The Economic Diamond Potential of the Kalahari of Botswana

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BOTSWANA DIAMONDS PLC

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AGENDA

- Significant Diamond Discoveries
- Economic Diamond Potential
- Exploration Potential
- The Future?

At the discovery pit over Orapa AK1, discovered 19 April 1967: Jim Gibson, Gavin Lamont & Manfred Marx

Reference: Brook, 2017

Significant Diamond Discoveries

"If you want to know the future, look at the past." Albert Einstein

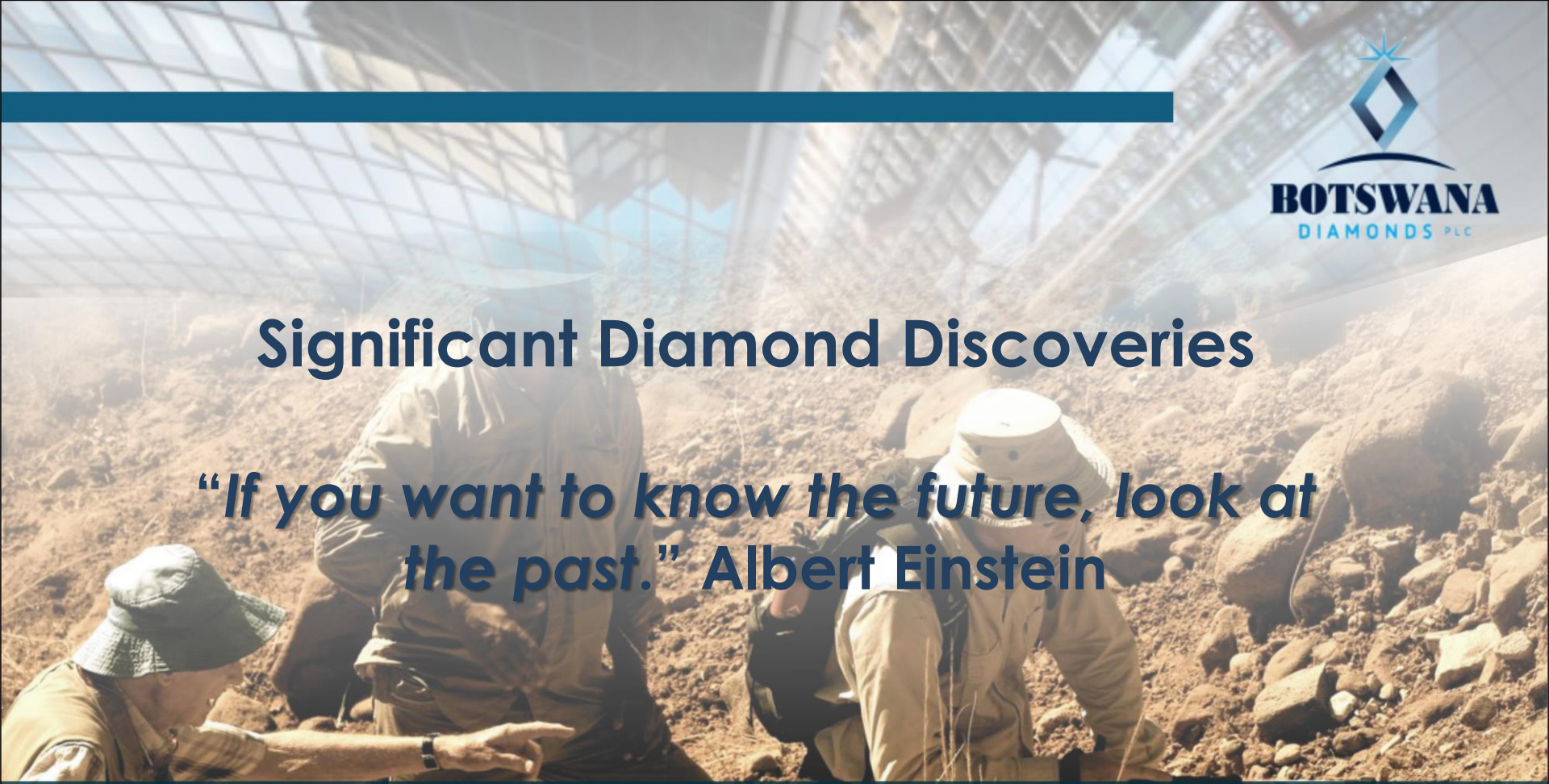
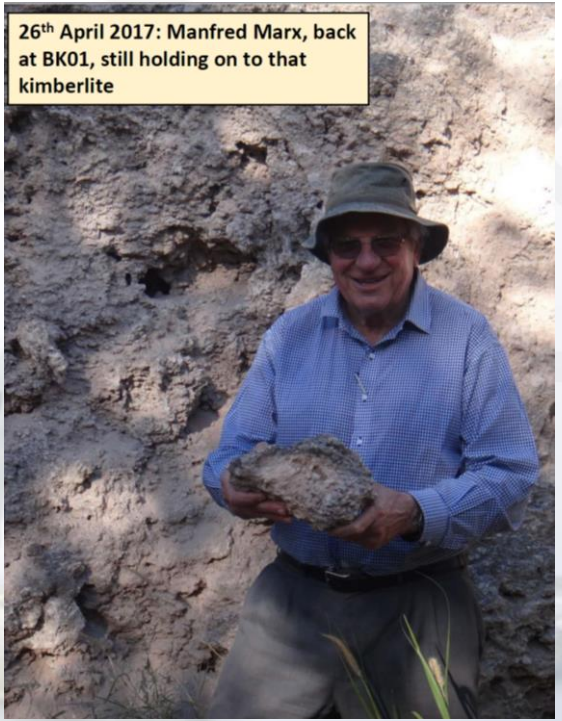


Photo: Andreas Stelzer

Diamond Discoveries: Orapa

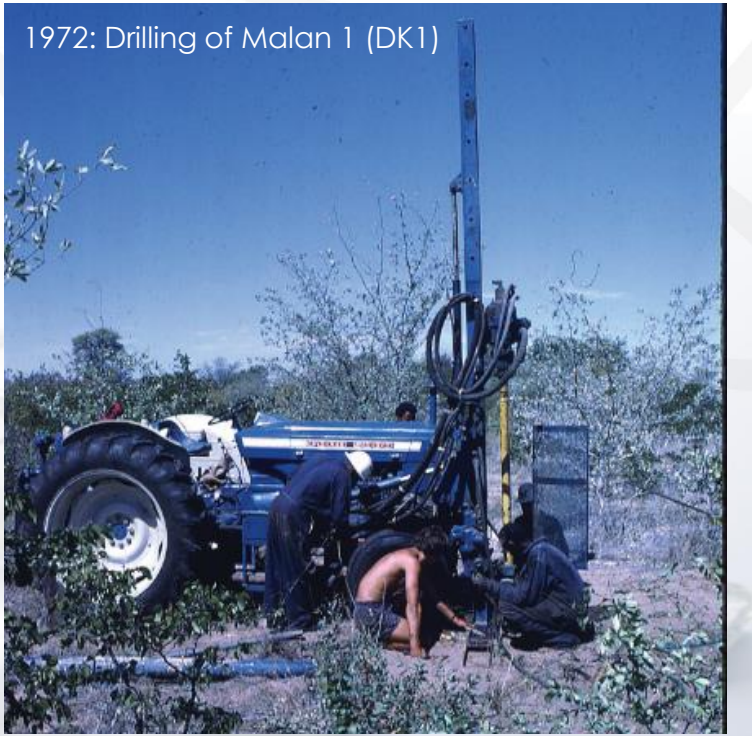
- 1896-1899: British West Charterland Limited explored for gold and diamonds.
- 1932: "*Kimberlites are undoubtedly present in Bechuanaland and gravels from large river may prove diamondiferous*" (Dr Alex du Toit).
- 1938: Victoria Prospecting Company Ltd washed 1,163 loads of the 'pebble beds' and recovered 4 tiny diamonds at Pitsane (the **first in Botswana**).
- 1959: Consolidated African Selection Trust ('CAST') found 3 diamonds in the Motloutse river.
- 1962: De Beers repeats CAST results following linear scoop sampling and hand gravitation developed by Dr Gavin Lamont.
- 1966 (July): Jim Gibson and Lamont went out on a crude road soil-sampling program south of the Makgadikgadi pans: 12 of the 17 samples were positive.
- 1967 (March): BK01 discovered by a team led by Manfred Marx, **Botswana's first kimberlite**, now the Orapa Mine.



References: De Wit, 2017; Marx, 2017

Diamond Discoveries: Jwaneng

- 1962: Gibson sampled either side of the Lobatse Ghanzi road and passed 20 km south of Jwaneng but no positive samples.
- 1969: Reconnaissance sampling produced first kimberlitic ilmenites.
- Lamont correctly hypothesized that bioturbation by White Ants would transport kimberlitic minerals to surface in areas of Kalahari cover.
- 1971 (March): drilling of DK1 and DK2, with a Vole drill, failed to intersect kimberlite.
- 1972 (March): discovery of Jwaneng by a team led by Stuart Vercoe assisted by Norman Lock.
- Now the **world's richest diamond mine**.


1972: Drilling of Malan 1 (DK1)

References: De Wit, 2017; Lock, 2017

Diamond Discoveries: Ghaghoo (Gope)

- 1977: Falconbridge flew an airborne magnetic survey over the Kokong and Tshabong areas.
- 1980: This was followed-up by a helicopter supported sampling program in the CKGR which led to the **discovery of Gope25 (Ghaghoo)** in 1981.
- 1982-2007: Falconbridge JV'd with De Beers who bulk sampled the property.
- 2007: Ghaghoo was sold to Gem Diamonds who developed a bulk sampling operation and then **small mine**.
- 2021: Conditional sale to BOD announced, now lapsed.

1980: Helicopter supported sampling programme in the CKGR

References: De Wit, 2017; Moore, 2017

Diamond Discoveries: Karowe (AK6)

- Discovered in 1969 by De Beers who considered the kimberlite too small and low grade.
- 2004: JV between De Beers and African Diamonds plc ('AFD') with positive initial drilling results, following application of **breakthrough geophysical and drilling technologies**.
- 2008: the JV applied for a Retention License which was opposed by AFD with an urgent interdict in the High Court of Botswana against De Beers. A Mining License was eventually awarded following settlement.
- 2009: De Beers unable to finance mine development led to an **updated positive study** by AFD and sourcing of Lucara to take over from De Beers.
- 2010: Lucara buys out AFD following confirmation of mines robust economics.
- 2012: Mine went into production and has not only been **highly profitable** but has produced some of the **world's largest diamonds**.

A 1,109-carat Type-IIa stone recovered in 2015, the Lesedi la Rona, is the world's second largest diamond after the 3,106-carat Cullinan found in South Africa in 1905. The name means "*Our Light*" in Setswana.

References: Campbell, 2017; Lucara Diamond internet site

Diamond Discoveries: KX36

- 1980-90's: heavy mineral sampling by Falconbridge, Rio Tinto and De Beers identified heavy mineral grain anomalies in the vicinity of KX36 in the CKGR.
- 2007: Petra acquired the Prospecting Licenses and performed Xcalibur airborne geophysics survey which led to the identification of several high priority targets.
- 2008: This was followed-up with **detailed and precise** ground gravity surveys and further heavy mineral sampling.
- 2008: **KX36 discovered** under 78m of Kalahari cover.
- 2008-15: Extensive evaluation programme with LDD, percussion and core drilling.
- 2021: KX36 acquired by BOD.

2015: Large Diameter Drilling ('LDD') with the Elephant Rig on KX36

References: Rogers, Hough & Davidson, 2013; Davidson, 2017

Economic Diamond Potential
(of the Kalahari)

Ghaghoo

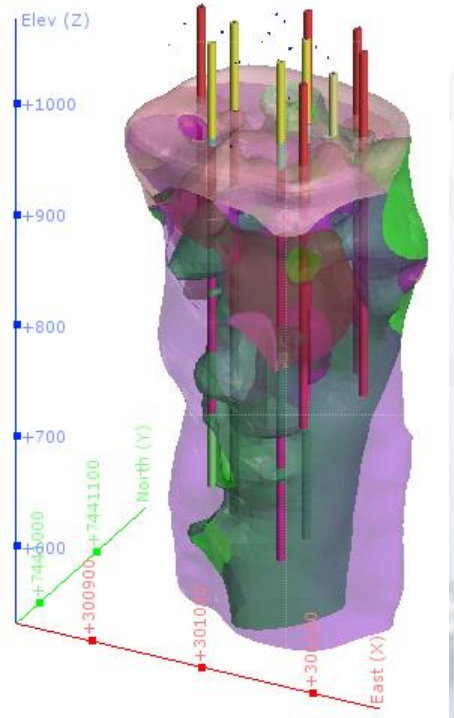
- Ghaghoo is a **10.8 Ha kimberlite pipe** in the CKGR.
- The pipe has an **Indicated Resource of 79.3MT** at an average grade of 19.5 cpht and diamond value of **$242/ct or $47/T** (2014 data)*
- Diamonds include **rare fancy and coloured diamonds**, notably orange and blue stones.
- The resource has been substantially **de-risked by Gem** through development expenditure to date of c.US$250M.
- Improvement areas have been identified which will enable a **sustainable commercial operation**.

* BCOS of +1.5mm

References: Gem Diamonds Ltd

KX36

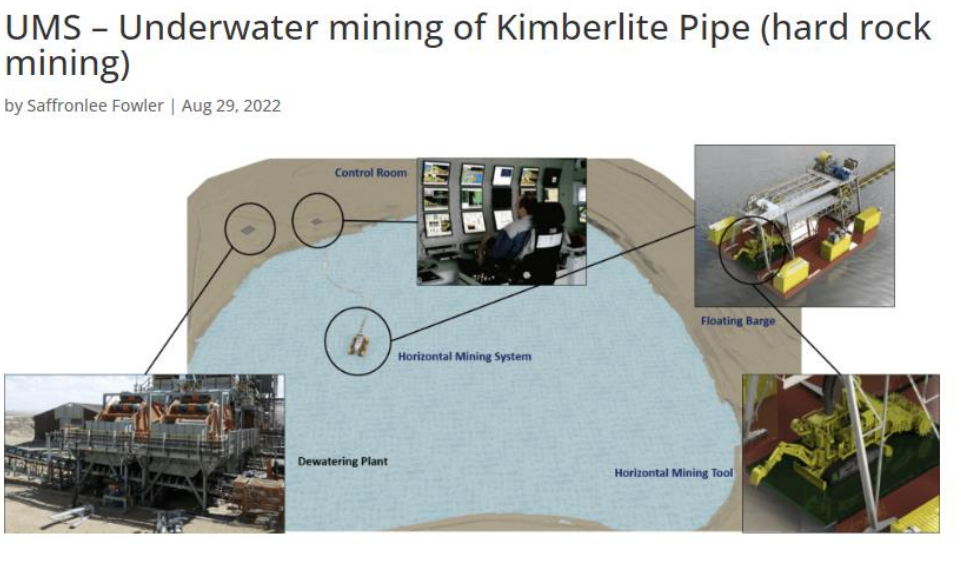
- KX36 is a **3.5 Ha kimberlite pipe** in the CKGR and is 60-km from Ghaghoo.
- The establishment of a footprint in the CKGR at Ghaghoo will **reduce the cost** of evaluation and development through **economies of scale**.
- The pipe has Resources of **17.9MT at 35 cpht (Indicated**) and 6.7MT at 36 cpht (Inferred) at $65/ct. The modelled grade range is 57–76 cpht at a modelled diamond value upside to $107/ct*.
- KX36 has an in-situ **bulk sampling plant** including crushing, screening, scrubbing, Dense Media Separation and X-Ray recovery.



References: Petra Diamonds Ltd

Central Kalahari Diamond Mines Concept

- Two mega pits.
- **Ultra low-cost stripping:**
  - Floating barge and underwater mining or
  - High angle conveyor concept.
- **Centralised diamond recovery** and **management.**
- Energy efficiency: **solar power.**
- Potentially **carbon neutral** operations.
  - Tailings absorb carbon dioxide.



Technical Innovation!

References: Underwater Mining Solutions

Exploration Potential
(of the Kalahari)

Exploration Strategy - General

- Diamond bearing kimberlites still **waiting to be discovered!**
- Target selection is key.
- Exploration needs to focus in **areas of cover**, such as the Kalahari.
- Sampling will require more precision and **finer grain sizes**.
- Focus on **Group 2**, low magnetic, low ilmenite bearing kimberlites.
- **More sensitive geophysical techniques** required.

References: Brook 2012 on 11IKC website; De Wit, May 2023

Exploration Strategy - Specifics

- In target areas, detailed **gravity** is a useful tool as is **EM:** two tools not everybody uses.
- Geochemically **sampling termite nests** is widely used in base metal exploration and has been used with some success by Pangolin Diamonds.
- One cannot ignore the **alluvial diamond potential** of Botswana. Where are the alluvials from Jwaneng? Pre-Kalahari reconstruction required.
- Expanding **microdiamond** research must be useful for evaluation of buried bodies.
- There are some developments using **passive seismics** to model kimberlites under cover.

The role of *Hodotermes mossambicus* termites and background kimberlite indicators in the Kgalagadi

T.A. Dira and L.R.M. Daniels

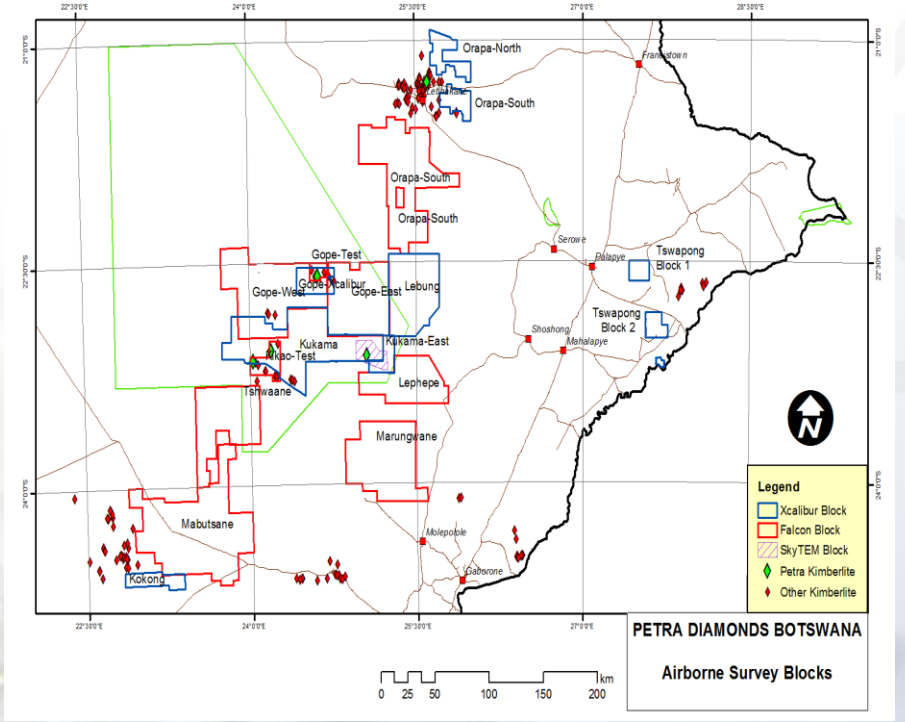
Geocontracts Botswana (Pty) Ltd, Botswana

A termite species study in the Malatswae area in the Central District of Botswana suggests that the dominant species capable of transporting kimberlite indicators from the kimberlite source through the Kalahari Formation to surface in the Malatswae area is *Hodotermes mossambicus*. This species constructs its nest and tunnel network underground. The points of material discharge at surface are small vent holes. Sampling in the *Hodotermes*-dominant area may result in single digit or zero indicators from the same size soil sample. It is probable that the widely reported 'background' scatter of kimberlite indicators in several areas of Botswana may in fact not be related to wind distribution but to the presence of weakly magnetic to nonmagnetic kimberlites and the inefficient transport mechanism from source to surface by *Hodotermes mossambicus*.

References: De Wit Pers Comm 2023; Dira & Daniels, 2018

Exploration Strategy - Data

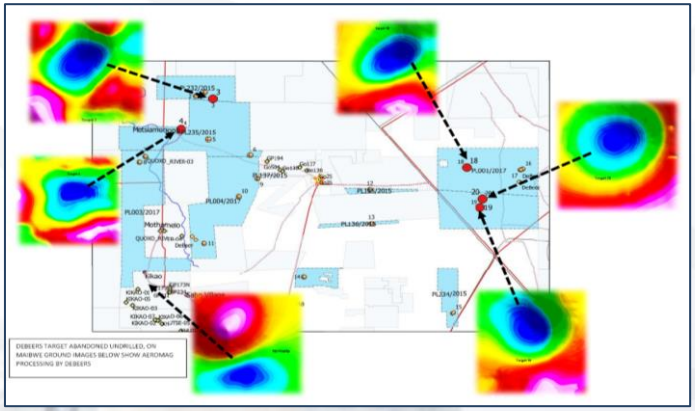
- Data sets:
  - African Diamonds PLC.
  - Botswana Diamonds PLC.
  - Sekaka Diamonds Pty.
- Sekaka database:
  - c.95,000 sq km of data.
  - c.375,000 km airborne geophysical data.
  - 606 ground geophysical surveys.
  - c.228k soil sample results.
  - c.32k drill hole logs.
- Potential application of **Machine learning** and **Artificial Intelligence**.



References: Petra Diamonds Ltd

Sekaka & Sunland

- BOD owns 100% and is the **operator** of Sunland and Sekaka.
- Three **Prospecting Licences** held by Sunland Minerals and Sekaka Diamonds in the Kalahari.
- Prospecting is mainly focused in the Kalahari where abundant kimberlitic indicators reported over eight **high-grade geophysical anomalies** have been discovered.
- Four **drill ready targets**.



Geophysical anomalies

Garnet

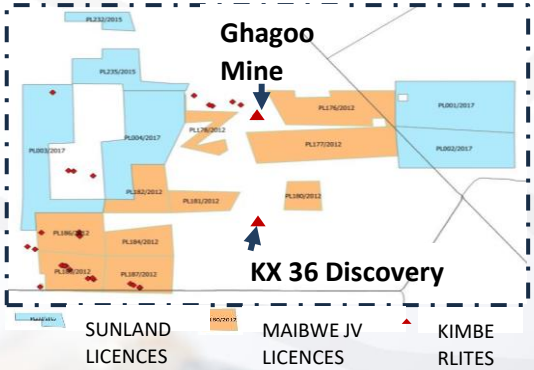
Chromium Diopside

Olivine

Ilmenite

Maibwe JV

- Maibwe Joint Venture owned by Future Minerals (50%) and Siseko (50%).
- Siseko is 51% owned by BOD.
- **Ten Prospecting Licenses** held by Maibwe in the Kalahari.
- Surrounding area hosts Gem's **Ghaghoo mine** and BOD's **KX36** advanced project.
- A 2015 drilling programme on PL 186 discovered kimberlites containing **significant quantities of microdiamonds.**




Exploration drilling at Maibwe

The Future?

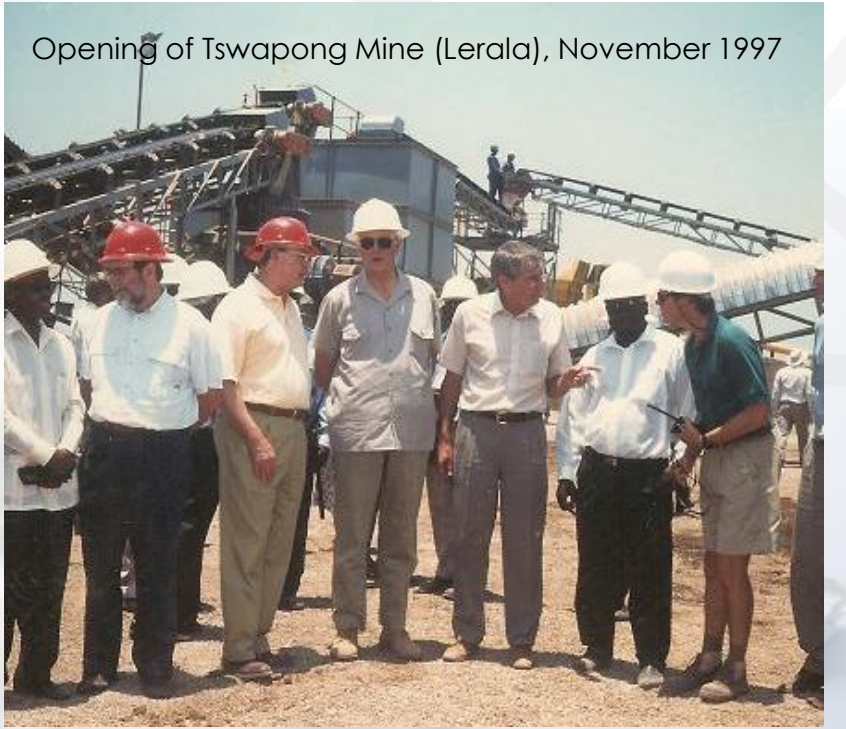
Photo: John Shelton

The Future: Potential Small Mines

		Tonnage (Mt)	Grade (cpht)	Value ($/ct)
Ghaghoo	**Indicated**	**79.3**	**19.5**	**242**
	Inferred	**28.7**	**17.5**	**239**
KX36	**Indicated**	**17.9**	**35.0***	**65***
	Inferred	**6.7**	**36.0***	**65***
Lerala	*Indicated*	*8.5*	*32.8*	*74*
	Inferred	*1.8*	*25.4*	*78*
Total		**142.9**		

Another large mine

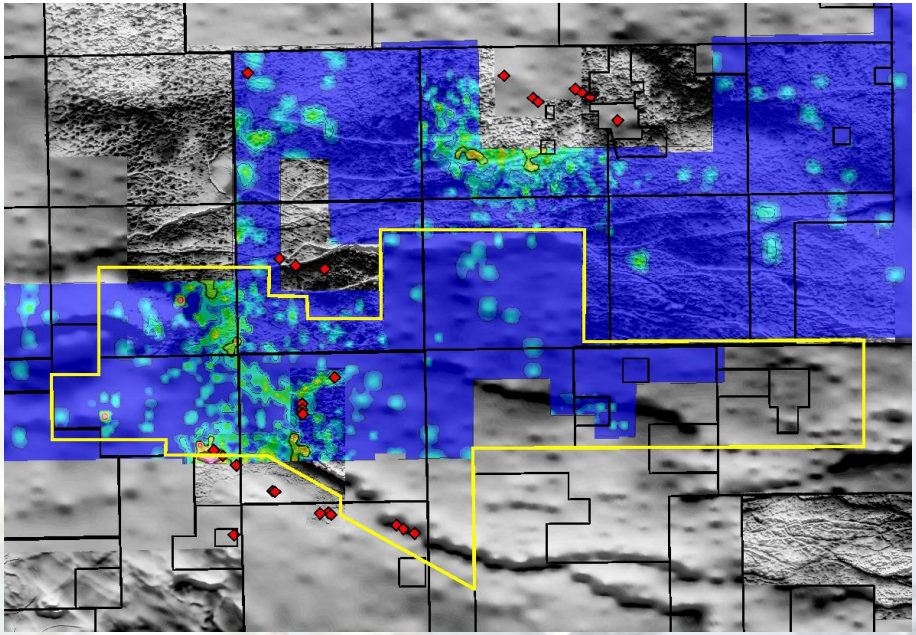
* The modelled grade range is 57–76 cpht and a modelled diamond value upside to $107/ct



References: BOD internet site; Kimberley Diamonds internet site

The Future: Technical

- **Metallurgical**, squeezing more life out of current mines or re-opening dormant mines:
  - Liberation: milling, inter-particle crushing.
  - Recovery: XRT sorting.
- **Exploration**, finding new deposits:
  - Use finer grain-sizes to locate **Group 2** and Ilmenite-poor Group 1 kimberlites.
  - Potential for **alluvial diamonds** cannot be excluded.
  - Airborne gravity/EM/QUID.
  - Capacity to drill at lower cost; sample Kalahari-bedrock interface.
  - Large, multi-dimensional, integrated data sets.
  - **Machine learning**.



Composite of geophysical and heavy mineral sampling results in the Kalahari

References: De Wit, 2017; BOD internet site; Petra Diamonds, 2015

The Future: Fiscal

Natural diamond demand will return and we need to be ready:

- Botswana remains a **highly attractive investment destination** due to relatively low competition, high diamond prospectivity and low unit operating costs.

Future diamond supply **depends on exploration** (and technical innovation): what is required to stimulate exploration spend?

- Security of tenure and political certainty are critical: Botswana is a stand-out performer here.
- **Local incentivisation is key**: how much Botswana money goes into exploration?
  - Flow through shares.
  - Replacement of State 10% royalty with corporate taxes and/or equity.
- Emergence of new business incubator models to drive particularly early-stage exploration and innovation.
- ***Diamonds 2067! Target 100-years of diamonds in Botswana!***

The author and team by 'The' Ghaghoo tree, CKGR.

Thank You

Questions & Discussion

Photo: Andreas Stelzer

About the Author

- James Campbell is Managing Director of Botswana Diamonds plc (a diamond development company active in Botswana, South Africa and Zimbabwe and listed on London AIM and the Botswana Stock Exchange). He has spent over thirty-five years in the diamond industry in a variety of leadership roles both in major and junior companies.
- Previous roles include Non-Executive Director of Shefa Gems (where he is still Technical Advisor); Chief Executive Officer and President of Rockwell Diamonds Inc; Non-Executive Director of Stellar Diamonds plc; Vice President - New Business for Lucara Diamond Corp, Managing Director of African Diamonds plc; Executive Deputy Chairman of West African Diamonds plc and Director of Swala Resources plc and Bugeco sa.
- James also worked at De Beers for over twenty years; his roles included General Manager for Advanced Exploration and Resource Delivery and the Executive Chairman Nicky Oppenheimer's first Personal Assistant.
- James holds degrees in Mining and Exploration Geology from the Royal School of Mines (Imperial College, London University) and an MBA with distinction (and top student prize) from Durham University. He is a Fellow of the Geological Society of South Africa, Institute of Mining, Metallurgy and Materials, South African Institute of Mining and Metallurgy and Institute of Directors of South Africa. He is also a Chartered Engineer (UK), Chartered Scientist (UK) and a Professional Natural Scientist (RSA).
- James is also chairman and founding director of Common Purpose South Africa NPC (a not-for-profit organization that develops leaders who can cross boundaries and is synonymous with the terms '*cultural intelligence*' and '*leadership beyond authority*'). CPSA celebrated its twentieth anniversary in 2020. He was also a director, trustee and chairman of the Joburg Ballet for almost fifteen years.

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