | 2.48 | 5.94 |
| | SE_500 | 1.38 | 2.52 | 3.48 |
| North | N_WX | 0.29 | 2.07 | 0.59 |
| | N_300 | 2.39 | 2.49 | 5.95 |
| | N_500 | 1.23 | 2.53 | 3.11 |
| Neck | Ne_WX | 0.21 | 2.06 | 0.43 |
| | Ne_300 | 4.09 | 2.44 | 9.96 |
| | Ne_500 | 2.54 | 2.48 | 6.29 |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

## 14.3 Diamond Grade Estimates

MSA took the sample grade information reported by MSC (Mineral Services, 2013) and produced its own Size Frequency Distribution ("SFD") analysis and grade estimate. The results are very similar to the results obtained by MSC. The following summary is taken from Mineral Services (2013) except where indicated otherwise.

### 14.3.1 Sample grade results

All bulk sample grade results are provided in Table 14-6. A total of 603,819 dry tonnes was processed during the three phases of the Mothae bulk sampling, from which 52,017 diamonds weighing 23,446 ct were recovered for a total dry sample grade of 3.88 cpht and an average diamond size of 0.45 cps (carats per stone). Individual bulk sample grades vary from 1.52 cpht (sample C1A) to 7.08 cpht (sample F1).

**Table 14-6**
**Summary of bulk sample results**

| Phase | Bulk sample | Geological domain | Included in estimate | Dry tonnes | Stones | Carats | Average size (cps) | Dry grade (cpht) |
|---|---|---|---|---|---|---|---|---|
| 1 | C1A | SW | No[1] | 1,837 | 90 | 27.86 | 0.31 | 1.52 |
| | C2A | SC | No[1] | 4,164 | 310 | 117.11 | 0.38 | 2.81 |
| | C2B | SC | No[1] | 1,617 | 211 | 75.47 | 0.36 | 4.67 |
| | G1 | SC/SE | No[1,2] | 6,199 | 1,007 | 408.07 | 0.41 | 6.58 |
| | F1 | SC | No[1] | 6,274 | 1,162 | 444.26 | 0.38 | 7.08 |
| | A1A | SE | Yes | 4,565 | 372 | 129.83 | 0.35 | 2.84 |
| | RCA | N/A | No[3] | (394)[3] | 6 | 2.60 | 0.34 | 0.66 |
| | All/Mix | N/A | No[4] | N/A | 7 | 3.57 | 0.51 | N/A |
| 2 | C2C | SC | Yes | 8,193 | 676 | 380.85 | 0.56 | 4.65 |
| | C3A | SW | Yes | 7,782 | 750 | 301.22 | 0.40 | 3.87 |
| | G1C | SC/SE | No[1, 2] | 21,970 | 2,529 | 1,166.97 | 0.46 | 5.30 |
| | F1C | SC | Yes | 15,390 | 11,519 | 715.79 | 0.47 | 4.65 |
| | E1A | N | Yes | 4,338 | 255 | 99.61 | 0.39 | 2.30 |
| 3 | F1D | SC | Yes | 1,594 | 111 | 77.65 | 0.70 | 4.87 |
| | C4A | SW | Yes | 29,558 | 1,458 | 759.23 | 0.52 | 2.57 |
| | C6A | SW | Yes | 7,497 | 529 | 260.50 | 0.49 | 3.47 |
| | C5A | SW | Yes | 49,486 | 3,133 | 1,120.07 | 0.36 | 2.26 |
| | C8A | SW | Yes | 49,443 | 3,522 | 1,442.13 | 0.41 | 2.92 |
| | C9A | SC/SW | No[2] | 40,923, | 3,840 | 1,940.71 | 0.51 | 4.74 |
| | G2A | SC | Yes | 34,005 | 4,256 | 1,909.78 | 0.48 | 5.62 |
| | F2A | SC | Yes | 50,692 | 4,083 | 1,979.76 | 0.48 | 3.91 |
| | G2B | SC | Yes | 22,656 | 3,022 | 1,286.89 | 0.43 | 5.68 |
| | G3A | SC | Yes | 30,523 | 3,722 | 1,564.70 | 0.44 | 5.42 |
| | C7A | SW | Yes | 18,426 | 875 | 403.20 | 0.46 | 2.19 |
| | C6B | SW | Yes | 9,773 | 570 | 346.55 | 0.61 | 3.55 |
| | E2A | N | Yes | 15,725 | 631 | 329.06 | 0.52 | 2.09 |
| | C11A[5] | SW | Yes | 68,367 | 4,373 | 1,907.59 | 0.44 | 2.79 |
| | F3A | SC | Yes | 7,660 | 585 | 365.91 | 0.63 | 4.78 |
| | C11C | SW | No[6] | 27,041 | 1,197 | 589.18 | 0.49 | 2.18 |
| | CD1B | SC | Yes | 52,559 | 6,691 | 2,937.63 | 0.40 | 5.11 |
| | CD1C | SC | No[6] | 5,563 | 525 | 262.07 | 0.50 | 4.71 |
| | | | **Total** | **603,819** | **52,017** | **23,446** | **0.45** | **3.88** |

**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Note:** *The geological domain to which each bulk sample has been assigned for grade and size-frequency distribution analysis is indicated (N/A = not applicable). Geological domain abbreviations: SW = South West; SC = South Centre; SE = South East; N = North*

*[1] Incomplete DTC data not appropriate for size distribution modelling – DTC data only obtained for a portion of the diamond parcel*

*[2] Sample comprises significant amount of material from more than one geological domain*

*[3] Recoveries derived from reprocessing of uncrushed oversize material – tonnage not included in total*

*[4] Recoveries from purging and cleaning of the plant at end of Phase 1, not attributable to an individual bulk sample*

*[5] Processing parameters not consistent. The first 40,645 tonnes of C11A were processed at a bottom cut off of 2 mm (Phase 3 standard). The remaining 27,722 tonnes were processed at an amended bottom cut off of 1.4 mm, which was changed back to 2 mm after completion of C11A*

*[6] Hard kimberlite bulk samples*

### 14.3.2 Total liberation (microdiamond) results

The results of processing of the two large samples by SGS Lakefield by total liberation laboratory methods (microdiamond analysis) taken from the Mothae kimberlite are summarised in Table 14-7. The two concentrates were stripped off microdiamonds by Mineral Services Laborories.

Due to the small stone populations returned, the microdiamond results were not used by MSC for size-frequency distribution or grade modelling and it was concluded by MSC that microdiamonds are not a practical method for evaluating diamond grade variation with depth within the Mothae kimberlite. Consequently no further microdiamond work was undertaken. However, MSA is of the opinion that total liberation diamond data may be useful (Section 14.3.4).

**Table 14-7**

**Total liberation recoveries from two samples from Mothae, broken down by size fraction**

| Sample number | Residue weight (g) | Screen size (microns) | Carats | Diamonds | % diamonds |
|---|---|---|---|---|---|
| 14/1/3/G2B-MD1 | 77.27 | 106 | 0.0002 | 13 | 48 |
| | | 150 | 0.0002 | 4 | 15 |
| | | 212 | 0.0006 | 4 | 15 |
| | | 300 | 0.0000 | 0 | 0 |
| | | 425 | 0.0017 | 1 | 4 |
| | | 600 | 0.0025 | 1 | 4 |
| | | 850 | 0.0383 | 3 | 11 |
| | | 1180 | 0.0254 | 1 | 4 |
| | | 1700 | 0.0000 | 0 | 0 |
| | | **Total G2B** | **0.0689** | **27** | **100** |
| 14/1/3/C7A-MD2 | 159.21 | 106 | 0.0001 | 8 | 30 |
| | | 150 | 0.0011 | 16 | 59 |
| | | 212 | 0.0012 | 6 | 22 |
| | | 300 | 0.0018 | 4 | 15 |
| | | 425 | 0.0065 | 4 | 15 |
| | | 600 | 0.0000 | 0 | 0 |
| | | 850 | 0.0000 | 0 | 0 |
| | | 1180 | 0.0000 | 0 | 0 |
| | | 1700 | 0.0000 | 0 | 0 |
| | | **Total C7A** | **0.0107** | **38** | **100** |
| | | **Total microdiamond recoveries** | **0.07960** | **65** | **100** |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

### 14.3.3 Assignment of samples to geological domains

Details of all bulk samples are provided in Table 14-6, including the assignment of samples to geological domains for estimation purposes. With the exception of samples C11C and CD1C, excavated to test diamond recovery from deeper, hard kimberlite, all bulk samples were taken from the highly weathered surface zone (upper ±20 m) of the Mothae kimberlite. Thus the sub-surface portions of each of the domains are not represented by direct bulk sampling.

Domain grade estimates and size-frequency distribution analysis are based on data for samples that for the most part satisfy the following criteria:

- Occur within (or largely within) the domain;
- Only comprise weathered kimberlite; and
- Have complete (sieved) DTC size data for the entire diamond parcel.

In total, samples incorporated into the grade and size distribution estimates for individual geological domains comprise ±488,000 t (dry) from a total of ±604,000 t sampled (81% of tonnes), representing 18,408 of 23,446 ct produced (79% of carats). The compiled sample results are summarised by domain in Table 14-8.

**Table 14-8**

**Summary of 20 bulk sample results by geological domain. Only data for samples that could be allocated to each domain are used**

| Geological domain | Included bulk samples | Dry tonnes | Stones | Carats | Avg. stone size (cps) | Sample grade (cpht) |
|---|---|---|---|---|---|---|
| South West | C3A, C4A, C5A, C6A, C6B, C7A, C8A; C11A[1] | 240,332 | 15,210 | 6,541 | 0.43 | 2.7 |
| South Centre | C2C, F1D, F1C, F2A, F3A, G2A, G2B, G3A, CD1B[2] | 223,272 | 24,664 | 11,309 | 0.46 | 5.1 |
| South East | A1A | 4,565 | 372 | 130 | 0.35 | 2.8 |
| North | E2A, E1A | 20,063 | 886 | 429 | 0.48 | 2.1 |
| **Total** | | **488,232** | **41,132** | **18,408** | **0.45** | **3.8** |

**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Note:** *[1] Despite the change in bottom cut-off during processing (see Section 9.6.6), the data for C11A were used as this had a negligible effect on modelled overall size-frequency but improved the statistics for large stone recoveries that were not affected by the processing change*

*[2] Sample CD1B includes an outlier boart stone weighing 254.04 ct that is included in the totals represented in the table but was not used for grade estimation and size distribution analysis*

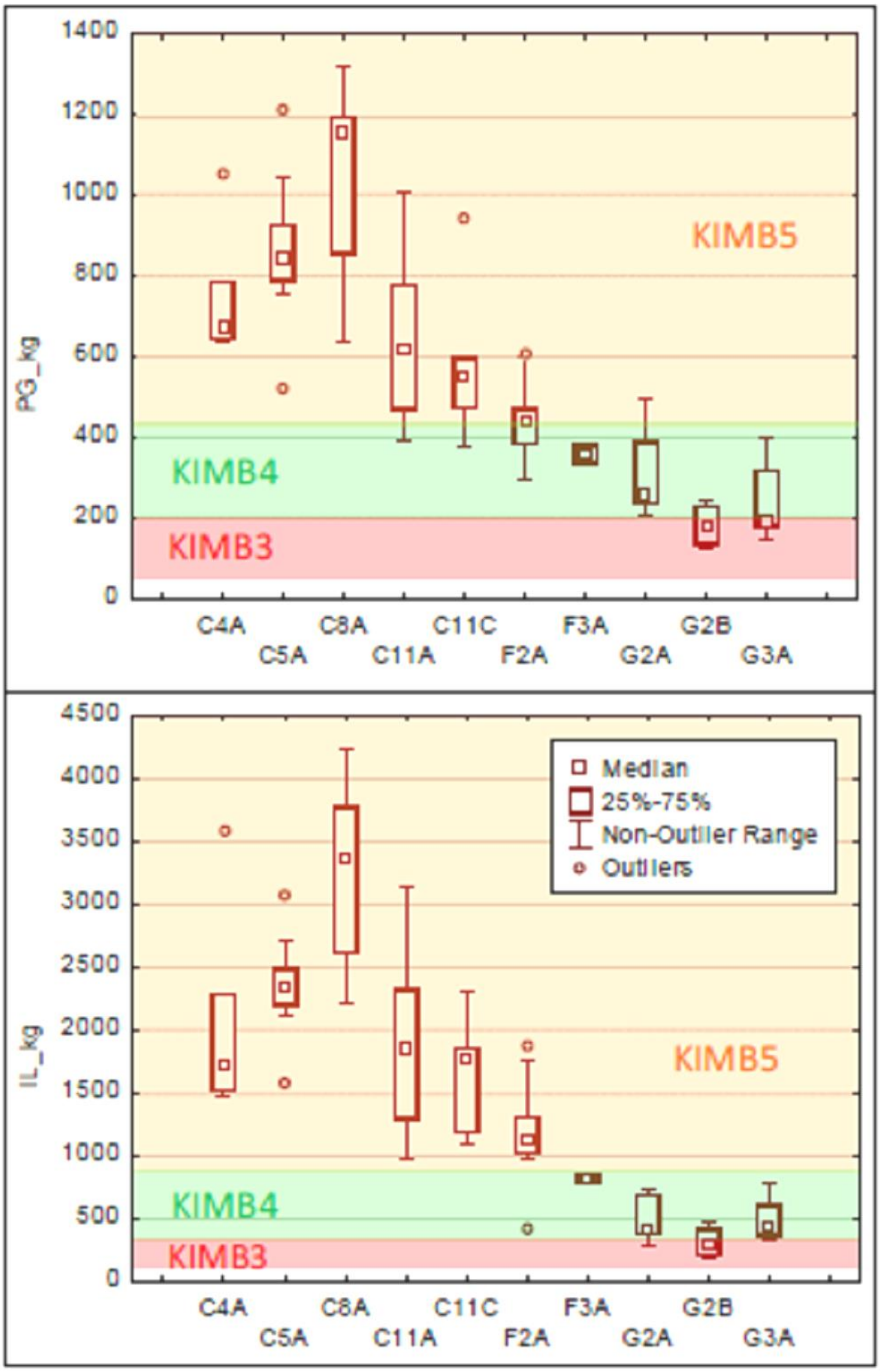
The only data that can be considered to be representative of the South East domain are from the small (4,565 t) A1A sample taken during Phase 1 of the Mothae program. Samples G1 and G1C overlap considerably into the SE domain, but are large samples (significantly larger than A1A) and incorporate only the western-most marginal material from the domain. Thus they are not considered to be representative and cannot be incorporated into the estimate for the South East domain without introducing significant bias. Sample A1A was processed early (Phase 1) in the evaluation programme and incomplete DTC sieve data are available for it. However, it is the only sample that can be considered to represent the South East domain and hence the resultant data have been used for size-frequency distribution (SFD) analysis and grade estimation.

With one exception, all data for the domain-assigned samples were used in the estimation process. The exception to this is a single very large (254.04 ct) boart diamond recovered from sample CD1B (South Centre domain) that was excluded from the sample data used for grade estimation. There are several reasons for this: a) the stone is a statistical outlier; b) including the stone has a disproportionate effect on the estimated average stone size for the +DTC23 size range and the overall proportion by weight of the diamond in the +20 ct range at Mothae and hence leads to overestimation of grades and values modelled on the basis of size distribution; and c) the diamond is not included in the 21,771 ct parcel sold and valued to date and hence its value is not reflected in the estimated average value for +20 ct stones. Excluding the diamond has a negligible effect on grade but a significant effect on average value estimates (see below) and hence for the sake of internal consistency it has been removed altogether.

Headfeed KIM samples were taken during Phase 3 bulk sampling to assess the degree of variability in KIM abundance within and between bulk samples and to confirm appropriate allocation of bulk samples to geological domains. The results are illustrated in Figure 14-19 and support the allocation of samples to the South West and South Centre domains.

**Figure 14-19**

**Box and whisker plots illustrating the range in purple garnet (PG_kg; top) and ilmenite (IL_kg, bottom) counts per kg in headfeed KIM samples from bulk samples of the South West (all C samples) and South Centre (all F and G samples) domains[1]**




**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

**Note:** *[1]Only bulk samples assigned to geological domains and for which at least four headfeed KIM samples were taken are shown. The headfeed data are for the most part consistent with abundances for the relevant kimberlite types as defined from drill core (shaded areas; see Section 14.1.3), with some overlap observed in certain samples that are close to or overlap the boundaries between domains (i.e. F2A and G2B)*

### 14.3.4 Diamond frequency distribution by domain

The SFDs for the four major domains are compared in Table 14-9. The SFD's for the South West and South Centre domains are well constrained (up to stone sizes of approximately 30 ct) due to the large parcels available (6,540 ct and 11,055 ct, respectively). The SFD of the North domain is less well constrained, being represented by a parcel of only 429 ct, and the South East domain is very poorly constrained, with only 130 ct available (Mineral Services, 2013).

For the purpose of SFD modelling, the following adjustments were made by MSC to the original sample data (Mineral Services, 2013):

- The 254.04 ct boart diamond recovered from sample CD1B (South Centre domain) was excluded from grade and SFD analysis
- The fragments of two broken diamonds that were recovered during processing of samples C2C and C9A were treated as single stones of the appropriate reconstituted size, i.e. 44.9 and 82.34 ct, respectively

**Table 14-9**

**Mothae bulk sample diamond recoveries per DTC and carat size classes summarised by geological domain**

| DTC/ct size class | South West | | South Centre | | South East | | North | | Mothae (all)[1] | | Avg. st. size[2] (cps) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | St | Ct | St | Ct | St | Ct | St | Ct | St | Ct | |
| DTC3 | 124 | 5 | 38 | 2 | 10 | 0 | 0 | 0 | 167 | 7 | 0.04 |
| DTC5 | 700 | 48 | 432 | 31 | 50 | 5 | 3 | 0 | 1,179 | 83 | 0.07 |
| DTC6 | 1,757 | 174 | 1,831 | 197 | | | 38 | 4 | 3,887 | 404 | 0.10 |
| DTC7 | 3,480 | 487 | 4,947 | 748 | 89 | 13 | 171 | 27 | 9,393 | 1,386 | 0.15 |
| DTC9 | 4,285 | 942 | 7,955 | 1,868 | 116 | 26 | 304 | 70 | 13,768 | 3,166 | 0.23 |
| DTC11 | 2,204 | 784 | 4,489 | 1,721 | 68 | 31 | 158 | 60 | 7,536 | 2,822 | 0.37 |
| DTC12 | 878 | 465 | 1,716 | 961 | | | 69 | 36 | 2,937 | ,1,614 | 0.55 |
| DTC13 | 846 | 681 | 1,728 | 1,436 | 18 | 17 | 78 | 65 | 2,940 | 2,418 | 0.82 |
| DTC15 | 203 | 225 | 378 | 452 | 11 | 14 | 9 | 10 | 640 | 746 | 1.17 |
| DTC17 | 220 | 321 | 404 | 620 | 4 | 7 | 15 | 22 | 709 | 1,068 | 1.51 |
| DTC19 | 282 | 659 | 491 | 1,186 | 5 | 13 | 26 | 61 | 882 | 2,105 | 2.39 |
| DTC21 | 166 | 769 | 188 | 896 | 1 | 4 | 14 | 61 | 413 | 1,947 | 4.71 |
| 8-10ct | 21 | 182 | 26 | 229 | 0 | 0 | 0 | 0 | 53 | 463 | 8.74 |
| 10-15ct | 23 | 260 | 25 | 297 | 0 | 0 | 1 | 12 | 55 | 645 | 11.72 |
| 15-20ct | 11 | 191 | 5 | 93 | 0 | 0 | 0 | 0 | 18 | 321 | 17.83 |
| 20-30ct | 5 | 115 | 6 | 142 | 0 | 0 | 0 | 0 | 12 | 278 | 23.18 |
| 30-45ct | 2 | 69 | 5 | 177 | 0 | 0 | 0 | 0 | 7 | 246 | 36.54 |
| 45-60ct | 3 | 163 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 163 | 51.45 |
| 60-100ct | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 82 | 77.25 |
| 100-200ct | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 144.35 |
| +200ct | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 244.35 |
| **Total** | **15,210** | **6,540** | **24,664** | **11,055** | **372** | **130** | **886** | **429** | **44,600** | **19,965** | **0.45** |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *[1] Data shown represent all Mothae samples for which reliable DTC size data are available. Includes certain mixed samples that were not included in the domain resource estimates*

*[2] Average stone sizes used for all SFD analyses*

The following analysis of diamond size frequency distribution ("SFD") was undertaken by MSA.

From the graphs shown in Figure 14-20 it was concluded that the order of coarseness ranks from South West to North, followed by South Centre and South East. North domain sampling consists of only approximately 20,000 tonnes of material but it does appear to have a slightly coarser size distribution than South Centre and South East. South West domain diamonds are clearly coarser than diamonds from elsewhere in the pipe.

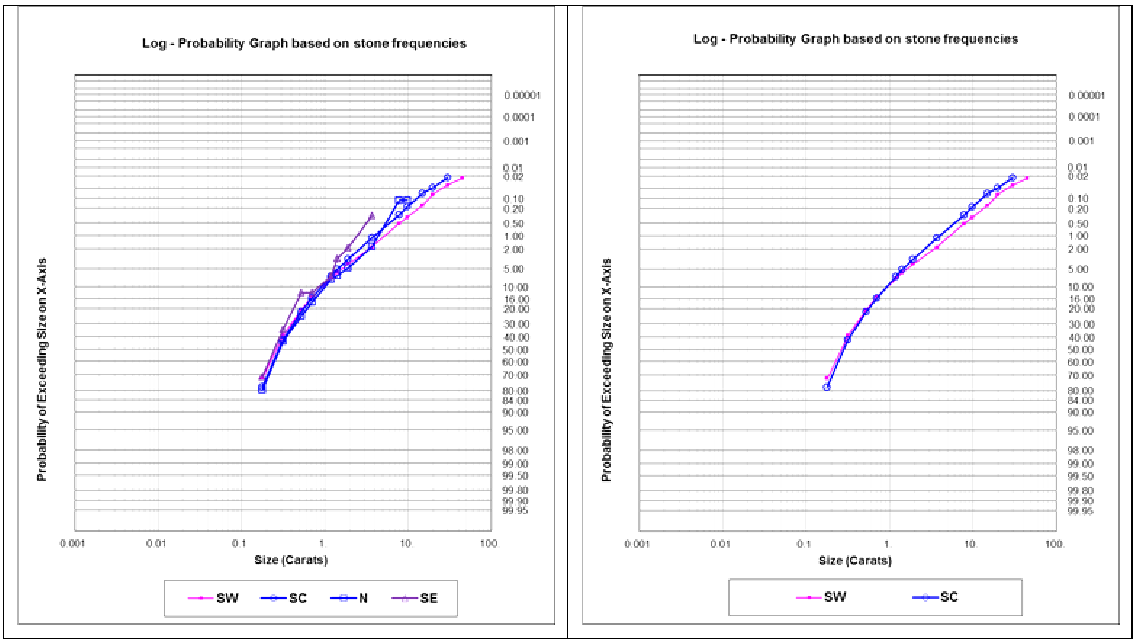
South East domain is represented by less than 5,000 tonnes and the 130 carats recovered does not allow for high confidence in the size distribution. It appears as if diamond size in this domain might be less coarse than elsewhere in the pipe, but in MSA's view, the data justifies a size model identical to the model for South Centre.

With the small number of microdiamonds available, the main source of information on diamond size was drawn from bulk sample macrodiamond recoveries. Therefore the sample grades shown in Table 14-9 largely determined the grades used for the Diamond Resource estimate. In the case of South West and South Centre domains, the respective microdiamonds were used to assist with grade estimates based on the microdiamond sample stone counts. In the case of South East and North domains, the South West microdiamonds were used, as their average bulk sample grades are similar.

Each size distribution model was authenticated by means of simulation of a large typical diamond parcel, which was based on a size model derived from bulk sample sieving. As an approximation of diamond concentration, the average sample stone frequency derived from microdiamond sampling was used. Diamond content for the typical parcel was compared with diamond content for the respective sample parcels. Each comparison comprised of a cumulative size- and grade-size distribution.

**Figure 14-20**

**Cumulative size frequency plots for macrodiamonds recovered from bulk samples (based on stone counts) for the four main geological domains**




***Source:*** *Lynn and Ferreira, 2013*

***Note:*** *SW – South West; SC – South Central; N- North; and SE- South East*

*The graph on the left shows recovery above +7 diamond sieve per domain, for all domains. The graph on the right shows recovery for SW and SC, indicating the coarser size distribution for SW. All the plots are for recovery above +7 diamond sieve to eliminate any inconsistencies that may have derived from changes to bottom screen size during sampling*

### *14.3.4.1 South West domain*

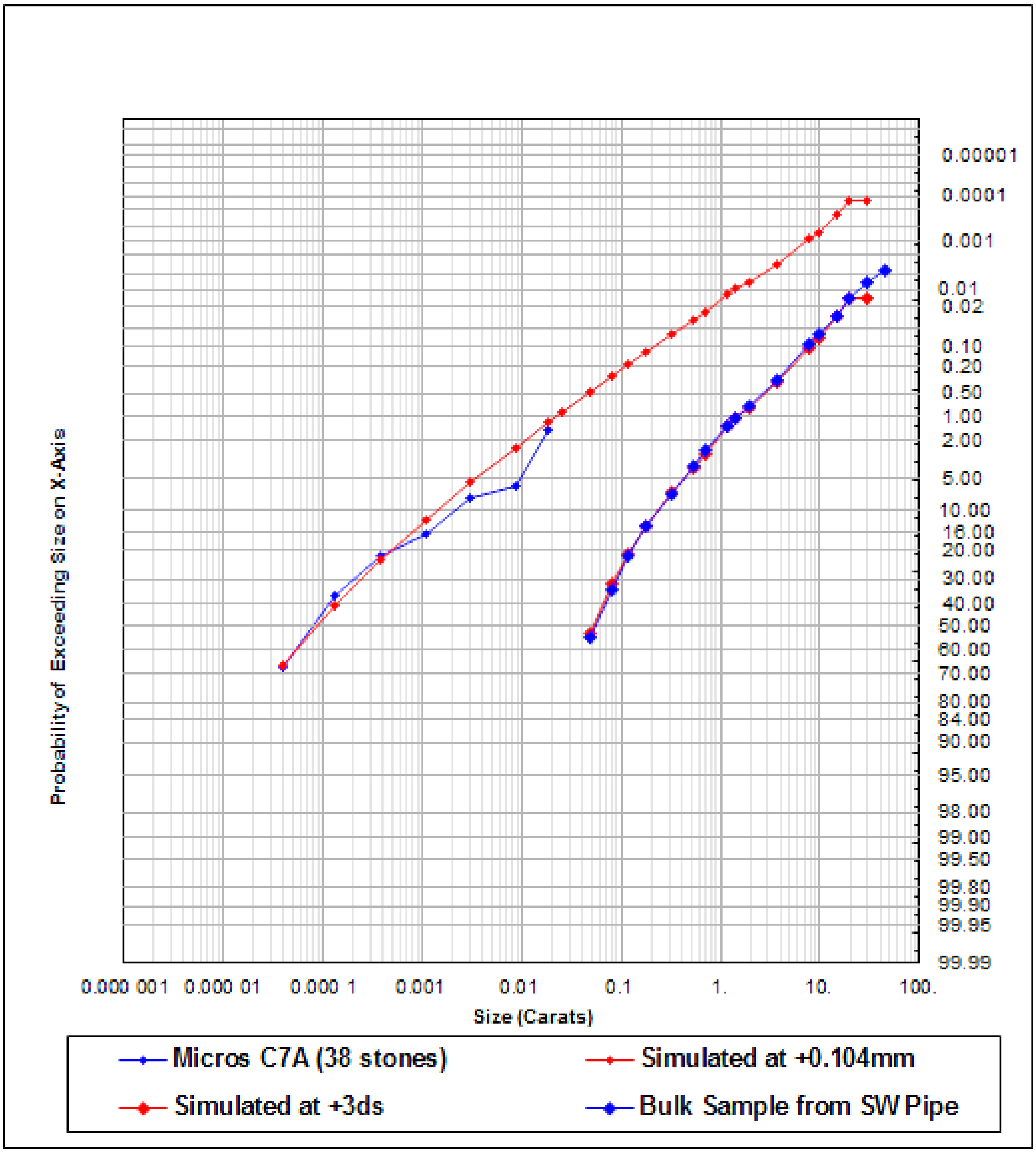
Average diamond concentration in the combined microdiamond sample was calculated at 73 stones per 1,000 kg at +0.106 mm recovery. The South West domain yielded 27 stones from 463 kg at an average concentration of 58 stones per tonne and the 429 kg sample from South Centre yielded 38 diamonds at an average of 89 stones per tonne. Bulk sample average grades amount to 2.7 cpht and 4.9 cpht for South West and South Centre respectively, which corresponds with the order of magnitude suggested by the associated microdiamond stone counts.

Observed microdiamond stone counts (diamond concentration) were subsequently combined with the size distribution model to simulate a typical parcel to be expected from South West domain. The typical parcel reflects South West diamond content, both with respect to size and concentration (Figure 14-21). A grade-size curve based on the typical parcel should therefore be expected to correspond closely with the grade-size curve based on sampling from South West.

Figure 14-22 shows a comparison of sampled and simulated size distributions on the left and the resulting grade size curves on the right. The size distribution model reflects the diamond distribution as suggested by sampling. On the right of Figure 14-22, the red and blue points represent micro- and macrodiamond sampling size class grades. The red curve represents the simulated typical parcel and its diamond content is based on the size model and the microdiamond average concentration (stone grade). The red typical parcel curve clearly overstates diamond content obtained from bulk sample macrodiamonds as reflected by the blue curve.

**Figure 14-21**

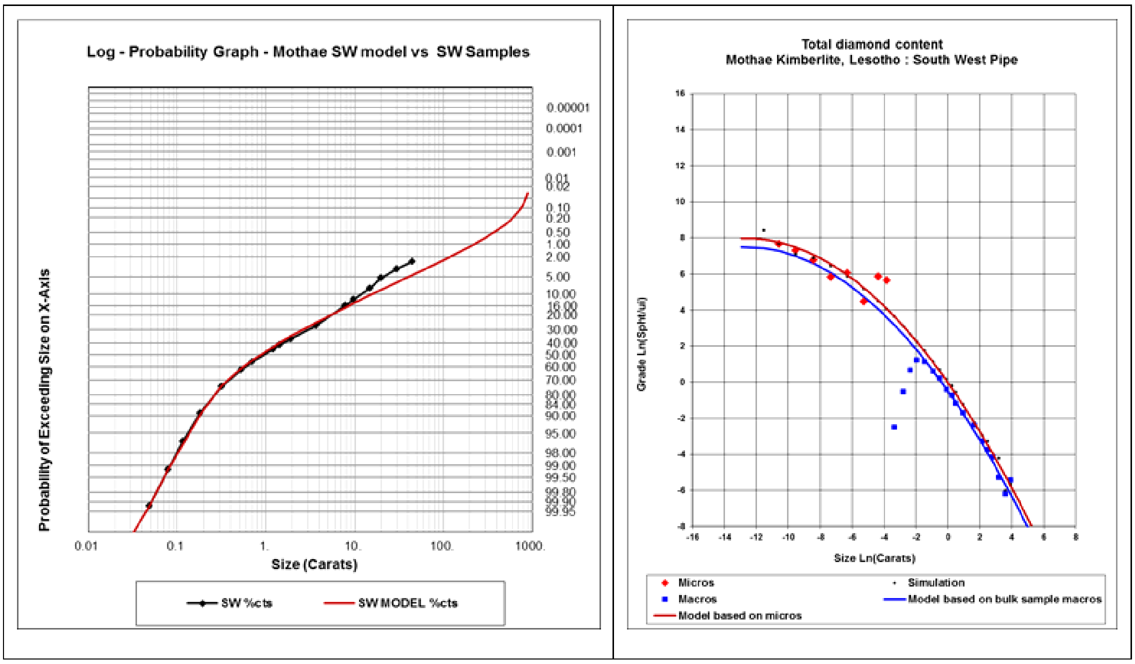
**South West domain cumulative size frequency plots for macrodiamonds recovered from bulk samples and microdiamonds**




***Source:*** *Lynn and Ferreira, 2013*

***Note:*** *The red curve on the left represents the mathematically simulated size distribution for +0.104mm microdiamonds. Despite there being only 27 microdiamonds recovered from sampling, there is good correspondence between the model and actual microdiamond size distribution. The red and blue lines on the right represent bulk sampling and a mathematically simulated parcel at +3 diamond sieve. The bulk sample graph includes an adjustment for normal recovery losses in the bottom size classes*

**Figure 14-22**
**South West domain grade-size model with sampling results**




**Source:** *Lynn and Ferreira, 2013*
**Note:** *Comparison of sampled and modelled size distributions on the left graph with the resulting grade size curves on the right graph. The size distribution model clearly reflects the diamond distribution as suggested by bulk sampling. In the figure on the right the red and blue points represent micro- and macrodiamond sampling size class grades respectively*

The higher microdiamond concentration is due to the small sample and the obvious high level of variation to be expected in a small sample from a low grade deposit. The blue sample points represent actual bulk sample recovery and depict screening losses during sample treatment in the bottom size classes. The blue curve represents total diamond content based on bulk sample recoveries.

It is concluded that microdiamonds may be used to estimate grade in the deeper levels of the pipe, if required. Low stone counts will be obtained, but the idea would be to model diamond concentration and to rely on the size distribution models obtained from the large bulk samples. By systematically comparing microdiamond recoveries MSA considers it will be possible to observe changes in size distribution with depth if these occur.

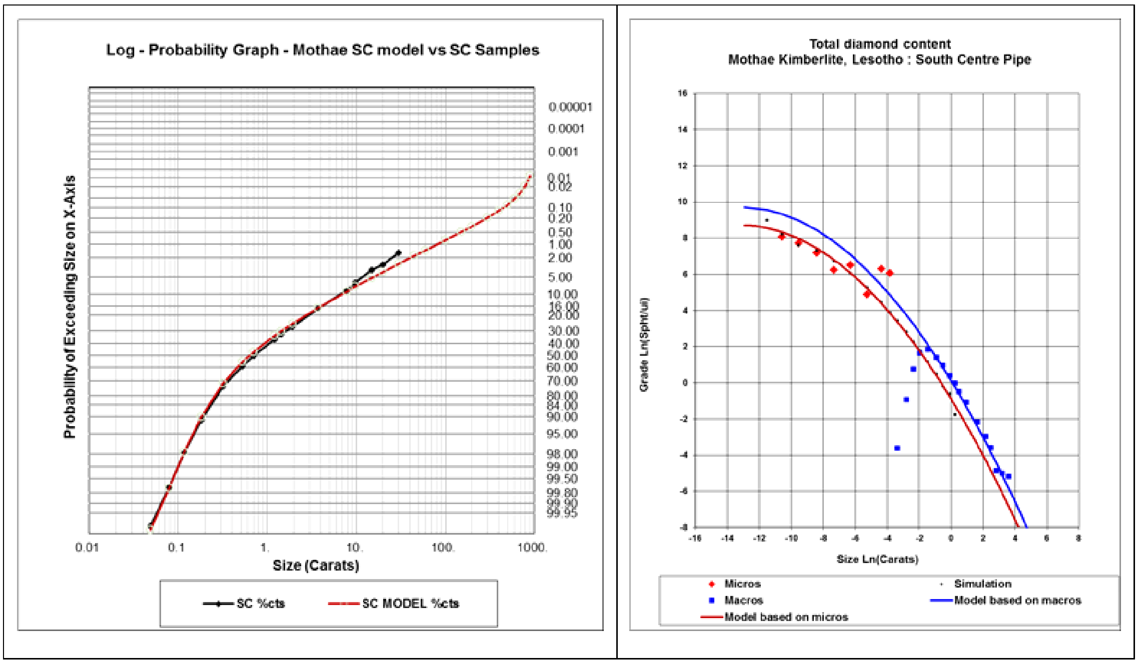
Using modifying factors to take account of bottom screen losses from total diamond content, a grade of 2.9 cpht was modelled for the South West domain. This grade is highly dependent on the modifying factors applied. Modifying factors were estimated at 0.6, 0.2, 0.05, 0.004 and 0.0001 respectively for size classes +7, +6, +5, +3 and -3. These factors are associated with the recovery efficiency of the facility used to treat bulk sample material at the time these samples were treated.

### *14.3.4.2 South Centre domain*

The same analysis as for South West domain was repeated by MSA for South Centre domain, using microdiamond concentration of 89 stones/tonne and South Centre bulk sampling recoveries. The simulated diamond size and grade curves are shown in Figure 14-23.

**Figure 14-23**

**South Centre domain grade-size model with sampling results**




***Source:*** *Lynn and Ferreira, 2013*

***Note:*** *Microdiamond stone counts under-estimated diamond concentration in the bulk sample. Having been collected from the bulk sample it is reasonable to assume that microdiamond sampling was therefore not fully representative of bulk sample material*

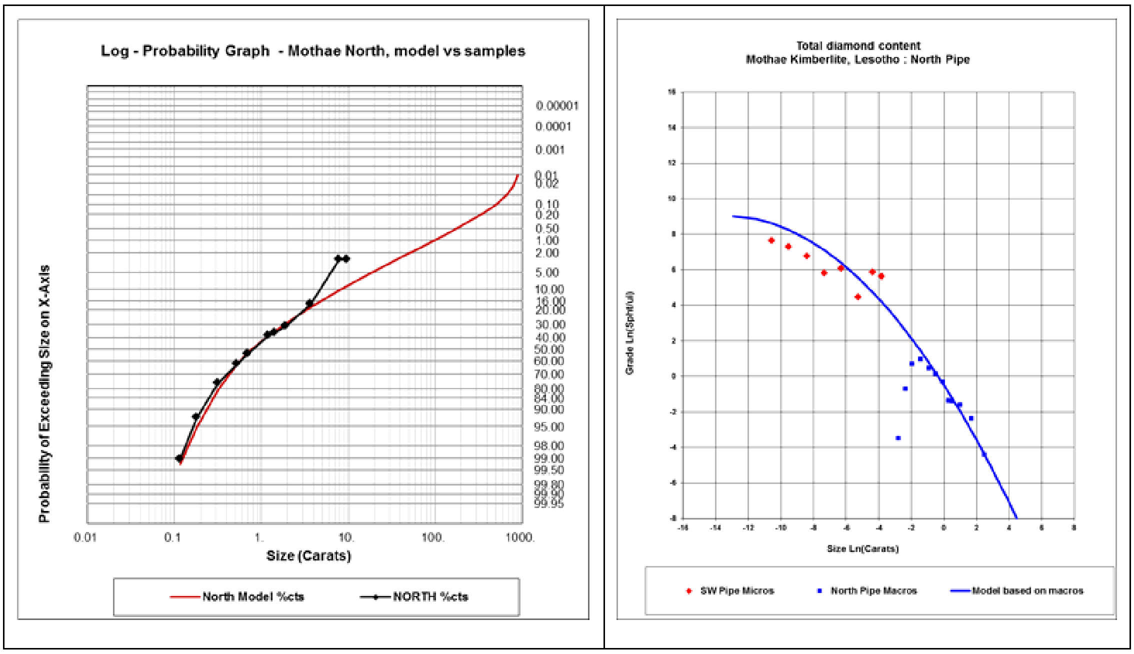
For South Centre domain the grade estimate based on bulk sampling amounts to 4.8 cpht at +7 diamond sieve recovery. A slightly different set of modifying factors of 0.80, 0.40, 0.10, 0.01, 0.0004 and 0.0001 for size classes +9, +7, +6, +5, +3 and -3 was derived from the data.

### *14.3.4.3 North domain*

Diamond content for North domain was modelled on the basis of its macrodiamonds only (Figure 14-24). For comparison, the microdiamonds from South West domain were included in the graphs, as material from North, South West and South East domains showed comparable bulk sample grades (Table 14-8).

**Figure 14-24**

**North domain grade-size model with sampling results. Microdiamond stone counts from South West domain are shown with the North bulk sample results for comparison**




***Source:*** *Lynn and Ferreira, 2013*

The grade for North domain was modelled at 2.4 cpht for diamond recovery at +7 diamond sieve. Diamond size distribution for North domain is fractionally coarser than the distribution models for South Centre and South East domains.

Modifying recovery factors were calculated at 0.6, 0.2, 0.035, 0.0015 and 0 for sieves +9, +7, +6, +5 and -5 diamond sieve.

### *14.3.4.4 South East domain*

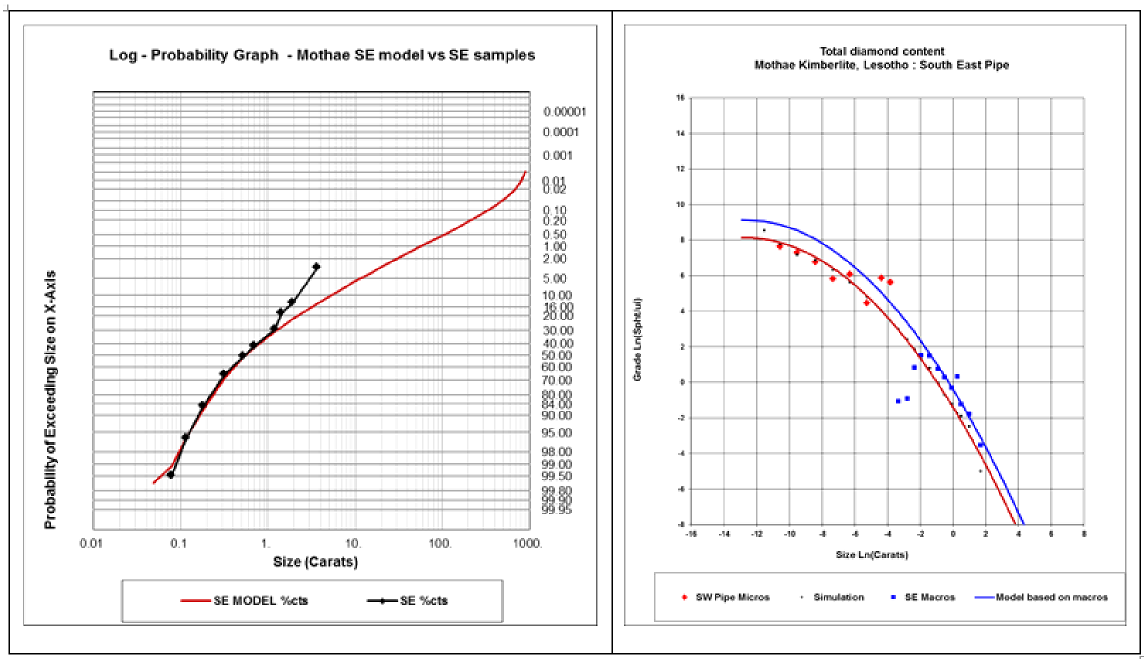
Without microdiamonds from this unit the procedure for South East domain was similar to that followed for North domain (Figure 14-25).

Bulk sampling from South East domain amounted to only 130 carats recovered from 4,565 tonnes of material. Sieving results shown in Table 14-9 indicate empty +6 and +12 diamond size classes and stones in the +5 and +11 size classes were redistributed into +5,+6 and +11, +12 size classes in the ratios observed in the fully populated samples from the other domains for the purposes of modelling the SFD. This had no effect on diamond grade, but by conforming to the sieving breakdown used for the other samples the data was in a more consistent format. It was accepted that these classes were empty because of sieving.

The grade for the South East domain was modelled at 2.9 cpht with modifying factors derived from the data at 0.80, 0.40, 0.15, 0.02 and 0.008 for +9, +7, +6, +5 and +3 diamond sieves.

**Figure 14-25**

**South East domain grade-size model with sampling results. Microdiamond stone counts from South West domain are shown with the North bulk sample results for comparison**




***Source:*** *Lynn and Ferreira, 2013*

### 14.3.5 Summary of grade estimation (weathered kimberlite)

The results of grade modelling for the weathered kimberlite are summarised in Table 14-10. The grade estimation has not followed the normal methodology which would include the use of total liberation (microdiamond) analysis using large numbers of microdiamonds. In the case of Mothae, microdiamond data is sparse. However, large numbers of macrodiamonds are available from upper elevations in the pipe. The connection between micro- and macrodiamonds has been demonstrated, suggesting that it will be possible to achieve higher levels of confidence by means of total liberation sampling from deeper levels in the body, if required.

It was observed that diamond size models for SC and SE are identical, with the North Pipe fractionally coarser.

**Table 14-10**

**Summary of modelled grade estimates for weathered kimberlite. Modelled grades are based on the modifying factors shown in the table**

| Pipe Domain | | South West | South Centre | South East | North |
|---|---|---|---|---|---|
| Sample tonnes | | 240,332 | 223,272 | 4,565 | 20,063 |
| Sample carats | | 6,540 | 11,056 | 130 | 428 |
| Sample cpht | | 2.72 | 4.95 | 2.85 | 2.13 |
| Modelled cpht | | 2.9 | 4.8 | 2.9 | 2.4 |
| Modifying factors - from total to sample recovery | DTC+9 | 1 | 0.700 | 0.80 | 0.600 |
| | DTC+7 | 0.60 | 0.270 | 0.40 | 0.200 |
| | DTC+6 | 0.20 | 0.045 | 0.15 | 0.035 |
| | DTC+5 | 0.05 | 0.015 | 0.02 | 0.0015 |
| | DTC+3 | 0.004 | 0.001 | 0.008 | 0.000 |
| | DTC-3 | 0.0001 | 0.0001 | 0.0001 | 0.000 |

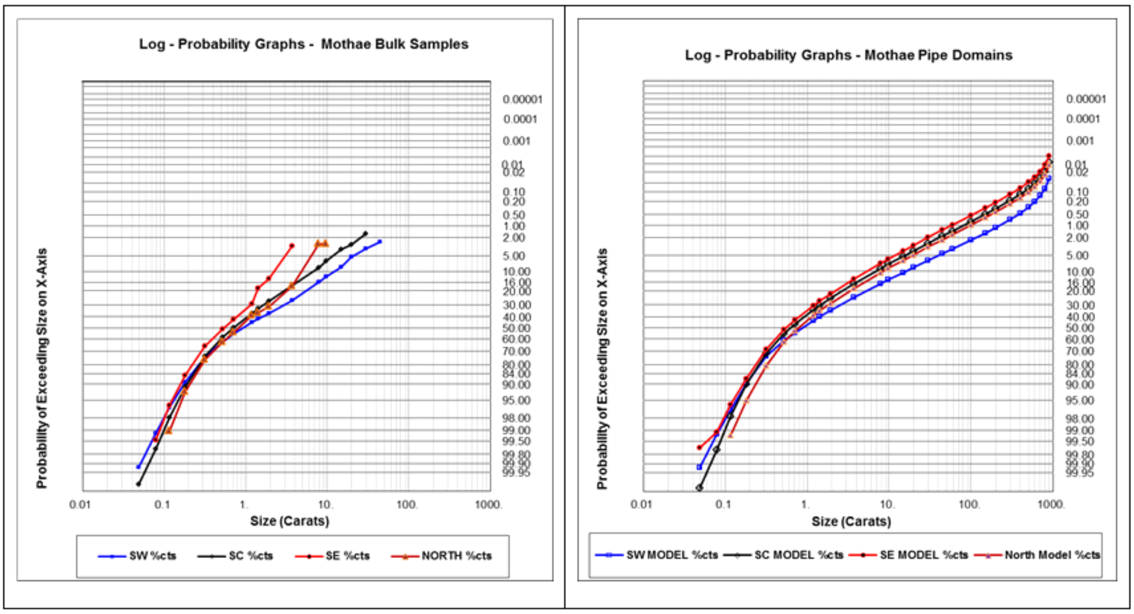
***Source:*** *Lynn and Ferreira, 2013*

Different sets of modifying factors were calculated on the basis of recovery profiles reflected by bulk sampling. Profiles differed because of different liberation properties of the material treated, or because of changes made to processing parameters. It is possible that one or two sets of factors may be used for mine planning purposes, depending on the hardness of the kimberlite. However, these may differ from the factors observed during sample treatment. Recovery factors for a mine plant would need to be established. The low grades require a high degree of accuracy with respect to diamond content and revenue estimation.

A comparison of the sampling and modelled size frequency distributions for the four domains is shown in Figure 14-26.

**Figure 14-26**

**Comparison of sampling and modelled diamond size frequency distributions for the 4 domains**




***Source:*** *Lynn and Ferreira, 2013*

***Note:*** *Size distribution models for South Centre and South East are identical, North domain is slightly coarser followed by South West, which seems to contain the coarser diamond assortment*

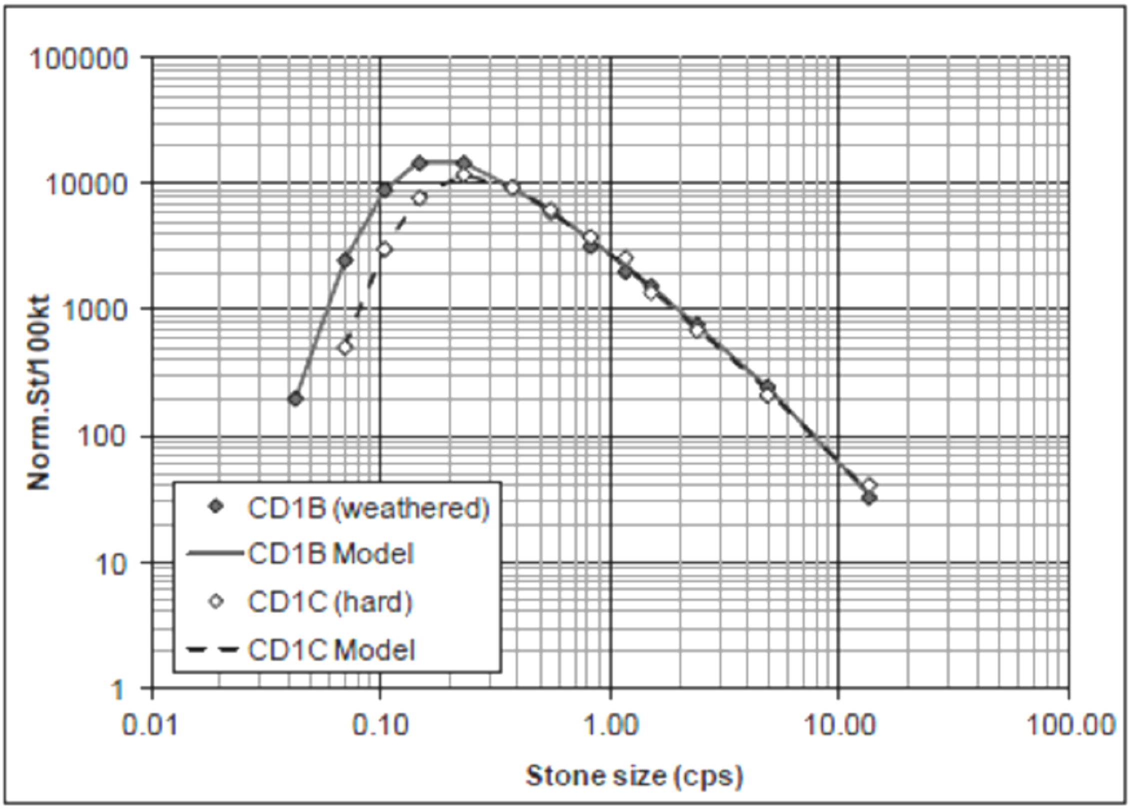
### 14.3.6 Modifying factors (weathered and fresh kimberlite)

Modifying factors are applied to grade models on the basis that not all diamonds are likely to be recovered from the kimberlite during processing. The models shown above have modifying factors applied on the basis of the current bulk sampling plant at Mothae, and the observation that diamonds that would report to the smallest sieve sizes were not all recovered. Losses occur because of diamond lockup, as well as bottom screening. Diamond lockup is more inclined to occur in hard kimberlite and affects mainly small stones. Screening losses occur regardless of the nature of material treated. Separate modifying factors for lower screen losses need to be specified for softer weathered kimberlite and hard fresh kimberlite.

In the MSC Diamond Resource estimation, hard rock recovery factors were calculated relative to weathered rock recovery, making use of samples that were collected for this purpose. Samples CD1B for weathered and CD1C for hard rock from South Centre domain were used (Figure 14-27). This is a reasonable approach assuming that bulk sampling reflects liberation as is expected mostly from weathered material, and that factorisation would be required to modify the diamond size distribution for hard rock recovery.

**Figure 14-27**

**Log stone frequency plot comparing the size distribution characteristics of diamond parcels recovered from CD1B and CD1C**




**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
**Note:** *The models that were fitted to the sample data and used as a basis for determining recovery factors for hard kimberlite are shown*

However, in MSA's approach, modifying factors in the review provide adjustment from total diamond content to recoverable diamond content and are applied for soft and hard kimberlite. The modifying factors are shown in Table 14-11 and represent modification of total diamond content to reflect recoverable diamond content for the different rock types.

Calculations were carried out as follows:

1. Compare +11 recovery diamond sample grades for CD1B (weathered) and CD1C (fresh)
2. Adjust all classes in the ratio of sample CD1C (3.7 cpht +11) to sample CD1B (4.1 cpht +11). This produces a CD1C sample grade of 5.2 cpht compared with CD1B grade of 5.6 cpht (+3)
3. Factor CD1C carats so that it has the same +11 carat total as CD1B (2,172 ct)
4. Apply the same factor to all other class carats for CD1C. The total factorised carats in CD1B becomes 2,938 ct and in for CD1B it becomes 2,758 ct and the class factor from soft to hard rock is given by carat ratios of CD1C to CD1B
5. The DTC+11 total diamond content from South Centre domain size model is 33.6% of total. This proportion is set to equal the +11 carat total of 2,172 ct for CD1B (and CD1C after adjustment). This was used with the total content class percentages to calculate total content class carats. The total is 6,467 ct, representing theoretical total content carats in 52,559 tonnes

6. The ratio of CD1B class carats to class total content provides the soft rock recovery factors, and the ratios of adjusted CD1C class carats to class total content carats gives hard rock recovery factors
7. The overall factor for soft rock is 0.45 and for hard rock is 0.43

**Table 14-11**
**Summary of modelled grade estimates for weathered kimberlite. Modelled grades are based on the modifying factors shown in the table**

| DTC Sieve class | Modifying factors | |
|---|---|---|
| | Soft (weathered) Rock | Hard (fresh) Rock |
| DTC11+ | 1.000 | 1.000 |
| DTC9 | 0.658 | 0.606 |
| DTC7 | 0.359 | 0.230 |
| DTC6 | 0.147 | 0.057 |
| DTC5 | 0.025 | 0.005 |
| DTC3 | 0.0014 | 0.000 |
| DTC2 | 0.000 | 0.000 |
| **Totals** | **0.45** | **0.43** |

***Source:*** *Lynn and Ferreira, 2013*

## 14.4 Diamond Revenue Estimation

Average size class values for diamonds from the large bulk samples (21,766 carats) were used to calculate the average diamond value for the four domains and for hard and weathered rock. Average diamond values (USD per carat) for each of the geological domains have been estimated by integrating diamond value data, derived from the sale of Mothae diamonds, with the size distribution estimates for each domain.

### 14.4.1 Diamond value data

Mothae diamonds have been sold on four separate occasions (March and December 2011, September 2012 and February 2013) providing an indication of the market value of the diamonds at the time of sale. The diamond sales were run by AGM Diamond Expertise HK Ltd ("AGM") who also processed and analysed the resultant data to provide key value information relevant to the Mothae Diamond Resource estimate (AGM, 2012).

The total parcel weight sold, the bulk samples from which the parcel was derived and the average diamond value realised for each of the four Mothae diamond sales are shown in Table 14-12. In 2012 AGM combined the data for the first three sales to provide an overall estimate of the average value per size class for the Mothae parcels, adjusted to market conditions at the time of the September 2012 sale. The estimates are based on the average of the first and second highest bids for each of the lots sold and hence are considered to be relatively conservative (they do not reflect the actual value realised). In addition to average values for each of the size ranges, AGM also provided estimates of the values of all individual stones larger than 10 ct, again based on the average of the first and second highest bids for the individual stones or the lots in which they were sold, adjusted to September 2012 prices.

**Table 14-12**

**Summary of the four Mothae diamond sales held to date, including 29 bulk samples that contributed to the parcels, total carats and average realised value**

| Sale | Date | Samples included | Total carats[1] | Carats sold | Average value (USD/ct) |
|---|---|---|---|---|---|
| Mothae001 | March 2011 | A1A, C1A, C2A, C2B, C3A, C4A, C5A, C6A, C8A, C9A, E1A, F1, F1C, G1, G1C | 9,381 | 9,381 | 872 |
| Mothae002 | December 2011 | C7A, F2A, G2A, G2B, G3A | 7,190 | 7,190 | 893 |
| Mothae003 | September 2012 | C6B, C11A, C11C, CD1B, E2A, F3A | 5,196 | 4,657 | 324 |
| Mothae004 | February 2013 | CD1C, C2C, F1D | 2,102[2] | 2,102 | 437 |
| **Total** | | | | **23,330** | **730** |

**Source:** *AGM, 2012 and GTC, 2017*

**Note:** *[1] The total carats available for sale differ slightly from the sample recovery totals recorded in Table 14-6 due to minor losses during acidisation and preparation of parcels for sale*

*[2] Includes diamonds from Mothae003 not sold in September 2012*

*Only the first three sales were included in the SFD and value modelling for the Diamond Resource estimate*

In order to allow for direct application of the diamond value breakdown to SFD data for each of the Mothae geological domains, the grainer and carat size ranges were allocated to DTC sieves (Table 14-13) and the diamond value recalculated accordingly. The final breakdown of values by DTC sieve class is provided in Table 14-13. The data for individual stones were used to subdivide the +DTC23 range into three size classes, 8 ct – 10 ct, 10 ct – 20 ct and 20 ct – 60 ct.

The Mothae diamonds were not sold separately by domain, and estimates of diamond value by size class are therefore made on a global basis. Based on assessments by AGM, there is general consistency between sales parcels in the make-up of diamonds in size ranges below approximately 5 ct. Similarly, there appears to be broad consistency in terms of the distribution of very high value diamonds. Of fourteen diamonds with adjusted values exceeding USD 5,000 per carat (Table 14-14), seven were derived from the South Centre domain, six from the South West domain and one from a mixed sample that transects the boundary between these two domains. These observations support the use of global average values per size class for all Mothae geological domains.

**Table 14-13**

**Value estimates per size class provided by AGM (average of the first and second highest bids for the three Mothae diamond sales adjusted to the September 2012 price book)**

| Valuation Size Class | DTC Equivalent[1] | Weight (ct) | USD/ct |
|---|---|---|---|
| +3 | +3 | 3 | 43 |
| +5 | +5 | 542 | 50 |
| +7 | +7 | 1,510 | 49 |
| +9 | +9 | 3,602 | 56 |
| +11 | +11 | 4,676 | 88 |
| 3gr | +13 | 1,605 | 106 |
| 4gr | +13 | 1,356 | 120 |
| 5gr | +15 | 707 | 171 |
| 6gr | +17 | 1,047 | 208 |
| 8gr | +19 | 1,171 | 268 |

| Valuation Size Class | DTC Equivalent[1] | Weight (ct) | USD/ct |
|---|---|---|---|
| 10gr | +19 | 354 | 473 |
| 3ct | +19 | 913 | 608 |
| 4ct | +21 | 762 | 654 |
| 5ct | +21 | 379 | 1,094 |
| 6ct | +21 | 442 | 1,241 |
| 7ct | +21 | 413 | 923 |
| 8ct | +23 | 282 | 1,068 |
| 9ct | +23 | 232 | 2,830 |
| 10ct | +23 | 185 | 1,521 |
| +10.8ct | +23 | 776 | 3,359 |
| +19.8ct | +23 | 807 | 7,196 |
| **Total/Average** | | **21,766** | **639** |

**Note:** *[1] The "DTC equivalent" column indicates the DTC size class to which the value data were assigned for value modelling*

**Table 14-14**

**List of Mothae diamonds with adjusted values (average of first and second highest bids, adjusted to September 2012 price book) exceeding USD 5,000 per carat**

| USD/ct | Weight (ct) | Value | Bulk sample |
|---|---|---|---|
| 41,869 | 28.89 | 1,209,585 | G2B |
| 40,947 | 13.87 | 567,939 | C9A |
| 31,091 | 56.51 | 1,756,960 | C7A |
| 23,171 | 20.11 | 465,967 | C5A |
| 23,050 | 24.57 | 566,343 | F1C |
| 21,750 | 11.76 | 255,780 | C8A |
| 18,872 | 11.87 | 224,011 | C8A |
| 16,876 | 19.20 | 324,014 | F2A |
| 15,102 | 17.63 | 266,244 | C8A |
| 12,636 | 29.90 | 377,819 | F2A |
| 9,225 | 37.26 | 343,709 | C4A |
| 8,380 | 18.05 | 151,266 | F3A |
| 5,699 | 11.35 | 64,680 | F2A |
| 5,482 | 10.61 | 58,165 | F2A |

***Source:*** *AGM, 2012 in Lynn and Ferreira, 2013*

### 14.4.2 Value modelling

The average value per sieve class has been estimated by MSC (Mineral Services, 2013). MSA has reviewed these estimates and found them to be acceptable.

Due to the large size of the parcel sold from Mothae, average values for size ranges up to 60 ct are considered to be reasonably well supported by the sale data (i.e. 26 stones totalling 807 ct of 20 – 60 ct diamonds sold) and the value estimates obtained directly from the sale data (Table 14-15) are used for estimation of average values per domain. The only modification made was to the average value for the 20 – 60 ct range which was adjusted upwards to account for the known breakage of two very large diamonds in the processing plant: 1) a > 45 ct white Type IIa diamond that was broken into multiple fragments, the largest of which was a 23.4 ct stone that sold for USD 2,786 per carat; and 2) a ±83 ct yellow diamond that was sold in two fragments for between USD 2,000 and USD 3,000 per carat. To account for this, an estimate of the value loss resulting from the breakage (USD 600,000, primarily associated with the breakage of the large Type IIa diamond) was added into the total value for 20 ct – 60 ct diamonds, raising the average value for this size range from USD 7,196 to USD 7,939 per carat.

Other than the above-described correction for value loss due to breakage of reconstituted large diamonds, the potential effect of diamond breakage has not been accounted for in diamond value modelling.

**Table 14-15**
**Estimates of average diamond values (USD per carat) for large stone size classes at Mothae**

| Valuation Size Class | Modelled Average Value (USD/ct) | Basis for estimate |
|---|---|---|
| +200 ct | 18,000 | Modelled value |
| 100-200 ct | 14 500 | Modelled value |
| 60-100 ct | 12,000 | Modelled value |
| 20-60 ct | 7,939 | Sale Data (adjusted for broken stones) |
| 10-20 ct | 3,005 | Sale Data |
| 8-10 ct | 1,865 | Sale Data |
| +21 ct | 923 | Sale Data |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

Due to the lack of data for diamonds larger than 60 ct, average values for these very large diamonds were derived based on simple conceptual modelling. There are very few constraints on the average values for very large stones from Mothae but the following factors were taken into consideration in estimating possible value ranges: a) The value of the largest diamonds (> 45 ct) sold from Mothae (4 stones; adjusted average value of USD 10,788 per carat; value of largest stone = USD 31,091 per carat); b) Limited published sale prices for very large stones sold by Letseng; and c) Estimations of the proportion of high value gem stones amongst the very large diamonds recovered from Mothae. Final estimates of average diamond values for the +8 ct size classes are provided in Table 14-15, including conceptual modelled estimates for 60 ct – 100 ct, 100 ct – 200 ct and +200 ct diamonds. These values, together with average values for smaller size classes based on the sale data (Table 14-13) represent what is considered to be a moderately conservative base-case model for the value distribution of Mothae diamonds.

### 14.4.3 Average value estimates

The average value estimates provided by AGM and Mineral Services (2013) in Table 14-13 and Table 14-15 were applied to the modelled SFD (Figure 14-26) and to the recovery factors (Table 14-11) estimated by MSA to provide estimates of the average diamond value for weathered and hard kimberlite in each of the Mothae geological domains (Table 14-16).

**Table 14-16**

**Estimates of average diamond values (USD per carat) for different geological domains at Mothae**

| Geological Domain | Average Value (USD/ct) | |
|---|---|---|
| | Weathered (soft) kimberlite | Fresh (hard) kimberlite |
| South West | 1,310 | 1,364 |
| South Centre | 695 | 737 |
| South East | 578 | 615 |
| North | 737 | 780 |

***Source:*** *Lynn and Ferreira, 2013*

The average USD/ct figures estimated by MSA in Table 14-16 are slightly higher to those estimated by MSC. This is because MSA modelled a slightly coarser SFD than MSC, based on the observed data.

## 14.5 Resource Classification and Summary

### 14.5.1 Assessment of uncertainty

MSC assessed the uncertainty related to each of the components of the resource estimate. The assessment with respect to tonnage, SFD, and grade is presented below (Mineral Services, 2013). The assessment of value uncertainty has been carried out by MSA.

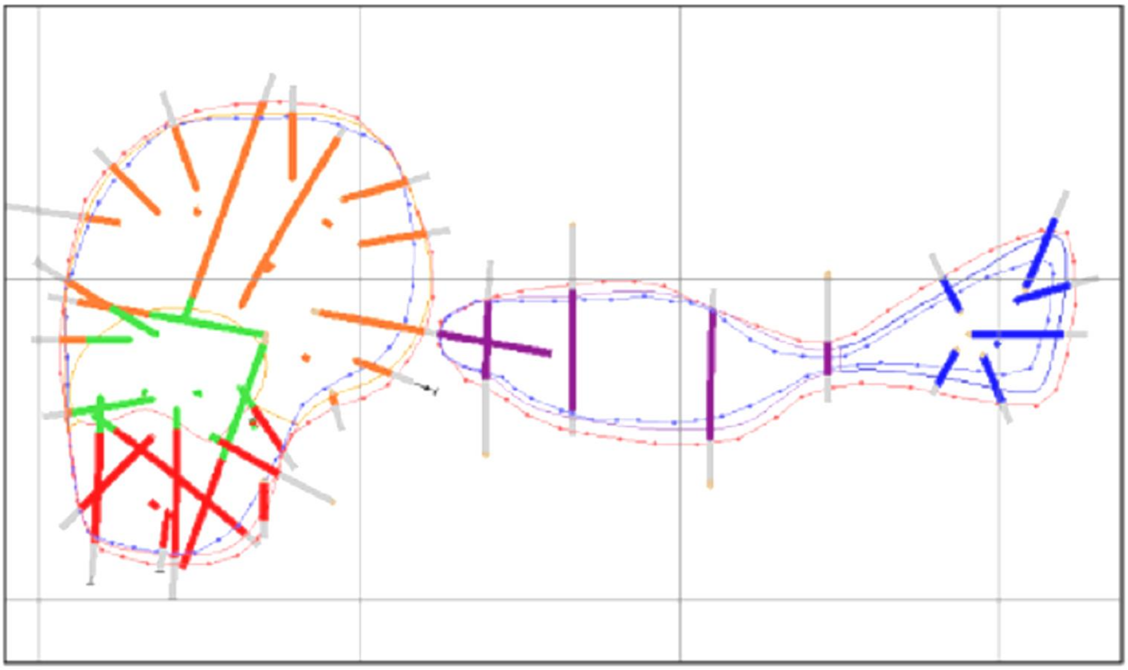
The assessment of uncertainty is not intended to be quantitative, or to account for all sources of risk, but provides an indication of the sensitivity of the Resource estimate to justifiable possible variations in key parameters and informs classification of the confidence level of each component of the estimate. Confidence levels for each component of the Resource estimate are assessed for each of the individual resource domains and resource classification is based on JORC 2012 guidelines for reporting of resources and reserves.

#### *14.5.1.1 Tonnage*

Due to the very large, spatially representative bulk density dataset and the relatively homogeneous geology within each resource domain, the average bulk density for each domain is considered to be constrained to better than ± 5%. Therefore most of the uncertainty in tonnage estimates is related to uncertainty in pipe or domain volume. To gauge the uncertainty associated with the interpretation of the pipe outline at any given depth level based on known locations of the pipe margin from drill hole intersections or surface exposure, low- and high-case pipe outline models were fitted to data pertaining to four different levels in the Mothae pipe model (e.g. Figure 14-28). Differences between these and the base-case (best fit) model are summarised in Table 14-17. Confidence levels in resource tonnes are highest near surface in the South Lobe and decrease with depth in the South Lobe and in the North and Neck domains. The overall volume of near-surface material in the South Lobe is estimated at a very high level of confidence. However due to the complex, gradational nature of the internal boundaries between individual geological domains, confidence in tonnage estimates for individual resource domains is lower and hence an "Inferred" level of confidence has been applied.

**Figure 14-28**

**Rotated plan view (north to the right) of the 2,900 mamsl level showing alternative models of the Mothae pipe outline in relation to the base-case pipe outline**



***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

***Note:*** *Solid lines, coloured by geological domain; South West = orange, South Centre = green, South East = red, Neck = purple, North is to the right. Grid blocks are 200 x 200 m*

**Table 14-17**

**Surface areas of alternative models of the pipe outline at various depths within the South Lobe and North / Neck domains of the Mothae pipe**

| Pipe domain | Level (mamsl) | Surface area ($m^2$) | | | % Variance from base-case | |
|---|---|---|---|---|---|---|
| | | Low-case | Base-case | High-case | Low-case | High-case |
| All | 3,000 | 77,027 | 81,598 | 86,784 | -6% | 6% |
| South Lobe | 2,900 | 43,671 | 46,557 | 49,289 | -6% | 6% |
| South Lobe | 2,800 | 39,906 | 44,193 | 47,998 | -10% | 9% |
| South Lobe | 2,700 | 34,598 | 38,894 | 43,321 | -11% | 11% |
| South Lobe | 2,600 | 27,021 | 33,778 | 38,090 | -20% | 13% |
| North/Neck | 2,900 | 18,425 | 22,665 | 28,403 | -19% | 25% |
| North/Neck | 2,800 | 11,058 | 18,803 | 23,577 | -41% | 25% |
| North/Neck | 2,700 | 9,071 | 18,759 | 26,926 | -52% | 44% |
| North/Neck | 2,600 | 8,817 | 18,822 | 24,091 | -53% | 28% |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*

#### *14.5.1.2 Size frequency distribution*

For each geological domain, the SFD models were constructed to represent best fit to the sample data. The large bulk samples collected provided very robust size frequency curves. However, the low grades require very high accuracy with respect to diamond content estimation. The impact of the modifying factors has a greater impact on grade than the uncertainty in the SFDs.

The following excerpt from Mineral Services (2013) summarises MSC's conclusions regarding uncertainty in SFD. Uncertainty in SFD has a modest impact on modelled grade estimates (maximum variation -5% to +9%) that primarily reflects the statistical uncertainty associated with the size of the available bulk sample (i.e. very low uncertainty for the South West and South Centre domains that are represented by very large bulk samples). It is important to recognise that this does not reflect the overall grade uncertainty which is linked not only to sample size, but to internal grade variability within each domain and the extent to which this is represented by the available bulk samples. This constitutes a greater source of risk than the uncertainty in the SFD.

The MSA and MSC estimates of the SFD produce grade estimates that vary by up to 4%.

#### *14.5.1.3 Grade*

A key source of uncertainty in the grade estimates stems from variability in grade within geological domains, the extent of which can be assessed by examining the variation in grade within each domain as determined from surface bulk samples. With some volumetrically minor exceptions, the geology and KIM data do not provide any evidence for variation at depth beyond what is evident at surface. Thus it is reasonable to assume that the variability in grade within domains with depth is likely to be well approximated by the variability within domains at surface. Grade variations within large surface bulk samples that are spatially well distributed across a domain therefore provide an indication of potential variability not only laterally but also with depth.

Summary statistics for the twelve bulk samples exceeding approximately 20,000 dry tonnes are shown in Table 14-18. All of these bulk samples are derived from the South West and South Centre domains and the samples provide very comprehensive spatial coverage of these domains. The average grade estimate based on these sample data therefore provides a reliable indication of the grade of the surface material in each domain, and the range of grades obtained provides a good indication of the maximum likely variance in grade with depth.

**Table 14-18**
**Summary statistics for the dry sample grade (cpht) of large (≥ 20,000 dry tonnes each) bulk samples from the South West and South Centre domains**

| Geological domain | n | Minimum | Mean | Maximum | Std Dev |
|---|---|---|---|---|---|
| South West | 6 | 2.2<br>*-19%* | 2.7 | 3.5<br>*30%* | 0.5<br>*18%* |
| South Centre | 6 | 3.9<br>*-26%* | 5.3 | 5.7<br>*8%* | 0.7<br>*13%* |

**Source:** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
**Note:** *n = number of samples; Std Dev = standard deviation. Italicised percentage values reflect the % difference relative to the mean grade*

The North and South East domains are not well represented by bulk samples, in terms of both sample size and distribution. Hence the degree of uncertainty of grade estimates for the uppermost portions of these domains (i.e. to 50 m below surface) is higher than it is for the South West and South Centre domains.

#### 14.5.1.4 Value

MSA has reviewed the uncertainty associated with revenue modelling for the Mothae kimberlite.

At Letseng Mine (adjacent to Mothae), the average revenue per carat is heavily affected by infrequent, very large (>100 ct), very high value stones. Such stones may occur at Mothae, but none were recovered during bulk sampling. It is important to recognise that the current annual production at Letseng is 7 Mt per annum (2015), which is approximately 12 times the total of the bulk samples collected at Mothae. The probability of recovering such large stones at Mothae during the bulk sampling was therefore quite low. It is not prudent to assume that such stones exist at Mothae, although their presence can be predicted from the data. The diamond populations of Letseng and Mothae share many common features, such as the presence of Type IIa diamonds, and an unusually coarse SFD. This situation can be regarded as upside potential for the Mothae average revenue per carat estimates.

Market fluctuations (see Section 19) will also have a major impact on value uncertainty. Average diamond prices have fluctuated by as much as ± 25% over the past 5 years.

#### 14.5.1.5 Effect of diamond recovery inefficiency, theft and diamond breakage

The following commentary on uncertainty associated with diamond recovery issues is from Mineral Services, (2013). Further uncertainty in the Resource estimate arises from an incomplete understanding of potential inefficient recovery of low-fluorescence stones by the X-ray recovery systems that were used during Phase 3 processing. To the extent that this may be a factor, it appears not to have had a significant impact on grade, but it is possible that it could represent some upside potential on average diamond value. The extent of this is entirely unknown and hence it has not been factored into the uncertainty estimates for diamond value or the resource classification.

Diamond breakage may have impacted the diamond size-frequency distribution and hence the average diamond value. The impact of breakage of the two large stones that are known to have been broken during processing has been factored into the value model. However, there is evidence for breakage of other large diamonds. Because other fragments of these stones were not identified, the evidence for breakage in the plant is equivocal. However, it is likely that at least some of the diamonds with fresh breaks were damaged during processing and hence, assuming that such breakage can be mitigated in future production plants for Mothae, there is potential upside on average diamond values.

The degree of potential diamond loss by theft is unknown. Other than the confirmed theft of several stones from sample C11A and the evidence in the C11A and North domain diamond size-frequency distributions for possible diamond loss in the 0.5 ct to 2 ct range, there is no clear indication in the available data of diamond removal. However, the possibility that this may have occurred cannot be ruled out entirely. To the extent that theft may have occurred, this represents additional upside potential on the resource estimate.

### 14.5.2 Resource Classification

Based on the uncertainty assessment described above, the confidence level for each of the components of the Mothae Resource estimate has been classified according to JORC guidelines (Table 14-19). The overall resource classification for each domain is based on the highest risk component. In general, diamond value estimates are considered to have the highest degree of uncertainty, followed by grade and then kimberlite tonnage. Due to the lack of exploration data constraining the Neck domains and the deeper portions (>300 m) of the North and South domains, these have not been classified as Resources and represent potential Exploration Targets. Exploration Targets are conceptual in nature and it is uncertain whether further exploration will result in the estimation of a Diamond Resource. At this stage Lucapa does not have a work plan to further investigate these portions of the Mothae kimberlite.

**Table 14-19**

**Resource classification matrix representing the interpreted confidence level in different components of the Resource estimate**

| Geological domain | Resource domain | Tonnes | Grade (cpht) | Average value ($/ct) |
|---|---|---|---|---|
| South West | SW_WX | IND | MEAS | IND |
| | SW_50 | IND | IND | IND |
| | SW_300 | INF | INF | INF |
| | SW_500 | INF | ET | ET |
| South Centre | SC_WX | IND | MEAS | IND |
| | SC_50 | IND | IND | IND |
| | SC_300 | INF | INF | INF |
| | SC_500 | INF | ET | ET |
| South East | SE_WX | IND | INF | INF |
| | SE_50 | IND | INF | INF |
| | SE_300 | INF | INF | INF |
| | SE_500 | INF | ET | ET |
| North | N_WX | INF | INF | INF |
| | N_300 | INF | INF | INF |
| | N_500 | ET | ET | ET |

***Source:*** *Mineral Services, 2013 in Lynn and Ferreira, 2013*
***Note:*** *Confidence is expressed in terms of JORC Resource categories. MEAS = measured; IND = indicated; INF = inferred ET = Exploration Target*

### 14.5.3 Mothae Diamond Resource Estimate

The Diamond Resource estimate for Mothae is summarised in Table 14-20. Estimates are provided for specific resource domains and are classified in accordance with JORC standards for reporting of Resources and Reserves (2012). The estimates are based on diamond recoveries at a 2.0 mm bottom cut-off and exclude the results from the fourth diamond sale in February 2013 which were not available at the time of conducting the Resource estimate.

The JORC checklist of assessment and reporting criteria (Table 1) is presented in Sections 14.6 to 14.9.

**Table 14-20**

**Diamond Resource estimate for Mothae (2.0 mm bottom screen), as at 8 September 2017**

| Resource Domain | Volume ($Mm^3$) | Bulk Density ($g/cm^3$) | Tonnes (Mt) | Grade (cpht) | Average Revenue (USD/ct) | Average rock value (USD/t) | Total Resource (Mct) |
|---|---|---|---|---|---|---|---|
| **INDICATED** | | | | | | | |
| SW_WX | 0.37 | 2.02 | 0.75 | 2.6 | 1,310 | 34 | 0.02 |
| SW_50 | 0.43 | 2.52 | 1.08 | 2.5 | 1,364 | 34 | 0.03 |
| SC_WX | 0.11 | 2.11 | 0.23 | 4.6 | 695 | 32 | 0.01 |
| SC_50 | 0.14 | 2.47 | 0.33 | 4.4 | 737 | 32 | 0.01 |
| **Total Indicated** | **1.04** | **2.29** | **2.39** | **3.0** | **1,196** | **34** | **0.07** |
| **INFERRED** | | | | | | | |
| SW_300 | 7.39 | 2.62 | 19.35 | 2.5 | 1,364 | 34 | 0.48 |
| SC_300 | 1.52 | 2.55 | 3.88 | 4.4 | 737 | 32 | 0.17 |
| SE-WX | 0.14 | 2.04 | 0.29 | 2.8 | 578 | 16 | 0.01 |
| SE_50 | 0.24 | 2.39 | 0.56 | 2.6 | 615 | 16 | 0.01 |
| SE_300 | 2.39 | 2.48 | 5.94 | 2.6 | 615 | 16 | 0.15 |
| N_WX | 0.29 | 2.07 | 0.59 | 2.5 | 737 | 19 | 0.01 |
| N_300 | 2.39 | 2.49 | 5.96 | 2.4 | 780 | 19 | 0.14 |
| **Total Inferred** | **14.37** | **2.55** | **36.57** | **2.7** | **1,053** | **28** | **0.97** |
| **Total Diamond Resource** | **15.41** | **2.53** | **38.96** | **2.7** | **1,063** | **28** | **1.04** |

***Source:*** *Lynn and Ferreira, 2013*

***Note:*** *Table contains rounded figures. The grade figures are based on recovery factors derived from total content curves for each geological domain, and the bulk sample plant recoveries achieved*

*WX indicates 'weathered material' (depth of ±20 m) and SW_50 and SW_300 indicate a 50 m and a 300 m depth*

*SW = southwest domain; SC = south centre domain; SE = southeast domain (all in South Lobe); N = North Lobe*

*The Diamond Resource estimate was originally reported in accordance with CIM in 2013 and has been re-stated in 2017 in accordance with JORC 2012 guidelines*

### 14.5.4 Exploration Target

The deeper part (>300 m) of the Mothae deposit and the Neck domain have insufficient exploration data to estimate a Diamond Resource and it is uncertain if further exploration will result in the estimation of a Diamond Resource. At this stage Lucapa does not have a work plan to further investigate these portions of the Mothae kimberlite.

## 14.6 JORC Table 1 : Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

**Table 14-1**

**JORC CODE, 2012 Edition – Section 1 Sampling Techniques and Data**

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Sampling techniques* | • *Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.*<br>• *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.*<br>• *Aspects of the determination of mineralisation that are Material to the Public Report.*<br>• *In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information.* | • Four of the five geological domains of the Mothae kimberlite were bulk sampled in three phases under the supervision of MSC (Section 9.6). Bulk sampling was predominantly carried out on near-surface weathered kimberlite (±20 m) using conventional free-dig truck and shovel methods. Limited excavation of unweathered hard kimberlite during Phase 3 required blasting. The five geological domains were delineated by geophysical surveys, shallow pitting, mapping, drilling and by their litho- and mineralogical characteristics<br>• Bulk sampling of each of the four spatially separate domains (Neck was excluded) was carried out in three successive phases with tonnages increasing from 29,000 t to 71,000 t and 596,000 t with a total of 29 sample batches collected (Sec 9.7). Independent surveyors conducted ad hoc surveys during Phase 1 and 2 to establish sample volumes at various stages of excavation. During Phase 3, daily survey work was carried out to monitor sample excavation progress and to calculate the in situ volumes of excavated bulk samples. Real time kinematic surveying was conducted using a Trimble R6 GPS receiver with a single fixed base station. Initially these survey results were verified weekly and then monthly by audit surveys conducted by an independent professional mine survey company<br>• Sample processing was conducted with crusher, scrubber and sizing screens followed by DMS, grease table, X-ray units (Section 9.7.6) and final recovery using glove boxes (Section 9.7.7). Process plant design, supervision and operation for Phases 1 and 2 was contracted to Gemcore and independently reviewed by Hatch Engineering. Phase 3 process plant modifications were designed and supervised by Paradigm and operated by Minopex<br>• Industry-standard methods and technology was used for all three phases. Process modifications between the phases e.g. insertion of a large diamond recovery circuit and the switch from grease table to X-ray technology in Phase 3 were implemented to optimise diamond recovery |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Drilling techniques* | • *Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc).* | • The core drilling campaigns of the five geological domains of the Mothae kimberlite were conducted in 2008/2009 and 2011/2012. Altogether, 43 holes were completed for a total drill length of 8,085 m. All drilling was undertaken by RDS using Boart Longyear LF90D core rigs and standard tubes. During 2008 and 2009, all drill holes commenced with HQ diameter and telescoped down to NQ diameter when stable unweathered ground was intersected. During 2011 and 2012, selected holes commenced with PQ diameter to provide samples for ore dressing studies ("ODS") after which holes telescoped down through HQ to NQ. Where no ODS sampling was required, the 2011 and 2012 holes began with HQ as in 2008 and 2009 (Section 10.1) |
| *Drill sample recovery* | • *Method of recording and assessing core and chip sample recoveries and results assessed.*<br>• *Measures taken to maximise recovery and ensure representivity of samples.*<br>• *Whether a relationship exists between recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.* | • Core run lengths were measured and recorded to provide a complete record of core return<br>• PQ, HQ and NQ were used to optimise sample recovery<br>• Drill core was not used for diamond grade estimation, hence it is not known if a bias exists between core recovery and diamond grade |

| Criteria | JORC Code explanation | Commentary |
| --- | --- | --- |
| *Logging* | • *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* | • Drill core was geologically logged in two stages: primary field logging and secondary interpretive logging. Primary logging recorded the depth of all kimberlite-wall rock contacts, preliminary subdivision of kimberlite into codes based on textural and component variations (Section 10.3):<br>• visual estimate of the total olivine and olivine macrocryst content, and the sizes of the five largest olivine crystals<br>• the type of magma clasts, specifically the relative proportion of cored and uncored varieties, and the maximum magma clast size<br>• size and number of country rock xenoliths (measured over 1 m interval)<br>• KIM abundance counts over a ±3 cm by 20 cm area<br>Secondary interpretive logging involved verifying the kimberlite-wall rock contacts, internal subdivisions and model codes assigned during the primary logging. The nature of and variations in rock texture and components were assessed to establish the major kimberlite types and the variability within them. The internal subdivisions derived from this stage of logging were then composited into geological domains based on their lithological characteristics and spatial distribution for the purpose of geological modelling. A five-tier geological coding system was applied to the Mothae drill cores (Sec 10.3.1) |
| | • *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* | • Logging was mainly quantitative. All cores were photographed at high resolution |
| | • *The total length and percentage of the relevant intersections logged.* | • All 8,085 m from the 43 holes were logged and used for geological modelling |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Sub-sampling techniques and sample preparation* | • *If core, whether cut or sawn and whether quarter, half or all core taken.*<br>• *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.*<br>• *For all sample types, the nature, quality and appropriateness of the sample preparation technique.*<br>• *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.*<br>• *Measures taken to ensure that the sampling is representative of the in situ material collected, including results for field duplicate/second-half sampling.*<br>• *Whether sample sizes are appropriate to the grain size of the material being sampled.* | • Logging and determination of textures and country rock xenoliths on full core<br>• Diamond grades were determined from mechanically excavated bulk sample material which had a natural moisture content<br>• Bulk samples did not require special preparation techniques; Representative KIM samples were collected at regular intervals from headfeed material during bulk sample processing in order to confirm the KIM signature of the material excavated and processed. This was to allow a correlation of the bulk sample material (and its associated diamond recoveries) with the surface delineation and drill core KIM abundance results. Samples were collected approximately every 4,000 tonnes during bulk sample processing. Samples were derived from the active ROM headfeed stockpile (see Section 9.7.5)<br>• No sub-sampling was carried out on the bulk sample material from the five geological domains<br>• Bulk samples are invariably representative of the in-situ material; No duplicate samples were collected or deemed necessary<br>• Mothae kimberlite has a low average grade (<5 cpht) and a relatively coarse diamond size population; The excavated volume (696,000 t) is considered to be sufficient for resource estimation; Bulk samples are from weathered material which required minimal crushing/blasting that could result in diamond breakage |
| *Quality of assay data and laboratory tests* | • *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.*<br>• *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.*<br>• *Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established.* | • Bulk sample processing, a total technique , was conducted with industry-standard equipment / procedures and managed by highly qualified contractors (Sec 9.7.6)<br>• Prepared 2-18 mm material was mixed into ferrosilicon slurry with a density of 2.70 g/cm$^3$ and passed through a cyclone set at a cut point of 2.90 g/cm$^3$. The DMS sink material was conveyed to the recovery sizing screens, where material was collected in storage bins in the 2-3 mm, 3-8 mm, 8-16 mm and +16 mm fractions (Phase 1 and 2) for final diamond recovery by grease table and hand-sorting; Phase 3 DMS sink was processed with X-ray units prior to hand sorting<br>• A range of audit work was carried out after each phase to assess grease and recovery tailings for unrecovered diamonds (Section 9.7.6.1 to 3) |
| *Verification of sampling and assaying* | • *The verification of significant intersections by either independent or alternative company personnel.*<br>• *The use of twinned holes.*<br>• *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.*<br>• *Discuss any adjustment to assay data.* | • Bulk samples from the same geological domain produced comparable results confirming the criteria for delineating the five geological domains<br>• Twin holes were not deemed necessary<br>• Primary data were recorded manually and then captured in digital format using suitable software; SOPs and selected data files were verified by CP (Section 12)<br>• No adjustments to assay data were done |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Location of data points* | • *Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.*<br>• *Specification of the grid system used.*<br>• *Quality and adequacy of topographic control.* | • Collar positions of 2008-2009 drill holes were initially captured using a Garmin handheld GPS set to record and average the position over 1 minute. Positions of all collars including the 2011-2012 holes were later surveyed by DGPS conducted by a registered mine surveyor. Drill holes were captured to sub-centimetre level accuracy with a Trimble R6 GPS receiver surveying in real time kinematic mode with a single fixed base station (Section 10.2). For the 2008-2009 drilling campaign, drill hole orientation and azimuth was measured using a Reflex EZ-shot survey tool. Significant azimuth errors were encountered with this tool (attributed to instrument drift and interference from magnetic bedrock) resulting in unacceptable apparent spatial deviations of drill holes. Starting azimuths were therefore used as a basis for plotting the drill holes in three-dimensions. During 2011 and 2012, drill hole orientation and azimuth was captured using a Reflex GYRO survey tool. No significant measurement errors were incurred with this system (Section 10.2)<br>• UTM Zone 35 S with WGS83 Datum<br>• The DGPS used has adequate topographic accuracy |
| *Data spacing and distribution* | • *Data spacing for reporting of Exploration Results.*<br>• *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.*<br>• *Whether sample compositing has been applied.* | • The spatial distribution and sample spacing of cored boreholes for KIMs is good<br>• Quantity and quality of data generated on the Project are of a high standard and appropriate for the declaration of an Indicated and Inferred Diamond Resource; The diamond content of the 4 domains beyond (>±20 m) the bulk sampled depth is reasonably constrained by documenting litho-/ mineralogical continuity in the cored holes; With volumetrically minor exceptions, the geology and KIM data do not provide evidence for variation at depth beyond what is evident at surface (Sec 14.5.1.3)<br>• The individual geological domains were bulk sampled separately |
| *Orientation of data in relation to geological structure* | • *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.*<br>• *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.* | • Sampling was conducted on a geological domain basis; Litho-/ mineralogical characteristics in holes confirm the vertical continuity of the individual domains<br>• A sub-vertical to vertical (as opposed to horizontal geological and grade homogeneity is a common feature in many kimberlites; Hence no drill- or sampling related bias is to be expected (Section 14.1.3.2 and 4) |
| *Sample security* | • *The measures taken to ensure sample security.* | • Core is stored on-site in locked containers, while bulk samples were processed within days of being excavated |
| *Audits or reviews* | • *The results of any audits or reviews of sampling techniques and data.* | • DMS tailings and grease audits were regularly conducted and shortcomings remedied by modifications to the processing plant design (Sec 9.7.6.1 to 3) |

## 14.7 JORC Table 1: Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

**Table 14-2**

**JORC CODE, 2012 Edition – Section 2 Reporting of Exploration Results**

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Mineral tenement and land tenure status* | • *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.*<br>• *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.* | • A Mining Lease ("ML"; number 001-16/17) for the Mothae kimberlite in the Lesotho highlands is valid until 28 January 2027 and renewable for a further 10 years; Lucapa holds a 70% interest in the ML and the remaining 30% is held by the GoL (Sec 4.2). A 4% royalty is payable for Phase 1 to the GoL and is based upon the gross sale value receivable at the mine gate and, in the case of diamond projects, is negotiable; There is no crop farming at the altitude of 2,900 m and the vegetation types are classified as 'Least Threatened' but are 'Poorly Protected'. Surface rights have been ceded to the ML holder (Sec 5.2); Sheep grazing occurs<br>• MSA is not aware of any impediments that could negatively affect the security of tenure |
| *Exploration done by other parties* | • *Acknowledgment and appraisal of exploration by other parties.* | • The most recent phase of prospecting was initiated by Motapa in 2006 which entered into an option agreement with Lucara to secure funding for a bulk sampling and core drilling programme (subject of this Report) in 2007. Lucara subsequently bought Motapa and in January 2017 Lucapa was awarded the Mothae Project through an international tender process by the GoL following Lucara's withdrawal from the Project (Section 6.2) |
| *Geology* | • *Deposit type, geological setting and style of mineralisation.* | • Mothae kimberlite is a diatreme which was the feeder to a now eroded volcano; Kimberlite is the main source of diamond. Karoo basalt is the country rock (Sec 8) |
| *Drill hole Information* | • *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes:*<br>○ *easting and northing of the drill hole collar*<br>○ *elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar*<br>○ *dip and azimuth of the hole*<br>○ *down hole length and interception depth*<br>○ *hole length.*<br>• *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.* | • Detailed drill hole information is tabulated in Section 10.1; The majority of the holes were drilled inclined to determine the contact between kimberlite and basalt country rock and the intersections were used to delineate the shape of the kimberlite and to construct the geological model; A total of 8,085 m were drilled in 43 holes during the two drill campaigns in 2008/2009 and 2011/2012<br>• No information was excluded |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Data aggregation methods* | • *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated.*<br>• *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.*<br>• *The assumptions used for any reporting of metal equivalent values should be clearly stated.* | • Diamond grades were determined from the bulk samples while the drill holes provided spatial information and lithological and mineralogical characteristics were used to define five geological domains and delineate them at depth<br>• Diamond grades were determined from 29 sample batches with a total of 604,000 dry tonnes processed from 4 of the 5 geological domains (Section 9.7); Grades were determined for each batch and the results used for the grade estimation of each domain (Section 14.3.2.) The 5$^{th}$ domain ('Neck') not sampled<br>• No metal equivalent values were used |
| *Relationship between mineralisation widths and intercept lengths* | • *These relationships are particularly important in the reporting of Exploration Results.*<br>• *If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported.*<br>• *If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known').* | • Not applicable to bulk samples<br>• Diamond mineralisation was not determined by drill holes which were used to delineate the geometry of the kimberlite and document geological continuity<br>• Not applicable to bulk samples |
| *Diagrams* | • *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views.* | • Maps and sections of drill hole intercepts of the kimberlite /country rock contacts are presented in Section 10.1 and 14.1.2.2 and 14.1.2.3 |
| *Balanced reporting* | • *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.* | • Diamond grades are reported individually for each of the 29 bulk sample batches; The five geological domains differ in their diamond content and size distribution (Section 14.3.1) |
| *Other substantive exploration data* | • *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.* | • Ground geophysics was conducted and all three methods used (magnetic, gravity and EM) were effective in mapping out the pipe margins; The magnetic survey was effective in discriminating most of the internal pipe geology (Section 9.1); Bulk sampling procedures and results are presented in Section 9.7 and bulk density in Section 9.7.3; Total liberation (microdiamonds) has been conducted on two samples (Section 9.5); No geotechnical studies, other than examining the contact characteristics of kimberlite with the basalt country rock, were conducted |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Further work* | • *The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling).*<br>• *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.* | • Total liberation studies should be carried out on drill core to assess the diamond characteristics in the deeper parts of the five domains not tested with bulk samples; The optimal bottom cut off size for processing should be further evaluated to determine diamond grade vs size vs value and associated processing costs; Conduct a Pre-Feasibility Study<br>• The spatial extent of the kimberlite has been adequately determined with the cored drill holes |

## 14.8 JORC Table 1: Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

**Table 14-3**

**JORC CODE, 2012 Edition – Section 3 Estimation and Reporting of Mineral Resources**

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Database integrity* | • *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.*<br>• *Data validation procedures used.* | • MSA has reviewed the data for the Diamond Resource estimation, MSC's methodology and estimation process and found it to be a well-executed and thorough piece of work<br>• The Diamond Resource estimate by MSC has been reviewed by MSA in detail and found to have been carried out according to best practice principles, excluding data where appropriate, and following strict a protocol. MSA remodelled the Diamond Resource and the results were very similar to the MSC results (Sec 12) |
| *Site visits* | • *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.*<br>• *If no site visits have been undertaken indicate why this is the case.* | • Dr Reichhardt conducted a site visit in February 2017 and Mr Lynn (author of 2013 CPR) conducted a site visit in September 2012; The aspects reviewed and findings are detailed in Section 12 |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Geological interpretation* | • *Confidence in (or conversely, the uncertainty of ) the geological interpretation of the mineral deposit.*<br>• *Nature of the data used and of any assumptions made.*<br>• *The effect, if any, of alternative interpretations on Mineral Resource estimation.*<br>• *The use of geology in guiding and controlling Mineral Resource estimation.*<br>• *The factors affecting continuity both of grade and geology.* | • The geological model is well constrained by drill holes<br>• Mineralogical and lithological data from the drill holes were used to delineate individual geological domains which were then assigned at depth with the grades from the bulk samples from the same domains<br>• The grades of the individual domains at depth (>20 m) might be lower or higher than established from the near surface bulk sampling<br>• Geological characteristics were used exclusively to identify and delineate the 5 domains which were then assigned the diamond grades established from the near surface bulk samples collected from these domains (Section 9.7.5)<br>• Geological continuity of the individual domains is adequately documented, however there is no confirmation that the domains have a homogenous diamond grade and size distribution |
| *Dimensions* | • *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.* | • Diamond grades at depths have not been determined directly (only by geological considerations) and the Diamond Resource is therefore classified as 'Inferred' beyond a depth of 50 m (Section 14.5.3) |
| *Estimation and modelling techniques* | • *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.*<br>• *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.*<br>• *The assumptions made regarding recovery of by-products.*<br>• *Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation).*<br>• *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.*<br>• *Any assumptions behind modelling of selective mining units.*<br>• *Any assumptions about correlation between variables.*<br>• *Description of how the geological interpretation was used to control the resource estimates.*<br>• *Discussion of basis for using or not using grade cutting or capping.*<br>• *The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available.* | • Average grade of bulk samples were applied on an individual domain basis together with average diamond values for the total bulk samples. Extrapolation of the near surface sampling data is to 300 m below surface based on diamond drill petrography showing no discernible change with<br>• MSA carried out checks on the MSC estimates and no significant differences were found between the two estimates<br>• There are no by-products<br>• No deleterious elements have been identified<br>• Block model interpolation was not carried out<br>• No SMU determination was carried out<br>• No variables were correlated<br>• The lithological and weathering domains were used to guide the bulk sampling, the results of which were applied to the domains<br>• No grade capping or cutting was applied<br>• Not applicable |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Moisture* | • *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.* | • Tonnage estimates were done on a dry basis (Sections 12.1 to 12.1.3) |
| *Cut-off parameters* | • *The basis of the adopted cut-off grade(s) or quality parameters applied.* | • A bottom cut-off of 2 mm was applied for the Diamond Resource estimation but Lucapa plans to use a 3 mm bottom cut off |
| *Mining factors or assumptions* | • *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.* | • A total of 604,000 dry tonnes of predominantly weathered material have been processed during the evaluation phase; The material was extracted with free-dig truck and shovel mining methods with minor blasting (Sec 9.7.2); Future open cast mining is likely to use the same method for weathered material while the unweathered material will require a conventional drill-and-blast method (Sec 16); The grade and size of diamonds in the deeper, unweathered portion of the pipe will need to be confirmed through mining and the processing plant needs to be optimised for the unweathered, fresh material |
| *Metallurgical factors or assumptions* | • *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.* | • Not applicable |
| *Environmental factors or assumptions* | • *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.* | • Environmental Management Programme and Environmental Impact Assessment have been completed for the Mothae Project and were approved prior to the granting of the Mining Lease; Lucapa continues an ongoing public participation process and is currently following up on an application from 2013 to change the scope of the Project allowing for a downsized scale of mining (see Section 20.2); To MSA's knowledge, there are no environmental impediments to the Project continuing to the development stage (see Section 4.2 and Sec 20); MSA has identified a potential risk with the 'fines' escaping into the local fresh water system; Tailings management will need to be designed to prevent fines escaping into local streams and potentially impacting on Lesotho's fresh water exports |

| Criteria | JORC Code explanation | Commentary |
| --- | --- | --- |
| *Bulk density* | • *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.*<br>• *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.*<br>• *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.* | • Bulk density measurements were determined from 543 surface samples and 785 drill core samples using the 'Archimedes Principle' method; Results were used for the tonnage calculations (Section 9.7.3); The frequency and spatial distribution of measurements are considered adequate by the CP<br>• The method applied is considered suitable and adequate for this type of deposit<br>• Bulk density measurements on a range of kimberlite material were used for the Resource estimation |
| *Classification* | • *The basis for the classification of the Mineral Resources into varying confidence categories.*<br>• *Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).*<br>• *Whether the result appropriately reflects the Competent Person's view of the deposit.* | • The South-west and South-central domains, which have the largest bulk sample tonnages, were declared as 'Indicated' for the weathered portion (±20 m) and the underlying unweathered part to a depth of 50 m; The SW, SC, SE and N domains were classified as 'Inferred' to a depth of 300 m; The depth interval to 500 m has been classified as Exploration Target for all four domains (Sec 14.5.3);<br>All relevant factors have been considered for the Diamond Resource estimate<br>• The results appropriately reflect the level of acquired data for this type of kimberlite deposit (low grade, high diamond value) |
| *Audits or reviews* | • *The results of any audits or reviews of Mineral Resource estimates.* | • The results obtained by MSA were comparable to the Diamond Resource initially estimated by MSC in terms of tonnage, grade and revenue (Sec 14) |
| *Discussion of relative accuracy/ confidence* | • *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.*<br>• *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.*<br>• *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.* | • A global estimate by geological domain has been made. The CP considers that the quantity of bulk sample processed is sufficient to determine average diamond grade and value for the deposit however local estimation has not been performed. Diamond drilling has confirmed geological continuity at depth, however the assumption that the grades and diamond values are the same at depth as the bulk sample near surface has not been verified |

## 14.9 JORC Table 1: Section 5 Estimation and Reporting of Diamonds and Other Gemstones

(Criteria listed in other relevant sections also apply to this section. Additional guidelines are available in the 'Guidelines for the Reporting of Diamond Exploration Results' issued by the Diamond Exploration Best Practices Committee established by the Canadian Institute of Mining, Metallurgy and Petroleum.)

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Indicator minerals* | • *Reports of indicator minerals, such as chemically/physically distinctive garnet, ilmenite, chrome spinel and chrome diopside, should be prepared by a suitably qualified laboratory.* | • Quantitative KIM abundances of purple garnet and ilmenite were used to discriminate different geological domains (see Section 14.1) |
| *Source of diamonds* | • *Details of the form, shape, size and colour of the diamonds and the nature of the source of diamonds (primary or secondary) including the rock type and geological environment.* | • Diamonds are derived from the Mothae kimberlite and in excess of 23,000 carats were recovered from bulk samples from 4 geological domains (see Section 14.4.) |
| *Sample collection* | • *Type of sample, whether outcrop, boulders, drill core, reverse circulation drill cuttings, gravel, stream sediment or soil, and purpose (eg large diameter drilling to establish stones per unit of volume or bulk samples to establish stone size distribution).*<br>• *Sample size, distribution and representivity.* | • Diamond grade and size distribution were established from three bulk sampling campaigns (See Section 9.7)<br>• A total of 604,000 dry tonnes of predominantly weathered material were processed from 4 geological domains identified in the kimberlite (Sec 9.7.1) |
| *Sample treatment* | • *Type of facility, treatment rate, and accreditation.*<br>• *Sample size reduction. Bottom screen size, top screen size and re-crush.*<br>• *Processes (dense media separation, grease, X-ray, hand-sorting, etc).*<br>• *Process efficiency, tailings auditing and granulometry.*<br>• *Laboratory used, type of process for micro diamonds and accreditation.* | • Industry standard processing plant operated by qualified experts (Section 9.7.6)<br>• Grizzly, scrubber, screens, crusher; 40 mm top and 2 mm bottom size (Sec 9.7.6.3)<br>• DMS, grease table, X-ray units and glove box hand-sorting (Sec 9.7.6.1 to 6.3)<br>• >90% recovery of carats; several phases of tailings audits; screening (Sec 9.7.6.3)<br>• Accredited SGS SA carried out total digestion on two samples (Sec 9.5 and 14.3.2) |
| *Carat* | • *One fifth (0.2) of a gram (often defined as a metric carat or MC).* | |
| *Sample grade* | • *Sample grade in this section of Table 1 is used in the context of carats per units of mass, area or volume.*<br>• *The sample grade above the specified lower cut-off sieve size should be reported as carats per dry metric tonne and/or carats per 100 dry metric tonnes. For alluvial deposits, sample grades quoted in carats per square metre or carats per cubic metre are acceptable if accompanied by a volume to weight basis for calculation.*<br>• *In addition to general requirements to assess volume and density there is a need to relate stone frequency (stones per cubic metre or tonne) to stone size (carats per stone) to derive sample grade (carats per tonne).* | • 52,017 diamonds weighing 23,446 ct were recovered for a total dry sample grade of 3.88 cpht at a 2 mm bottom cut-off with an average diamond size of 0.45 cps (carats per stone). Individual bulk sample grades vary from 1.52 cpht to 7.08 cpht (see Sec 14.3.1)<br>• Size frequency distribution models were created for the four major geological domains and results presented and discussed in Sections 14.3.4 and 14.5.1.2 |
| *Reporting of Exploration Results* | • *Complete set of sieve data using a standard progression of sieve sizes per facies. Bulk sampling results, global sample grade per facies. Spatial structure analysis and grade distribution. Stone size and number distribution. Sample head feed and tailings particle granulometry.* | • The data for a complete set of DTC sieve sizes for the individual geological domains are presented in Sec 14.3.4; The five domains are spatially separate and have different diamond grades and size frequency distributions; Mothae, like nearby Letseng kimberlite mine, has a relatively coarse diamond size distribution; The +20 mm / -40 mm material is passed through a coarse diamond X-ray |

| Criteria | JORC Code explanation | Commentary |
| --- | --- | --- |
| *Reporting of Exploration Results* | • *Sample density determination.*<br>• *Per cent concentrate and undersize per sample.*<br>• *Sample grade with change in bottom cut-off screen size.*<br>• *Adjustments made to size distribution for sample plant performance and performance on a commercial scale.*<br>• *If appropriate or employed, geostatistical techniques applied to model stone size, distribution or frequency from size distribution of exploration diamond samples.*<br>• *The weight of diamonds may only be omitted from the report when the diamonds are considered too small to be of commercial significance. This lower cut-off size should be stated.* | recovery unit; -2 mm goes to tailings but no particle size analyses is conducted;<br>• 543 near surface and 785 drill core samples (Sec 11.3) density measurements were determined by the 'Archimedes Principle' method (Sections 12.1 to 12.1.3)<br>• Percentage of concentrate and -2mm material has not been quantified<br>• Bulk sample grades vary from 1.52 cpht to 7.08 cpht (see Sec 14.3.1) at 2 mm and can be modelled to drop by 10- 20% when using a 3 mm bottom cut-off<br>• The potential effects of plant inefficiencies are discussed in Section 14.5.1.5; plant performance for hard, unweathered kimberlite have been assessed in Sec 14.3.6<br>• Size frequency size distribution models were carried out for the four major geological domains and are presented in Section 14.3.4<br>• All diamonds (+2 mm cut off) have been reported (Sec 14.3.1) including the results of microdiamond work (+106 micron) from 2 large samples (Sec 14.3.2) |
| *Grade estimation for reporting Diamond Resources and Ore Reserves* | • *Description of the sample type and the spatial arrangement of drilling or sampling designed for grade estimation.*<br>• *The sample crush size and its relationship to that achievable in a commercial treatment plant.*<br>• *Total number of diamonds greater than the reported lower cut-off sieve size.*<br>• *Total weight of diamonds greater than the reported lower cut-off sieve size.*<br>• *The sample grade above the specified lower cut-off sieve size.* | • A total of 29 bulk sample batches (604,000 dry t) spread over the four geological domains were used to establish diamond content (Section 9.7.1 and 14.3.1)<br>• Bulk samples were mainly weathered near-surface material and required minimal crushing; Cone crusher (18 mm) and scrubber were used for oversize (Sec 9.7.6.3)<br>• 52,017 diamonds (≥2 mm) weighing 23,446 ct were recovered (see Sec 14.3.1)<br>• The 52,017 diamonds (≥2 mm) had a total weight of 23,446 ct<br>• Overall estimated grade for Mothae is 3.0 cpht at a 2 mm bottom cut-off for the Indicated Diamond Resource and 2.7 cpht for the Inferred Diamond Resource |
| *Value estimation* | • *Valuations should not be reported for samples of diamonds processed using total liberation method, which is commonly used for processing exploration samples.*<br>• *To the extent that such information is not deemed commercially sensitive, Public Reports should include:*<br>  ○ *diamonds quantities by appropriate screen size per facies or depth.*<br>  ○ *details of parcel valued.*<br>  ○ *number of stones, carats, lower size cut-off per facies or depth.*<br>• *The average $/carat and $/tonne value at the selected bottom cut-off should be reported in US Dollars. The value per carat is of critical importance in demonstrating project value.*<br>• *The basis for the price (eg dealer buying price, dealer selling price, etc).*<br>• *An assessment of diamond breakage.* | • Valuation is based on macrodiamonds recovered from 3 bulk sample campaigns (see Sections 14.4.2 and 14.4.3)<br>• A detailed description of the quantities, size distribution of the four diamond parcels valued by AGM in Antwerp, Belgium is presented in Sections 14.4.1 to 14.4.3; All diamonds are from the near-surface weathered bulk sample material from the 4 domains; Diamonds were not sold separately by domain, and estimates of value by size class are therefore made on a global basis (Sec 14.4.3)<br>• Average $/carat and $/t values (at ≥2 mm) for the resource estimation are presented in Section 14.5.3<br>• Diamonds were sold on a sealed tender basis by AGM (Section 14.4.1)<br>• Diamond breakage has occurred and an assessment is presented in Section 9.7.7 |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| *Security and integrity* | • *Accredited process audit.*<br><br>• *Whether samples were sealed after excavation.*<br>• *Valuer location, escort, delivery, cleaning losses, reconciliation with recorded sample carats and number of stones.*<br>• *Core samples washed prior to treatment for micro diamonds.*<br>• *Audit samples treated at alternative facility.*<br>• *Results of tailings checks.*<br>• *Recovery of tracer monitors used in sampling and treatment.*<br>• *Geophysical (logged) density and particle density.*<br>• *Cross validation of sample weights, wet and dry, with hole volume and density, moisture factor.* | • Sub-contractors were used for plant design and operating (Sec 9.7.7); Various audits were carried out (Sec 9.7.6.3)<br>• Samples transported ±100 m from pit to plant and processed within a few days<br>• Couriered in 4 batches and valued by AGM in Antwerp, Belgium; Minimal cleaning losses observed; One known case of theft in final recovery unit (Sec 11.1)<br>• Tungsten drill bit and tracers used for MiDA work (Sec 9.5)<br>• All bulk samples treated on site; Grease audited by external operator (Sec 9.7.6.3)<br>• Results of various tailing audits are discussed in Sections 9.7.6.1 and 9.7.6.3<br>• Diamond simulant breakage tests done in bulk sampling plant (Section 9.7.7)<br>• No down-hole geophysics were carried out<br>• Bulk density measurements using 'Archimedes Principle' carried out on 543 bulk samples (Sec 9.7.3) and 785 drill core samples (Section 11.3) |
| *Classification* | • *In addition to general requirements to assess volume and density there is a need to relate stone frequency (stones per cubic metre or tonne) to stone size (carats per stone) to derive grade (carats per tonne). The elements of uncertainty in these estimates should be considered, and classification developed accordingly.* | • Relevant uncertainties were addressed and are discussed in Section 14.5.1 and Sections 14.5.1.1 to 14.5.1.5 |

# 15 DIAMOND RESERVE ESTIMATES

No Diamond Reserve estimates currently exist for the Mothae Project.

# 16 MINING METHODS

Lucapa envisages mining the kimberlite in two phases. Phase 1 will include the weathered kimberlite material at the top of the pipe while mainly the underlying harder and unweathered kimberlite is planned to be mined during Phase 2.

MSA (2017) developed a mine design and schedule for the Mothae kimberlite. The mine design and schedule are based on an updated open pit optimisation using prices per kimberlite domain provided by Lucapa in July 2017 (at 3 mm bottom cut-off size) for the recoverable diamonds and updated optimisation parameters. The process followed was based on a Whittle™ pit optimisation, from which a conceptual mine plan and design was compiled. Allowance was made haulage roads, infrastructure, waste rock storage, etc. and schedules of production (mineralised material and waste) drawn up.

## 16.1 Model generation

In order to prepare the 3D block model for import into the Whittle™ pit optimisation software, the following model generation steps were undertaken:

- an adjusted depletion surface was generated;
- waste models were generated based on the adjusted depletion surface;
- the 2013 MSC GEMS model was imported and joined with the sub-celled Datamine model, based on 2017 MSA domain solids wireframes;
- the Diamond Resource classification was appended based on the 2013 MSC model;
- the model containing the domain, density, volume and Diamond Resource classification (MSC, 2013) was appended with average grade and price information provided by Lucapa in July 2017 based on Lucapa's internal modelling processes for the 3 mm bottom cut-off screen ("BCOS") sizes;
- the Neck domain price and grade (3 mm BCOS) model was retained from the MSA 2013 work as no information was modelled by Lucapa for the Neck Geological Potential domain. This domain did not contribute economically to the pit optimisation process as it was treated essentially as waste, however, carat and tonne information are reported (albeit separately) in the mine schedule as future potential incidental to the mine design;
- the volumes, masses, carats and values were calculated; and
- the mining cost adjustment factors ("MCAFs") were calculated based on pit depth and cost increase factors.

## 16.2 Exchange rate

An exchange rate of 13.40 ZAR to 1 USD was used in the optimisation. The Lesotho currency (Loti/Maloti) (LSL) is equivalent to the South African Rand.

## 16.3 Mining production and processing limit

The processing tonnage limit was set at 1.08 million tonnes per annum ("Mtpa") for the Phase 1 processing plant and 2.16 Mtpa for the Phase 2 upgrade which starts ramping up in month 35. One calendar quarter has been allowed for site establishment activities and one quarter for Phase 1 plant ramp-up. An additional three month ramp-up period has been allowed for the Phase 1 to Phase 2 plant upgrade.

## 16.4 Mining dilution and recovery

A mining dilution of 5 % was applied to allow for some mixing of basalt waste with the kimberlite ore, typically at the contact zones, and waste internal to the kimberlite. A mining recovery of 95 % was used in the pit optimisation to allow for a loss of 5 % kimberlite due to incorrect loading and hauling of the material to the waste dump.

## 16.5 Mining Costs

The mining costs were based on budget estimates by Lucapa and extensive Lesotho kimberlite mining experience. The mining cost adjustment factors ("MCAFs") and contractor monthly fee were estimated by MSA, derived from first principles using its database of recent budgeted costs (2016/2017 budget year) applicable to similar Lesotho-based open pit mines in close proximity to the Mothae deposit. The mining costs comprise:

- a reference load and haul cost of LSL 27.67 per bank cubic metre ("bcm") for basalt and kimberlite respectively (1 LSL = 1 ZAR);
- a drill and blast cost for basalt of LSL 26.42 per bcm (including pre-splits in final walls);
- ancillary and support equipment at LSL 22.38 per bcm;
- a contractor monthly management fee of LSL 1.36 million per month;
- an additional LSL 0.82 per tonne has been applied to the processing cost to allow for the kimberlite incremental cost (material re-handle, blast pattern differences, etc.);
- a basalt load and haul incremental cost, to allow for longer hauling distances as the pit deepens, was set at LSL 0.14 per bcm for volumes mined below 3,010 mamsl, and LSL 0.11 per bcm for volumes mined above 3,010 mamsl; and
- kimberlite load and haul incremental cost, to allow for longer hauling distances as the pit deepens, was set at LSL 0.12 per bcm for volumes mined below 3,010 mamsl, and LSL 0.09 per bcm for volumes mined above 3,010 mamsl.

The reference mining cost (basalt at 3,010 mamsl) is LSL 28.22 per tonne mined (USD 2.11 per tonne mined, converted at an exchange rate of LSL 13.4 per USD).

## 16.6 Carat Prices

Lucapa provided MSA with updated average grades and carat price values per domain (July 2017) as part of internal modelling processes, based on a 3 mm BCOS size. The Lucapa diamond prices and average grade per domain at the 3 mm BCOS sizes are listed below:

- North Domain – Grade: 1.78 cpht; Carat Price: USD 1,017 / ct (source: Lucapa 2017);
- Neck Domain – Grade: 1.80 cpht; Carat Price: USD 1,398 / ct (source: MSA 2013); Note[1]
- South West Domain – Grade: 1.88 cpht; Carat Price: USD 1,798 / ct (source: Lucapa 2017);
- South Central Domain – Grade: 3.26 cpht; Carat Price: USD 963 / ct (source: Lucapa 2017); and
- South East Domain – Grade: 1.92 cpht; Carat Price: USD 803 / ct (source: Lucapa 2017).

Note[1]: This domain did not contribute to the pit optimisation process as it was treated essentially as waste, however, carat and tonne information are reported in the mine schedule as future potential incidental to the mine design.

## 16.7 Geotechnical design parameters

Geotechnical slope design parameters were aligned with the geotechnical Pre-feasibility Study recommendations set out by SRK Consulting in August 2012. Several slope set scenarios were evaluated in the open pit optimisation process to determine the potential waste stripping reduction should optimised slope recommendations become available in future geotechnical iterations.

The pit design is based on Indicated and Inferred Diamond Resource material only.

## 16.8 Bottom cut-off screen size

The BCOS selection was guided by Lucapa. A bottom cut-off screen size of 3 mm was used for all open pit optimisations.

## 16.9 Diamond recovery

Lucapa provided diamond prices per carats and the average grade per domain for the 3 mm BCOS. The average grades are recoverable grades and hence the processing recovery factor was set to unity (100 %) in the pit optimisations.

## 16.10 Processing cost

The processing costs for the Phase 1 (1.08 Mtpa) and Phase 2 (2.16 Mtpa) crush-mill-DMS-diamond sort processing plant were supplied by Lucapa. The cost of processing applied in the pit optimisations is LSL 57.33 per tonne milled and LSL 32.37 per tonne milled (USD 4.28 and USD 2.42 per tonne milled) for the Phase 1 and Phase 2 processing plants respectively.

For the purposes of the pit optimisation, all fixed cost components were added to the processing cost and include:

- ore incremental cost;
- contractor monthly managements fee;
- general and administrative monthly costs, and
- off-mine fixed costs.

## 16.11 On-mine additional costs

General and administrative ("G&A") costs used in the open pit optimisations were LSL 2.27 million per month and LSL 2.57 million per month for Phase 1 and Phase 2 respectively (LSL 25.22 per tonne milled and LSL 14.30 per tonne milled).

## 16.12 Off-mine additional costs

The off-mine costs used in the open pit optimisations were LSL 1.17 million per month for both Phase 1 and Phase 2 (LSL 13.00 per tonne milled).

The government of Lesotho legislates a royalty on precious stones, calculated on diamond sales revenue. A 5 % royalty is applicable to Phase 1 of Mothae and it is assumed this will be the same for Phase 2.

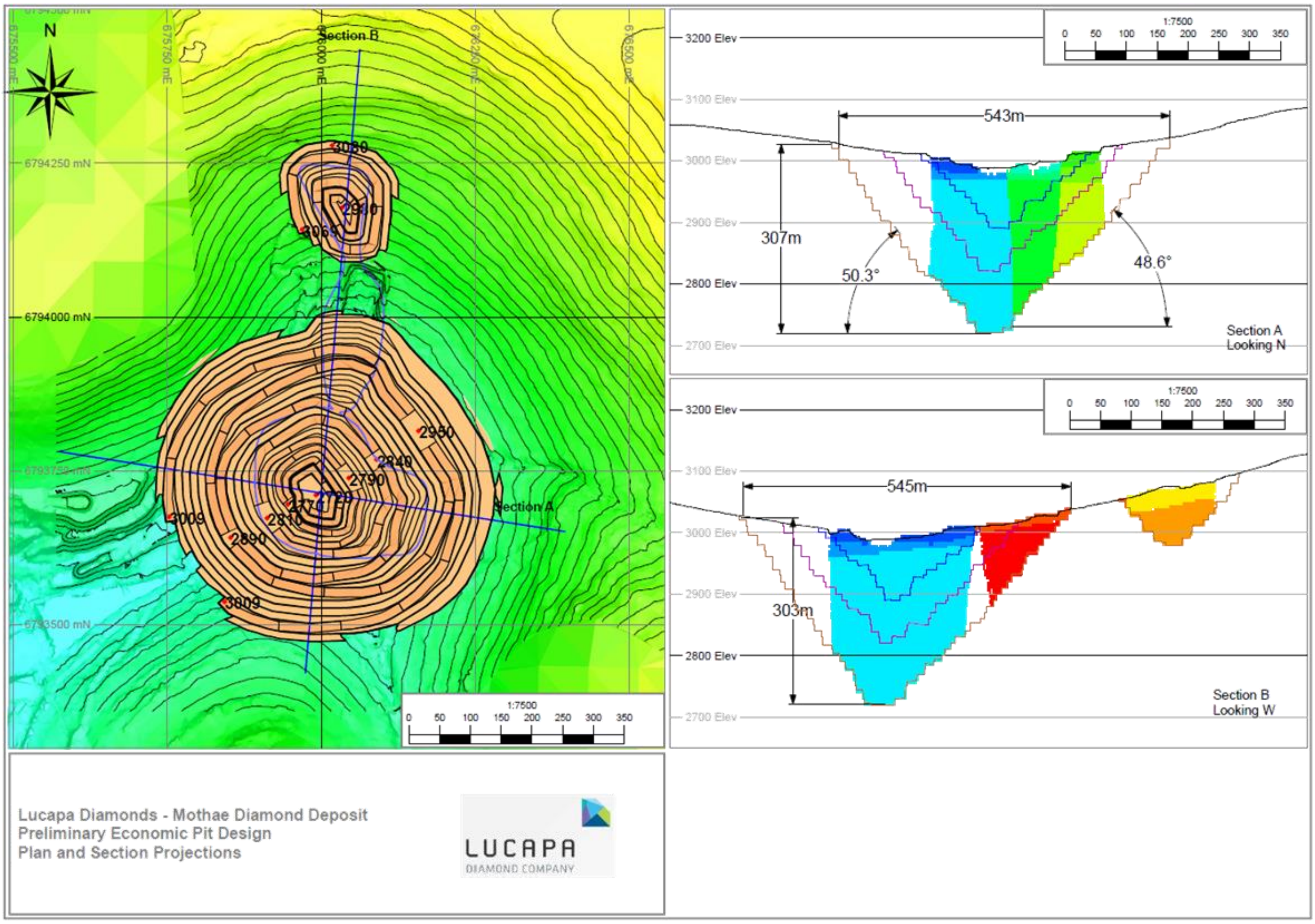
Marketing costs were estimated at 2 % of diamond sales revenue.

## 16.13 Whittle™ evaluations

A total of fourteen separate Whittle™ runs were completed to evaluate the pit size sensitivity.

Two interim pushbacks and a final wall design were completed. Figure 16-1 illustrates the final cut design.

**Figure 16-1**
**Final cut pit design**




***Source:** MSA, 2017*

## 16.14 Mining method

Mining by conventional open pit methods such as drill and blast followed by load and haul will be employed. Drilling and blasting will be performed on 10 m benches, as will loading of the blasted material. Where possible in the near surface weathered zone, “free dig” mining will be carried out (i.e. without drilling and blasting). Ripping by bulldozer may also be employed in transitional kimberlite to reduce the quantity of drilling and blasting required.

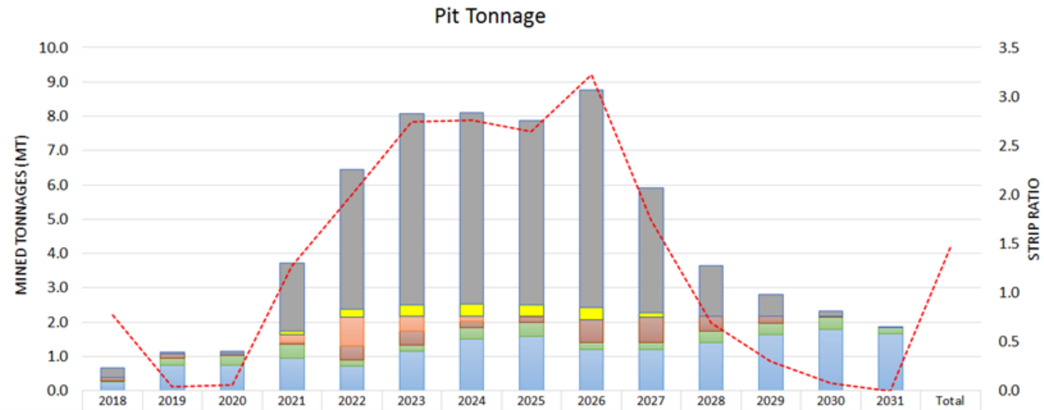
The envisaged scale of mining at the Mothae deposit is relatively small with a peak total material movement of 8 Mtpa to 9 Mtpa. The annual processing plant feed requirement is approximately 1.1 Mtpa (2019) ramping up to approximately 2.2 Mtpa (2022) until end of life of mine.

### 16.15 Mine production schedule

The mine production schedule is illustrated in Figure 16-2. An initially reduced stripping ratio has been sequenced to assist with early cash flows for capital repayment. An increased stripping ratio is required in the initial years of Phase 2 (2.2 Mtpa processing limit) in order to prevent a bottle-neck in the kimberlite supply to the plant. As a result, years 2023 and 2024 will require a higher stripping ratio to prevent a bottle-neck in the pit. Increased stripping in cut 2 of the Phase 1 (first 3 years) will reduce the peak mining tonnages but will negatively affect cash flow during the lower production period of Phase 1.

**Figure 16-2**

**Mothae production schedule**



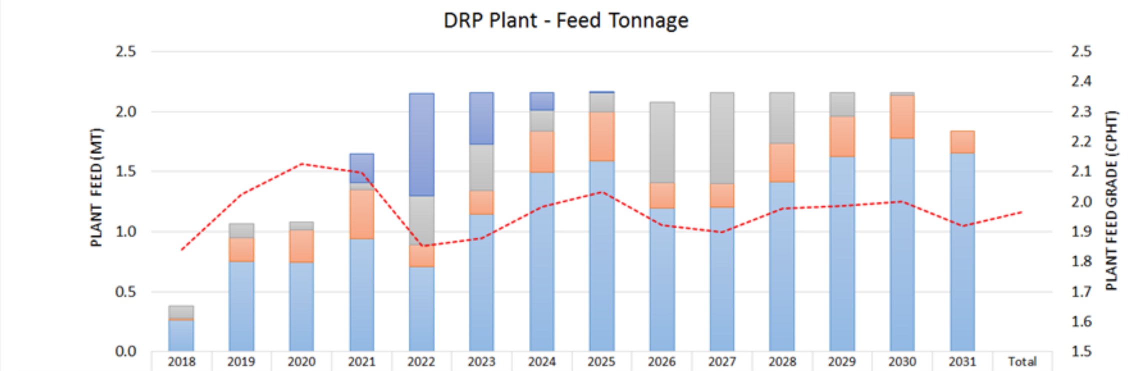

| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Waste | 0.3 | 0.0 | 0.1 | 2.0 | 4.1 | 5.6 | 5.6 | 5.4 | 6.3 | 3.6 | 1.5 | 0.7 | 0.2 | 0.0 | 35.3 |
| Other Kimberlite | 0.0 | 0.0 | 0.0 | 0.1 | 0.2 | 0.3 | 0.4 | 0.3 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 1.9 |
| N - Kimberlite | 0.0 | 0.0 | 0.0 | 0.2 | 0.9 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 |
| Ne - Kimberlite | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SE - Kimberlite | 0.1 | 0.1 | 0.1 | 0.1 | 0.4 | 0.4 | 0.2 | 0.2 | 0.7 | 0.8 | 0.4 | 0.2 | 0.0 | 0.0 | 3.5 |
| SC - Kimberlite | 0.0 | 0.2 | 0.3 | 0.4 | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.2 | 3.6 |
| SW - Kimberlite | 0.3 | 0.8 | 0.7 | 0.9 | 0.7 | 1.1 | 1.5 | 1.6 | 1.2 | 1.2 | 1.4 | 1.6 | 1.8 | 1.7 | 16.5 |
| Total Pit Tonnage | 0.7 | 1.1 | 1.1 | 3.7 | 6.5 | 8.1 | 8.1 | 7.9 | 8.8 | 5.9 | 3.7 | 2.8 | 2.3 | 1.8 | 62.5 |
| Strip Ratio | 0.8 | 0.0 | 0.1 | 1.3 | 2.0 | 2.7 | 2.8 | 2.6 | 3.2 | 1.7 | 0.7 | 0.3 | 0.1 | 0.0 | 1.5 |

***Source:** MSA, 2017*

### 16.16 Plant feed schedules

The plant feed schedule is developed from the expected commissioning dates for the plant (developed in two phases) and the aligned mine production schedules. Cognisance is taken of stockpiling and re-handling in scheduling of the tonnages. Figure 16-3 shows the processing plant feed tonnage schedule for the Phase 1 and Phase 2.

## Figure 16-3
## Mothae diamond recovery plant feed schedule (Phase 1 & 2)

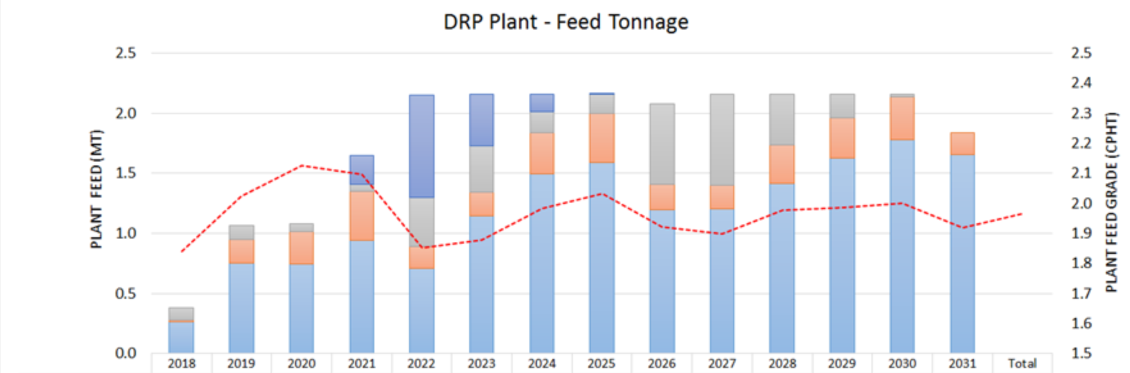



| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N - Kimberlite | 0.0 | 0.0 | 0.0 | 0.2 | 0.9 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 |
| Ne - Kimberlite | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SE - Kimberlite | 0.1 | 0.1 | 0.1 | 0.1 | 0.4 | 0.4 | 0.2 | 0.2 | 0.7 | 0.8 | 0.4 | 0.2 | 0.0 | 0.0 | 3.5 |
| SC - Kimberlite | 0.0 | 0.2 | 0.3 | 0.4 | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.2 | 3.6 |
| SW - Kimberlite | 0.3 | 0.8 | 0.7 | 0.9 | 0.7 | 1.1 | 1.5 | 1.6 | 1.2 | 1.2 | 1.4 | 1.6 | 1.8 | 1.7 | 16.5 |
| Total Feed | 0.4 | 1.1 | 1.1 | 1.6 | 2.1 | 2.2 | 2.2 | 2.2 | 2.1 | 2.2 | 2.2 | 2.2 | 2.2 | 1.8 | 25.3 |
| DRP Feed Grade | 1.84 | 2.02 | 2.12 | 2.10 | 1.85 | 1.88 | 1.98 | 2.03 | 1.92 | 1.90 | 1.98 | 1.99 | 2.00 | 1.92 | 1.96 |

***Source:*** *MSA, 2017*

Figure 16-4 shows the annual schedule of diamonds estimated to be recoverable by the processing plant.

## Figure 16-4
## Estimate of recoverable diamonds




| | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| N - Kimberlite | 0.0 | 0.0 | 0.0 | 0.2 | 0.9 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.7 |
| Ne - Kimberlite | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SE - Kimberlite | 0.1 | 0.1 | 0.1 | 0.1 | 0.4 | 0.4 | 0.2 | 0.2 | 0.7 | 0.8 | 0.4 | 0.2 | 0.0 | 0.0 | 3.5 |
| SC - Kimberlite | 0.0 | 0.2 | 0.3 | 0.4 | 0.2 | 0.2 | 0.3 | 0.4 | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.2 | 3.6 |
| SW - Kimberlite | 0.3 | 0.8 | 0.7 | 0.9 | 0.7 | 1.1 | 1.5 | 1.6 | 1.2 | 1.2 | 1.4 | 1.6 | 1.8 | 1.7 | 16.5 |
| Total Feed | 0.4 | 1.1 | 1.1 | 1.6 | 2.1 | 2.2 | 2.2 | 2.2 | 2.1 | 2.2 | 2.2 | 2.2 | 2.2 | 1.8 | 25.3 |
| DRP Feed Grade | 1.84 | 2.02 | 2.12 | 2.10 | 1.85 | 1.88 | 1.98 | 2.03 | 1.92 | 1.90 | 1.98 | 1.99 | 2.00 | 1.92 | 1.96 |

***Source:*** *MSA, 2017*

## 16.17 Diamond Resources included in the Mothae pit design

Table 16-1 summarises the Diamond Resources estimated to be included in the proposed Mothae open pit.

**Table 16-1**
**Diamond Resources included in the pit design for the Mothae Deposit**

| Domain | Classification | Tonnage (Mt) | Carats (cts) | Grade (cpht) |
|---|---|---|---|---|
| South West | Indicated | 1.97 | 35,038 | 1.78 |
| | Inferred | 14.54 | 259,038 | 1.78 |
| | **Sub-Total** | **16.51** | **294,076** | **1.78** |
| South Central | Indicated | 0.59 | 18,029 | 3.07 |
| | Inferred | 3.03 | 93,335 | 3.08 |
| | **Sub-Total** | **3.62** | **111,363** | **3.08** |
| South East | Indicated | | | - |
| | Inferred | 3.53 | 64,133 | 1.81 |
| | **Sub-Total** | **3.53** | **64,133** | **1.81** |
| North | Indicated | | | - |
| | Inferred | 1.67 | 28,106 | 1.68 |
| | **Sub-Total** | **1.67** | **28,106** | **1.68** |
| **Total Diamond Mineral Resources** (as included in the Production Schedule) | **Indicated** | 2.56 | 53,067 | 2.07 |
| | **Inferred** | 22.78 | 444,611 | 1.95 |
| | **Grand Total** | **25.34** | **497,678** | **1.96** |

**Notes:**

1. The estimated Diamond Resource included in the Mothae pit is defined within a mine design guided by Lerchs-Grossman ("LG") pit shells.
2. The LG shell generation was performed on Indicated and Inferred Diamond Resource materials only
3. Rounding as required by reporting guidelines may result in apparent summation differences between tonnes, grade and contained carats
4. Tonnage and grade measurements are in metric units
5. No minimum economic cut-off grade applied – cash flow method utilised
6. No geological potential, deposit or mineralised waste contributes value to the pit optimisation
7. Estimated Diamond Resource for the Mothae pit is modified to include ore-loss (5 %) and dilution (5 %)

## 16.18 Conclusions

The following observations are based on the results of the Whittle™ simulations:

- including the material below 300 mbs (being the geological potential / Inferred Diamond Resource interface) does not significantly drive the pit shell deeper (assuming projection downwards of current grades and prices);
- including the Neck domain material does add additional mineralised volumes (~8.4 Mt Whittle™ Comparison);
- waste volumes mined are significantly sensitive to basalt slope angles; and
- very low stripping in Phase 1 applies "bottle-neck" pressure on the pit to deliver ore tonnages at lower LOM stripping ratios.

## 16.19 Recommendations

The following recommendations may be considered:

- investigate the potential benefits of a larger than 3 mm bottom cut-off screen size;
- conduct an exploration programme to increase the percentage of Indicated Diamond Resources category down to approximately 2,725 mamsl and to allow the inclusion of Neck kimberlite in the Diamond Resource estimate; and
- investigate the possibility of increasing the planned overall slope angles for the country rock material.

# 17 RECOVERY METHODS

The different processing plant designs used during the individual phases of the bulk sampling programme are discussed in Section 9.7.6.

Lucapa envisages building a new plant for the initial Phase 1 processing of weathered kimberlite. For Phase 2 mining of the mainly unweathered and harder kimberlite Lucapa plans to further modify the plant to ensure that optimal treatment processes are used for the two different types of kimberlite material. The following sub-sections summarise Lucapa's planned processing flow sheet.

## 17.1 Process and Layout

A new 150 tonnes per hour ("tph") plant is proposed to be laid out on the slopes of the hills to the south west of the main pit. The layout provides for a future upgrade of the plant to 300 tph, by simply adding additional modules to the new layout. The proposed plant will be relocated to fall outside the blasting zone/extents of the pit. This would ensure that at no time would the new plant need to be relocated to provide access to an encroaching pit and the plant is now also situated very close to the existing slimes dam, which could be used until a new slimes dam is built.

The plant layout utilises the sloping terrain to limit the amount of bulk earthworks. The front-end loading bins would be located at the base of the slope to minimise ore hauling costs.

All the individual plant sub-sections will be housed in individual enclosures with connecting walkways and conveyors enclosed.

The individual components of the processing plant are briefly described in the following sub-sections.

### 17.1.1 Receiving Bin

The plant will receive -450 mm ROM material via a 5 $m^3$ feed hopper, fitted with a static grizzly to scalp at 450 mm. The material is then extracted from the bin via a variable speed vibrating grizzly feeder ("VGF"), supplied with 100 mm aperture grizzly bars. A self-cleaning magnet positioned above the feeder, will remove tramp iron prior to the refurbished Sandvik Hybrid crusher. The VGF undersize and hybrid crusher product will discharge onto the primary crusher product transfer conveyor, which in turn will discharge onto the scrubber feed transfer conveyor. The scrubber feed transfer conveyor will be fitted with a weightometer for accounting purposes and will be a common conveyor when the plant capacity is doubled in future.

### 17.1.2 Scrubber and Screening

The scrubber feed transfer conveyor will discharge onto the scrubber feed conveyor via a pre-fitted bifurcated chute. The other leg of the bifurcated chute will be blanked off and will be used when the plant capacity is doubled in future.

The scrubber feed conveyor is used to feed the scrubber, after pulping with DMS effluent. The scrubber (2.75 m x 6 m) will be fitted with a trommel screen to cut at 50 mm. The scrubber trommel oversize (+50 mm) is conveyed to the secondary crusher surge bin. The conveyor is fitted with a weightometer for accounting purposes.

The trommel undersize {-50 mm) is discharged to a double deck primary screen. From the double deck screen, the +10 mm material is conveyed to an X-Ray Transmission ("XRT") module while the -10 mm material is conveyed to the DMS surge bin. The primary screen effluent (-3 mm) will be pumped to the new degrit module.

### 17.1.3 XRT Module

An XRT module will be used to ensure recovery of large, low luminescence Type IIa diamonds. The -50 mm +10 mm material is conveyed to a classifying screen for XRT feed to be split into a coarse (-50 mm +25 mm} and fine (-25 mm +10 mm) fraction. The two fractions will be fed through individual XRT machines using conveyors. These conveyors will be fitted with weightometers for control and accounting purposes.

Concentrates from the XRT will be fed to the sort house via a tube feeder. The coarse XRT tailings will be conveyed to the secondary crusher surge bin, while the fines XRT tailings will be conveyed to the tailings stockpile.

### 17.1.4 Secondary Crushing

The +50 mm trommel oversize and the -50 mm +25 mm XRT coarse tailings will be conveyed to a 5 ton surge bin above a wet flush cone crusher. A self-cleaning magnet is positioned above the conveyor for tramp iron removal. Material is extracted from the bin using a variable speed pan feeder to achieve choke feed conditions into the cone crusher. The cone crusher product is discharged to a secondary single deck screen to be screened at 3 mm. The screen oversize (+3 mm) will be conveyed to and discharged onto the scrubber feed transfer conveyor, while the screen undersize (-3 mm} will be pumped to the scrubber feed chute or primary sizing screen underpan.

### 17.1.5 Dense Media Separation ("DMS") Module

The DMS plant will be fed from the DMS surge bin (40 t capacity} with a belt feeder fitted with a weightometer for control and accounting purposes. The plant will be supplied with a 65 tph DMS, which will be utilised to concentrate the -10 mm +3 mm DMS feed from the primary double deck screen.

DMS tailings will be conveyed to the tailings stockpile (16 h surge capacity at 150 tph feed). DMS effluent (including the recovery effluent recycled to DMS) will be recycled to the primary scrubber and screen.

### 17.1.6 X-ray Recovery

DMS concentrate will be classified into a -10 mm +5 mm fraction and a -5 mm +3 mm fraction which will discharge into individual surge hoppers. The fractions will be batch fed to the recovery plant via a tube feeder and a jet pump system to a dewatering screen at the top of the recovery plant. The concentrate will be dried using a drier and fed to two CDX 113 VE X-ray machines. Tailings will be weighed using a batch weigh system prior to being conveyed to an enclosed stockpile area.

Concentrate will also be weighed using a batch weigh system located at the glovebox (similar system supplied for the XRT concentrate) prior to being hand-sorted.

### 17.1.7 Water Recovery

Effluent from the primary screen will be pumped to a degrit module which is equipped with a cyclone and degrit screen. The grit is discarded and conveyed to the final tailings conveyor. The cyclone overflow reports to the degrit screen underpan and is pumped to a 7 m diameter ultra-high rate thickener. The thickener overflow is recirculated back to the plant process water tank while the thickener underflow is pumped to the slimes dam.

Lucapa is considering a 3 mm bottom cut-off size and to incorporate an X-Ray Transmission ("XRT") diamond sorting unit into the flow sheet for Phase 1 to ensure recovery of large, low luminescence Type IIa diamonds. X-ray fluorescence ("XRF") units will be used for final diamond recovery.

# 18 PROJECT INFRASTRUCTURE

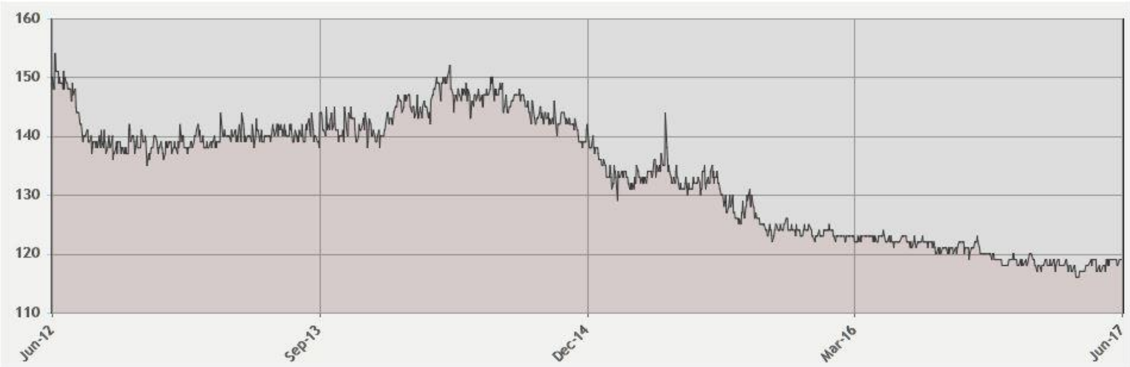
The Mothae Project has not yet progressed to the stage where infrastructure and logistics requirements for the project have been investigated in detail. A summary of available infrastructure is provided in Section 5.3 and the layout of the planned processing plant is presented in Section 17.

## 19 MARKET STUDIES AND CONTRACTS

The current diamond market has seen a fall in prices by an average of 31% since August 2011. This decrease followed a rapid price increase after the Global Financial Crisis ("GFC") in 2008 which saw the price index peak at 170 in August 2011. The diamond price index for the past 5 years is shown in Figure 19-1 while Figure 19-2 shows the price development for various carat sizes over the past 9 years. The spike prior to the GFC and the brief high in August 2011 followed by an overall decline in all sizes except the 4+ carats can be readily traced in Figure 19-2. It is anticipated that a large percentage of Mothae's revenue will be derived from the 4+ carat size.

**Figure 19-1**

**Overall diamond price index for the five year period ending June 2017. Diamond prices have fallen on average by an estimated 20% since June 2012**




***Source:*** *polishedprices.com, 2017*

**Figure 19-2**

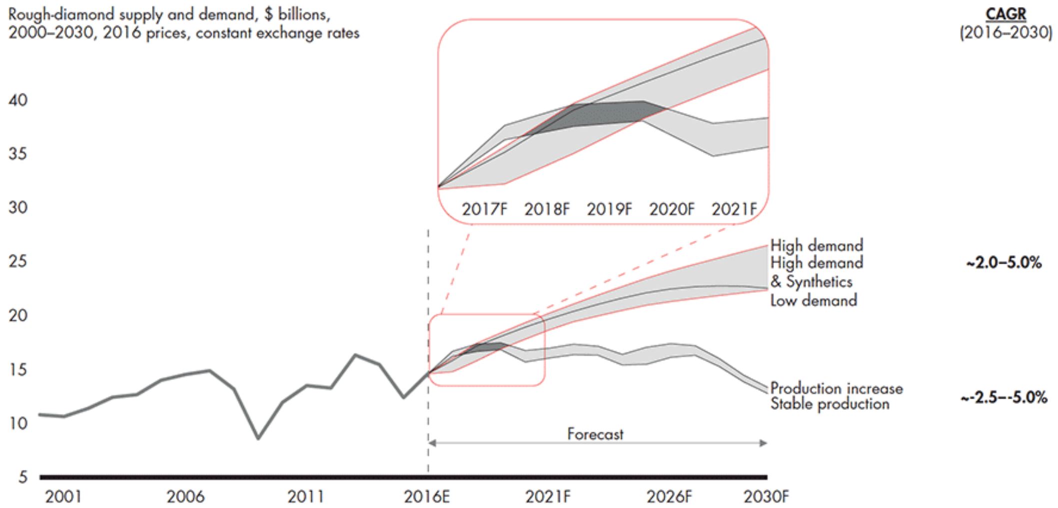
**Diamond price volatility of various carat sizes for nine year period up to December 2016**


***Source:*** PriceScope.*com, 2017*

The current price low is superimposed over a long term forecast of rough diamond price increase based on macroeconomic trends and an increasing appetite for diamond jewellery in key diamond markets (US, Japan, China and India), which indicates that demand for rough diamonds will outpace supply in three to four years (e.g. Bain & Company, 2016; Figure 19-3). This apparent imbalance may translate into a positive outlook for diamond producers and support for a potential long-term price increase.

**Figure 19-3**

**Global demand for rough diamonds is projected to exceed supply through 2030**




**Source:** *Bain & Company, 2016*
**Note:** *CAGR: Compound annual growth rate*

MSA is not aware of any sales contracts or off-take agreements entered into by Lucapa for the Mothae Project. The marketing of diamond parcels by sealed tender with individual offers for large high quality stones through established international diamond dealers has become the preferred platform for small to medium-sized producers.

# 20 ENVIRONMENTAL STUDIES, PERMITTING AND SOCIAL OR COMMUNITY IMPACT

The authors are not qualified to provide comment on environmental issues associated with the Mothae Diamond Project. No guarantee, be it expressed or implied, is made by MSA with respect to the completeness or accuracy of the environmental aspects of this document. MSA does not undertake or accept any responsibility or liability in any way whatsoever to any person or entity in respect of this part of this Report, or any errors in or omissions from it, whether arising from negligence or any other basis in law whatsoever. The following summary was provided by Lucapa:

The regulatory framework in Lesotho includes several relevant pieces of legislation:

- National legislation:
  - Section 36 of Lesotho Constitution states that: "Lesotho shall adopt policies to protect and enhance the natural and cultural environment of Lesotho for the benefit of both present and future generations and shall endeavour to assure all citizens a sound and safe environment adequate for their health and well-being."
  - The Environment Act, 2008
  - Mines and Minerals Act, 2005
  - Mine Safety Act, 1981
  - The Town and Country Planning Act, 1980
  - Historical Monuments, Relics, Flora and Fauna Act, 1967
  - Labour Code, 1992
  - Labour Code (Amendments and Schedules), 2002 and 2006
  - Workmen's Compensation Act, 1997
  - Land Administration Authority Act, 2010
  - Water Act, 2008.
- National Policies:
  - Water and Sanitation Policy, 2007
  - National Environmental Policy, 1998.
- International conventions and Principles:
  - The Convention on the Conservation of Biological Diversity (CBD)
  - The Convention on the International Trade in Endangered Species of Wild Fauna and Flora (CITES)
  - The Equator Principles.

Prospecting was initiated by Motapa Exploration Limited in 2006 at a site that was not pristine. Historical prospecting and artisanal workings have resulted in disturbance of the land and the river banks in the vicinity of the kimberlite pipe.

## 20.1 Prospecting Licence Phase

A baseline assessment of the biophysical environment at the Project was completed in 2007 during the Prospecting License ("PL") phase. Regular monitoring of the performance of the prospecting Environmental Management Plan ("EMP") was undertaken by staff employed by Motapa and subsequently Mothae Diamonds (Pty) Ltd as well as by independent environmental consultants.

A new finding was the discovery of a previously undocumented population of Maloti Redfin *(P. Quathlambae)* in the Mothae River. The most significant potential impacts on freshwater ecosystems and water quality are those related to tailings management, sediment run-off, altered river flow patterns and the direct loss of wetlands.

The proposed Mothae Mine would operate with a water deficit, requiring make-up water from a clean water system. This means that effective implementation of the proposed water management plan (i.e. including measures for the conservation of water, water demand management and maximising the reuse and recycling of water) would be vital for the successful operation of a mine.

## 20.2 Mining Lease Phase

A Mining Lease ("ML") was granted to Mothae Diamonds in September 2009 under the original environmental clearance, (based on the original EMP for the PL), and subject to undertaking a detailed Environmental Impact Assessment ("EIA") for the long term mining. A new ML was granted to Mothae Diamonds in January 2017 and is valid until 28 January 2027.

A Conceptual Study was completed by ADP Projects (Pty) Ltd from Cape Town, South Africa in 2009 in accordance to the terms of being granted the ML. The Mothae Conceptual Study provided the scope of work envisaged for a full-scale mining phase including the associated infrastructure, services and ancillary works.

A number of different alternatives were considered during the Mothae Conceptual Study. The preferred alternatives arising from the Mothae Conceptual Study were assessed by specialists in their various disciplines to form the final EIA. The EIA confirmed that the most important biophysical issues are all related to water.

The EIA was submitted and approved by the National Environmental Secretariat of the Government of Lesotho in January 2012.

## 20.3 Public Participation Process

A public participation process ("PPP") was commenced in 2007. The public participation process involved the following steps:

1. *Stakeholder Analysis*. A stakeholder database was compiled to identify potential Interested and Affected Parties ("I&AP's") that need to be involved in the consultation process.
2. *Courtesy Visits*. Initial and ongoing consultations with the Department of Environment ("DoE") as the national institution entrusted with the mandate of safeguarding environmental security in the country were maintained throughout the bulk sampling programme.
3. *Background Information Document* ("BID"). The BID was prepared in both official languages, Sesotho and English and disseminated to I&AP's in the district of Mokhotlong; Letseng village, Mofolane village, the herdsmen / cattle post owners and the Thaba-Kholo and Ha Meno villages downstream of Mothae which were consulted during the PPP as the nearest communities to the study area.

4. *Newspaper Public Notices*. A Public Notice was placed in a Sesotho newspaper – the Lentsoe la Basotho for the week of 21 to 27 July 2011; A Public Notice was also placed in an English newspaper 'The Public Eye' on 8 July 2011.
5. *Radio Public Notices*. Public notices were broadcast twice on Radio Lesotho in both English and Sesotho in July 2011.
6. *Community Leaders' Sensitization*. Sensitization meetings were held with the community leaders, especially the Chiefs and Community Council Secretaries in the absence of the councillors while awaiting local Government elections of September, 2011 to inform them about the impending EIA studies for Mothae. One of the aims of the sensitization visits was to find out under whose administration the Mothae area falls; which villages are more likely to be impacted by the Project in terms of grazing and labour attraction; and to solicit their permission to mobilize the affected communities for community consultations. The starting point was to have meetings with the District Council Secretary ("DCS") and District Administrator ("DA") of Mokhotlong in order to establish the boundaries under their jurisdiction. This was followed by visits to the chiefs and community councils based on information and advice from the DCS and DA.
7. *Inception Workshop*. This was held on 11 July, 2011 at the Senqu Lodge in Mokhotlong. Various institutional stakeholders and community representatives as identified in the stakeholder database were invited by the consultant to attend the workshop. During the workshop, the proposed EIA methodologies for undertaking the Socio-Economic Impact Assessment ("SIA"), PPP and Biophysical Impact Assessment were outlined. All comments received were noted.
8. *Community Consultations*. These took place between 12 and 15 July, 2011. There are no communities in the immediate vicinity of Mothae. However, it was noted that there is likely to be attraction of labour from the following nearest places: Letseng village; Mofolaneng village in the Mapholaneng area and the Thaba-kholo, Ha Meno and Cangela villages which, when grouped together, are the nearest community downstream of Mothae. Other stakeholders that would be impacted are the livestock owners who have cattle posts that would be lost to the Project and its activities. Therefore, there were three community consultations plus the herdsmen / cattle post owners that were held separately in each community. In each of them, plenary sessions were held, followed by Focus Group Discussions assisted by three research assistants to solicit community views on the Project and its potential impacts, and suggested mitigation strategies.
9. *Draft Issues Report*. The information collected during the Inception Workshop and community consultations was captured and compiled into a General Issues report which indicated major findings and recommendations for incorporation into the EIA.
10. *National Stakeholder Workshop*. A summary of Issues and Responses received was circulated at the National Stakeholder Workshop held at the Senqu Lodge in Mokhotlong on the 2$^{nd}$ of September, 2011. I&APs were invited to express their comments on the findings and recommendations of the Issues and Response Report, the findings of the Biophysical studies, the SIA findings, and to comment on the recommended mitigation strategies for inclusion in the EIA.

11. *Final EIA and EMMP*. Mothae Diamonds provided responses to the issues raised during the PPP. These have, where appropriate, been incorporated into the EIA report and the Environmental Management and Mitigation Plan ("EMMP").

As an outcome of the PPP process it was concluded that all the stakeholders and communities support the Project and would like the Project to go ahead. However, a number of issues and concerns were raised. There were relatively few biophysical issues raised and these are addressed in the EIA and EMMP. There were a number of other socio-economic issues raised which included employment, crime, loss of communal grazing land and corporate social responsibility. These are issues that cannot all be resolved by the mine and require on-going consultation between the mine and the relevant stakeholders. For that reason it was proposed that Mothae Diamonds will form a Stakeholder Liaison Committee that will meet on a regular basis in order to prioritise possible assistance from the mine towards community needs as well as to resolve any issues and concerns. A summary of the impacts of the proposed bulk sampling programme on the environment and proposed mitigation measures is provided in Table 20-1.

The DoE which is part of Lesotho's Ministry of Tourism, Environment and Culture confirmed in a letter dated 27 June 2017 that Lucapa is granted environmental clearance subject to the following conditions:

1. An audit on the 2011 Environmental and Social Impact Assessment ("ESIA") and Environment and Social Management Plan ("ESMP") is to be submitted before 27 December 2017
2. No construction activities shall commence before submission of a Construction EMP
3. An environmental audit is undertaken every six months from the commencement of production
4. An environmental risk assessment plan will be submitted to DoE within six months of the commencement of production
5. The proposed mitigation measures in the EMP will be observed and complied with. However the management of the project will be proactive in addressing the impacts which are not anticipated in the EMP
6. Any adverse effects on mining operations on surface and underground water will be minimised through progressive rehabilitation, which includes control of storm water runoff and prompt revegetation of disturbed areas. Also, appropriate measures will be taken to prevent contamination of water sources, especially the Mothae River
7. All necessary approvals and permits will be acquired from the relevant departments / authorities before commencing of the project. This clearance does not exonerate the company from obtaining such permits
8. If any changes are required or anticipated the DoE will be consulted in advance for concurrence
9. The DoE reserves the right to revoke this clearance if there are any deviations from above conditions and if there are adverse environmental concerns caused by the project which are unforeseen at the beginning of the project

**Table 20-1**

**Summary of Environmental and Community Impacts and mitigation measures**

| Item | Impact | Proposed Mitigation |
|---|---|---|
| Soil | Loss of soil | Minimise surface infrastructure footprint<br>Peat should be removed from areas of impact and used for rehabilitation of exposed areas<br>Minimise erosion by contouring the landscape |
| Vegetation | Loss of vegetation | Construction activities in wetlands to be minimised.<br>Topsoil to be stripped and stored separately.<br>Promotion of concurrent rehabilitation of disturbed areas |
| Mammals, Reptiles and Amphibians | Habitat loss, disturbance and displacement | Environmental awareness training and compliance to the EMP |
| Fish | Habitat loss, disturbance and displacement | Avoid contamination of rivers and implement a water quality monitoring system<br>Minimise and contain runoff from construction phase |
| Freshwater ecology and Water Quality | Tailings and sedimentation, altered river flow patterns and loss of wetlands | Design and implement a tailings and storm water management systems<br>Avoid wetland areas and rehabilitate those that will not be lost through mining related activities |
| Groundwater | Leaks and spills | Strict clean-dirty water separation programme<br>Reduction, control and clean-up of all spillages |
| Surface Water | Reduced catchment yield | Put in place measures to conserve water and maximize the reuse and recycling of water.<br>Maximise the diversion of clean run-off around the dirty activities |
| Energy | Mainly off-site environmental issues | Energy management plan which should include maximising energy efficiency and proportion of renewable energy |
| Socio-economic | Project contribution to the economy through the procurement of goods and services, employment of people and the payment of taxes | Skills development; Stakeholder and Community relations through committees that meet regularly and a dedicated liaison person at the project site; transparent recruitment policy to be developed; CSIR projects. |
| Other Impacts | Air Quality | Use of appropriate PPE, dust suppression techniques and re-vegetation of exposed soils |
| | Noise | Adequate warning and safety procedures and signs and proper PPE when working in noisy environment |
| | Solid Waste | Solid waste management system that includes principles of reduce, reuse and recycle and segregation of different waste |
| | Traffic | Adequate signage and road marking are in place and arrange with authorities when extra heavy load are to be transported to Mothae |

***Source:*** *Lucara, in Lynn and Ferreira, 2013*

# 21 CAPITAL AND OPERATING COSTS

The Mothae Project has not yet progressed to the stage where capital and operating cost requirements for the Project have been finalised. The capital and operating costs for Phase 1 and Phase 2 and will be subject to separate studies. The likely mining costs are presented in the conceptual mining study in Section 16.

# 22 ECONOMIC ANALYSIS

No economic analysis of the Mothae Project has yet been reported as this will be part of the planned Pre-feasibility Study.

## 23 ADJACENT PROPERTIES

The Mothae Project lies within the northern Lesotho kimberlite cluster (Figure 7-3). This area of kimberlite occurrences was first recognised in the late 1950s and includes over 100 known kimberlite intrusions, varying in size from the Kao pipe (19.8 ha) and the main Letseng pipe (15.9 ha) to several small dykes and blows.

Historically, only the Letseng and Liqhobong pipes have been mined. The status of the adjacent properties is summarised in Table 23-1.

**Table 23-1**

**Summary of adjacent properties Diamond Resource estimates**

| Company | Kimberlite Project | Total Diamond Resources Mt* | Grade cpht* | Revenue USD/ct* | Calculated Revenue USD/t | Average Price USD/ct for size of production / parcel (ct) | Source |
|---|---|---|---|---|---|---|---|
| GEM Diamonds | Letseng | 211.6 | 1.90 | USD 2,839 | USD 54 | USD 1,695 [1] 108,206 ct | Jan 2012 Diamond Resource statement |
| Paragon Diamonds | Motete[4] | 1.6 | 65.00 | USD 62 | USD 40 | NA | Nov 2012 Diamond Resource statement |
| Firestone Diamonds | Liqhobong | 83.4 | 27.00 | USD 132 | USD 36 | USD 90 [2] 310,376 ct | Diamond Resource update, Oct 2015 |
| Namakwa Diamonds | Kao | 183.4 | 6.36 | USD 201 | USD 13 | USD 274.5 [3] 13,976 ct | Aug 2012 Diamond Resource statement |
| Paragon Diamonds | Lemphane[5] | 30.0 | 1.96 | NA | NA | NA | www.paragondiamonds.com |

**Note:** **Includes code-compliant and historic or unverified Diamond Resources. MSA has not verified these estimates, with the exception of the Motete Project; NA = not available*

[1] = Average price for 2016 (Gem Diamonds Annual Report 2016); Average price for 2015: USD 2,299/ct from 108,579 ct; Average price for first half of 2017: USD 1,779/ct from 49,930 ct

[2] = Average price for all 2017 sales reported by Mining Weekly on 17 July 2017

[3] = Tender in early 2013 reported by Mining Weekly on 12 March 2013

[4] = Motete dyke is now owned by Lesotho-based Northern Fissures following Paragon's insolvency

[5] = Lemphane kimberlite is now held by Lesotho-based Lekatla Group following Paragon's insolvency

### 23.1 Letseng Diamond Mine

The Letseng Mine (Figure 23-1) is situated less than 7 km south east of the Mothae Project and was acquired by Gem Diamonds from JCI Ltd in 2006 for USD 118.5 million. The mine is characterised by very low grade ore but is well known for producing large diamonds. It produces the highest percentage of 'special' diamonds (gems greater than 10.8 carats) of any kimberlite diamond mine.

Letseng is renowned for its production of large, high value diamonds, many of which have been identified as Type IIa stones. The largest diamond recovered in 2015 weighed 357 carats and was sold for USD 19.3 million which was the highest USD value ever achieved for a single Letseng diamond. Previous Type IIa diamonds include the 478 carat "*Leseli la Letšeng*" white diamond (sold for USD 18.4 million) which is the world's 22nd largest rough gem diamond, the 603 carat "*Lesotho Promise*" (16th largest; sold for USD 12.4 million) and the 493 carat "*Letšeng Legacy*" (20th largest; sold for USD 10.4 million) recovered in 2008, 2006 and 2007 respectively.

**Figure 23-1**

**Panoramic view of Satellite pit at Letseng Mine**

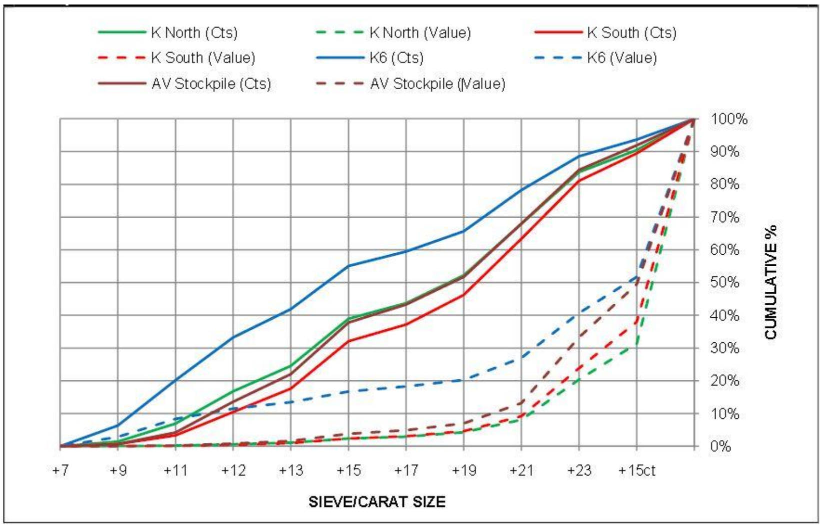
***Source:*** *GEM Diamonds, 2017*

An important aspect of the Letseng Mine for comparison with the Mothae Project, is the proportion of Type IIa diamonds produced and the mine's revenue curve (Figure 23-2). Approximately 20% and over 50% of diamonds from the Letseng Main Pipe and Satellite Pipe respectively are Type IIa diamonds (Figure 23-3), and this proportion is higher in the large size categories (Venmyn, 2011). Between 50% and 70% of revenue is generated from diamonds greater than 15 ct in weight from the Main Pipe at Letseng. This figure is over 70% for the Satellite Pipe. Since very few data points have been generated for the Mothae Project in this size range, the revenue estimates are necessarily conservative. The implication for Mothae is that the overall average value per carat could be higher than has been estimated in this Report.

Gem Diamonds has recently completed construction of the Coarse Recovery Plant which recovered a high-quality 52 carat Type IIa on its first day of operation (Gem Diamonds, 2015). The objectives of the new plant are to improve liberation, reduce diamond damage and therefore increase average revenue per carat) and reduce unit costs for mining and processing ore.

**Figure 23-2**

**Cumulative SFD and value for the Letseng Mine Main Pipe and alluvial ventures (AV)**




***Source:*** *Venmyn, 2011 in Lynn and Ferreira, 2013*

**Figure 23-3**

**Examples of large diamonds from the Letseng Mine**

***Source:*** *Gems and Gemology, 2015; Photo by Robert Weldon/GIA, courtesy of Gem Diamonds Ltd*
***Note:*** 299.35 ct slightly yellowish partial octahedron and a colourless 112.61 ct Type IIa diamond

## 23.2 Liqhobong Diamond Mine

The Liqhobong Mine is owned by Firestone Diamonds (75%) and GoL (25%). It is located in the highlands of Lesotho at an elevation of 2,600 m (Figure 23-4). Liqhobong is situated some 20 km due west of Mothae, on a parallel structural trend. The Satellite Pipe (1.6 ha) has a grade of 68 cpht and the Main Pipe (9.5 ha) has a grade of about 17 cpht.

**Figure 23-4**

**Aerial view of Liqhobong Mine in winter and summer**

***Source:*** *Firestone, 2017*

Trial production from a pilot plant was conducted between 2011 and 2013 and produced in excess of 325,000 carats and the results were reported in a Definitive Feasibility Study ("DFS") released in November 2013. An updated Diamond Resource and life of mine plan in October 2015 reports an overall Diamond Resource of 83.4 Mt at an average grade of 27 cpht. Production started in late 2016, and it is planned to ramp up to 1 million carats per annum for a 15 year life of open pit mine with a plant designed at 500 tonnes per hour.

According to the DFS, start-up capital for the project is estimated at USD 185 million, operating costs at USD 15 per tonne. The average 'post-financing' revenue is quoted as USD 165/ct. In 2015 Firestone estimated the Net Present Value of the project as USD 389 million at a discount rate of 8% with an IRR of 42%.

## 23.3 Kao Diamond Mine

The Kao Mine is owned by Namakwa Diamonds (62.5%), GoL (25%) and Kimberlite Investments Lesotho Limited (12.5%). The Kao kimberlite pipe has a surface area of 19.8 ha and is the largest diamond-bearing pipe in Lesotho (Figure 23-5). The following information has been compiled from Namakwa Diamonds' website and other public domain websites and the Independent Technical Report on Kao, prepared by Venmyn in 2012.

Namaqua Diamonds through its subsidiary Storm Mountain Diamonds intended to develop the mine as an open pit in two Phases. Phase 1 operations were planned for a period of four years, ending in 2015. Dependent on the results of a long-term planning study and decisions regarding the size of the processing plant for Phase 2, the mine has a potential life of up to 21 years.

Phase 1 anticipated the mining and processing of weathered and hard kimberlite at a production rate of 300,000 ct from 3.6 Mt of ore per annum. This process was aimed to establish revenues for the various kimberlite domains and to provide for waste stripping of 9 Mt of basalt to complete the slimes dam wall, as well as exposing high value kimberlite for mining.

**Figure 23-5**
**Aerial view of Kao Mine**

***Source:*** *Namakwa Diamonds, 2017*

During 2012, 121,521 carats were recovered from 1.12 Mt, including individual stones of 82 ct, 72 ct and 60 ct, as well as three 50 ct stones. In addition, a broken 131.72 carat near-gem white stone (88.6 ct and 43.12 ct respectively) was recovered. A 36.06 ct and a 23.82 ct exceptional pink stone were recovered in 2014 together with a 51 ct and 35 ct yellow diamond.

In 2012, Kao had an Indicated Diamond Resource of 52.8 Mt, grading at 6.3 cpht and with an average diamond revenue of USD 204/ct, and an Inferred Diamond Resource of 130.7 Mt with an average grade of 6.4 cpht and an average diamond revenue of USD 201/ct (Venmyn, 2012). This Diamond Resource is compliant with JORC, 2012.

## 23.4 Lemphane Project

The Lemphane Project comprises a kimberlite pipe of 6.4 ha in extent at an elevation of 2,600 m in the Lesotho Highlands (Figure 23-6). The project is approximately 24 km west of Mothae and has been bulk sampled. Paragon Diamonds Limited website (www.paragondiamonds.com) indicates a sample grade of 1.96 cpht and a coarse size frequency distribution. The largest diamond reported to date is a 6.3 ct stone. Paragon conducted a Pre-feasibility Study and obtained a Mining Lease in March 2014. However, Paragon delisted at the London Stock Exchange in December 2015 due to insolvency and the Lemphane kimberlite is now held by the Lesotho-based Lekatla Group.

**Figure 23-6**

**Aerial view of the Lemphane kimberlite (position traced with white stippled line)**

***Source:*** *Paragon, 2010*

## 23.5 Motete Project

The Motete Project is situated 20 km west northwest of Mothae and following Paragon's insolvency is now held by Lesotho-based private company Northern Fissures. Motete is a kimberlite dyke outcropping across a river valley with a strike length of 1.5 km and an average width of 1.4 m (Figure 23-7). An Inferred Diamond Resource of 1.5 Mt at an average grade of 65 cpht (1.18 mm bottom size cut-off) and average diamond revenue of USD 62 per tonne has been reported by Paragon. This Diamond Resource is compliant with JORC, 2012.

**Figure 23-7**

**Aerial view of Motete kimberlite dyke (position traced with yellow line)**


***Source:*** *Paragon, 2015* ***Note:*** *yellow symbols indicate bulk sample positions*

## 24 OTHER RELEVANT DATA AND INFORMATION

Below is a brief summary of common challenges inherent in diamond sampling and evaluation:

- Even in economically viable deposits, diamonds are present in extremely small quantities, and their distribution within the host tends to be erratic e.g. a grade of 10 carats per hundred tonnes ("cpht") is equivalent to 20 parts per billion
- The size and value of stones is erratic and it is possible that the bulk of the value of a parcel of diamonds is attributable to a small number of individual stones or even a single stone
- Drill sampling of hard kimberlite tends to break larger diamonds and under-recover smaller diamonds due to limited liberation.

It is not uncommon for there to be multiple intrusions within a single kimberlite pipe, where the later phases intrude earlier ones. The concentration and quality of diamonds may vary between different phases and lithologies and therefore a sound geological model and lithologically controlled sampling are important in evaluation. To eliminate the evaluation challenges caused by these factors, very large samples are required. In most diamondiferous kimberlites, grade may be determined by relatively small samples and analysis for microdiamonds using caustic fusion for a total diamond content liberation. This is because the diamond population in a kimberlite follows a log normal size distribution. The size frequency of the commercial sized diamond population can therefore be reasonably accurately estimated from the size frequency of the 'microdiamond' population. However, the microdiamond population does not provide adequate revenue information. In order to determine the typical revenues to be expected for a diamond deposit, the following is required:

- Grade (cpht)
- Diamond size frequency distribution ("SFD")
- Diamond revenue (USD/ct), determined by the valuation or sale of a complete parcel (>1,000 ct) of diamonds at current prices

In order to estimate a Diamond Resource the following parameters must be defined:

- Tonnage, which is the calculated volume of the ore deposit multiplied by its density (specific gravity)
- Average grade
- Average diamond value.

# 25 INTERPRETATION AND CONCLUSIONS

Lucapa holds a 70% interest in the Mothae Project, which involves the Mothae kimberlite pipe (8.81 ha). Phased evaluation through an effective and diligently executed drilling and bulk sampling programme by MSC and its associates between 2006 and 2012 has led to the development of a sound geological understanding, and a reasonably robust geological model of the uppermost 300 m of the pipe. It has also led to the estimation of a Diamond Resource, which is stated in Section 14 of this Report.

The Mothae Project is a low grade, high value kimberlite, which makes evaluation particularly difficult because very large bulk samples are required to provide adequate diamond recoveries for grade and revenue estimation. The bulk sampling took place in the near surface environment, because drilling cannot obtain sufficient volumes of sample to produce meaningful bulk samples from depth.

## 25.1 Geological and Grade Model

The outline and internal geological contacts of the Mothae kimberlite have been mapped and characterised by detailed geological and geophysical investigations. The kimberlite consists of a main southern lobe (South Lobe) with a surface expression of 5.05 ha connected to a smaller northern lobe (North Lobe) by an elongate central kimberlite body (Neck). Wall rock contacts for the Neck are not exposed and remain poorly constrained. However, the kimberlite-basalt contact is typically sharp and steep-walled in both the North and South Lobes, with localized zones of wall rock breccia.

Geophysical and geological studies of the Mothae kimberlite have identified five main geological domains within the pipe. All of the domains contain varieties of massive volcaniclastic kimberlite (“VK”). These domains are: North, Neck, South West, South Central and South East. These domains were sampled separately and different grades and average diamond revenues have been assigned to each domain in the Diamond Resource estimate.

In addition to the five domains, the geological model recognises the weathered zone of each domain as a separate geological unit. This is because the weathered zone responds differently to processing through the plant, and exhibits different recovery characteristics to fresh, hard kimberlite. The majority of the sampling undertaken was in weathered kimberlite. Bulk samples of fresh, hard kimberlite provided an indication of the difference in recovery factors to be expected between the weathered and unweathered material.

In order to overcome the problem of demonstrating geological and grade continuity at depth (for Diamond Resource estimation purposes), Lucara undertook detailed geological studies of the kimberlite from drill core, which included petrography and KIM studies. The latter were used to ‘fingerprint’ the different geological domains, and demonstrate their continuity and geometry at depth. The quality of this work is such that MSA is comfortable to extend the grade and revenue information obtained in the near surface environment into the pipe at depth, for the purposes of declaring a Diamond Resource, subject to the degrees of uncertainty on aspects of the Diamond Resource estimate described in Section 14 of the Report.

The majority of the Diamond Resource is classified as 'Inferred'. However, the Diamond Resource in the South West and South Central domains in the South Lobe of the pipe above 50 m depth is classified as 'Indicated' due to the considerable amount of sampling data.

## 25.2 Diamond Revenue Model

Despite the very large total quantum of bulk samples processed from Mothae (603,819 dry tonnes) and the fact that a very coarse SFD has been demonstrated (Section 14.3.4), the largest gem diamonds reported from the three Phases of bulk sampling were a 56.51 ct stone and two broken stones that would have been at least 82.34 ct and 44.9 ct respectively. If these stones are included, only 41 diamonds of over 15 ct were reported during the whole programme, out of a total of 52,017 stones. This result is statistically expected based on the total sample size and means that the revenue model for stones of over 15 ct in weight is limited by lack of data and will therefore have a relatively high margin of error until more 15+ ct diamonds are recovered.

Between 70% and 80% of diamond revenue at Letseng Mine comes from diamonds of over 10 ct. Available evidence (proportion of Type IIa diamonds, comparison of SFDs) suggests that the Mothae revenue model may be comparable to Letseng. However, without sufficient data on revenues for very large stones, the revenue model for the coarsest stones has an inherent uncertainty.

In addition to a relative lack of revenue data for very large diamonds, the data used for the revenue modelling was derived by averaging the best two sale prices tendered for each diamond parcel, rather than the best price.

For these reasons, MSA considers that the revenue model for Mothae may be conservative.

The global diamond market has experienced significant volatility over the past decade. Despite this, the market fundamentals suggest that demand will outstrip demand over the next 10 years, and consequently rough diamond prices can be expected to rise on average over this period.

## 25.3 Total Liberation Diamond Sampling

Lucara undertook limited total diamond liberation (microdiamond or MiDA) sampling of the Mothae kimberlite, and concluded that the diamond recoveries were too small to assist in the grade modelling of the pipe. MSA has reviewed this work and concluded that in fact the microdiamond data provides useful support to the bulk sampling data, and could be used for future grade modelling at depth. Low stone counts will be obtained, but it will be possible to model diamond concentration and to rely on the size distribution models obtained from the large bulk samples. By systematically comparing microdiamond recoveries, MSA believes it will be possible to identify changes in SFDs at depth if these occur.

# 26 RECOMMENDATIONS

On the basis of the Diamond Resource estimate, and the potential upside with respect to the average revenue per carat for each of the geological domains within the Mothae kimberlite, MSA recommends that a Pre-Feasibility Study or Feasibility Study be undertaken for Phase 2 (mining of unweathered kimberlite). The Study would be aimed at establishing realistic estimates of the key parameters of optimum open pit dimensions, waste stripping ratio, operating costs, optimum plant configuration including top and bottom size cut-offs and capital costs to arrive at an economic model and to confirm that the current Diamond Resource has the potential to be mined economically.

It is recommended to carry out processing studies work including 3 mm and 4 mm bottom size cut-off test work on the existing drill cores and to use the results to optimise the plant parameters.

It is also recommended to carry out total diamond liberation (microdiamond) studies on selected drill cores from the South Lobe to assess diamond content and size frequency at depths from approximately 20 m (below weathered zone) to approximately 150 m. If this method is successful in constraining the diamond grade, size frequency and diamond characteristics it should be extended to the North Lobe and the Neck.

The estimated costs for the recommended work are shown in Table 26-1. The costs exclude any costs related to Phase 1 production.

**Table 26-1**
**Summary of estimated costs for recommended work programmes**

| Activity | Cost (USD) |
|---|---|
| Pre-Feasibility or Feasibility Study for Phase 2 (mining of unweathered kimberlite) | 180,000 |
| Processing studies on existing core (four domains) | 40,000 |
| Total diamond liberation (MiDA) on existing core | 60,000 |

If it is established that the existing Diamond Resource cannot support mine development, then the project will need to establish what diamond revenue could potentially make the Project economic. Based on the work that has been completed to date, a reduction in the level of uncertainty associated with Diamond Resource tonnage and grade is unlikely to have a major impact on the overall project revenue. Average diamond revenue (expressed as USD/ct) may change slightly with further bulk sampling and a greater number of very large stones on which to base an improved average diamond revenue estimate. However, the main factor which is likely to change over time (based on published forecasts) is the diamond market. All recent published analyses of the diamond market project an increase in demand and a decrease in supply over the next decade, which has the potential to drive rough diamond prices up. Therefore the Project economics may improve over time.

## 27 REFERENCES

***AGM*** (2012). Valuation and assessment of diamond sale results for the Mothae Diamond Project. Unpublished report by A.G.M. Diamond Expertise (HK) Ltd., December 1, 2012.

***Bailey, D.K.*** (1992). Episodic alkaline igneous activity across Africa: implications for the causes of continental break-up. In: Storey, B.C., Alabaster, T. and Pankhurst, R.J. (Eds.), *Magmatism and the causes of continental break-up*, Geol. Soc. Spec. Publ., 68, 91-98.

***Bain & Company*** (2016). The Global Diamond Industry 2016. The enduring allure of timeless gems; Report commissioned by AWDC. www.bain.com

***Begg G.C., Griffin W.L., Natapov L.M., O'Reilly S.Y., Grand S.P., O'Neill C.J., Hronsky J.M.A., Poudjom Djomani Y., Swain, C.J., Deen T. and Bowden P.*** (2009). The lithospheric architecture of Africa: Seismic tomography, mantle petrology and tectonic evolution. Geosphere 5, 23-50.

***Bleackley, D. and Workman, D.R.*** (1964). Reconnaissance Mineral Survey of Basutoland. Inst. Geol. Sciences. Overseas Division, Rep. 3. London.

***Brown, R. W., Summerfield M.A. and Gleadow A. J. W.*** (2002). Denudational history along a transect across the eastern margin (Drakensberg Escarpment) of southern Africa derived from apatite fission-track thermochronology, J. Geophys. Res., 107, 10.1029/2001JB000745.

**Catuneanu, O., Wopfner, H., Eriksson, P.G., Cairncross, B., Rubidge, B.S., Smith, R.M.H. and Hancox, P.J.** (2005). The Karoo basins of south-central Africa. Journal of African Earth Sciences, Volume 43, Issues 1-3, October 2005, Pages 211-253.

***Clifford,T.N.*** (1966). Tectono-metallogenic units and metallogenic provinces of Africa. Earth and Planetary Science Letters 1, 421-434.

***CIM*** (2010). Guidelines for the reporting of diamond results.

***De Wit, M.J., Roering, C., Hart, R. J., Armstrong, R. A., De Ronde, C. E. J., Green, R .W. E., Tredoux, M., Peberdy, E and Hart, R. A.*** (1992). Formation of an Archean continent. Nature 357, 553-562.

***Eglington, B., Reddy, S. and Evans, D.*** (2008). IGCP 509 Example Space-Time Plot: Palaeoproterozoic of Southern Africa. Geological Society, London, Special Publications; 2009; v. 323; p. 27-47.

***Firestone Diamonds*** (2012). Liqhobong Definitive Feasibility Study. October 2012.

***Firestone Diamonds*** (2015). Liqhobong Mine Expansion Project; Diamond Resource and Reserve Report, October 2015. Internal Technical Report, 118 pp.

***Foundation Resources*** (2017). Mothae Diamond Size Frequency Distribution and Value. Unpublished Technical Document for Lucapa.

***GEM Diamonds*** (2012). Resource and Reserve statement, 31 January 2012.

***GEM Diamonds*** (2017). Full year 2016 results. www.gemdiamonds.com

***GTD Consulting Limited*** (2017). Summary Report on Mothae Diamond Mine. Unpublished Technical Report for Lucapa, February 2017. 9 pp.

***James, D.E., Fouch, M.J., VanDecar, J.C., van der Lee, S. and the Kaapvaal Seismic Group*** (2001). Tectospheric structure beneath southern Africa. Geophysical Research Letters, Vol. 28, No. 13, Pages 2485-2488, Jul 1, 2001.

***Jones, A.G., Evans, R.L., Eaton, D.W.*** (2009)[1]. Velocity–conductivity relationships for mantle mineral assemblages in Archean cratonic lithosphere based on a review of laboratory data and Hashin–Shtrikman extremal bounds. Lithos 109, pages 131–143.

***Jones, A.G., Evans, R.L., Muller, M.R., Hamilton, M.P., Miensopust, M.P., Garcia, X., Cole, P., Ngwisanyi, T., Hutchins, D., Fourie, C.J.S., Jelsma, H., Aravanis, T., Pettit, W., Webb, S., Wasborg, J., and The SAMTEX Team.*** (2009)[2]. Area selection for diamonds using magnetotellurics: Examples from southern Africa. Proceedings of the 9th International Kimberlite Conference. Lithos 112S, pages 83–92.

***Lipton, I. T***. (2001).Measurement of bulk density for resource estimation in mineral resources and ore reserve estimation. In: The AusIMM Guide to Good Practice. Ed. AC Howards, pages 57 – 66.

***Lynn, M. and Ferreira, J.*** (2013). NI 43-101 Technical Report and Mineral Resource Estimate for the Mothae Diamond Project, Lesotho, prepared by The MSA Group on behalf of Lucara Diamond Corp. Project Code J2613. Effective Date: 28 February 2013. 165 pp.

***Marsh, J.S., Hooper, P.R., Rehacek, J., Duncan, R.A. and Duncan, A.R.*** (1997). Stratigraphy and age of Karoo basalts of Lesotho and implications for correlations within the Karoo Igneous Province. Geophysical Monograph, vol 100, pp 247-272.

***MSC - Mineral Services Canada*** (2013). Geology and Mineral Resource Estimate for the Mothae Kimberlite Pipe. Mineral Services Canada Inc. 31 January, 2013.

***Mucin, L. and Rutherford, M.C.*** (2006). The Vegetation Map of South Africa, Lesotho and Swaziland. SANBI, Pretoria.

***MSA*** (2010). NI 43-101 Independent Technical Report on the Lemphane Kimberlite Project, Lesotho

***MSA*** (2007). Independent NI 43-101 Technical Report on the Mothae Kimberlite for Motapa Diamonds. Effective Date: 12 February 2007.

***MSA*** (2013). NI 43-101 Technical Report and Mineral Resource Estimate for the Mothae Diamond Project, Lesotho. Report for Lucara Diamond Corp. Effective date 28 February 2013. 151 pp.

***MSA*** (2015). Mothae Kimberlite Project - Diamond Revenue Model Update. Unpublished Report for Paragon Diamonds dated 14 September 2015. 10 pp.

***MSA*** (2017). Mothae Kimberlite Project – Mine Planning Study. Report for Lucapa Diamonds. 31 pp.

***Nixon, P.H.*** (1973). Lesotho Kimberlites. Lesotho National Development Corporation. 351 pp.

***Polishedprices*** (2017). Overall index 5 years. www.polishedprices.com

***PriceScope*** (2017). Diamond Price Chart. www.pricescope.com/diamond-prices/diamond-prices-chart

***Venmyn*** (2012). Samrec Compliant Diamond Resource Statement for Namakwa's Kao Kimberlite Mine, Lesotho.

# APPENDIX 1:

## Glossary of Technical Terms

## Glossary of Technical Terms

| | |
|---|---|
| *Archaean* | The oldest rocks of the Precambrian era, older than about 2,500 million years |
| *basalt* | A dark, fine-grained volcanic rock of low silica (<55%) and high iron and magnesium composition, composed primarily of plagioclase and pyroxene |
| *basement* | The igneous and metamorphic crust of the earth, underlying sedimentary deposits |
| *bcm* | Bank cubic metre |
| *BCOS* | Bottom cut-off screen |
| *breccia* | Intensely fractured body of rock |
| *CAGR* | Compound annual growth rate |
| *Cambrian* | The oldest of the systems into which the Palaeozoic stratified rocks are divided, 545 to 490 million years ago |
| *carbonate* | A rock, usually of sedimentary origin, composed primarily of calcium, magnesium or iron and $CO_3$. Essential component of limestones and marbles |
| *chrome diopside* | A calcium, magnesium silicate, $Ca(Mg,Fe,Cr)(Si,Al)_2O_6$, with a high proportion of chromium substitution in the lattice, which is a common indicator mineral for diamond |
| *chromite* | An oxide of chromium, $(Mg,Fe)Cr_2O_4$, some varieties of which can represent an indicator of diamonds |
| *conglomerate* | A rock type composed predominantly of rounded pebbles, cobbles or boulders deposited by the action of water |
| *cpht* | Carats per 100 tonnes |
| *cps* | Carats per stone |
| *ct / cts* | Carat / carats |
| *craton* | Large, and usually ancient, stable mass of the earth's crust comprised of various crustal blocks amalgamated by tectonic processes. A cratonic nucleus is an older, core region embedded within a larger craton |
| *Cretaceous* | Applied to the third and final period of the Mesozoic era, 141 to 65 million years ago |
| *diamond drilling* | Method of obtaining cylindrical core of rock by drilling with a diamond set or diamond impregnated bit. |
| *diatreme* | A volcanic vent or pipe created by gaseous magma sourced from the mantle |
| *dipolar anomaly* | A magnetic dipole created by a magnetic source with a roughly cylindrical shape and considerable depth extent |
| *DMS* | Dense media separation |
| *DRP* | Diamond recovery plant |
| *dyke* | A tabular body of intrusive igneous rock, crosscutting the host strata at an oblique angle |
| *fault* | A fracture or fracture zone, along which displacement of opposing sides has occurred |
| *ESIA* | Environmental and social impact assessment |
| *ESMP* | Environment and social management plan |
| *gneiss* | A coarse grained, banded, high grade metamorphic rock |
| *gravity survey* | Recording the specific gravity of rock masses in order to determine their distribution |
| *ilmenite* | An iron, magnesium and titanium oxide ($(Fe,Mg)TiO_3$). The magnesium-rich ilmenite in kimberlite is called picro-ilmenite |
| *indicator minerals* | A suite of resistant minerals with an origin and mode of occurrence similar to diamond, that can be indicative of the presence of primary diamond deposits |
| *joints* | Regular planar fractures or fracture sets in massive rocks, usually created by unloading, along which no relative displacement has occurred |

| | |
|---|---|
| *kimberlite* | An alkaline ultramafic igneous rock that is generated at great depths in the earth and emplaced at the surface in pipes (diatremes), dykes or sills. The principal source of primary diamonds |
| *KIM* | Kimberlite Indicator Mineral: pyrope garnet, eclogitic garnet, picro-ilmenite, chromite, chrome diopside |
| *kt* | Kilotonnes (1,000 tonnes) |
| *ktpm* | Kilotonnes per month |
| *limestone* | A sedimentary rock containing at least 50% calcium or calcium-magnesium carbonates |
| *lineament* | A significant linear feature of the earth's crust |
| *lithosphere* | Mass of the mantle attached to the base of the crust that has a geological history related to that of the overlying crust, and that is cold and rigid relative to the deeper parts of the mantle |
| *LSL* | Lesotho Loti (sing.), Maloti (pl.); LSL linked to ZAR at a one to one ratio |
| *load* | An historical measure of weight on South African kimberlite mines. It is equivalent to 16 cubic feet or 1,600 pounds of broken fresh kimberlite, or approximately 0.726 metric tonnes |
| *m* | metre |
| *$m^3$* | Cubic metre |
| *M* | Maloti (plural of Lesotho Loti – currency) |
| *Ma* | Million years |
| *mafic* | Descriptive of rocks composed dominantly of magnesium and iron rock-forming silicates |
| *mamsl* | Standard metric measurement in metres of the elevation or altitude of a location in reference to a historic mean sea level |
| *mantle* | The layer of the earth between the crust and the core. The upper mantle, which lies between depths of 50 and 650 km beneath continents, is the principal region where diamonds are created and stored in the earth |
| *mbs* | Metres below surface |
| *MCAF* | Mining cost adjustment factor |
| *Mct* | Million carats |
| *MDC* | Mine design criteria |
| *Mesoproterozoic* | Middle Proterozoic era of geological time, 1,600 to 1,000 million years ago |
| *metamorphism* | Alteration of rock and changes in mineral composition, most generally due to increase in pressure and/or temperature |
| *MiDA* | Microdiamond analysis |
| *$Mm^3$* | Million cubic metres |
| *MSC* | Mineral Services Canada |
| *Mt* | Million tonnes (1,000,000 tonnes) |
| *Mtpa* | Million tonnes per annum |
| *Palaeozoic* | An era of geologic time between the Late Precambrian and the Mesozoic era, 545 to 251 million years ago |
| *picro-ilmenite* | A magnesium-rich variety of ilmenite, commonly indicative of the presence of diamonds |
| *Precambrian* | Pertaining to all rocks formed before Cambrian time (older than 545 million years) |
| *Proterozoic* | An era of geological time spanning the period from 2,500 to 545 million years before present |
| *pyrope garnet* | A ruby-coloured garnet, $Mg_3Al2(SiO_4)_3$, common in deep-seated ultramafic intrusive rocks and a common indicator of the presence of diamonds |
| *ROM* | Run of mine |
| *sandstone* | A sedimentary rock composed of cemented or compacted detrital minerals, principally quartz grains |
| *satellite positioning system (global positioning system GPS)* | An instrument used to locate or navigate, which relies on three or more satellites of known position to identify the operators location |
| *SFD* | Size frequency distribution of diamonds |
| *SG* | Specific gravity |

| | |
|---|---|
| *spinel* | A group of oxide minerals of various compositions, (Mg,Fe,Mn)(Al,Fe,Cr)$_2$O$_4$, commonly occurring as an accessory in basic igneous rocks |
| *SRK* | SRK Consulting |
| *stratigraphic drill hole* | A drill hole completed to determine the nature of rocks, rather than to identify mineral deposits, frequently applied for research or in the early stages of petroleum exploration |
| *strike* | Horizontal direction or trend of a geological structure. |
| *tectonic* | Pertaining to the forces involved in, or the resulting structures of, movement in the earth's crust |
| *tph* | Tonnes per hour |
| *tpm* | Tonnes per month |
| *ultramafic* | Igneous rocks consisting essentially of ferromagnesian minerals with trace quartz and feldspar |
| *volcaniclastic* | Pertaining to clastic rock containing volcanic material |
| *vm* | Vertical metre |
| *Whittle™* | Whittle is a suite of mine optimization and strategic mine planning software products developed by Jeff Whittle from 1984 |
| *xenolith* | Applies to a rock that is foreign to the body of rock in which it occurs |
| *ZAR* | South African Rand (currency) |

# APPENDIX 2:

## Competent Person's Consent Form

The MSA Group (Pty) Ltd
Registration No: 2000/002800/07
Tel: +27 (0)11 880 4209 Fax: +27 (0)11 880 2184
email: info@msagroupservices.com
Henley House, Greenacres Office Park:
Cnr Victory and Rustenburg Roads, Victory Park, 2195
PO Box 81356, Parkhurst, 2120, South Africa
Directors: BJ Burnand, KD Scott, NN Buthelezi, SZ Majola

Specialist Consultants to the Mining Industry

## Competent Person's Consent Form

Pursuant to the Financial Conduct Authority's Listing Rules and Clause 9 of the JORC Code 2012 Edition (Written Consent Statement)

**Report name**

Mothae Diamond Project in Lesotho; JORC Mineral Resource Statement and Competent Persons Report

(*Insert name or heading of Report to be publicly released*) ('Report')

The MSA Group (Pty) Ltd

(*Insert name of company releasing the Report)*

Mothae kimberlite

*(Insert name of the deposit to which the Report refers)*

If there is insufficient space, complete the following sheet and sign it in the same manner as this original sheet.

15 September 2017

*(Date of Report)*

THE MSA GROUP

Specialist Consultants to the Mining Industry

The MSA Group (Pty) Ltd
Registration No: 2000/002800/07
Tel: +27 (0)11 880 4209 Fax: +27 (0)11 880 2184
email: info@msagroupservices.com
Henley House, Greenacres Office Park:
Cnr Victory and Rustenburg Roads, Victory Park, 2195
PO Box 81356, Parkhurst, 2120, South Africa
Directors: BJ Burnand, KD Scott, NN Buthelezi, SZ Majola

## Statement

I,

Friedrich Johannes Reichhardt

(*Insert full name(s)*)

confirm that I am the Competent Person for the Report and:

- I have read and understood the requirements of the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ("JORC Code, 2012 Edition").
- I am a Competent Person as defined by the JORC Code, 2012 Edition, having 25 years' experience that is relevant to the style of mineralisation and type of deposit described in the Report, and to the activity for which I am accepting responsibility.
- I am Professional Geologist registered with the South African Council for Natural Scientific Professions (SACNASP), a 'Recognised Professional Organisation' ("RPO") included in a list promulgated by ASX from time to time.
- I have reviewed the Report to which this Consent Statement applies.

I am a Principal Consultant working for

The MSA Group (Pty) Ltd

*(Insert company name)*

and have been engaged by

Lucapa Diamond Company Limited

*(Insert company name)*

to prepare the documentation for

Mothae kimberlite

*(Insert deposit name)*

on which the Report is based, for the period ended

8 September 2017

*(Insert date of Resource/Reserve statement)*

I have disclosed to the reporting company the full nature of the relationship between myself and the company, including any issue that could be perceived by investors as a conflict of interest.

I verify that the Report is based on and fairly and accurately reflects in the form and context in which it appears, the information in my supporting documentation relating to Diamond Resources.

THE MSA GROUP

Specialist Consultants to the Mining Industry

The MSA Group (Pty) Ltd
Registration No: 2000/002800/07
Tel: +27 (0)11 880 4209    Fax: +27 (0)11 880 2184
email: info@msagroupservices.com
Henley House, Greenacres Office Park:
Cnr Victory and Rustenburg Roads, Victory Park, 2195
PO Box 81356, Parkhurst, 2120, South Africa
Directors: BJ Burnand, KD Scott, NN Buthelezi, SZ Majola

## Consent

I consent to the release of the Report and this Consent Statement by the directors of:

Lucapa Diamond Company Limited

*(Insert reporting company name)*

| | |
|---|---|
| | 15 September 2017 |
| Signature of Competent Person: | Date: |
| South African Council for Natural Scientific Professions | 400048/04 |
| Professional Membership:<br>*(insert organisation name)* | Membership Number: |
| | Craig Blane, Johannesburg, South Africa |
| Signature of Witness: | Print Witness Name and Residence:<br>(eg town/suburb) |

The MSA Group (Pty) Ltd
Registration No: 2000/002800/07
Tel: +27 (0)11 880 4209 Fax: +27 (0)11 880 2184
email: info@msagroupservices.com
Henley House, Greenacres Office Park:
Cnr Victory and Rustenburg Roads, Victory Park, 2195
PO Box 81356, Parkhurst, 2120, South Africa
Directors: BJ Burnand, KD Scott, NN Buthelezi, SZ Majola

THE MSA GROUP

Specialist Consultants to the Mining Industry

## Competent Person's Consent Form

Pursuant to the Financial Conduct Authority's Listing Rules and Clause 9 of the JORC Code 2012 Edition (Written Consent Statement)

**Report name**

Mothae Diamond Project in Lesotho; JORC Mineral Resource Statement and Competent Persons Report

(*Insert name or heading of Report to be publicly released*) ('Report')

The MSA Group (Pty) Ltd

(*Insert name of company releasing the Report)*

Mothae kimberlite

*(Insert name of the deposit to which the Report refers)*

If there is insufficient space, complete the following sheet and sign it in the same manner as this original sheet.

15 September 2017

*(Date of Report)*

The MSA Group (Pty) Ltd
Registration No: 2000/002800/07
Tel: +27 (0)11 880 4209 Fax: +27 (0)11 880 2184
email: info@msagroupservices.com
Henley House, Greenacres Office Park:
Cnr Victory and Rustenburg Roads, Victory Park, 2195
PO Box 81356, Parkhurst, 2120, South Africa
Directors: BJ Burnand, KD Scott, NN Buthelezi, SZ Majola

Specialist Consultants to the Mining Industry

## Statement

I,

Johannes Ferreira

*(Insert full name(s))*

confirm that I am the Competent Person for the Report and:

- I have read and understood the requirements of the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ("JORC Code, 2012 Edition").
- I am a Competent Person as defined by the JORC Code, 2012 Edition, having 35 years' experience that is relevant to the style of mineralisation and type of deposit described in the Report, and to the activity for which I am accepting responsibility.
- I am Professional Geologist registered with the South African Council for Natural Scientific Professions (SACNASP), a 'Recognised Professional Organisation' ("RPO") included in a list promulgated by ASX from time to time.
- I have reviewed the Report to which this Consent Statement applies.

I am an Associate Diamond Consultant working for

The MSA Group (Pty) Ltd

*(Insert company name)*

and have been engaged by

Lucapa Diamond Company Limited

*(Insert company name)*

to prepare the documentation for

Mothae kimberlite

*(Insert deposit name)*

on which the Report is based, for the period ended

8 September 2017

*(Insert date of Resource/Reserve statement)*

I have disclosed to the reporting company the full nature of the relationship between myself and the company, including any issue that could be perceived by investors as a conflict of interest.

I verify that the Report is based on and fairly and accurately reflects in the form and context in which it appears, the information in my supporting documentation relating to Diamond Resources.

THE MSA GROUP

Specialist Consultants to the Mining Industry

The MSA Group (Pty) Ltd
Registration No: 2000/002800/07
Tel: +27 (0)11 880 4209 Fax: +27 (0)11 880 2184
email: info@msagroupservices.com
Henley House, Greenacres Office Park:
Cnr Victory and Rustenburg Roads, Victory Park, 2195
PO Box 81356, Parkhurst, 2120, South Africa
Directors: BJ Burnand, KD Scott, NN Buthelezi, SZ Majola

## Consent

I consent to the release of the Report and this Consent Statement by the directors of:

Lucapa Diamond Company Limited

*(Insert reporting company name)*

15 September, 2017

Signature of Competent Person:

Date:

South African Council for Natural Scientific Professions

400047/06

Professional Membership:
*(insert organisation name)*

Membership Number:

Craig Blane, Johannesburg, South Africa

Signature of Witness:

Print Witness Name and Residence:
(eg town/suburb)