THE DEVELOPMENT OF AK6

J A H Campbell[*1], W Lamb[*2], J Clarke[*3], K Petersen[*4]
[*1] African Diamonds, [*2] Lucara Diamond Corporation, [*3] Paradigm Project Management, [*4] Metal Dog Minerals

1. Introduction

AK6 is a Cretaceous aged kimberlite located in the north-east of Botswana, close to Debswana's Orapa and Letlhakane Mines. It was discovered by Debswana in 1969, but was considered unattractive from an economic perspective. In 2003, Debot Prospecting Pty Ltd ('Debot') re-assessed the area and with the advent of new prospecting technology, particularly large diameter drilling ('LDD') and more detailed ground geophysical surveys found AK6 to be of interest. In 2005, the Boteti joint venture was formed between Debot and African Diamonds plc ('AFD'), which covered a number of Prospecting Licenses, including that which contained AK6.

Debot embarked on a comprehensive evaluation of the kimberlite in early 2005 and this included a number of techno-economic studies. These culminated in the submission of a Mining License application in September 2007, which was issued by the Government of the Republic of Botswana ('GRB') effective 10 October 2008.

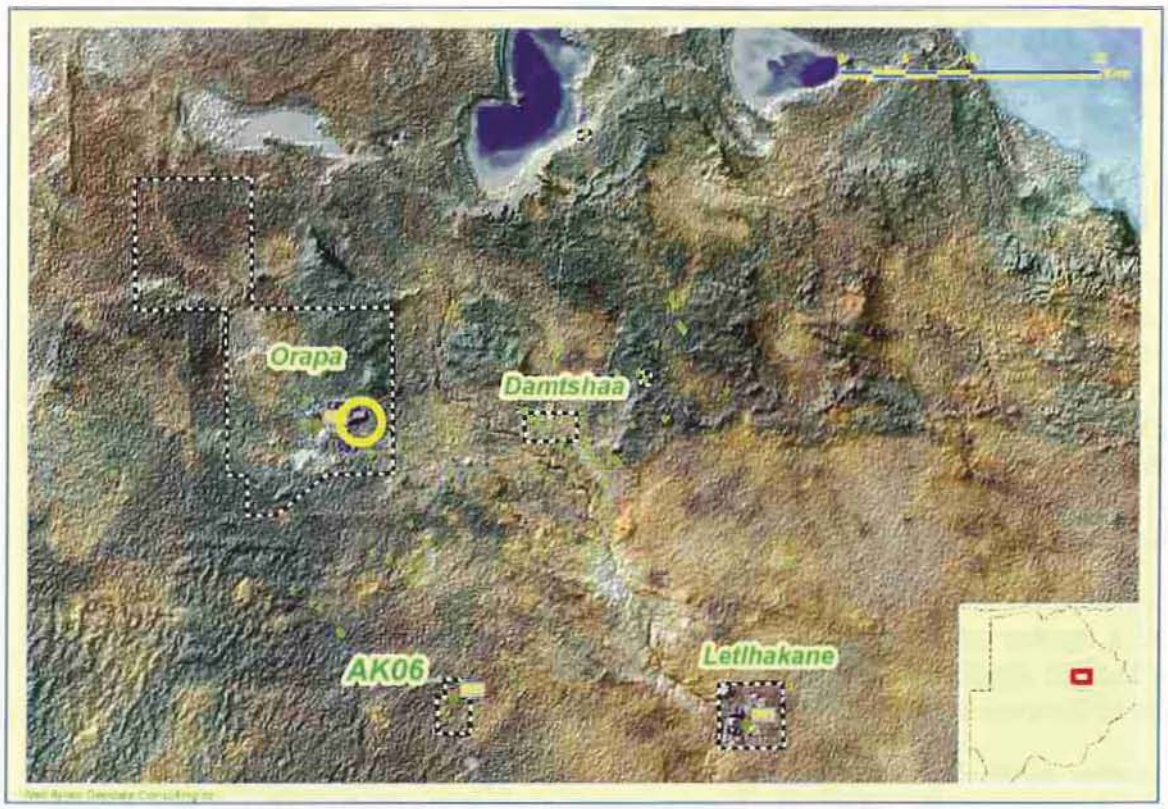
In November 2009, Debot sold its share in the Boteti joint venture to Lucara Diamond Corporation ('Lucara') for USD49M. Following approval of the GRB, AFD has four months to fund a 40% share in the project at the same pro-rata sum as Lucara purchased from Debot.

This paper presents the background to AK6 and how it has progressed from a poorly known deposit to a world class kimberlite diamond mining project. The technical development of AK6 will follow the Value Engineering Study ('VES') (commissioned by AFD) as delivered by Paradigm Project Management ('PPM') during the first half of 2009. The main emphasis has been to reduce upfront capital costs and design an operation that is technically fit for the ore body and economically flexible. The Feasibility Study is planned to be completed by May 2010, with the first diamonds being produced from AK6 towards the end of 2011.

2 Location & history

The Cretaceous-aged AK6 kimberlite is a 9.5 Hectare pipe, situated approximately 25km south of Debswana's Orapa Mine and 15km west of Debswana's Letlhakane Mine in northern central Botswana (see Figure 1). The area has existing infrastructure (roads, power supply) and a labour pool that is familiar with mining and diamond mining in particular.
Botswana is generally arid with low summer rainfall, mild winters and hot summers.

Figure 1: Location of AK6 in North Central Botswana



When AK6 was discovered in 1969, it was thought to be uneconomic due to the limited physical size and grade of the resource (estimated at 3.3ha and 3.5cpht respectively). Debswana, the holders of the Prospecting Licence at the time, did not pursue any further work on AK6. In the late 1990s, Debswana relinquished a number of Prospecting Licences and in April 2000, Debot was granted PL13/2000. The licence area held under PL13/2000 included the AK6 kimberlite.

Debot commenced with further work on the AK6 kimberlite in 2003, and using new geophysical and drilling technologies, determined that the size and grade of the pipe was significantly higher than originally estimated. The size was estimated to be closer to 9.5ha, and the modelled grade and revenue were 23cpht and US$138/carat respectively. The results were attractive enough to commission an advanced exploration programme ('AEP') for the AK6 deposit, which was approved in early 2005.

Based upon results from various mining conceptual studies, a plan was presented to the Boteti Board in March 2007 to work towards submission of a Mining Licence application to the GRB by the end of September 2007.

3 Terms and Conditions of the AK6 Mining Licence

The statutory negotiations under Section 51 of the Mines and Minerals Act were successfully concluded between Boteti and the GRB during October 2008 and culminated in the signature, by Boteti and the GRB, of Heads of Agreement dated 10 October 2008. The mining licence was issued to Boteti on 28 October 2008, effective from 10 October 2008.

The essential provisions of the Heads of Agreement are as follows:

- The GRB undertakes to issue a mining licence to Boteti over the AK6 kimberlite for a period of 15 years commencing on 10 October 2008 and expiring on 9 October 2023;
- The GRB will not take equity in the project;
- Boteti will pay a royalty of 10% on the Gross Market Value received by Boteti on the sale of its diamonds;
- Boteti will be taxed under the Twelfth Schedule of the Income Tax Act at the variable rate of income tax and unlimited carry-forward of losses, as defined in the Twelfth Schedule will apply. In addition. Boteti will be allowed to offset withholding taxes against the variable rate of income tax;
- Boteti will sell its entire diamond production exclusively to the Diamond Trading Company Botswana ('DTCB') on the same overall terms as the current agreement between Debswana and DTCB;
- Boteti's diamond production will be valued by the Government and Boteti diamond valuators;
- Boteti must commence working for profit no later than 30 months from the date of the granting of the Mining Licence (and the Heads of Agreement state that the estimated date by which Boteti intends to work for profit is 9 April 2011);
- If it is necessary to amend Boteti's programme of mining operations after the Mining Licence is granted, Boteti can apply for the amendment under Section 43 of the Mines and Minerals Act and the Heads of Agreement provide that the Minister will act reasonably in considering any such request;
- The GRB undertakes that Boteti will be supplied with electricity from the national grid on non-discriminatory terms as to supply and tariffs and, otherwise, on commercial terms negotiated between Boteti and Botswana Power Corporation; and
- If Boteti chooses to install its own back-up power generation at the AK6 mine, GRB undertakes to waive the Road Levy on imported fuel used in the electricity generation up to 31 December 2013.

Following Debot's exit from the Boteti JV, the marketing of diamonds through the DTCB falls away. Discussions have already begun with the GRB on possible amendments to the diamond marketing and the start of production clause.

4 The Resource

In April 2000, Debot was granted a Prospecting License over the deposit. A phased approach was adopted for the resource delivery, commencing shortly thereafter with the drilling of three 6 inch holes which identified the Centre & North Lobes for the first time.
The AK6 kimberlite was re-evaluated by Debot on behalf of Boteti in 2003/4. The programme included further delineation of the ore body, as well as an additional 100 tonne sample campaign. During this period, five LDD holes (12 inch) and 44 percussion holes (6½ inch) were drilled for sampling and delineation. Four high resolution geophysical surveys were conducted to further delineate the kimberlite and increase the confidence in the modelled contacts. The estimated size of the deposit was increased to 9.5ha, based on interpretation of the geophysical results, containing a modelled grade and revenue of 25cpht and US$124 per carat respectively.

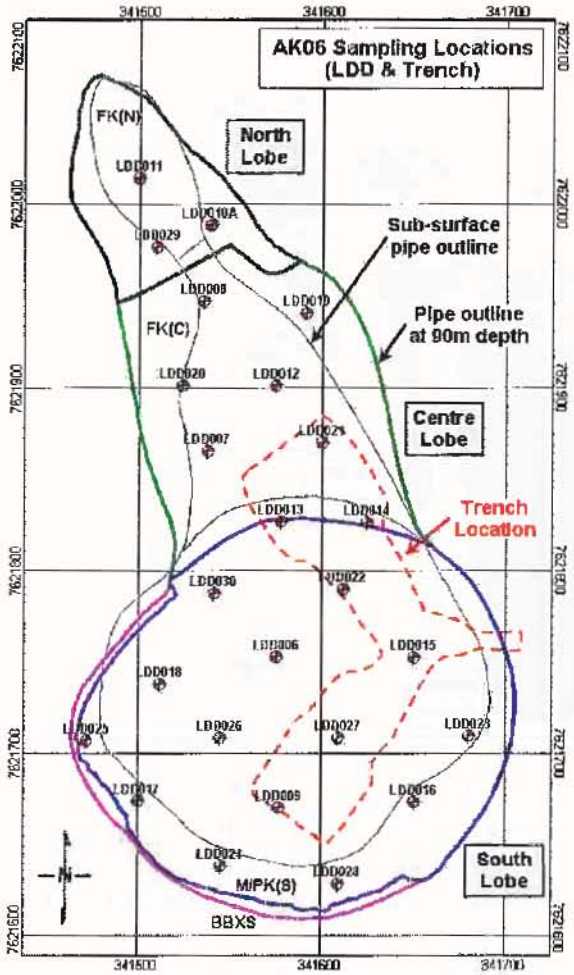
The results that were obtained were sufficient to justify the more detailed AEP carried out by Debot in its capacity as the Boteti operator.

Thirteen LDD holes, with a 23 inch bit diameter, were drilled during Phase 1 to gather spatial grade information and to produce a preliminary estimate of the revenue per carat. Seventeen inclined and twelve vertical core holes were completed for geological characterisation and modelling, micro diamonds and metallurgical studies.

A further twelve LDD holes were drilled, and two additional bulk trench samples were completed during Phase 2 in order to improve the confidence in the spatial grade estimates and to obtain a sufficiently large parcel of stones to increase the confidence in the revenue estimate and to determine the resource to reserve modifying factors. Eleven vertical core holes preceded the LDD holes as pilot holes and a further 29 inclined core delineation holes were drilled to increase the confidence in the resource volume.

Figure 2 shows the 25 LDD holes that were drilled as well the position of the trench samples, overlain on the outline of the kimberlite pipe (South, Centre & North kimberlite lobes). The near surface (1012m amsl) outline is shown in grey and the outline of the three lobes at a depth of 90m below surface is coloured by lobe.

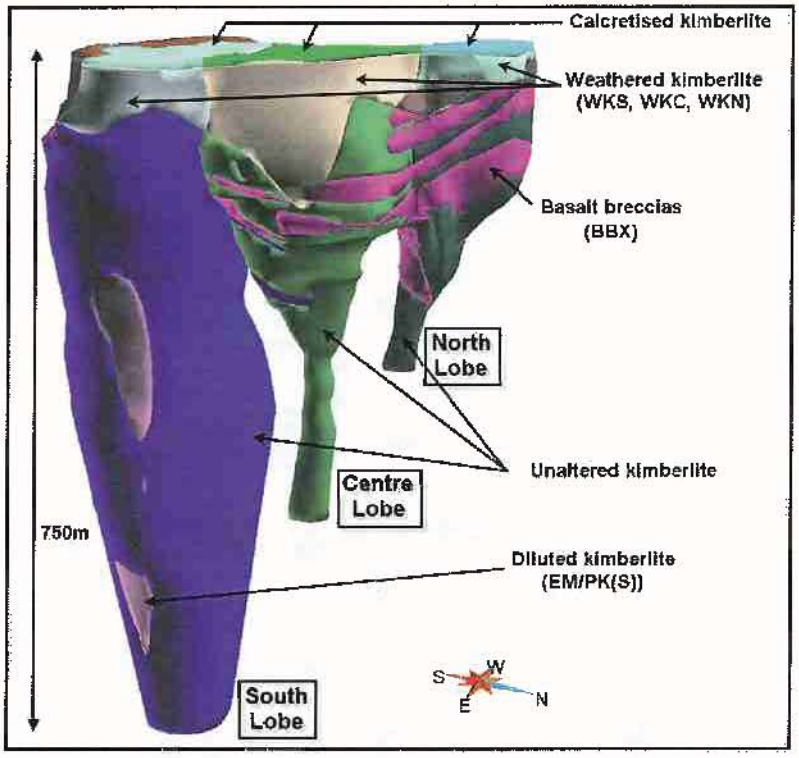
Figure 2: LDD hole and trench bulk sample locations at AK6



A combined total of 44 6½ inch percussion holes, 23 pilot holes (core), 31 large diameter holes (23 inch), and 51 delineation holes were used in the evaluation of the AK6 kimberlite.

AK6 is a roughly north-south orientated multi-lobate kimberlite. Each pipe is capped by duricrust (12m), followed by altered rock, which is either weathered kimberlite or basalt breccia (30 – 70m), before unaltered kimberlite is intersected. Each pipe also contains distinct zones of crustal dilution, typically basalt breccia. The infill of the Centre & North Lobes resembles typical volcaniclastic kimberlite, but exhibits textural heterogeneity. The South Lobe kimberlite in contrast is harder, darker, denser, and exhibits preferential lithic clast orientation and olivine-rich zones in places. The South Lobe kimberlite is also less diluted by crustal material.

Figure 3: Geological model of the AK6 kimberlite.



The total volume of the kimberlite pipes shown in Figure 3 is 26Mm^3, modelled to a depth of 750m below surface. Down to a depth of 372m, the resource volume is 15.1Mm^3 which equates to approximately 40Mt tonnes. The South Lobe is significantly larger than the Centre & North Lobes, making up 72% of the total volume from surface to a depth of 372m. The resource, to a depth of 372m below ground level, is estimated to contain 8.9M carats in 40Mt at an average grade of 22cpht. Of this, the north and central lobes are estimated to contain 2.7M carats in 10.4M tonnes at an average grade of 26cpht. The south lobe, being the largest has a grade of 21cpht, containing 30M tonnes of ore and 6.2M carats. The south lobe further extends from 372m to beyond 758m below surface (the maximum limit of drilling) containing an additional 6M carats and 31M tonnes at an average grade of 19cpht.

The grades as determined by previous studies (ie. as noted above) are considered conservative, chiefly due to liberation issues within the sampling processes used, and it is expected, following further analytical work which will take place within the auspices of the revised Feasibility Study, that the grade will increase by 10-20%.
The diamond values used in the VES came from Debot and these were used in order to derive a mineral reserve:

- North Lobe US$153 per carat
- Centre Lobe US$153 per carat
- South Lobe US$139 per carat

However, there is still much work to be done on the diamond valuation in order to determine the eventual economics of the project. Following various independent analyses of the diamonds it was noted that there is a much higher proportion of broken diamonds or fragments than originally thought. This is considered to be an artefact of the sampling (drilling and treatment) processes. Further, the abundance of high value, large, Type II, diamonds (see Figure 4), which are relatively abundant in the southern lobe, may not have been appropriately considered in terms of an eventual production diamond valuation.

Type II diamonds contain nitrogen in such low quantities that its presence is difficult to detect with standard infrared spectroscopy. As with Type I, Type II diamonds can be subdivided. Type IIa diamonds are often absolutely colourless and exhibit an extreme transparency. A number of large historical diamonds, such as the Cullinan and the Koh-i-Noor diamonds are of Type IIa. Those Type II diamonds which conduct electricity due to boron being present as an impurity are termed Type IIb. Most diamonds of this type are blue in colour. Type IIa diamonds are the most commonly found Type II diamonds at AK6.

Figure 4: Diamonds from AK6

The relatively high levels of diamond breakage not only cause challenges with the diamond valuation, but also with postulating a production diamond size frequency distribution from the sampling data.

As a result of the high levels of diamond breakage in the sampling diamonds and the abundance of high value Type II diamonds (see Figure 5), Boteti believes that there is considerable upside in the diamond value, even at today's diamond prices. A full, independent, diamond valuation and re-assessment of the diamond size frequency distribution has been scheduled for early in 2010.

Figure 5: Type II diamonds from AK6 photographed under transmitted light

The AK6 diamond resource and reserve has been classified in accordance to the South African Code for Reporting of Mineral Resources and Mineral Reserves (SAMREC, 2000). The AK6 pipe is classified as an Indicated Resource between surface and a depth of 372m below surface. From 372m to 758m below surface, AK6 is classified as an Inferred Resource.

5 Techno-Economic Study (Value Engineering Study)

5.1 Introduction

During 2009, AFD commissioned PPM to undertake a VES on the AK6 project. This study utilised all of the information previously derived by Debot during its many reviews of the project and then considered the potential for a new, 'fit for purpose' design for the new mine. The main findings of this VES are summarised in the following review.

The VES will be used as a foundation for a revised Feasibility Study, which is currently being compiled. The Feasibility Study has been targeted for completion by May 2010 and with the first diamonds being produced from AK6 by the end of 2011.

5.2 VES Concepts

One of the main drivers in the VES was to reduce the upfront capital costs associated with the development of a new mine for AK6. In order to do this, it was decided that, as and where possible, operations would be outsourced as long as the overall efficiency and security of the product were not compromised.

This approach led to the determination that the mining operations and maintenance, the plant operations and maintenance and the accommodation camp and infrastructure operations and maintenance could successfully be contracted out. This has led to a significant reduction in the capital cost of developing the mine, but obviously with an increase in the overall operating costs.

5.3 Mining

At a very early stage in the VES, it was determined that it could be preferable to undertake the development of the AK6 mine in a phased manner. The main production parameters were therefore set at 2M tonnes per annum for Phase 1 and 4M tonnes per annum for Phase 2. The selection of these production rates were determined mainly by the treatment plant equipment parameters.

The mine design (see Figure 6), undertaken using Whittle open pit optimisation software to generate the maximum Net Present Value for the project, indicated that the Life of Mine would be in the region of 12 years, treating a total of 35M tonnes, down to a depth of 288m, thereby recovering 7.2M carats.

The main mining parameters are:

Phase 1: 2012 to 2016

- Kimberlite mined: 8.5Mt
- Waste stripped: 19.2Mt

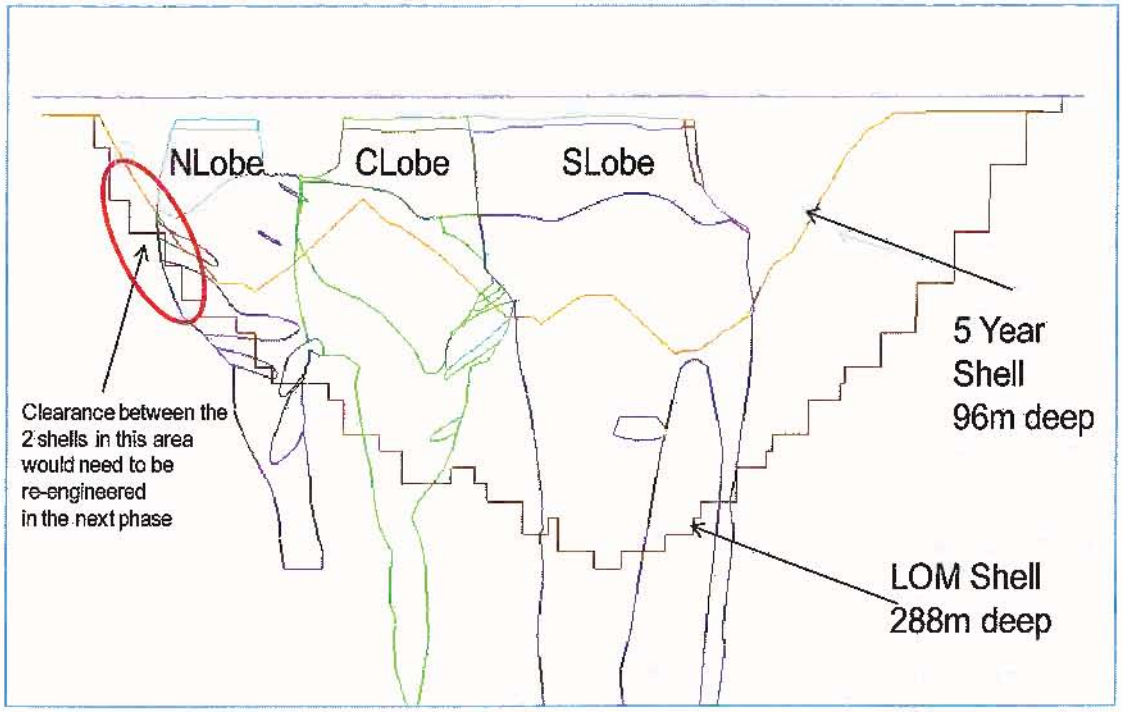
Phase 2: 2017 to 2023

- Kimberlite mined: 27.2Mt
- Waste stripped: 70.7Mt

LOM

- Kimberlite mined: 35.7Mt
- Waste stripped: 89.9Mt

Figure 6: North South section looking East showing the five year shell and the 12 year LOM Shell relative to the ore body



The waste stripping over the Life of Mine will total 89.9M tonnes, thereby generating a strip ratio of approximately 2.5:1. It is considered that further optimisation of the mine plan, to be undertaken during the current Feasibility Study, will allow for a significant reduction in this stripping ratio thereby enhancing the economics of the project. The stripping ratio could in fact be as low as 1.7:1 as determined by previous Debot studies after a comprehensive optimisation of the detailed mine plan. In addition to this, with the anticipated increases in diamond grade and value the amount of kimberlite mined could considerably increase to possibly in excess of 40M tonnes and the pit depth to 350m or deeper. This would also have the effect of increasing the LOM. These comments apply to an open pit operation and no consideration has yet been made to extending the LOM by going underground.

The main mine design criteria used in the VES were:

- Bench height: 12m.
- Face batter angle: As close to vertical as is possible.
- Berm width: Dependant on slope angle.
- Slope angle: Dependant on rock type.
- Ramp width: 25m upper benches, 20m lower benches.
- Ramp gradient: 8%.
- Minimum bench width: 30-45m.

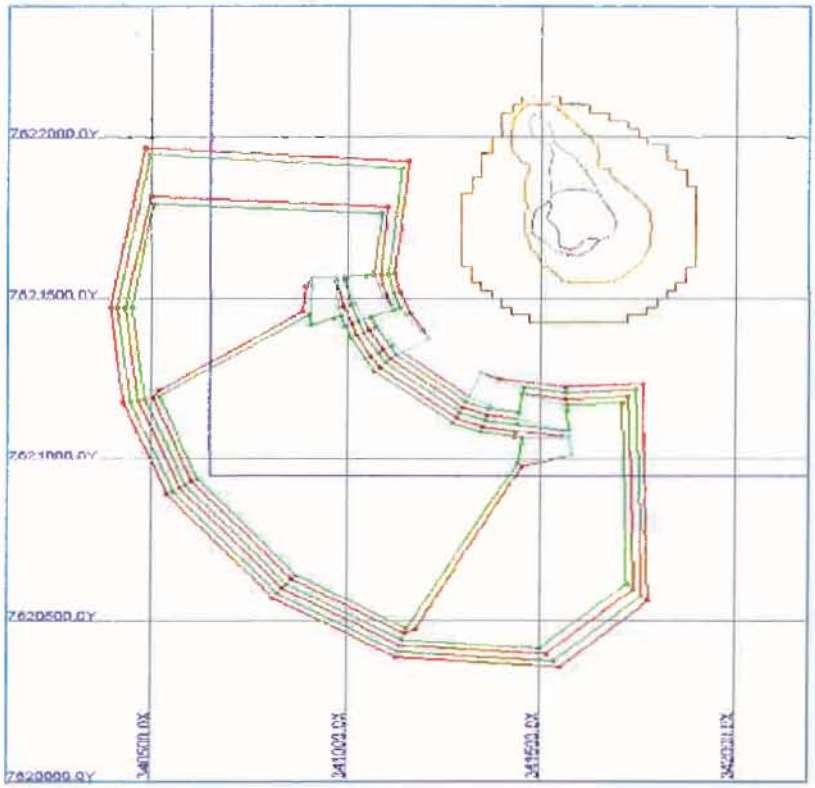
The mine plan in the VES has been divided into two main sections: a detailed five year plan followed by a remaining LOM plant based on the Whittle schedules.

The detailed initial five year open pit design (see Figure 7) comprises two mining cuts: Cut 1 provides ore for the first two years and focuses on the North and Centre lobe down to 84m below surface due to their high values and minimal waste rock, and Cut 2 takes the pit down to 96m below surface for the next three years. Each mining cut is accessed by a single anti-clockwise ramp of 20m width for Cut 1 and 25m width for Cut 2 at a gradient of 8%.

Figure 7: Plan View showing the five year Cut 1 and Cut 2 designs. The designs have been refined to take geotechnical requirements into account.

Waste mining (see Figure 8) starts very low at 0.38Mt in the first year, gradually increasing year on year. In year 4, the final cut is commenced with waste tonnes increasing to 5Mt per annum, which steadily increases further to a peak of 15Mt in years 7 and 8, where after it starts reducing. With detailed design, taking improved design and split shell configurations into account, it is likely that the total waste tonnes and peak rate will be reduced.

Figure 8: LOM Waste Dump showing the 5yr and LOM pit perimeters.



Pit dewatering will be undertaken by a wellring around the perimeter of the pit. This water will be used for the ore processing plant process water. If any additional water is required, it will be extracted from a nearby separate wellfield.

The top 70m of each of the kimberlites has been weathered and therefore requires a treatment process that can successfully handle wet, sticky material. Below this, the material gets harder and more competent and therefore requires more comminution in order to liberate the diamonds. The South lobe, below 70m is especially challenging as it contains high density material which generates high DMS yields and therefore requires additional downstream capacity to cater for these larger tonnages.

The VES has determined that mining will be undertaken by a contractor on a wet rate basis. This means that the appointed contractor will be responsible for the provision of the entire infrastructure for the site establishment and maintenance of the mining equipment. The contract will be based on the delivery of kimberlite from the open pit to the treatment plant tipping bin, as determined by the mine plan, on a rate per tonne basis.

5.4 Treatment

One of the main driving requirements of the VES was to reduce both capital and operating expenditure of the treatment plant when compared to the previous Debot design which concentrated on a more 'standard' flowsheet utilising attrition scrubbers, high pressure grinding rolls and cone crushers as the main diamond liberation unit processes.

A complete review of the proposed Debot plant design was therefore undertaken by breaking down the flowsheet into the separate unit processes and deriving a business case for each one relating to its diamond liberation and/or diamond recovery. If the added value for a specific section was calculated to be low, or even negative, then it could effectively be excluded from the revised VES flowsheet.

In this manner, a unit process priority was derived that facilitated the simplification of the overall flowsheet.

The VES also determined that autogenous milling would be the preferred comminution and diamond liberation unit process due to numerous factors, including:

- Autogenous milling undertakes the same diamond liberation role as all of the attrition scrubber, secondary crusher, tertiary crusher, and HPGR unit processes.
- Autogenous mills can treat the heavily weathered kimberlite in the top 70m of the AK6 open pit, thereby resolving the common materials handling problems relating to clay as this is removed very early in the plant flowsheet.
- It reduces the required DMS capacities due to the ability to remove virtually all internal recycle loads.
- It removes the need for internal water recovery circuits due to the overall lower usage of water.
- It reduces capital expenditure due to the simplicity of the flowsheet.
- It reduces operating costs due to the simplicity of the flowsheet.
- It reduces operating manpower requirements.
- It has a higher overall engineering availability and metallurgical utilisation than the standard Debot flowsheet designs.
- It allows for a very flexible flowsheet that can easily be adapted to changing ore characteristics as and when required with minimal impact on ongoing operations.

An additional very important aspect of placing an autogenous mill in the treatment flowsheet is that diamond liberation is expected to be greater than that of conventional diamond plant flowsheets without compromising on minimising diamond damage / breakage. An additional 10% (or more) carats are expected to be liberated by using this technology. Detailed modelling and analysis of the recovery factor will take place under the auspices of the Feasibility Study.

Autogenous milling in southern Africa diamond processing has been slow to gain traction over the last ten years mainly because of the speculation surrounding potential diamond damage. This is despite this technology being used for over fifty years in Russia and Angola with no evidence to suggest that diamond damage is more or less prominent than that resulting from conventional comminution equipment.

Designing a diamond processing flowsheet has traditionally been centred around:

- upfront size preparation
- mass balance management
- maximising liberation potential through grits and slimes production
- Asset efficiency (multiple tasks for equipment)

The net result is often a business that becomes focussed on the tactical goal of treating tonnes, irrespective of the requirements for the profitable release, concentration and recovery of diamonds. Autogenous milling is a technology that helps to regain the focus on 'fit for purpose', which

- contains compressive, shear and abrasive forces in a single device
- contains internal classification and recycling of material
- reduces the need to support large circuits and ancillary equipment
- selectively reduces softer components to fine sizes
- selectively leaves intact the harder components, which are usually waste

The upside of this technology is that it can be 'tuned' very easily for the purposes of operating at the correct level of liberation, as based on the optimal offset between value release and operating costs. Consequently, autogenous milling, in conjunction with a very diligent strategy in control, becomes a business tool that ensures economic productivity over just production.

The VES treatment plant design is based on the use of autogenous milling and has therefore provided significant savings in terms of the capital expenditure and the operating costs.

As noted above, the VES indicates that the AK6 mine should be developed in two phases. This was decided for a number of reasons:

- Plant equipment sizing and operational parameters
- The "difficult" material in the deeper parts of the South lobe; Unit 13
- Limitations of Ore Dressing Studies ('ODS') based on small quantities of drill core
- The facility to sample Unit 13 during Phase 1 operations
- The flexibility of the plant operations in terms of tonnage throughput, top cut off size and bottom cut off size

It is interesting to note that historically diamond treatment plant designs have been undertaken based on incredibly small samples. Whilst the near surface bulk samples do bear some resemblance to the kimberlite to be treated in the first few years of the LOM, the treatment characteristics of the ore at depth have to be based on drill cores which often equate to approximately 0.0000025% of the ore body to be treated. Despite this, the plant design is often completed for the LOM in minute detail, and the project NPV is calculated to two decimal places, despite this huge degree of uncertainty! It is therefore not surprising that these "optimal", "best practice" and "maximum diamond liberation" plant designs often do not perform as expected.

The VES approach has therefore been to accept that the knowledge of the kimberlite at depth is extremely limited and ensure that the plant design has adequate flexibility to adjust to the different material types that can be expected in terms of:

- In-situ diamond grade
- In-situ diamond size distribution
- Diamond characteristics: Type II's?
- Kimberlite hardness
- Comminution limits required for economic diamond liberation
- Waste rejection
- Top cut off sizes
- Bottom cut off sizes
- Tonnage throughput for the selected cut off sizes

This level of process flexibility also provides significant economic flexibility, especially in the early phases of the LOM, which will be extremely beneficial to the AK6 Mine.

The main unit processes in the VES flowsheet are:

- Primary crushing
- Autogenous milling
- Dewatering and screening
- Dense medium separation (DMS)
- Magnetic separation
- X-ray machines
- Grease belt
- Handsorting

The VES has determined that the plant operations and maintenance will be undertaken by a contractor. It is expected that the contract will be based on a portion of fixed costs and a variable rate per tonne for the plant tonnages treated as required by the overall mine plan.

5.5 Infrastructure

As noted above, the VES was designed to reduce capital costs when compared with the previous studies undertaken. In order to achieve this objective, it was decided that many of the mine operations would be contracted out, including the mining operations and maintenance, and the plant operations and maintenance. This option means that the need for large on-mine infrastructure to be included in the mine development capital budget has been significantly reduced.

The current gravel access road, which consists of a 7m wide partially engineered calcrete surfaced road, will be upgraded and used for the project. An allowance for the relocation and compensation for affected parties has been included in the VES capital estimate.

The required power for Phase 1 is estimated to be in the region of 6MVA and 10MVA for Phase 2. The power supply for the mine will consist of a new 33kV overhead power line from the main Orapa distribution substation. The AK6 substation will consist of one incoming bay, a transformer bay for the 33kV/550V transformers, and a 550V distribution board.

The majority of the process water will be provided from the pit dewatering system. Any additional process water required will be sourced from the local aquifer by means of a wellfield. All pipelines will be surface run and the process water will be pumped into a holding tank from where it will be distributed to the various areas of the plant.
Due to the fact that the mining will be undertaken by a contractor on a wet rate basis, there will be no requirement for mining maintenance facilities to be constructed as part of the mine's capital cost. A terraced area will be provided for the contractor. Light, on-road vehicles will be maintained at a local servicing facility in Letlhakane.

All treatment plant maintenance and repairs will be executed at the treatment plant workshop. This central complex will also cater for all of the infrastructure maintenance requirements such as generators, electrical infrastructure, wellfields, process water supply, potable water supply, sewage disposal services, offices, etc..
Offices will be provided for all mine management personnel, and will generally be of a semi-mobile 'park home' type construction, and a fixed pre-fabricated construction. All offices will be air-conditioned. Ablution blocks will be also be provided, positioned at appropriate locations near the pit and treatment plant.

Personnel employed by Boteti would be employed on the basis of a 'clean wage' type arrangement where employees would be responsible for arranging their own accommodation in or around Letlhakane.
Personnel employed by the mining and plant operations contractors would negotiate their own conditions of employment with their potential employees, providing these are consistent with the overall employment philosophies of Boteti.

Generally accommodation will not be provided by the mine for operating personnel. However there will be a small number of rooms at the mine site for essential shift maintenance staff and visitors. There will also be a small messing and recreation facility.
A permanent on-site paramedic will cater for any medical situation that may arise. Provision will also be made for medical evacuation through a recognized professional company.

5.6 Capital Costs

The capital costs to develop the AK6 mine in accordance with the PPM VES are as follows:

SECTION	PHASE 1 US$	PHASE 2 US$
Mining	300,000	160,000
Plant	34,000,000	15,800,000
Engineering	7,000,000	1,150,000
Security	1,700,000	30,000
Infrastructure	2,400,000	710,000
Logistics	370,000	230,000
Environmental	70,000	25,000
Feasibility Study	1,700,000	600,000
Sub total	47,540,000	18,705,000
Contingency @ 30%	14,300,000	5,600,000
Project Management Fee	1,600,000	600,000
TOTAL	63,440,000	24,905,000

It is important to bear in mind that the VES is a conceptual level study and therefore is subject to a large contingency. The Feasibility Study will generate a more accurate estimate for both capital expenditure and operating costs.

5.7 Working Costs

The two main areas of working costs are the mining and plant operations. Both of these will be contracted out and therefore quotes were obtained within the ambit of the VES.

The mine plan is based on an Indicated mineral resource that can be considered to be at Feasibility Study level. This VES is approximately the eighth technical study that has been undertaken on AK6 and therefore it is considered that the mining costs are also much closer to a Feasibility Study in terms of their accuracy. In the light of this, and other recent experiences, it is considered that these operating costs only require a 15% contingency attached to them.

The treatment plant flowsheet is simple and therefore the operating costs can be relatively accurately assessed at the level of this study. It is therefore considered that these operating costs only require a 15% contingency attached to them.

The Manpower costs were obtained from a reputable Botswana consultancy that has just completed a survey of major mining companies in that country, and therefore these costs are also considered accurate for this study.
In summary, the mine operating costs are approximately USD14.50 per tonne treated for Phase 1 and USD13.80 per tonne treated for Phase 2.

5.8 Commitment to Social and Environmental Responsibility

A great deal of emphasis has been placed on the Environment, Community, occupational Health and Safety ('ECoHS') work stream during the course of the AK6 project life cycle, going back to the exploration and conceptual study phases when an initial environmental and social scan was completed.

Subsequent to this, a four stage process has been followed which included a Preliminary Environmental Impact Assessment, a Scoping Stage, a detailed Environmental Impact Assessment ('EIA') and an Environmental Management Programme ('EMP').The work culminated in both the EIA and the EMP being submitted to the Department of Environmental Affairs ('DEA') for evaluation as part of the Mining Licence Application process. Both were approved, with applicable conditions, by the DEA on 6 February 2008. These conditions have been reviewed and will be met without difficulty in the normal course of business.

In addition to the EIA and EMP applications, two applications for common law land rights, (for the mining lease area and the AK6 access road) were submitted to and approved by the Ngwato Land Board, the district authority. Relocation and compensation processes are being addressed in consultation with the Land Board and affected parties, being guided by the Land Board's and international compensation guidelines.

An extensive public participation process is ongoing to ensure that all stakeholders are informed and have the ability to communicate concerns and recommendations to the project team. The stakeholders include the local community and authorities at both central and local government department levels.

6. Conclusion

The development of AK6 will follow the Value Engineering Study ('VES') delivered by Paradigm Project Management ('PPM') and commissioned by AFD during the first half of 2009. One of the main drivers in the VES was to reduce the upfront capital costs associated with the development of a new mine for AK6. In order to do this, it was decided that, as and where possible, operations would be outsourced as long as the overall efficiency and security of the product were not compromised. This approach led to the determination that the mining operations and maintenance, the plant operations and maintenance and the accommodation camp and infrastructure operations and maintenance could successfully be contracted out. This has led to a significant reduction in the capital cost of developing the mine, but obviously with an increase in the overall operating costs.

The Feasibility Study is planned to be completed by May 2010, with the first diamonds being produced from AK6 towards the end of 2011.

References

1. African Diamonds Annual Report 2008
2. African Diamonds Annual Report 2009

The Author

James Andrew Hartley Campbell, *Managing Director,* African Diamonds plc

James joined African Diamonds as Managing Director from De Beers on 1st December 2006 where he was a General Manager in the Global Mining and Exploration group. He continued working with De Beers, but representing the minority shareholder in the development of the AK6 mine in Botswana. In 2008 James successfully challenged De Beers when they wished to delay the development of the AK6 mine in Botswana. Last year James led the buy-out of

De Beers from the project by first delivering an innovative techno-economic solution to the development of AK6 and then sourcing a new Joint Venture partner (Lucara Diamond Corporation), along with the necessary interim finance.

His distinguished 21-year career at De Beers started in the field as an exploration geologist. James then went on to evaluate many of the De Beers Group's resources, both green and brown fields. He then worked-on and led small-scale mine development before being hand-picked as Personal Assistant to Nicky Oppenheimer when the latter assumed his chairmanship of De Beers in 1998. Shortly thereafter he was part of the leadership team which undertook a fundamental strategic review of the business. James then went on to direct a global e-business programme for the Group and head the IT department at Corporate Headquarters before returning to Global Mining and Exploration.

James is also Deputy Chairman of West African Diamonds plc, which is the subject of a friendly reverse takeover with Stellar Diamonds, as well as director of Swala Resources plc an unlisted gold and base metals explorer.

James holds a degree in Mining & Exploration Geology from the Royal School of Mines (London) and an MBA with distinction from Durham University. He is a Fellow of the Institute of Materials, Minerals & Mining, Member of the Institute of Directors (SA), Chartered Engineer (UK), Chartered Scientist (UK) and a Professional Natural Scientist (RSA)."