Sibanye Gold Limited

Report on the evaluation of options and alternatives to the closure of the underground workings at Ezulwini Mine

28 July 2017

EXECUTIVE SUMMARY

Sibanye Gold Limited (Sibanye) appointed Jones and Wagener to compile the necessary application documentation and to conduct the environmental assessments to apply for the cessation of pumping activities and the associated closure of the underground workings of Ezulwini Mine. Sibanye was asked by Jones and Wagener to provide a document detailing the alternatives that were considered before the decision was taken that the only feasible option to make application for was to cease all pumping activities at the shaft and close the underground workings. This document serves to provide certain of the key information that was taken into account during the consideration of alternatives by Sibanye in the feasibility stage of the project.

Ezulwini Mine faces significant challenges with regard to the underground mine environment. The difficult geology and stratigraphy of the mine results in lower than expected grade and ore yield, while a seismic event that occurred in 2014, combined with a Section 54 stoppage from the DMR, rendered a large portion of the shaft inaccessible. In addition, the shaft infrastructure is aging and requires a great deal of maintenance to be conducted to ensure that the shaft remains safe. These conditions were kept in mind when evaluating the alternative options, as any option that requires access to underground infrastructure would be impacted by the cost implications of this maintenance. Ezulwini Mine also experiences a large volume of fissure water ingress into the mine. Approximately 70 ML/d of fissure water is pumped to surface on a daily basis in order to control water levels within the mine. The pumping operations amount to approximately R13 million per month, in large part due to the electricity cost involved. Closure options for the underground workings therefore have to take all of the above considerations into account.

The evaluation of options open to Ezulwini Mine, post cessation of underground mining activities, shows that though several options were considered and evaluated, based on costs, benefits and the sustainability of a long term solution, the only option that ensures Sibanye reduces its losses in the shortest timeframe possible, while making provision for future planning and costs, **is the option to cease pumping activities and allow the underground workings to re-water.** Other options that were considered include:

- Various permutations of care and maintenance;
- Optimised pumping arrangements;
- The operation of a surface water treatment facility to produce potable water for local communities.

The care and maintenance options were disregarded based on the fact that mining at Ezulwini has proved unprofitable for many years, and thus a return to mining activity is unlikely. Care and maintenance would ultimately lead to a full closure in the near future, therefore it would be a temporary option only. The pumping arrangements optimisation would provide some level of relief from current pumping costs, but Sibanye would still experience monthly losses, while no production from the mine ensures there is no income. This solution is therefore not considered viable. The water treatment option is attractive, based on the socio-economic benefits associated with it, however, due to the substantial time delays and the high degree of uncertainty regarding the regulatory environment and willingness to engage, this option is not deemed feasible at this stage. The decision was therefore made that closure of the underground workings, and cessation of pumping activities, would be the preferable option, as it would result in the least cost to the company, minimising the impact of the profitability of the bigger group and therefore preserving jobs of other marginal operations. The metallurgical plants on surface should remain operational, as long as there is surface material available for the plants to process.

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2 DOCUMENT BACKGROUND

Jones and Wagener were appointed as the Independent Environmental Practioner to compile the necessary application documentation and to conduct the environmental assessment to apply for the cessation of pumping activities and the associated closure of the underground workings of Ezulwini Mine. Sibanye was asked by Jones and Wagener to provide a document detailing the alternatives that were considered before the decision was taken that the only feasible option to make application for was to cease all pumping activities at the shaft and close the underground workings. This document serves to provide certain of the key information that was taken into account during the consideration of alternatives by Sibanye in the feasibility stage of the project. .

The full financial evaluation undertaken in support of the decision to cease underground mining activities can be reviewed in Appendix A.

3 FACTORS INFLUENCING THE DECISION TO CEASE MINING OPERATIONS

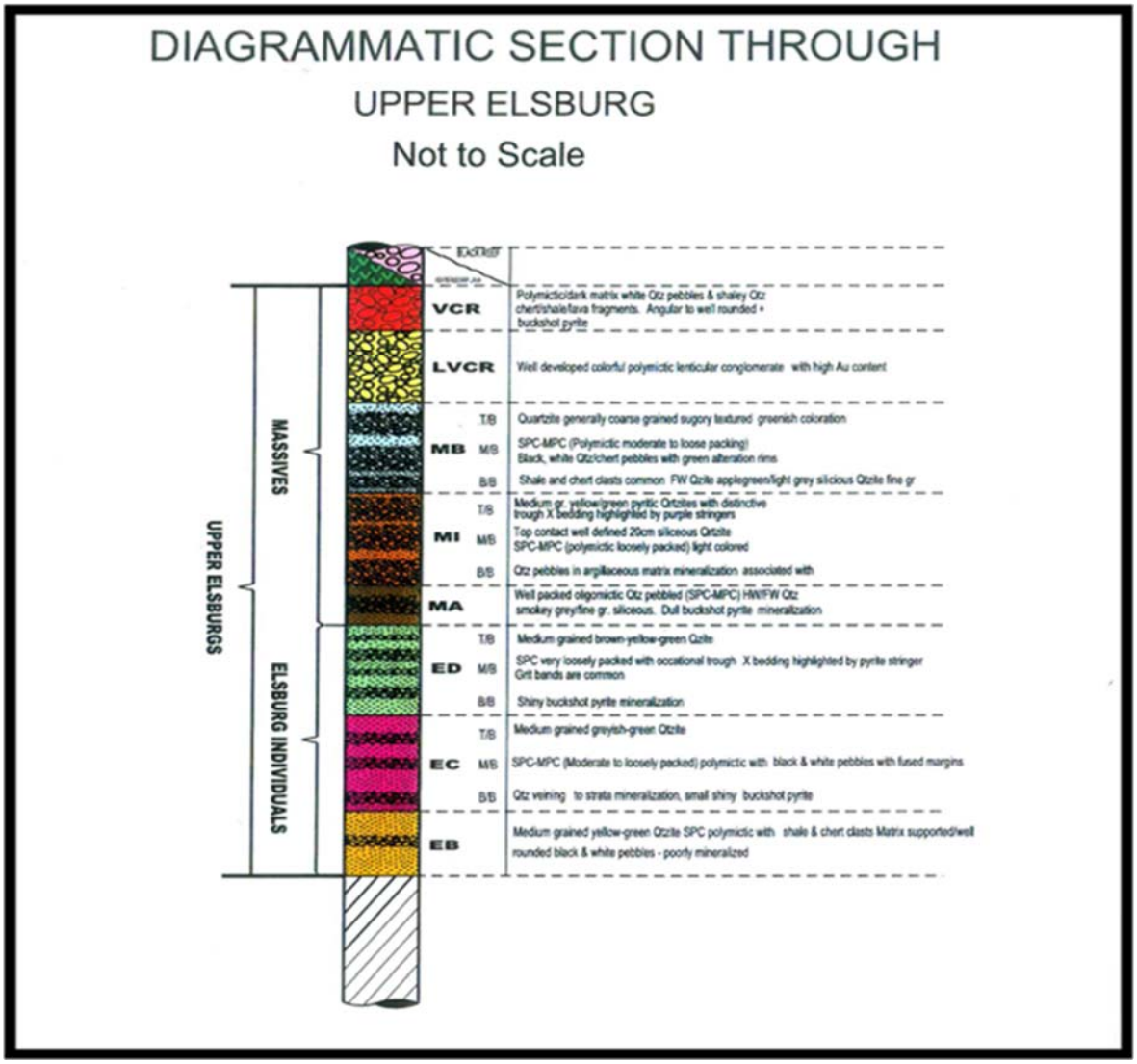
This section of the document provides an overview of the key constraints that adversely affect mining production at the Ezulwini operations.

3.1 Geological Constraints

3.1.1 Local Geology

Figure 1 below shows the local geology describing the nature of the ore body mined at Ezulwini. This ore body is characterised by a number of different reef bands which contributes to the logistical challenges as set out below.

Figure 1 : Diagrammatic Section through Upper Elsburg



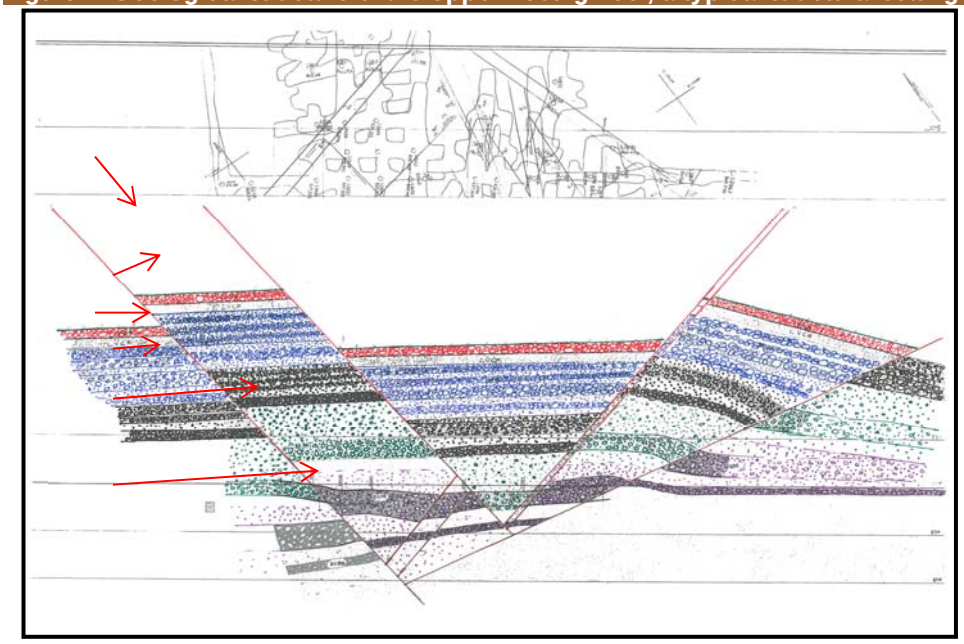
3.1.1.1 General stratigraphy

The ore body at Ezulwini is very complex with respect to its geological structure and stratigraphy. The total number of reef units mined in the Upper Elsburg Reef is 26. Each one of these units has its own distinguishing features and it is virtually impossible to discern the differences especially to the untrained eyes in underground conditions. Great difficulty has been encountered in the negotiation of faults as reef is exposed on either side of the structure. This results in broken grade falling short of the block value due to mining ending up on the wrong reef band. See Figure 2 below. That is, the miner assumes that he still on reef whereas he is on a different reef horizon. Planned ounces have been lost in this way in that the mining is carried out on the "wrong reef" with a low grade / value.

While geological models are constantly being updated on an on-going basis, the operation has, from time to time, had to deviate from its plans in order to mitigate the geological problems to achieve profitability.

The Section 189 business case, attached as Appendix A, provides more detail on the geology of the mine and the challenges that the geology provides in terms of profitable mining,

Figure 2: Geological Structure of the Upper Elsburg Reef, a typical structural setting on Ezulwini

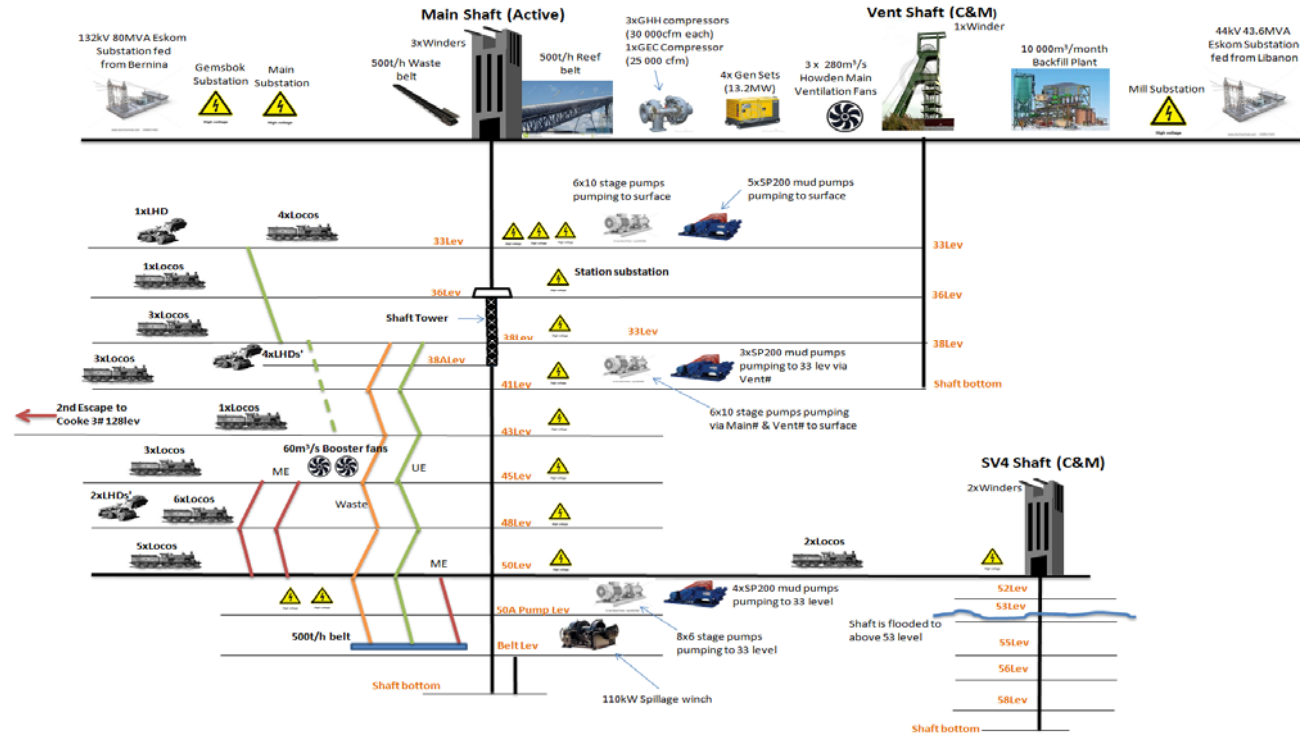


3.1.2 Infrastructure and logistical constraints

3.1.2.1 State of underground infrastructure

In terms of underground infrastructure, as illustrated in Figure 2, Ezulwini is a completely separate entity from the other Cooke operations. Although there is a connection between Ezulwini and Cooke 3 Shafts, this is as a result of a legal requirement for the purpose of providing a second escape way. As the connection is approximately 5km away, **logistically it would be impractical and not economically viable to operate Ezulwini from Cooke 3**.

Figure 3 : Schematic Layout of Ezulwini Workings



The infrastructure at Ezulwini is aging and extensive maintenance and repair is necessary to continue the safe use of the shaft. A structural inspection report compiled by GK Structural Consulting (GK Structural Consulting , 2017), dated August 2017, laid out the following recommendations:

"The overall recommendation is that significantly more shaft time is needed for maintenance if the shaft is going to be kept in a safe operational condition.

The shaft engineering team has a good understanding of what maintenance is required in the shaft, and is generally using a rational approach to scheduling maintenance. An area that appears to be neglected is the station steelwork, probably because this is not recorded on the shaft scroll. Moiling, removal of loose rock and rock bolting is consuming the greatest amount of shaft maintenance time. Most of the remaining shaft time is being used for replacement of severely corroded buntons and guides. A small amount of time is being used for maintenance work on pipe columns.

In addition to this, the following work is recommended:

(a) A structural design check is recommended to confirm whether the dividers are actually required once buntons have been replaced.

(b) The rational programme of replacing the corroded and damaged buntons and guides should be increased. The current condition of the shaft suggests that insufficient shaft time is being made available.

(c) A rational programme of replacing the corroded and damaged shaft station steelwork should be implemented.

3.1.2.2 Seismic Risk and Collapsed Access Ways

Access to 36 Level is not possible due to a **total collapse of the access ways** caused by the Western Area Formation (WAF). The 36 level ore reserve has thus not been exploited since the operation was restarted during 2006. Due to financial constraints, infrastructure re-development has not been undertaken.

In addition, on 38 Level, due to the deterioration in the condition of the main access haulage, equipment has to be moved by hand.

On the 14 November 2014, a Section 54 stoppage was issued by the DMR, regarding the above collapse and a seismic event of 2.8. The Section 54 can be found in Appendix C.

3.1.2.3 Logistical Factors

There are a number of logistical factors that impact on productivity at Ezulwini, including:

(a) Floating Tower

The moving tower in the shaft prevents conveyances and skips from travelling at full speed in the shaft. This reduces the time available for moving men, material and rock. In addition, rock mass movement in the shaft requires constant attention and additional repairs to maintain clearances (moiling sidewalls).

(b) Transportation and Travelling Time

All personnel and material are transported daily in the main shaft with the two man winders. The one man winder can transport 120 people per trip and the other man winder 60. The duration for transporting the day shift underground, which is in the order of 1200 employees, is approximately 2.5 hours. This has a direct impact on the availability of the shaft to transport material and to conduct maintenance.

The distances from the shaft to the workings at levels 45 and 48 (uranium bearing ME band) are far at around 6 km, which increases travelling time for employees to up to 2.5 hours per day. Therefore time spent on the face is limited, with an effective face time of approximately 5 hours and 30 minutes.

(c) Hoisting Capacity

Rock is hoisted from underground to surface via a Koepe winder having two 20 ton skips with a current calculated skip factor of 16.6 tons. The current hoisting capacity per day during a 13 hour hoisting cycle, due to the peak periods, legal maintenance and the moiling at the shaft on night shift, is 2200 tons. Although production rates are not reaching this level, the hoisting restrictions result in logistical difficulties and ore accumulating underground.

3.2 Cost Factors

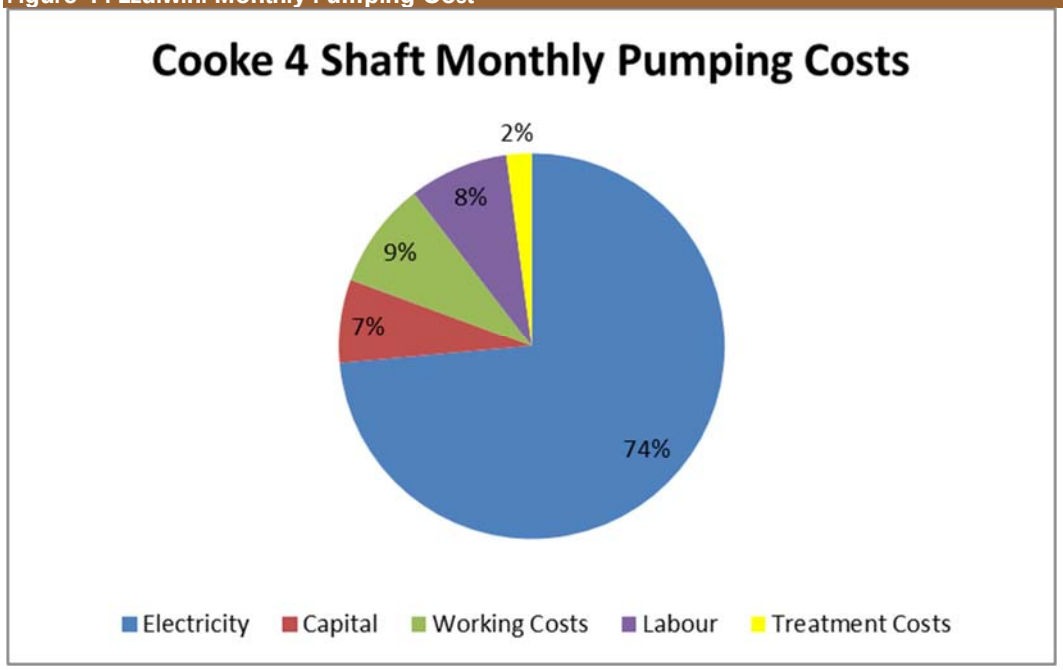
3.2.1 Pumping

Ezulwini experiences substantial ingress of fissure water from the overlying dolomitic formations. The water enters the Ezulwini workings through a number of discontinuities in the rock mass that extend from the dolomitic strata down to the working levels of the mine. Approximately 70 million litres of dolomitic water is pumped per day at a cost of approximately R156 million per annum.

Failure to continue pumping operations would result in flooding of the mine. **Not only does this water need to be pumped to surface but additional storage dams have to be maintained and the water needs to be treated to remove metals. All of the above add a significant additional financial burden to the Mine.**

As can be seen from Figure 4 below, the major cost associated with pumping is electricity which amounts to 74% of total pumping costs. These costs add an abnormally high fixed cost component to the Ezulwini operations' cost structure.

Figure 4 : Ezulwini Monthly Pumping Cost



4 ALTERNATIVE SOLUTIONS CONSIDERED TO ADDRESS EZULWINI'S LOSS MAKING POSITION

This section of the report provides an overview of alternative options considered by management for Ezulwini, along with an analysis of the feasibility of these options and the subsequent decision. The Section 189 report presented further economic modelling of some of the options presented below.

4.1 Alternatives considered to address the sustained financial losses at Ezulwini

4.1.1 Base Case

Alternative 1 Base case – continue with operations according to the approved operation plan with mined volume and gold production at the proportion of plan delivered 2016 year to date and gold price at the 2016 year to date level

Continuing operations at the current level of performance was not a viable basis on which to proceed, and alternatives that may involve downscaling of certain operations have been considered to reduce the level of financial loss that would be expected.

4.1.2 Care and Maintenance Options

It should be noted that care and maintenance is not considered to be a long term sustainable option for Ezulwini, as it is a single shaft mine, with the result being that if the underground workings are placed on care and maintenance, there is no underground ore being produced, and therefore no income generated. **Care and maintenance would therefore inevitably lead to a full closure application in the short term future of the shaft.**

Alternative 2a Alternative 1 with processing of ore currently treated at Ezulwini Plant at Doornkop Plant and the Ezulwini Plant placed on care and maintenance. Impacts of improved recovery, lower metallurgical cost per ton, and rock transport cost are included

Alternative 2b Care and maintenance of the Ezulwini underground mining operations and keeping both the gold and uranium modules of Ezulwini Plant operational based on alternative feed sources than Ezulwini underground ore, potentially including Cooke 3 underground mining and Surface rock dump material from Venterpost rock dump.

Alternative 2c Care and maintenance of underground workings of Ezulwini, while keeping both the gold and uranium modules of Ezulwini Plant operational based on alternative feed sources than Ezulwini underground ore, potentially including Cooke 3 underground mining and Surface rock dump material from Venterpost rock dump.

Alternative 2d Placing Ezulwini underground operations and all Ezulwini Plant operations on care and maintenance.

4.1.3 Closure Options

Alternative 3 Closure of underground workings of Ezulwini, while keeping both the gold and uranium modules of Ezulwini Plant operational based on alternative feed sources than Ezulwini underground ore, potentially including Cooke 3 underground mining and Surface rock dump material from Venterpost rock dump. Cessation of pumping operations underground would result in the underground workings being allowed to re-water.

Alternative 4 Closure of the Ezulwini underground operations and all Ezulwini Plant operations, allowing the underground workings to re-water.

Alternative 5 Closure of underground workings with optimised pumping operations i.e. pumping from a higher level. This would minimise the head of pressure to be placed on the plugs between South Deep and Ezulwini.

Alternative 6 Closure of the Ezulwini underground workings with continued pumping of fissure water to surface to be treated at a potable water treatment facility, for supply to local communities.

4.2 Analysis of Care and Maintenance Options

All of the alternatives involving care and maintenance of the underground operations would inevitably proceed to final irrevocable closure.

The business case report, attached in Appendix A, details the financial evaluation of the care and maintenance options presented above. A summary of those findings is presented below:

“Financial evaluation of the alternatives was performed at the year to date (up to June 2016) average monthly gold production of 117kg per month and at a gold price of R600, 000/kg (As at 1 August 2017, the gold price was approximately R550,000/kg) as representative of

circumstances at the time. Under alternative 1(base case), Ezulwini is projected to make a loss of R447 million over the 18 months from July 2016 to December 2017. Table 1 identifies by how much Sibanye's financial loss would be reduced each month relative to the base case of alternative 1 through implementing each of the alternatives considered. Negative numbers indicate that the alternative would result in an increased loss."

Table 1 : Reductions in projected financial loss through implementation of alternatives

Alternative	Monthly loss (R million)	
	During care and maintenance	Post care and maintenance
2a	10.6	10.6
2b	-0.7	12.3
2c	3.8	16.8
2d	13.9	26.9

It is evident that the financial losses would be reduced most effectively by downscaling operations in accordance with alternative 2d. However, this option would still incur considerable monthly losses of approximately R 26.9million per month. This would be unsustainable and would inevitably lead to full closure of the operations very shortly. **There was therefore no incentive to initiate care and maintenance rather than the closure of the mine.**

4.3 Analysis of Closure Options

4.3.1 Alternative 3: Metallurgical plants remain operational while underground operations cease

The cessation of mining in the underground operations, and the cessation of the associated pumping operations, would result in the mine workings re-watering over a period of time. This means that no underground mining operations would be possible. The cessation of pumping would therefore result in the full closure of the underground workings. However, the surface metallurgical plants could continue to operation, treating the remaining ore stockpiles, along with surface material from Venterspost rock dump, among others. The plant could also potentially form part of the West Rand Tailings Retreatment Project in the future. Keeping the plants operational would result in some income, while reducing the costs associated with continuing mining operations. Re-watering would also prevent illegal mining activity and the potential loss of life.

The Ezulwini Plant processes material at a cost of R294/ton, depending on the amount to be processed. While it currently operates with a recovery of approximately 92%, this could potentially be improved, thereby improving the profitability of the processing operations. However, without underground ore, material to be processed through the plant is transported by road from Venterspost at approximately R55/t extra. This may prove viable, as long as waste material with a high enough grade is available nearby.

4.3.2 Alternative 4: Cessation of underground mining operations and metallurgical plant operations

The cessation of mining in the underground operations, and the cessation of the associated pumping operations, would result in the mine workings re-watering. The cessation of pumping

would therefore result in the full closure of the underground workings. The surface metallurgical plants could be closed.

This option would result in a full closure plan and surface rehabilitation being required. The commitments contained in the interim closure plan would therefore come into effect.

4.3.3 Alternative 5: Cessation of mining with optimised pumping operations

The cessation of mining activities would mean that the associated pumping of the underground fissure water is no longer necessary. However, re-watering of the underground workings will result in a significant head of water above the plugs installed between Ezulwini and the neighbouring mine, South Deep. While the plugs were designed to withstand this pressure head and extensive investigation has been done to ensure the safety of the plugs and the pillar, an option to keep the water level below the shaft collar was investigated to reduce this pressure head.

The extensive investigative work conducted by SRK, over numerous years, concluded that the risk of the plug or pillar between Ezulwini and South Deep failing is "cosmically" unlikely. It therefore follows that the need for extra caution, at significant cost to Sibanye, is unnecessary. This situation was therefore not considered as a favourable scenario and provides no real benefits to Sibanye Gold nor outside stakeholders.

A full analysis of pumping was conducted in 2016. It showed that pumping during off-peak times could potentially result in savings, although comparatively small when viewed in light of the magnitude of the current costs. A further optimisation study focused on the costs of pumping from various levels at Ezulwini, using a key indicator of (R/ML.Height pumped)/month.

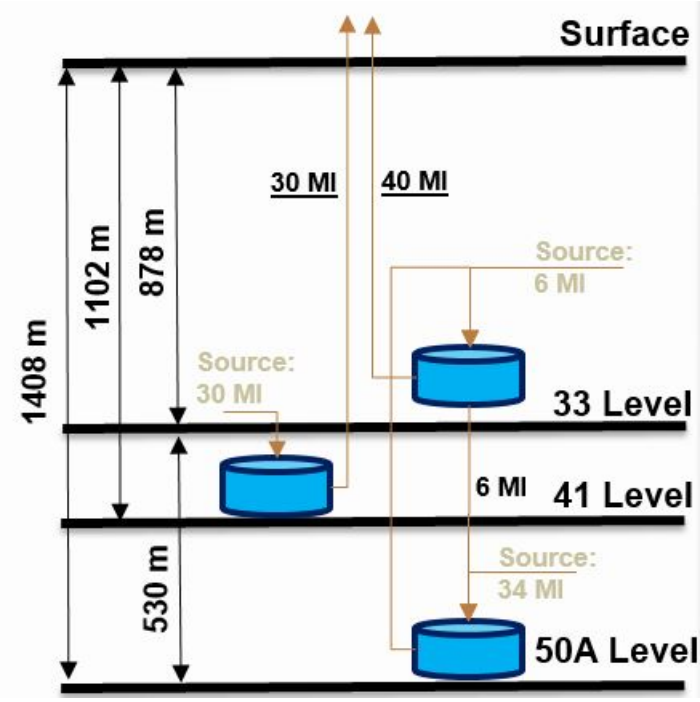


Figure 5 Ingress water infrastructure system at Ezulwini

Should the underground operations cease, but full re-watering of the mine not be desirable, then the full volume of fissure water could be pumped from 33 level. The cost of pumping could then be reduced to approximately R7.2 million per month, based on current electricity costs. This however would require a significant capital investment to upgrade the pump station and storage dam system to accommodate the volumes at 33 level.

Table 2 Approximate monthly pumping cost

Level	Volume pumped	Distance to be pumped (m)	Cost (R million/month)
33 lvl to surface	40	878	4.1
41 lvl to surface	30	1102	3.9
50 lvl to 33 lvl	40	530	2.5
Total Current	**70**		**10.5***
Total post closure (33 lvl)	**70**	**878**	**7.2**

*Note: this costs covers only the cost of electricity with regards to pumping, and does not include the cost of treatment and labour requirements, which , when taken into consideration, lead to the approximate amount of R13 million per month in total.

This scenario would still incur substantial cost to the mine with no tangible benefit. The head of water on the plugs between South Deep and Ezulwini remain significant and this operation will therefore provide little to no reduction in the perceived risk to South Deep mine. The cost of pumping would be an ongoing cost, while no mining activities results in no income being gained from this operation. The cost of electricity increases each year, with little consultation, the result being that the costs of this form of operation have the potential to spiral out of control. The pumping infrastructure, including the pumps and the columns, will require maintenance, and as the infrastructure is already classified as "aged", it will likely need to be replaced in the near future. This also means that the shaft infrastructure will need to be maintained in a safe condition. This will all incur costs which seem wasteful given the very limited benefit derived from this operation.

4.3.4 Alternative 6: Cessation of mining with construction and operation of a potable water treatment facility on surface

A further alternative considered is the construction of a potable water treatment facility, which would treat the fissure water to potable standards for sale by the municipality. This would allow the underground workings to remain dewatered and would provide the local community with a supply of drinking water for the foreseeable future.

According to the Water Services Act of 1997, no entity who is not a water services provider can provide drinking water. Therefore, the West Rand District Municipality, or similar, would need to partner with Sibanye to achieve this goal. Estimated cost implications of this alternative, based on similar proposals, are given below as an indication:

Table 3 Estimated cost of 70 ML/day potable water treatment plant

Description	Assumption	Approx. Cost (R million)
Capital Cost for installation of Reverse Osmosis treatment plant	R10 million per ML treated	700

Operational Costs per month	R 7,740 per ML treated	16.5 * per month
Pipeline infrastructure	10% of capital cost	70
Pumping Cost while institutional arrangements are made	2 years of current pumping costs at R13m per month	312

*Note: The operating cost is the cost to treat 70 ML/day to drinking water standards (SANS241(2015)), based on a Reverse Osmosis treatment plant. The current Crystalactor plant treats only unimpacted fissure water. The full volume of water will likely contain other streams with higher concentrations of metals and mine-related constituents. This cost represents a worst case treatment system.

In addition to the above, the shaft infrastructure and pumping infrastructure would need to be maintained so that safe access to pumps and dams underground is available. The current state of the infrastructure requires remediation work to be done to ensure the shaft would remain accessible, as described above. This cost would then be in addition to the costs in Table 3 above.

Sibanye Gold entered into discussions with Rand Water Board, along with representatives of DWS, on this matter and meetings were held on 31 August 2016 and 10 November 2016. Discussions indicated that significant engagement with stakeholders would be required, including local and national government, NGO's, communities and media. Additionally, a full Environmental Impact Assessment would be required. The timeframes suggested by Rand Water Board, and corroborated by DWS, intimated that a period of 2-3 years was a likely timeframe for the implementation of the project. While significant interest was shown by the attendees of the meetings, and discussions are likely to continue on this matter, the timeframes associated with this venture proved too long for it to be considered a suitable alternative to this particular project. The minutes of the meetings are attached to this document in the Appendix B.

While there are benefits associated with this option, namely that the cost of pumping ingress water would be catered for while also providing a potable water supply, the barrier to this alternative remains the legislation and the associated timeframes it would take to gain the necessary approvals. It is estimated to take a best case scenario of 2 years to obtain agreement between the necessary parties and Sibanye cannot continue to sustain a loss-making operation for this length of time. Additionally, the challenges of who takes over ownership and operation of the plant, along with maintenance of the underground pumps and shaft system necessary for the continued pumping, remains unclear. The state of the shaft infrastructure and pumping equipment, as discussed above, requires attention and maintenance. The uncertainty and the risks associated with this option have ensured that Sibanye is not willing to delay the closure of Ezulwini's underground operations based on this alternative.

5 ANALYSIS

Numerous alternatives were investigated for the future of the Ezulwini operations, including care and maintenance options as well as full closure options. The closure of the underground operations at Ezulwini, and the associated termination of pumping activities, would result in the re-watering of the underground workings.

The care and maintenance options proposed above provide minor relief in terms of monthly losses, with no foreseeable sustainable future. The care and maintenance options are therefore not considered worthwhile, as they inevitably would lead to a full closure application in the near future.

The cessation of underground activities have been extensively studied. The current shaft infrastructure requires maintenance and repair work to be conducted, combined with difficult geological features and low and unpredictable grade, results in the fact that a return to mining

activity is considered highly unlikely at any time in the future. Therefore, the decision to re-water the shaft is the best option for the underground workings, incurring the least cost to the company, minimising the impact of jobs on other marginal operations while also contributing to a sustainable closure plan for the long term.

The construction of a water treatment plant for the provision of potable water would be preferable, if it did not involve high capital and operating costs and involve a large degree of uncertainty, both In terms of licencing and authorisation for the project, as well as the long term operating model and ownership.

The metallurgical plants should remain operational, as the removal and processing of surface material encourages the reduction in the mine footprint and aides in concurrent rehabilitation by removing waste rock dumps. As long as there is surface material within a reasonable radius to make processing profitable, the use of the plants will continue.

6 CONCLUSION

The Ezulwini operations have an extended history of loss making. This is largely a result of the operation being faced with significant challenges that include inherently difficult geology, mining complexity, high pumping costs and the operations economics.

Sibanye has extensively considered the feasibility of different alternatives to the full closure of the underground workings of the mine, and has concluded that the only feasible option going forward is the cessation of pumping and rewatering of the mine workings. The surface metallurgical plants should remain operational to treat surface stockpiles. While the option of a potable water treatment plant is considered an attractive alternative, although it is extremely costly and until there is more certainty in terms of legislative provision for this type of project, and more clarity on the ownership and operation of such a plant, the high degree of uncertainty means this option is not a viable solution to Ezulwini's closure scenario.

7 REFERENCES

GK Structural Consulting . (2017). *Sibanye Gold Cooke 4 Shaft Structural Inspection 2017.* Johannesburg.

8 Appendix A

Business case/ reasons for possible retrenchments based on operational requirements at Ezulwini Mining Company (Pty) Ltd and associated support services and management employees

9 Appendix B

Minutes of Meetings held with Rand Water Board regarding potable water treatment and supply

10 Appendix C

Section 54 Stoppage Notice

11 Appendix D

Sibanye Response to NUM Submission on Proposed Alternatives