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Environmental Impact Assessment for Sibanye Gold Limited's West Rand Tailings Retreatment Project

Closure Liability Report

Project Number:

GOL2376

Prepared for:

Sibanye Gold Limited

August 2015

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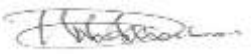
Hlayiseko Mashaba	Report Compilation		July 2015
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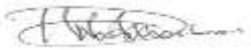
I, Hlayiseko Mashaba as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of Sibanye Gold Limited, other than fair remuneration for work performed, specifically in connection with the proposed West Rand Tailings Retreatment Project, Gauteng Province.



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Experience (years):	2-3 years

EXECUTIVE SUMMARY

Digby Wells Environmental (Digby Wells) was appointed by Sibanye Gold Limited (Sibanye) to calculate the environmental closure liability for the West Rand Tailings Retreatment Project (WRTRP). The WRTRP entails processing the Tailings Storage Facilities (TSFs) namely Cooke, Driefontein 3 and 5 and Cooke 4 South through the Central Processing Plant and depositing the residue onto a new Regional TSF (RTSF). This document details the assessment of the closure liabilities pertaining to Sibanye as required in the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as amended and associated regulations. Section 24P of NEMA provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impact.

The report contains the estimated closure costs (planned and unplanned) as well as the methodology and assumptions made to arrive at the final closure estimate. The environmental liabilities associated with WRTRP were assessed as at July 2015 based on the infrastructure plan provided by Sibanye.

The environmental liability only focused on the proposed mining activities and was calculated by means of the Digby Wells' standard method for assessment of mine closure. The focus of this financial provision was on the calculation to rehabilitate the dump footprints, RTSF, demolishing of the Central Processing Plants and Uranium Plant and other infrastructure and the general surface rehabilitation of the disturbed areas.

The estimated cost for the closure of the WRTRP assuming early closure at the end of fifth, tenth year of mining and at the end of life of mine is presented in Table 1-1 below. It is recommended that the liability figures be updated on an annual basis, or when detailed evaluations of the requirements for hydrogeological closure, or other closure cost items, are obtained.

During the decommissioning phase and after closure of the mine has occurred, monitoring and maintenance will be required to ensure that the closure objectives have been met. Monitoring requirements relates to groundwater, surface water, soil and vegetation aspects. These post-closure monitoring and maintenance costs have been included in the above estimates.

Table 1-1: A summary of Closure Liability for WRTRP

Mining Right Area	Closure Cost After one year of Mining	Closure Cost After Ten years of Mining	Planned Closure Cost
Driefontein Mining Boundary	R 9,686,963.27	All infrastructure and dump footprints would have been rehabilitated during year 10 of mining	R 23,423,521.70
Ezulwini Mining Boundary	The pipeline will only be constructed from year 8 of mining	R 419,425.51	R 419,425.51

Mining Right Area	Closure Cost After one year of Mining	Closure Cost After Ten years of Mining	Planned Closure Cost
Cooke Mining Boundary	R 2,609,960.43	R 47,198,088.91	R 26,829,349.74
Kloof Mining Boundary	R 146,651,567.34	R 286,009,667.16	R 286,009,667.16
Total	**R 158,948,491.03**	**R 333,627,181.58**	**R 336,681,964.11**

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1 Introduction

Digby Wells Environmental (Digby Wells) was appointed by Sibanye Gold Limited (Sibanye) to calculate the closure liabilities for the West Rand Tailings Retreatment Project (WRTRP) on the West Rand in the Gauteng Province, South Africa. The closure liability assessment is conducted as part of the Environmental Impact Assessment (EIA) process. This closure cost calculation is based on the rehabilitation DMR guidelines in the "Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine" in line with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).

The focus of this closure liability calculation is on the cost to rehabilitate the dump footprints, RTSF, demolishing of the Central Processing Plants and Uranium Plant and other infrastructure and the general surface rehabilitation of the disturbed areas. The closure liabilities were calculated for both unplanned (early) closure and for planned (full life of mine) closure.

There are numerous benefits of appropriate environmental liability management including:

- Minimised residual environmental impacts upon closure;
- Advanced financial planning for environmental liabilities; and
- Reduced cost of financial provision.

The environmental liabilities associated with the WRTRP were assessed as at July 2015.

1.1 Project background

Sibanye Gold Limited's (Sibanye Gold) Tailings Storage Facility (TSF) holdings in the West Rand can be divided into three blocks; the Northern, Southern and Western Blocks (See Plan 1 for the regional setting under Appendix A). Each of these blocks contains a number of historical TSFs. It is proposed that each of the blocks will be reclaimed in a phased approach. Initially the Driefontein 3 TSF (Western Block) together with the Cooke TSF (Northern Block) will be reclaimed. Following reclamation of Driefontein 3 TSF, the Driefontein 5 TSF (Western Block) and Cooke 4 Dam South (C4S) (Southern Block) will be reclaimed.

- Western Block comprises: Driefontein 1, 2, 3, 4 and 5 TSFs, and Libanon TSF. Once the Driefontein 3 and 5 TSFs have been reclaimed the remainder of the Driefontein TSFs, namely Driefontein 1, 2 and 4 and the Libanon TSF, will be processed through the CPP.
- Northern Block comprises: Cooke TSF, Venterspost North TSF, Venterspost South TSF and Millsite Complex (38, 39 and 40/41 and Valley). Venterspost North and South TSFs and Millsite Complex (38, 39 and 40/41 and Valley).
- Southern Block comprises: Kloof No.1 TSF, Kloof No.2 TSF, South Shaft TSF (future), Twin Shaft TSF (future), Leeudoorn TSF and C4S TSF. Following

completion of the Module 3 float and gold plants, Kloof 1 and 2 TSFs, South Shaft TSF (future), Twin Shaft TSF (future) and Leeudoorn TSF will be reclaimed.

The entire proposed infrastructures associated with the WRTRP are indicated from Plan 2 to Plan 5 under Appendix A.

Once commissioned the proposed project will initially reclaim and treat the TSFs at a rate of 1.4 Mt/m (1Mt/m from Driefontein 3 followed sequentially by Driefontein 5 and C4S, and 0.4 Mt/m from Cooke TSF). Reclamation and processing capacity will ultimately ramp up to 4 Mt/m over an anticipated period of 8 years. At the 4Mt/m tailings retreatment capacity, each of the blocks will be reclaimed and processed simultaneously.

The tailings material will be centrally treated in a Central Processing Plant (CPP). In addition to gold and uranium extraction, sulfur will be extracted to produce sulfuric acid, an important reagent required for uranium leaching.

To minimise the upfront capital required for the West Rand Tailings Retreatment Project (WRTRP), only essential infrastructure will be developed during initial implementation. Existing and available infrastructure may be used to process gold and uranium until the volumetric increase in tonnage necessitates the need to expand the CPP.

The new RTSF will be located in an area that has been extensively studied as part of the original West Wits Project (WWP) and Cooke Uranium Project (CUP) projects. The deposition area on which the project is focussing has been termed the Regional TSF (RTSF) and is anticipated to accommodate the entire tonnage from the district. The proposed RTSF will be one large facility as opposed to the two independent deposition facilities proposed by the WWP and CUP respectively.

1.2 Terms of reference

The closure cost assessment is done in accordance with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended,[1] and associated regulations[2]. These Regulations provide that the holder of a mining right must make full financial provision for rehabilitation of negative environmental impacts. The financial provision must guarantee the availability of sufficient funds to undertake the:

- Rehabilitation of the adverse environmental impacts of the listed or specified activities;
- Rehabilitation of the impacts of the prospecting, exploration, mining or production activities, including the pumping and treatment of polluted or extraneous water;

[1] Previously, closure methodology was prescribed in Section 41 (1) of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) and its Regulations, but these provisions have been repealed. Section 24P in NEMA as amended provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts arising from mining activities

[2] Environmental Impact Assessment Regulations, 2014, GN R982 in Government Gazette 38282 of 4 December 2014

- Decommissioning and closure of the operations;
- Remediation of latent or residual environmental impacts which become known in the future;
- Removal of building structures and other objects; or
- Remediation of any other negative environmental impacts.

The closure cost assessment has been developed in line with these requirements.

2 Details of the Specialist

The specialists involved in determining the environmental liabilities for WRTRP were Hlayiseko Mashaba and Renée Van Aardt. Their Curricula Vitae can be made available upon request.

Hlayiseko Mashaba completed his BSc (hons) in Environmental analysis and management at the University of Pretoria in December 2012. During his honours program, Hlayiseko attended several courses which include Environmental Impact Assessments (EIA), Environmental Compliance, Environmental principles, Urban Geography of SA etc. Hlayiseko joined Digby Wells in April 2013 and is currently working as an Environmental Consultant in the Mine Closure and Rehabilitation Department. He is involved in conducting liability assessments, mine rehabilitation and closure plans.

3 Aims and Objectives

Mine closure aims to achieve long-term site stability and the establishment of a self-sustaining ecosystem which supports the final end land use.The overall rehabilitation and closure objective for the WRTRP is to:

- Remove mining infrastructure that cannot be used by a subsequent land owner or a third party. Where buildings can be used by a third party, arrangements must be made to ensure their long term sustainable use;
- Provide practical rehabilitation measures for rehabilitation of the Driefontein Dumps (DRI3 and DRI5), the Cooke Dump, Cooke 4 South and the RTSF;
- Any proposed post closure developments on old mining land will need to undergo extensive environmental and stability assessments before they can be permitted
- Implement progressive rehabilitation measures, beginning during the construction phase wherever possible;
- Clearing the footprint of all slimes and rehabilitating the area;
- Conducting a radiological field survey in order to control or stop any action of radon emitting material;
- Leave a safe and stable environment for both humans and animals and make their condition sustainable;

- Follow a process of closure that is progressive and integrated into the mine plans and that will assess the closure impacts proactively at regular intervals throughout project life;
- To prevent any soil and surface/groundwater contamination by managing all water on site;
- Comply with local and national regulatory requirements; and
- To maintain and monitor all rehabilitated areas following re-vegetation and, if monitoring shows that the objectives have been met, making an application for closure.

4 Closure Cost Provision Methodology

4.1 Literature review and desktop assessment

The 2014 closure cost assessments reports for Kloof and Driefontein compiled by Golder Associates have been reviewed before assessing the environmental liability associated with the WRTRP for the proposed reclamation process. Legal requirements which have served as guidelines to the compilation of this closure cost assessment have also been reviewed.

Other documents that were reviewed include:

- Rehabilitation plan compiled by Digby Wells;
- Current environmental studies; and
- The Draft Regional Closure Strategy for the far West Rand Goldfield and the West Rand Goldfield (Council of Geoscience Reports).

4.2 Methodology

The "*Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine*" will be used to assess the applicant's environmental liability. The DMR (formerly known as the Department of Minerals and Energy) Guideline Document format makes use of a set template for which defined rates and multiplication factors are used. The methodology described below details how the final closure liability was estimated for the proposed mine using the Digby wells methodology

4.2.1 Infrastructure measurement

The infrastructure areas and other areas affected by mining activities were measured from plans provided by the applicant and the layout plan is attached in Appendix A. Measurements that were taken have been standardised to ensure that the costs calculated are easily updatable. Quantities of steel and concrete structures/ buildings, fences and pipelines were received from the project engineers and were assumed to be correct. The concrete and steel estimates associated with the plants are based on previous experience and assumptions.

4.3 Rates

The rates used were updated by quotes from demolition and civil contractors and professionals wherever possible. Rate formulation takes into consideration the total labour costs, plant costs, fuel costs and construction costs into consideration thus providing a more accurate, defendable rate.

Each type of infrastructure has a particular rate for demolition and these have been summarised in Table 4-1 below.

Table 4-1: Unit rates for demolition of mine infrastructure

Environmental Liabilities Estimate - Unit Rates.					
Class	**Item**	**Description**	**Unit**	**Rate**	
101	Brick Buildings	1 storey	m²	R	291.15
102	Brick Buildings	2 storey	m²	R	367.90
103	Brick Buildings	3 storey	m²	R	407.54
104	Buildings	with large foundations (Fitting shop etc)	m²	R	543.79
105	Car Port	Demolish	m²	R	53.26
106	Coal Bay	Demolish	m²	R	526.45
107	Concrete	Un-Reinforced Concrete	m³	R	365.42
108	Concrete	Reinforced - Low level	m³	R	526.45
109	Concrete	Reinforced - High Level	m³	R	680.05
110	Concrete	Large bases - Mill Bldgs/ Winder House etc.	m³	R	990.97
111	Dam	Water dams - Flatten the earth walls	m³	R	18.21
112	Hostel Rooms	Demolish	m²	R	292.34
113	Dam	Remove Plastic Liner.	m²	R	4.95
114	Dam	Remove Sludge - monitor	m³	R	37.16
115	Dam	Flatten the walls	m³	R	12.39
116	Manhole	1m deep	item	R	743.23
117	Manhole	2m deep	item	R	1 164.39
118	Paved Areas	Remove paving	m²	R	37.16
119	Pipelines	On Surface on plinths	Km	R	18 580.69
120	Plug Shaft	Plug the shaft. Assume the shaft backfilled with rubble	m²	R	8 125.96
121	Plug Shaft	Plug the shaft. Assume the shaft not backfilled with rubble	m²	R	29 072.59
122	Prefab Building	Single storey	m²	R	86.71
123	Rails 36 Kg	36 Kg rails (Per single rail)	Km	R	47 071.09
124	Rails 22kg	22 Kg rails (Per single rail)	Km	R	22 296.83
125	Rehabilitation/clean up	Pick up spilled slime	m³	R	99.10
126	Rehabilitation/clean up	Grade an area	ha	R	41 205.34
127	Rehabilitation/clean up	General clean up	m²	R	9.29

128	Rehabilitation/clean up	Rubble - Load and Cart away - 2km	m³	R	37.09
129	Rehabilitation/clean up	Replace soil and spread 150mm thick	m³	R	12.80
130	Rehabilitation/clean up	Replace soil and spread 300 mm thick	m³	R	12.80
131	Rehabilitation/clean up	Revegetate areas where structures have been removed	Ha	R	25 963.84
132	Rehabilitation/clean up	Bulldoze material - 50m	m³	R	7.57
133	Road	Tarred	m²	R	51.81
134	Roads	Gravel	m²	R	7.43
135	Shaft headgear	Steel - Demolish	t	R	1 486.46
136	Shaft headgear	Concrete - Demolish	m³	R	1 362.58
137	Steel Buildings	1 storey	m²	R	216.77
138	Steel Buildings	2 storey	m²	R	278.71
139	Steel Buildings	3 storey	m²	R	340.65
140	Steelwork	Below 20m high	t	R	1 981.94
141	Steelwork	Above 20m high	t	R	3 220.65
142	Sub Station	Demolish	m²	R	371.61
143	Tank	Steel	m³	R	69.37
144	Tank	Concrete	m³	R	73.08
145	Tailings dams	Tops - Construct and vegetate contour walls - leach for 18 months (labour only no water costs included)	ha	R	18 580.69
146	Tailings dams	Tops - Vegetate area between contour walls -dryland	ha	R	55 742.08
147	Tailings dams	Sides - vegetate and leach for 18 months (labour only no water costs included)	ha	R	192 000.49
148	Tailings dams	Sides vegetation maintenance/annum for 3 years	ha	R	37 161.39
149	Vent shaft	Short Drift	Sum	R	200 671.48
150	Vent shaft	Long drift	Sum	R	371 613.85
151	Wall	Precast - 2m high - demolish	m	R	75.56
152	Wall	Brick 1 brick thick - 2m high - demolish	m	R	34.68
153	Fencing	Wire	m	R	12.39
154	Tailings dams	Sides - cladding	m²	R	21.79
155	Profiling		m²	R	11.61
156	Load & Haul Rock		m³	R	44.47
157	Hydro seeding		ha	R	26 878.00
158	Radiation Clearance		Sum	R	-
159	Trench	Dig diversion trench around site	m³	R	203.33
160	Conveyor		m²	R	123.87
161	Explosive Bay		m²	R	94.06
162	Monitoring costs	for 5 years	No	R	946 162.67

4.4 Model Compilation

A closure cost model for each mine has been compiled in Microsoft Excel. The model consists of an input sheet, containing all measurements of each area of the mine, a standard rate sheet and a summary sheet, which summarises the costs for closure. Each sheet is linked to the rate sheet, thereby, allowing the costs calculations to be updated easily from year to year.

5 Assumptions and Limitations

- All infrastructure measurements in terms of footprints and volumes were done by Digby Wells GIS Unit;
- The plan used to measure the areas is representative of the infrastructure and liabilities associated with the proposed expansion. These areas were assumed to be all that Sibanye was liable for and no investigation was conducted to determine whether Sibanye is responsible for any additional areas. This report did not include a legal due diligence process;
- All the proposed infrastructure associated with the Driefontein mining boundary will be removed after the reclamation process for Driefontein 3 and 5 dumps has been completed;
- Calculations don't account for any value recovered from the sale of plant or other material;
- This report must be considered as a living document and should be updated annually or when updated information is available and monitoring and rehabilitation progresses;
- A contingency of 10% has been included to allow for unforeseen costs associated with contractors or rate increases;
- Sibanye will only be responsible for rehabilitating the sites which have been disturbed during the reclamation process;
- It is assumed sufficient topsoil will be sourced from the current mining footprint and thus the costs provided are based on placement of topsoil not transportation of topsoil or the development of borrow pits outside the mining lease area
- Groundwater monitoring has been assumed to take place for a period of five years;
- It was assumed that 2-3 years is adequate for the monitoring and maintaining of vegetation after rehabilitation; and
- A radiation clearance certificate will need to be obtained for final closure of the site.

6 Infrastructure and Rehabilitation

The report and its associated costing have been based upon DMR guidelines set out by the Department of Minerals Resources (2005) in the “Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine”. The guidelines outline the methods for infrastructure removal and rehabilitation required for closure, and the actions which are described below follow these guidelines.

The areas to be rehabilitated are Driefontein 3 and 5 dump footprints, Cooke dump footprint, Cooke 4 South dump footprint, CPP, RTSF and the entire supporting infrastructure.

6.1 Processing Plants

Sibanye proposes to construct three CPP and the objective of the closure of the plants will be to ensure that it presents no risk to public safety after closure. This effectively requires the demolition and removal of buildings after mining has ceased. The concrete bases are to be demolished to one metre below ground level. During the demolition of the plant infrastructure the opportunity should be taken to salvage and sort materials for re-use or recycling, especially metal, stone and concrete, wood and other combustible material, as well as plastic and glass for salvaging. Dismantled steel structures for example can be sold as scrap metal, which may contribute towards offsetting closure costs.

Associated with the plant, are a number of hazardous chemicals in the form of reagents and hydro carbons. Caution must be taken to ensure that the demolition of the plant does not generate any additional environmental or health hazards. During closure the plant area should be assessed for hydrocarbon contamination. Contaminated areas should then be cleaned up by removing the contaminated soil and overburden materials and disposing of it in an officially registered hazardous waste site.

6.2 Reclaimed Tailings Storage Facility Footprints

Once the sites has been cleared of surface infrastructure all tailings residue must be cleared from the site. Prior to the decommissioning of the site, soil samples are to be taken to determine site specific requirements for the closure plan. The closure plan must take into account the geochemistry, geology, groundwater, surface water, final land-use and the radioactivity of the area.

Regardless of the vegetation planted on the footprint the exposed area will require amelioration of the soil, this will include the following, as described in the South African Chamber of Mines Guidelines, 2007:

- The footprint area must be ripped to ensure compaction is reduced;
  - Correct soil moisture content for maximum disturbance must be established;
  - Ripping must penetrate through soil into the underlying overburden materials; and

- Acceptable soil bulk density values must be determined and progress monitored against target.

- Surface tillage should produce an acceptable seedbed for the vegetation to be established;
- Soil fertility should be restored:
  - Soils should be analysed for plant nutrient content;
  - Fertiliser should be applied, where necessary, to raise soil nutrient content to the desired levels; and
  - Rates of fertiliser to be applied frequently exceed normal agricultural dressings.
- Immobile fertilisers should be incorporated into the plant rooting zone; and
- Maintenance dressings of fertiliser should be applied annually until the soil fertility cycle is restored.

Should the reclamation process not continue throughout the life of mine, costs have been allocated to shape the remaining portion of the TSF to a stable slope in consultation with the engineers and vegetate the side slopes.

6.3 Regional Tailings Storage Facility (RTSF)

All the dumps will be centrally processed through the CPP and the residue deposited onto a new Regional TSF (RTSF). Post closure, the tailings material must be stabilised and protected from oxidation and erosion. The following section details the activities that must take place in rehabilitating the RTSF.

6.3.1 Side slopes

It is important to maximise the stability of the deposited material by minimising the risk of excessive erosion. This risk can be minimised by decreasing the slope of the final landform thereby lowering the expected rate of erosion and averting costly implications to re-profile the RTSF at final closure. Additionally the creation of a sustainable vegetation cover will support the side slopes from erosional processes like wind and water.

Information associated for rehabilitation of the side slopes and erosion risk was extracted from previous studies undertaken (Golder, 2009 and SLR, 2015). Assuming the same modelling for erosion rates of the final cover as previously undertaken and vegetation covers and slope angels it is important to ensure the final slope angels are correct to minimise the risk of erosion. It is recommended that the final landform must have size slopes at a 1:4.5 (V:H). The angle of the side slopes should be considered at the time of deposition of material to avoid re-shaping, thus reducing the financial provision in the long term and associated maintenance costs.

Surface water diversion and management measures will need to be left in such a state as to control erosion around the RTSF i.e. any upslope water will need to be permanently diverted around the site.

6.3.2 Landform Covering

Selecting a cover system for the rehabilitation of the RTSF is crucial. Based on the Definitive Feasibility Study (DFS) Report is has been advised that a constant outer slope should be achieved and movement away from the step-ins which create a steeper intermediate slopes, which increase the risk of erosion and limit vegetation establishment. Based on this the slope has been set at 1:4.5 as this slope has been found to be far more erosionally stable. In addition to this, this slope angle will allow for easier access for placement of cover material and vegetation establishment.

In terms of the cover material selected is has been suggested that a cover material consisting of topsoil, subsoil and rock mix is placed onto the side slopes and then ripped into the surface. The mix will consist of roughly 250 mm of topsoil and 100 mm of waste rock. The rock that will be introduced will allow for protrusions that may be advantageous for plant growth as they would mimic natural slopes and dissipate the kinetic energy of rain drops as they strike the surface (SLR, 2015).

It is recommended that the RTSF be capped and covered for the following reasons:

- To limit the ingress of precipitated water into the tailings and prevent seepage from the tailings into the surrounding environment as well as to surface and groundwater;
- Decrease percolation and reduce the salt load on the environment;
- Provide a suitable growth medium for vegetation and to store and release water to the vegetation and into the environment through evapo-transpiration; and
- Buffer any radiation from the tailings material and eliminate fugitive radiation dust that could otherwise originate from the tailings (Golder, 2009).

The RTSF should be capped and covered with the following material:

- The store-and-release cover as recommended in the DFS.

When rehabilitating the top surface of the RTSF care must be taken to avoid the formation of a bowl. To this end it was decided to ‘paddock’ off the top surface of the RTSF to rather have many smaller catchments with resulting smaller ponds after storms, as well as shorter slope lengths. The paddocks have only been sized to store fairly average and frequent rainfall events, with the runoff from larger storm events then spilling over and accumulating at the central low point. This spilling over will attenuate the flood hydrograph as well as hold back some of the runoff within each paddock (SLR, 2015).

The top surface will be covered with 200 mm of topsoil mixed into the 100 mm of the tailings beach. In addition to this a large rock clad berm will also be constructed around the crest of the RTSF at closure. This will serve to contain large storm events and reduce wind erosion

on the crest (SLR, 2015). It is proposed that 0.25 m of topsoil will be stripped from the RTSF footprint (25% contingency built into the stripping ratio to cater for loss of soil). This will allow for a 200 mm layer of soil to be utilised as a capping, with additional material being utilised from the starter wall.

6.3.3 Vegetation Establishment

In addition to capping the final landform indigenous vegetation will be planted on the RTSF to reduce percolation through transpiration of water. It will also assist in stabilising the side slopes of the tailings, preventing wind and water erosion and minimise dust generation.

The option to undertake concurrent rehabilitation should be investigated. If concurrent rehabilitation is possible (does not pose a risk to the stability of the facility) the following should be undertaken:

- Profiled outer slopes should be rehabilitated as soon as possible. This will ensure that rehabilitation takes place prior to final closure and should any corrective action be required then this can be implemented whilst the RTSF is still operational; and
- The objectives for the vegetation of the sides and tops of the TSF are to:
  - Prevent erosion;
  - Introduce a vegetation layer to evapo-transpirate rainwater falling on the RTSF;
  - Re-establish eco-system processes to ensure that a sustainable land use can be established without requiring fertilizer additions; and
  - Restore the biodiversity of the area as far as possible.

Irrigation will be required to assist in establishing vegetation on the top and sides of the RTSF. It is recommended that the water extracted from the groundwater interception drains (refer to the surface and groundwater reports compiled by Digby Wells) be used for this purpose as.

In addition to this the DFS makes the following recommendations regarding vegetation requirements:

- Hydroseed and establish vegetation cover on the sides lopes of the RTSF;
- Growing and planting of specified 1 litre container pants to side slopes (400 per ha);
- Growing and planting of specified 5 litre container plants to side slopes (25 per ha);
- Growing and planting of specified 10 litre container plants to side slopes (5 per ha);
- Growing and planting of specified 100 litre container plants to side slopes (2 per ha);
- Hydroseeding and establishment of vegetation on the surface of subsoil and topsoil borrow areas;
- Supply and apply chemical fertilisers to rehabilitated side slopes on an annual basis based on soil monitoring results;

- Supply and apply organic material; and
- Filling in of gulleys with soil.

6.4 Supporting Infrastructure

All mechanical equipment, pipelines, tanks, foundations and site infrastructure must be removed. All foundations are to be removed to one metre below surface. The remaining inert rubble is then to be deposited onto the RTSF. Finally the footprint area is to be ripped, and where possible covered with 150 mm of topsoil and vegetated.

6.5 Land Preparation, Fertilizing and Seeding

For all the disturbed and void areas that have been filled, top soiled and levelled, will now have to be prepared for planting.

The recommended approach, for which this costing has been derived, is as follows:

- Lime and superphosphate are applied to the surface;
- These ameliorants are then incorporated by deep ripping, which penetrated 100mm through the soil into the underlying overburden material;
- Compound (NPK + Zn) fertilizer is applied, and disced in as part of seedbed preparation;
- A grass seed mix is then planted, usually with first rains, or after rains have commenced; and
- The site is then mulched using locally obtained grass; this is to stimulate the long term establishment of indigenous vegetation and to reduce erosion during early plant growth.

6.6 Maintenance and Aftercare

Maintenance and aftercare must be planned for 2-3 years after the land preparation and replanting of vegetation has been completed.

Maintenance will specifically focus on fertilizing the rehabilitated area annually, control of wattle and all other alien plants and general maintenance, including rehabilitation of cracks, subsidence and erosion gullies. Continuous erosion monitoring of rehabilitated areas and slopes should be undertaken and zones with excessive erosion should be identified. The cause of the erosion should be identified, and rectified. Zones with erosion will need to be repaired with topsoil.

7 Post-closure land use

Prior to the final rehabilitation of the site and any subsequent development thereafter, it is necessary that a radiation assessment be completed to determine if any radioactive hotspots exist on site. Should radioactive hotspots exist, these should be excavated and taken to the

regional tailings facility owned by Sibanye. Once the radiation report reveals that the site falls within the National Nuclear Regulator's (NNR) clearance requirements for the proposed land use, then the report must be submitted to the NNR for approval.

The property should then be rehabilitated with indigenous vegetation in order that the site reflects a sustainable vegetation cover. Upon final rehabilitation the site will be handed back to the land owner. An assessment of the suitability of the property for any proposed development should be undertaken prior to the closure of the site.

8 Cyanide Decontamination

Gold mining companies in South Africa are signatory to the International Cyanide Management Code which was developed by a Steering Committee under the guidance of the United Nations Environmental Program (UNEP) and International Cyanide Management Institute (ICMI). The purpose of the code is to create and generate information for responsible cyanide management practices related to cyanide use including the gold mining industry.

A figure of R 517 491 has been included for the cleaning and removal of sodium cyanide systems. This figure is based on a quotation from a reputable Cyanide Cleaning Specialist. The basis for this figure includes the following activities:

- Test for explosive gas and high pressure (HP) cleaning of tanks and equipment;
- Flame cut all lines and equipment into 1 metre lengths for safe disposal; and
- Removal of all cyanide pipes and drip trays from Cyanide Tanks.

9 Long Term Water Impacts

Information contained in this section has been extracted from the Interim RTSF DFS conducted by SLR Consulting and supplemented with information extracted from the Groundwater Study undertaken by Digby Wells (2015).

Several scenarios regarding the management or mitigation of groundwater impacts associated with the RTSF have been considered. Based on the work conducted to date the following has been recommended to mitigate the migration of the groundwater contamination plume:

- Instillation of a Class C liner without the instillation of blast curtain; and
- Instillation of a blast curtain, with an average height of 30 m down gradient of the RTSF.

Further mitigation measures have been provided for both in the Groundwater Report (Digby Wells, 2015) and the DFS (SLR Consulting, 2015).

It is important to note that authorisation of the above measures will need to be obtained from the relevant authorities and which measure that will be adopted is subject to the respective competent authorities buy in to the proposed measures.

After closure it is expected that a detailed monitoring programme will need to be implemented to monitor groundwater impacts into the future. This report does provide some recommendations regarding rehabilitation of the RTSF in terms of minimising ingress of surface water into the RTSF, thus potentially reducing the amount of water moving through the system which could potentially result in assisting post closure as to reduce the extent of contamination plumes migration.

One measure is utilising concurrent rehabilitation of the side slopes of the RTSF, which reduces the net infiltration of rainfall through the side slopes, which reduces the amount of water reporting as seepage to groundwater or the underdrains. This will also reduce dust emissions and improves runoff quality and infiltration quality from surrounding land (SLR, 2015). Taking the above into account concurrent rehabilitation should be considered, if possible as one of the mitigation measures associated with groundwater, surface water and air quality impacts.

10 Post Closure Management

Maintenance and aftercare must be planned for three years after the project has ceased. Maintenance will specifically need to focus on vegetation on the rehabilitated areas and the management of alien vegetation. Furthermore groundwater monitoring will have to take place surrounding the footprint of the reclaimed dump. It has been recommended that the groundwater is monitored for at least a period of five years on a quarterly basis after closure. The monitoring process will be used to assess whether the rehabilitation process has been successful or not and to indicate that no further deterioration on groundwater quality is foreseen.

The cost associated with post-closure monitoring and management has been calculated using current groundwater monitoring rates as well as rates for vegetation monitoring and maintenance. These costs have been included in the total for closure liability.

11 Summary of Liabilities

The calculation of the financial provision is according to Digby Wells' standard method for assessment of mine closure. The summary of the calculated cost for the fifth, tenth year of mining and planned closure of each mining right boundary for Sibanye is presented in Table 11-1 to Table 11-4 below and the detailed cost calculation are presented is attached in Appendix B.

Figure 11-1 to Figure 11-4 indicates the reclamation schedule for all the dumps. Driefontein 3 will be reclaimed from the first year of mining to the 5th year of mining whilst Driefontein 5 will be reclaimed from the 5th year to the 8th year of mining. Cooke dump will be mined throughout the life of mine while Cooke 4 South dump will be mined from year 8 to year 11 of mining.

Table 11-1: A summary of Closure Liability for Driefontein mining boundary

Driefontein Mining Boundary			
Description	**Closure Cost After 1 year of Mining**	**Planned Closure Cost**	**Closure Cost After 10 years of Mining**
West block Thickener	R 2,186,501.57	R 2,186,501.57	All infrastructure and dump footprints would have been rehabilitated during year 10 of mining
Dams and pump stations	R 2,464,143.68	R 2,464,143.68	
Linear Infrastructure	R 1,210,027.93	R 1,210,027.93	
Driefontein TSFs	R 952,722.82	R 10,429,807.72	
Total	**R 6,813,396.00**	**R 16,290,480.90**	
Monitoring Costs (groundwater)	R 798,950.00	R 798,950.00	
Monitoring Costs (vegetation)	R 7,109.90	R 43,964.90	
Maintenance Costs (vegetation)	R 198,560.24	R 1,966,220.09	
Radiation Clearance	R 370,000.00	R 740,000.00	
Project Management (12%)	R 817,607.52	R 1,954,857.71	
Contingency (10%)	R 681,339.60	R 1,629,048.09	
GRAND TOTAL	**R 9,686,963.27**	**R 23,423,521.70**	

Table 11-2: A summary of Closure Liability for Cooke mining boundary

Cooke Mining Boundary			
Description	**Closure Cost After 1 year of Mining**	**Closure Cost After 10 years of Mining**	**Planned Closure Cost**
Cooke Dumps	R 1,288,959.99	R 33,203,994.55	R 18,051,590.29
Linear Infrastructure	R 30,588.89	R 30,588.89	R 30,588.89
Total	**R 1,319,548.88**	**R 33,234,583.44**	**R 18,082,179.18**
Monitoring Costs (groundwater)	R 588,950.00	R 588,950.00	R 588,950.00
Monitoring Costs (vegetation)	R 3,750.00	R 111,624.00	R 73,170.00
Maintenance Costs (vegetation)	R 37,410.79	R 5,211,323.12	R 3,366,971.15
Radiation Clearance	R 370,000.00	R 740,000.00	R 740,000.00
Project Management (12%)	R 158,345.87	R 3,988,150.01	R 2,169,861.50

Cooke Mining Boundary			
Description	**Closure Cost After 1 year of Mining**	**Closure Cost After 10 years of Mining**	**Planned Closure Cost**
Contingency (10%)	R 131,954.89	R 3,323,458.34	R 1,808,217.92
GRAND TOTAL	**R 2,609,960.43**	**R 47,198,088.91**	**R 26,829,349.74**

Table 11-3: A summary of Closure Liability for Ezulwini mining boundary

Ezulwini Mining Boundary			
Description	**Closure Cost After 1 year of Mining**	**Closure Cost After 10 years of Mining**	**Planned Closure Cost**
Linear Infrastructure	The pipeline will only be constructed from year 8 of mining	R 343,791.40	R 343,791.40
Total		**R 343,791.40**	**R 343,791.40**
Project Management (12%)		R 41,254.97	R 41,254.97
Contingency (10%)		R 34,379.14	R 34,379.14
GRAND TOTAL		**R 419,425.51**	**R 419,425.51**

Table 11-4: A summary of Closure Liability for Kloof mining boundary

Kloof Mining Boundary			
Description	**Planned Closure Cost**	**Unplanned Closure Cost after 10 years**	**Unplanned Closure Cost after 1 year**
Central Processing Plant	R 57,013,822.86	R 57,013,822.86	R 19,004,607.62
Dams	R 1,088,759.52	R 1,088,759.52	R 1,088,759.52
Linear Infrastructure	R 2,538,491.76	R 2,538,491.76	R 2,538,491.76
RTSF	R 172,308,394.02	R 172,308,394.02	R 77,172,014.32
Total	**R 232,949,468.17**	**R 232,949,468.17**	**R 99,803,873.23**
Monitoring Costs (groundwater)	R 809,750.00	R 809,750.00	R 809,750.00
Monitoring Costs (vegetation)	R 260,797.42	R 260,797.42	R 139,897.42
Maintenance Costs (vegetation)	R 12,055,263.66	R 12,055,263.66	R 6,256,591.14
Cyanide Decontamination	R 1,552,473.00	R 1,552,473.00	R 517,491.00
Radiation Clearance	R 1,110,000.00	R 1,110,000.00	R 1,110,000.00
Project Management (12%)	R 13,976,968.09	R 13,976,968.09	R 7,128,508.85

Kloof Mining Boundary			
Description	**Planned Closure Cost**	**Unplanned Closure Cost after 10 years**	**Unplanned Closure Cost after 1 year**
Contingency (10%)	R 23,294,946.82	R 23,294,946.82	R 11,880,848.08
GRAND TOTAL	**R 286,009,667.16**	**R 286,009,667.16**	**R 146,651,567.34**

Figure 11-1: Driefontein 3 reclamation schedule

Figure 11-2: **Driefontein 5 reclamation schedule**

Figure 11-3: **Cooke reclamation schedule**

Figure 11-4: Cooke 4 South reclamation schedule

12 Recommendation

Recommendations for the WRTRP are as follows:

- It is recommended that the closure cost is updated on annual basis to account for possible changes in the mine plan and rehabilitation requirements of the mine, as well as macro-economic factors, such as inflation and depreciation;
- A specific scope of work for the demolition and rehabilitation of the plant must be provided to contractors to ensure that it is carried out correctly;
- A topsoil balance must be done to ensure enough material is available to rehabilitate the dump footprints;
- Monitoring and maintenance of the rehabilitated areas should take place regularly after closure;
- Hydrogeological studies should be conducted for the RTSF to define the post-closure influence of the mining on the groundwater quality of the surrounding areas;
- Concurrent rehabilitation must be conducted where possible so as to reduce the liability burden when the mine ceases to operate;

- It is recommended, should reclamation activities stop before the dumps has been fully reclaimed, that the site be left in a stable condition such that it is not prone to wind and water erosion; and
- Should the radiation clearance assessment identify radiation hotspots after the dumps has been cleared, then it is recommended that these hotspots be excavated and deposited on the RTSF.

13 References

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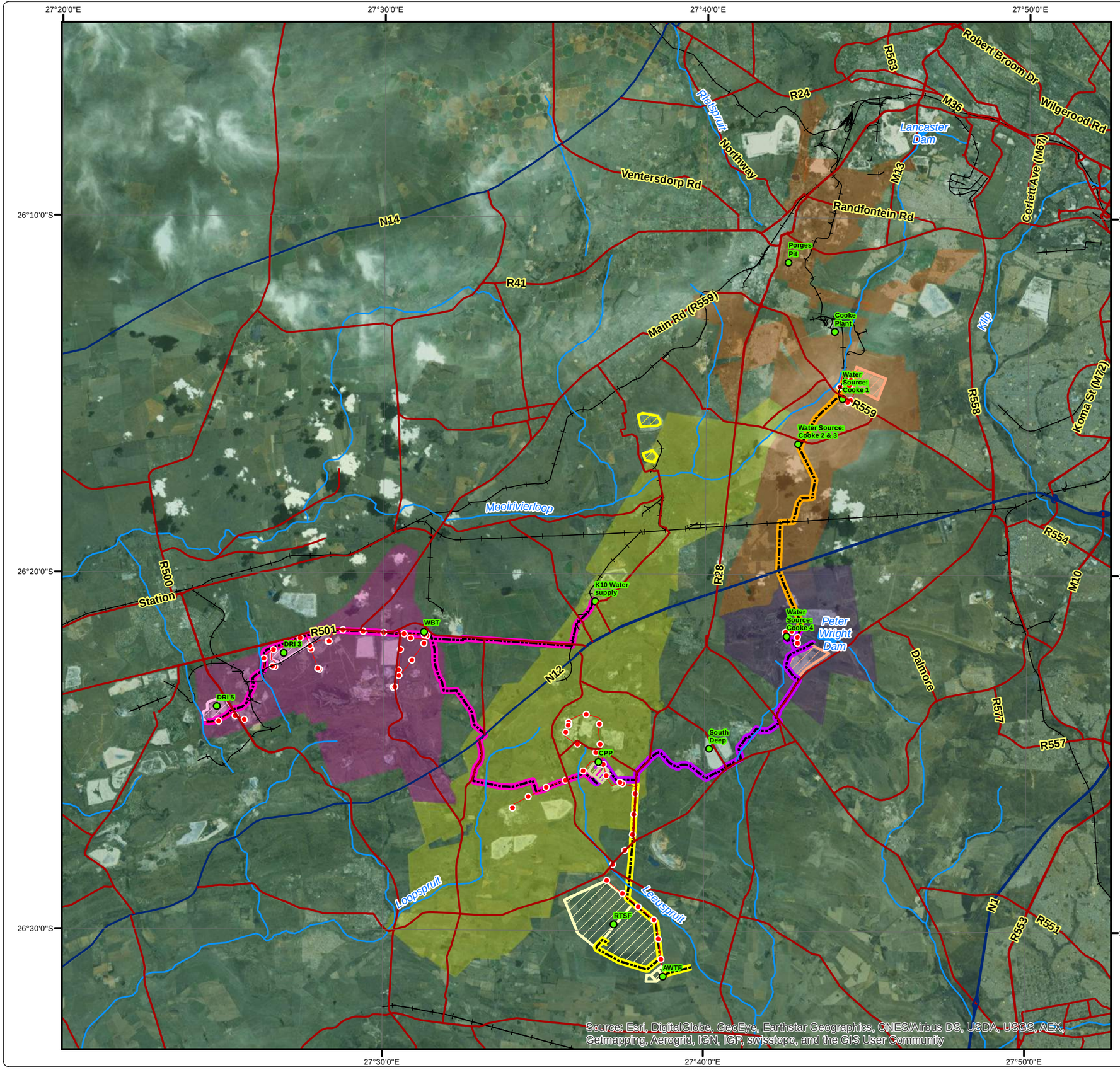
Appendix A: Plan

Plan 1

Sibanye WRTRP EIA

Regional Setting



Legend

- Major Town
- Secondary Town
- Other Town
- Settlement
- Main Roads
- National Roads
- Railway Line
- River
- Dam

Infrastructure

- Infrastructure Point
- Powerlines
- Pipelines: Kloof Mining Right
- Pipelines: Driefontein Mining Right
- Pipelines: Cooke Mining Right
- Pipelines: Ezulwini Mining Right
- CPP and Future Uranium Plant
- Regional Tailings Storage Facility
- TSF within Kloof Mining Right
- TSF within Driefontein Mining Right
- TSF within Cooke Mining Right
- Kloof Mining Right
- Driefontein Mining Right
- Cooke Mining Right
- Ezulwini Mining Right

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Datum: WGS 1984	Revision Number: 1
Central Meridian: 27°E	Date: 26/10/2015

N

0 2.5 5 10

Kilometres

1:200 000

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Plan 2

Sibanye WRTRP EIA

Kloof MRA Infrastructure

Legend

- Major Town
- Other Town
- Settlement
- Arterial / National Route
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Perennial Pan
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Powerlines
- Pipelines: Kloof Mining Right
- CPP and Future Uranium Plant
- Regional Tailings Storage Facility
- TSF within Kloof Mining Right
- Kloof Mining Right

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Revision Number: 1
Date: 30/11/2015

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Kilometres

1:120 000

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Plan 3

Sibanye WRTRP EIA

Driefontein MRA Infrastructure

27°24'0"E 27°26'0"E 27°28'0"E 27°30'0"E 27°32'0"E

26°20'0"S 26°22'0"S 26°24'0"S 26°26'0"S

Bank
MOOIRIVERLOOP
Carletonville
R501
R500
N12
LOOPSPRUIT
East Driefontein
Leeudrif

DRI3 Pollution Control Dam
FAT DRI3 Eastern Pump Station
FAT DRI3 Collection Sump 1
DRI 3
FAT DRI5 Collection Sump 2
Offset (13#) Substation
West Drie North (N#) Substation
West Drie Six (6#) Substation
BWSF Tank 1
WBT
BWSF Tank 2
East Drie Shaft (2#) Substation
FAT DRI5 Collection Sump 1
DRI 5
FAT DRI5 Collection Sump 2
DRI5 PCD
FAT DRI5 Pump Station 1
DRI5 Reclamation Pump Station
West Drie Gold (DP2&3) Substation

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Legend

- Major Town
- Other Town
- Settlement
- Arterial / National Route
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Powerlines
- Pipelines: Driefontein Mining Right
- WBT Footprint
- TSF within Driefontein Mining Right
- Driefontein Mining Right

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Revision Number: 1
Date: 30/11/2015

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Kilometres

1:60 000

Plan 4

Sibanye WRTRP EIA

Cooke MRA Infrastructure

Legend

- Major Town
- Secondary Town
- Other Town
- Settlement
- Arterial / National Route
- Main Road
- Minor Road
- Railway Line
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Perennial Pan
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Powerlines
- Pipelines: Cooke Mining Right
- TSF within Cooke Mining Right
- Cooke Mining Right

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Kilometres

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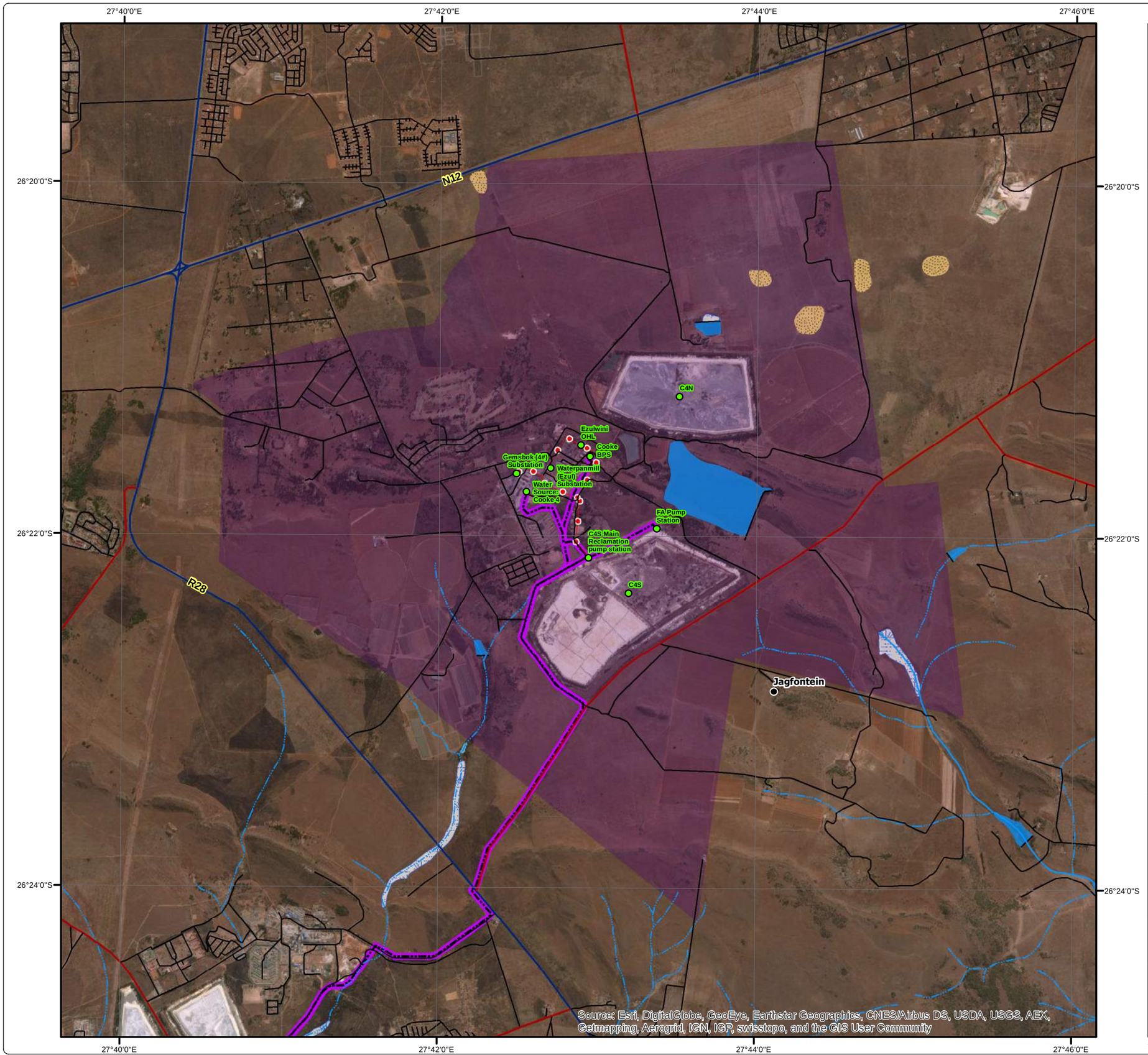
Plan 5

Sibanye WRTRP EIA

Ezulwini MRA Infrastructure



Legend

- Settlement
- Arterial / National Route
- Main Road
- Minor Road
- Non-Perennial Stream
- Perennial Stream
- Dam Wall
- Dam / Lake
- Perennial Pan
- Non-Perennial Pan
- Wetland

Infrastructure

- Infrastructure Point
- Powerlines
- Pipelines: Ezulwini Mining Right
- Ezulwini Mining Right

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Kilometres

1:40 000

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Appendix B: Detailed Cost Breakdown for Driefontein Boundary

	Company:	Sibanye Gold Limited				Date:	27/01/2016	
	Site:	Driefontein mining boundary				Assignment:	Closure Cost Assessment	
							Detailed Breakdown	

Ref.	Description	Class	Unit	Quantity	Rate	Amount	Comments	Image
Area 1	**West block Thickener**							Links to Accompanying Images
Block 1	Demolish infrastructure							
1	Thickner feed Box	143	m³		R 69.37			
2	West Block Thickener	143	m³		R 69.37			
	concrete slab	107	m³		R 365.42			
3	Thickner Transfer Tank	143	m³		R 69.37			
	concrete slab	107	m³		R 365.42			
4	Thickner Transfer Tank Agitator	140	t		R 1,981.94		Assumed tonnage	
5	Thickner Transfer Tank	143	m³		R 69.37			
	concrete slab	107	m³		R 365.42			
6	Thickner Transfer Tank Agitator	140	t		R 1,981.94		Assumed tonnage	
7	Warm 16/14 AH Rubber	127	m²		R 9.29			
8	Spillage sump	107	m³		R 365.42			
9	Gland Service Water Tank	143	m³		R 69.37			
10	Flocculunt Holding Tank	143	m³		R 69.37			
	concrete slab	107	m³		R 365.42			
11	Flocculant Holding Tank Agitator	140	t		R 1,981.94			
	concrete slab	107	m³		R 365.42			
12	Flocculunt Holding Tank	143	m³		R 69.37			
13	Flocculunt Holding Tank Agitator	140	t		R 1,981.94			
14	Process Water Tank	143	m³		R 69.37			
	concrete slab	107	m³		R 365.42			
15	Process Water Tank	143	m³		R 69.37			
	concrete slab	107	m³		R 365.42			
16	Metso MM400C5 Metal	140	t		R 1,981.94		Assumed tonnage	
17	Store Room Containers (X5)	122	m²		R 86.71			
18	MV Switchgear	142	m²		R 371.61			
19	MCC	142	m²		R 371.61			
20	Control Room	101	m²		R 291.15			
21	Site Offices (X4)	122	m²		R 86.71			
22	Ablution Block	101	m²		R 291.15			
23	Shift Locker Room Containers (X8)	122	m²		R 86.71			
24	Workshop	137	m²		R 216.77			
	Rehabilitation							
	Pick up spilled slime	125	m³		R 99.10			
	Grade an area	126	ha		R 41,205.34			
	General clean up	127	m²		R 9.29			
	Rubble	128	m³		R 37.09		Load and Cart away - 2km	
	Replace soil and spread	129	m²		R 23.12		150mm thick	
	Replace soil and spread	130	m²		R 26.46		300 mm thick	
	Revegetate areas	131	Ha		R 25,963.84		Where Structures Have Been Removed	
	Bulldoze material	132	m³		R 7.57		50m	
	Remove by hand	159	m³		R 203.33		Cart Away - 2km	
					Demolition Total	R -		
					Rehabilitation Total	R -		
					Block Total	R -		
Area 2	**Dams and pump stations**							Links to Accompanying Images

Block 2	Rehabilitation							
	DRI3 PCD							
	Remove plastic liner	113	m²		R 4.95		Assume 1m deep	
	Fill dam	128	m³		R 37.09			
	DRI5 PCD							
	Remove plastic liner	113	m²		R 4.95		Assume 1m deep	
	Fill dam	128	m³		R 37.09			
	DRI 5 Pump Station (P&C)	101	m²		R 291.15		Assumed same size as those at Kloof	
	Return Water Pump Station	101	m²		R 291.15			
	DRI3 Reclamation Pump Station	101	m²		R 291.15			
	FAT Pump Station No.1	101	m²		R 291.15			
	FAT Pump Station DRI 5	101	m²		R 291.15			
	FAT Pump Station No.2	101	m²		R 291.15			
	Rehabilitation							
	Pick up spilled slime	125	m³		R 99.10			
	Grade an area	126	ha		R 41,205.34			
	General clean up	127	m²		R 9.29			
	Rubble	128	m³		R 37.09		Load and Cart away - 2km	
	Replace soil and spread	129	m²		R 23.12		150mm thick	
	Replace soil and spread	130	m²	0.00	R 26.46		300 mm thick	
	Revegetate areas	131	Ha	0	R 25,963.84		Where Structures Have Been Removed	
	Bulldoze material	132	m³		R 7.57		50m	
	Remove by hand	159	m³		R 203.33		Cart Away - 2km	
					Demolition Total	R -		
					Rehabilitation Total	R -		
					Block Total	R -		
Area 3	**Linear Infrastructure**							Links to Accompanying Images
Block 1	Rehabilitation							
	Pipelines							
	DRI3 to WBT	119	Km		R 18,580.69			
	DRI5 to DRI3	119	Km		R 18,580.69			
	WBT to CPP	119	Km		R 18,580.69			
	DRI3 HP water	119	Km		R 18,580.69			
	BWSF to DRI3	119	Km		R 18,580.69			
	BWSF to DRI5	119	Km		R 18,580.69			
	K10 to BWSF	119	Km		R 18,580.69			
	To the CPP	119	Km		R 18,580.69			
	Rehabilitation							
	Pick up spilled slime	125	m³		R 99.10			
	Grade an area	126	ha		R 41,205.34			
	General clean up	127	m²		R 9.29			
	Rubble	128	m³		R 37.09		Load and Cart away - 2km	
	Replace soil and spread	129	m²		R 23.12		150mm thick	
	Replace soil and spread	130	m²	0.00	R 26.46		300 mm thick	
	Revegetate areas	131	Ha	0	R 25,963.84		Where Structures Have Been Removed	
	Bulldoze material	132	m³		R 7.57		50m	
	Remove by hand	159	m³		R 203.33		Cart Away - 2km	
					Demolition Total	R -		
					Rehabilitation Total	R -		
					Block Total	R -		
Area 4	**Driefontein TSFs**							Links to Accompanying Images
Block 4	Rehabilitation							
	Driefontein 3						All the dumps would have been reclaimed after 10 years of mining	
	Rip compacted soil	134	m²		R 7.43			
	Re-vegetation	131	Ha		R 25,963.84			
	Driefontein 5							
	Shape final topography	132	m³		R 7.57			
	Rip the reclaimed dump area	134	m²		R 7.43			
	Re-vegetate	131	Ha		R 25,963.84			
	Monitoring and Maintenace							
	Monitor tailings dam quaterly for 5 years	162	No		R 946,162.67			
	Vegetation maintenance for three years	148	ha		R 37,161.39			
					Demolition Total	R -		
					Rehabilitation Total	R -		
					Block Total	R -		

Appendix C: Detailed Cost Breakdown for Cooke Mining Boundary

	Company:	Sibanye Gold Limited				Date:	27/01/2016	
	Site:	Cooke mining boundary				Assignment:	Closure Cost Assessment	
							Detailed Breakdown	

Ref.	Description	Class	Unit	Quantity	Rate	Amount	Comments	Image
Area 1	**Cooke Dumps**							Links to Accompanying Images
Block 1	Demolish infrastructure							
1	Cooke Dump footprint							
	Shape TSF	132	m³	201493	R 7.57	R 1,526,182.98		
	Rip the reclaimed dump area	134	m²	1150000	R 7.43	R 8,547,118.60		
	Re-vegetate	131	Ha	115	R 25,963.84	R 2,985,841.86		
2	Cooke 4 South							
	Shape TSF	132	m³	493500	R 7.57	R 3,737,961.27		
	Rip the reclaimed dump area	134	m²	1636000	R 7.43	R 12,159,205.25		
	Re-vegetate	131	Ha	163.6	R 25,963.84	R 4,247,684.59		
	Rehabilitation							
	Pick up spilled slime	125	m³		R 99.10			
	Grade an area	126	ha		R 41,205.34			
	General clean up	127	m²		R 9.29			
	Rubble	128	m³		R 37.09		Load and Cart away - 2km	
	Replace soil and spread	129	m²		R 23.12		150mm thick	
	Replace soil and spread	130	m²		R 26.46		300 mm thick	
	Revegetate areas	131	Ha		R 25,963.84		Where Structures Have Been Removed	
	Bulldoze material	132	m³		R 7.57		50m	
	Remove by hand	159	m³		R 203.33		Cart Away - 2km	
					Demolition Total	R 33,203,994.55		
					Rehabilitation Total	R -		
					Block Total	R 33,203,994.55		
Area 2	**Linear Infrastructure**							Links to Accompanying Images
Block 2	Demolish infrastructure							
	Pipeline							
	Cooke Dump to Booster Pump Station	119	Km	1.646272927	R 18,580.69	R 30,588.89		
	Rehabilitation							
	Pick up spilled slime	125	m³		R 99.10			
	Grade an area	126	ha		R 41,205.34			
	General clean up	127	m²		R 9.29			
	Rubble	128	m³		R 37.09		Load and Cart away - 2km	
	Replace soil and spread	129	m²		R 23.12		150mm thick	
	Replace soil and spread	130	m²		R 26.46		300 mm thick	
	Revegetate areas	131	Ha		R 25,963.84		Where Structures Have Been Removed	
	Bulldoze material	132	m³		R 7.57		50m	
	Remove by hand	159	m³		R 203.33		Cart Away - 2km	
					Demolition Total	R 30,588.89		
					Rehabilitation Total	R -		
					Block Total	R 30,588.89		

Appendix D: Detailed Cost Breakdown for Ezulwini Mining Boundary

	Company:	Sibanye Gold Limited				Date:	27/01/2016
	Site:	Ezulwini mining boundary				Assignment:	Closure Cost Assessment
							Detailed Breakdown

Ref.	Description	Class	Unit	Quantity	Rate	Amount	Comments
Area 1	**Ezulwini Dump**						
Block 1	Demolish infrastructure						
1	Pipeline CPP to Ezulweni	119	Km	18.50261501	R 18,580.69	R 343,791.40	Early closure on the 10th year of mining
	Rehabilitation						
	Pick up spilled slime	125	m³		R 99.10		
	Grade an area	126	ha		R 41,205.34		
	General clean up	127	m²		R 9.29		
	Rubble	128	m³		R 37.09		Load and Cart away - 2km
	Replace soil and spread	129	m²		R 23.12		150mm thick
	Replace soil and spread	130	m²		R 26.46		300 mm thick
	Revegetate areas	131	Ha		R 25,963.84		Where Structures Have Been Removed
	Bulldoze material	132	m³		R 7.57		50m
	Remove by hand	159	m³		R 203.33		Cart Away - 2km
					Demolition Total	R 343,791.40	
					Rehabilitation Total	R -	
					Block Total	R 343,791.40	

Appendix E: Detailed Cost Breakdown for Kloof Mining Boundary

	Company:	Sibanye Gold Limited					Date:	27/01/2016	
	Site:	Kloof mining boundary					Assignment:	Closure Cost Assessment	
								Detailed Breakdown	
Ref.	**Description**	**Class**	**Unit**	**Quantity**	**Rate**		**Amount**		**Comments**
Area 1	**Central Processing Plant**								
Block 1	Demolish infrastructure								
1	Sulphide Flotation Feed	137	m²	1385.41	R	216.77	R	300,321.90	
2	Sulphide Flotation	137	m²	720.91	R	216.77	R	156,275.08	
3	Oxide Flotation	137	m²	1556.23	R	216.77	R	337,351.36	
4	Oxide Flotation	137	m²	113.4	R	216.77	R	24,582.26	
5	Oxide Flotation	137	m²	82.2	R	216.77	R	17,818.88	
6	Ultra Fine Grinding	137	m²	412.26	R	216.77	R	89,367.56	
7	Sulphide Concetrate Thickener	140	t	67	R	1,981.94	R	132,790.02	assumed tonnage of steel
	concrete removal	108	m³	93	R	526.45	R	48,960.13	
8	Oxide Concentrate Thickener	140	t	67	R	1,981.94	R	132,790.02	assumed tonnage of steel
	concrete removal	108	108	245.5	R	526.45	R	129,244.20	
9	Carbon in Leach (CIL)	140	t	318	R	1,981.94	R	630,257.09	Assumed tonnage of steelworks
	concrete removal	108	m³	1092	R	526.45	R	574,886.63	
10	Cyanide Detox	143	m³	1050	R	69.37	R	72,836.32	
11	CIL Dewatering	108	m³	61.72	R	526.45	R	32,492.68	
12	Acid wash, elution and regeneration	137	m²	587.76	R	216.77	R	127,411.53	
13	Tailings Thickener	143	m³	45000	R	69.37	R	3,121,556.36	assumed 3m high
	concrete removal	108	m³	277	R	526.45	R	145,827.47	
14	Water Services								
	Tanks (5)	143	m³	1179	R	69.37	R	81,784.78	
	Pipes	119	Km	0.072	R	18,580.69	R	1,337.81	
	concrete base	107	m³	378	R	365.42	R	138,128.87	
17	Air Services	137	m²	300.91	R	216.77	R	65,229.69	
18	Gold Room	101	m²	228	R	291.15	R	66,382.21	assumed brick building
19	Med, Eng offices and Lab	122	m²	194.33	R	86.71	R	16,850.33	
19	Med, Eng offices and Lab	122	m²	196.95	R	86.71	R	17,077.51	assumed prefab building
19	Med, Eng offices and Lab	122	m²	114.19	R	86.71	R	9,901.40	
19	Med, Eng offices and Lab	122	m²	126.97	R	86.71	R	11,009.56	
20	MCC and control rom	142	m²	476.99	R	371.61	R	177,256.09	
21	AU Workshop	137	m²	462.61	R	216.77	R	100,282.17	
21	AU Workshop	137	m²	475.27	R	216.77	R	103,026.53	
22	Main stores	137	m²	495.12	R	216.77	R	107,329.51	
22	Main stores	137	m²	484.11	R	216.77	R	104,942.82	
22	Main stores	137	m²	5.81	R	216.77	R	1,259.46	
22	Main stores	137	m²	5.88	R	216.77	R	1,274.64	
22	Main stores	137	m²	21.06	R	216.77	R	4,565.28	
22	Main stores	137	m²	20.93	R	216.77	R	4,537.10	
22	Main stores	137	m²	281.5	R	216.77	R	61,022.09	
23	Floculant plant								
	Flocculant building	138	m²	15.9	R	278.71	R	4,431.50	
	Steel tank	143	m³	113.04	R	69.37	R	7,841.35	
	Steel tank	143	m³	50.24	R	69.37	R	3,485.04	
23	Floculant plant								
	Flocculant building	138	m²	15.9	R	278.71	R	4,431.50	
	Steel tank	143	m³	113.04	R	69.37	R	7,841.35	
	Steel tank	143	m³	50.24	R	69.37	R	3,485.04	
24	Diesel off loading and storage	137	m²	171.27	R	216.77	R	37,127.01	
25	Cyanide off loading and storage	137	m²	173.01	R	216.77	R	37,504.20	
25	Cyanide off loading and storage	137	m²	25.79	R	216.77	R	5,590.62	
25	Cyanide off loading and storage	137	m²	28.06	R	216.77	R	6,082.70	
26	Caustic off loading and storage	137	m²	189.91	R	216.77	R	41,167.69	
27	Hydrochloric acid off loading and storage	137	m²	332.14	R	216.77	R	71,999.56	assumed steel structures
28	Copper sulphide off loading and storage	137	m²	116.18	R	216.77	R	25,184.89	
29	Lime off loading mixing and storage	137	m²	147.55	R	216.77	R	31,985.11	
30	SMBS Storage and make up	137	m²	232.04	R	216.77	R	50,300.41	
30	SMBS Storage and make up	137	m²	243.89	R	216.77	R	52,869.19	
30	SMBS Storage and make up	137	m²	120.41	R	216.77	R	26,101.85	
31	Flotation reagents								
	concrete base	108	m³	438	R	526.45	R	230,586.40	
	Steelworks	140	t	53.07	R	1,981.94	R	105,181.58	
31	Flotation reagents								
	concrete base	108	m³	438	R	526.45	R	230,586.40	
	Steelworks	140	t	53.07	R	1,981.94	R	105,181.58	
32	Security and change house	101	m²	336.54	R	291.15	R	97,983.64	
32	Security and change house	101	m²	346.15	R	291.15	R	100,781.59	
33	Admin Building and Parking	137	m²	690.78	R	216.77	R	149,743.66	
34	Equipment off loading (rip area)	134	m²	820.85	R	7.43	R	6,100.78	
35	Heli pad	107	m³	179.695	R	365.42	R	65,664.20	
36	MCC	142	m²	635.16	R	371.61	R	236,034.25	
37	Sewerage plant								Assumed details of the sewerage plant
	concrete removal	107	m³	21	R	365.42	R	7,673.83	
	Plastic tanks (x6)	143	m³	510	R	69.37	R	35,377.64	
	Sludge tank (x2)	107	m³	4	R	365.42	R	1,461.68	
38	Emergency power generators	142	m²	37.29	R	371.61	R	13,857.48	
38	Emergency power generators	142	m²	95.31	R	371.61	R	35,418.52	
38	Emergency power generators	142	m²	37.29	R	371.61	R	13,857.48	
	Uranium plant								
	Tailings Feed Plant	137	m²	554.77	R	216.77	R	120,260.13	
	Cooke Uranium Leach	143	m³	320	R	69.37	R	22,197.73	
	Cooke Rip Pre-Screening and pH Adjustment	137	m²	550.49	R	216.77	R	119,332.33	
	Cooke Rip Screening and Rip Section 1 and 2	137	m²	1142.35	R	216.77	R	247,632.63	
	Cooke Rougher Flotation/pH Adjustment	137	m²	1877.45	R	216.77	R	406,983.75	
	Cooke Uranium Rip Effluent	137	m²	914.41	R	216.77	R	198,221.00	
	Elution Wash Clarifier Effluent	143	m³	380	R	69.37	R	26,359.81	
	Cooke Uranium Tailings Thickener	143	m³	45000	R	69.37	R	3,121,556.36	
	concrete removal	108	m³	277	R	526.45	R	145,827.47	
	Cooke Uranium SX	137	m²	1082.6	R	216.77	R	234,680.34	
	Central Uranium Leach Plant - 1	137	m²	2021.88	R	216.77	R	438,292.53	
	Central Uranium pH Adjust - 1	137	m²	435.27	R	216.77	R	94,355.54	
	Central Uranium Rip - 1	137	m²	606.86	R	216.77	R	131,551.92	
	Central Uranium Leach Plant - 2	137	m²	1600.7	R	216.77	R	346,991.34	
	Central Uranium pH Adjust - 2	137	m²	410.58	R	216.77	R	89,003.38	
	Central Uranium Rip - 2	137	m²	1048.89	R	216.77	R	227,372.86	
	Central Uranium Rip Elution - 2	137	m²	1013.22	R	216.77	R	219,640.51	
	Central Uranium SX	137	m²	1049.3	R	216.77	R	227,461.74	
	Central Uranium Adu Plant	137	m²	719.47	R	216.77	R	155,962.93	
	Adu Calcining Plant	137	m²	187.96	R	216.77	R	40,744.98	
	Roaster Plant	137	m²	4004.46	R	216.77	R	868,065.80	
	Sulphuric Acid Storage Tanks	143	m³	456	R	69.37	R	31,631.77	

	SX Fire Water	137	m²	420.53	R	216.77	R	91,160.28	
	U Raw/Potable Water Storage Tanks	143	m³	76	R	69.37	R	5,271.96	
	Air Services U Plant	137	m²	269.8	R	216.77	R	58,485.83	
	Boiler	138	m²	877.5	R	278.71	R	244,568.37	
	Diesel Storage Area (U-Plant)	137	m²	535.24	R	216.77	R	116,026.52	
	Ammonia Storage	137	m²	235.89	R	216.77	R	51,135.00	
	Security and Change House - U	101	m²	829.64	R	291.15	R	241,549.73	
	Workshop - U	137	m²	1117.37	R	216.77	R	242,217.60	
	Chop House - U	101	m²	284.65	R	291.15	R	82,875.86	
	Control Room - U	101	m²	198.05	R	291.15	R	57,662.27	
	Met and Engineering Offices - U	137	m²	355.31	R	216.77	R	77,022.24	
	Lab - U	101	m²	152.02	R	291.15	R	44,260.63	
	Central U Plant Sub	142	m²	337.85	R	371.61	R	125,549.74	
	Cooke U Plant Sub	142	m²	355.26	R	371.61	R	132,019.54	
	Medical Station U Plant	101	m²	154	R	291.15	R	44,837.11	
	Acid Storage Weighbridge	107	m³	196.69	R	365.42	R	71,874.52	
	Acid Plant	140	t	80	R	1,981.94	R	158,555.24	
	Rehabilitation								
	Pick up spilled slime	125	m³		R	99.10			
	Grade an area	126	ha	6.105203	R	41,205.34	R	251,566.95	
	General clean up	127	m²		R	9.29			
	Rubble	128	m³		R	37.09			Load and Cart away - 2km
	Replace soil and spread	129	m³		R	12.80			150mm thick
	Replace soil and spread	130	m³	18,315.61	R	12.80	R	234,439.80	300 mm thick
	Revegetate areas	131	Ha	6.105203	R	25,963.84	R	158,514.53	Where Structures Have Been Removed
	Bulldoze material	132	m³		R	7.57			50m
	Remove by hand	159	m³		R	203.33			Cart Away - 2km
						Demolition Total	R	18,360,086.34	
						Rehabilitation Total	R	644,521.28	
						Block Total	R	57,013,822.86	
Area 2	**Dams**								
Block 2	Rehabilitation								
39	Plant run off dam								
	Remove plastic liner	113	m²	8452.9	R	4.95	R	41,882.86	Assume 1m deep
	Fill dam	128	m³	8452.9	R	37.09	R	313,528.23	
40	Process water run off dam								
	Remove plastic liner	113	m²	8438.83	R	4.95	R	41,813.15	Assume 1m deep
	Fill dam	128	m³	8438.83	R	37.09	R	313,006.36	
41	Reagent run off pond								
	Remove concrete	107	m³	596.3	R	365.42	R	217,900.12	
	Fill pond	128	m³	1192.6	R	37.09	R	44,234.97	Assume 1m deep
	Rehabilitation								
	Pick up spilled slime	125	m³		R	99.10			
	Grade an area	126	ha		R	41,205.34			
	General clean up	127	m²		R	9.29			
	Rubble	128	m³		R	37.09			Load and Cart away - 2km
	Replace soil and spread	129	m³		R	12.80			150mm thick
	Replace soil and spread	130	m³	5,425.12	R	12.80	R	69,441.52	300 mm thick
	Revegetate areas	131	Ha	1.808373	R	25,963.84	R	46,952.31	Where Structures Have Been Removed
	Bulldoze material	132	m³		R	7.57			50m
	Remove by hand	159	m³		R	203.33			Cart Away - 2km
						Demolition Total	R	972,365.69	
						Rehabilitation Total	R	116,393.83	
						Block Total	R	1,088,759.52	
Area 3	**Linear Infrastructure**								
Block 1	Rehabilitation								
42	Pipelines								
	CPP to RTSF	119	Km	17.9	R	18,580.69	R	332,594.40	
	Treatment facility to RTSF	119	Km	3.9	R	18,580.69	R	72,464.70	
	RWD to AWTF	119	Km	1.96	R	18,580.69	R	36,418.16	
	AWTF to leeuspruit	119	Km	1.57	R	18,580.69	R	29,171.69	
43	CPP Gravel roads (rip)	134	m²	43565.81	R	7.43	R	323,793.17	
44	RTSF Gravel roads (rip)	134	m²	166959.963	R	7.43	R	1,240,892.70	
45	RTSF Fence	153	m	10307.7686	R	12.39	R	127,683.65	

46	Concrete fence	152	m	2740.95009	R	34.68	R	95,067.00	
	Rehabilitation								
	Pick up spilled slime	125	m³		R	99.10			
	Grade an area	126	ha		R	41,205.34			
	General clean up	127	m²		R	9.29			
	Rubble	128	m³		R	37.09			Load and Cart away - 2km
	Replace soil and spread	129	m³		R	12.80			150mm thick
	Replace soil and spread	130	m³	13,069.74	R	12.80	R	167,292.71	300 mm thick
	Revegetate areas	131	Ha	4.356581	R	25,963.84	R	113,113.58	Where Structures Have Been Removed
	Bulldoze material	132	m³		R	7.57			50m
	Remove by hand	159	m³		R	203.33			Cart Away - 2km
						Demolition Total	R	2,258,085.47	
						Rehabilitation Total	R	280,406.29	
						Block Total	R	2,538,491.76	
Area 4	**RTSF**								
Block 4	Rehabilitation								
	RTSF Top Surface								
	Load and haul- soil and waste rock	128	m³	2170000	R	37.09	R	80,487,910.95	250mm topsoil and 100mm waste rock
	Spread soil and waste rock cover - Top surface	130	m³	2170000	R	12.80	R	27,776,000.00	
	Tops - Construct and vegetate contour walls - leach for 18 months (labour only no water costs included)	145	ha	620	R	18,580.69	R	11,520,029.42	
	Tops - Vegetate area between contour walls -dryland	146	ha	620	R	55,742.08	R	34,560,088.27	
	RTSF Side Surface								
	Load and haul- soil and waste rock for the sides	128	m³	171500	R	37.09	R	6,361,141.35	250mm topsoil and 100mm waste rock
	Spread soil and waste rock cover - sides	130	m³	171500	R	12.80	R	2,195,200.00	
	Sides - vegetate and leach for 18 months (labour only no water costs included)	147	ha	49	R	192,000.49	R	9,408,024.03	
	Monitoring and Maintenance								Cost included under the vegetation monitoring tab
						Rehabilitation Total	R	172,308,394.02	
						Monitoring Total	R	-	
						Block Total	R	172,308,394.02	