mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Scoping Report for Listed Activities Associated with Operations at Kloof Mining Right Area, Sibanye Gold Limited

DMR REFERENCE NUMBER: GP 30/5/1/2/2 (66) MR

DRAFT FOR PUBLIC REVIEW

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Scoping Report - DRAFT FOR PUBLIC REVIEW**
Project Name:	**Scoping Report for Listed Activities Associated with Operations at Kloof Mining Right Area, Sibanye Gold Limited**
Project Code:	**GOL2376**

Name	Responsibility	Signature	Date
Riaan Swemmer	Report Writer		July 2015
Duncan Pettit	Report Writer		July 2015
Marcelle Radyn	Project Manager		July 2015
Grant Beringer	Project Sponsor		July 2015

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the Environmental Impact Assessment (EIA) Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The Environmental Assessment Practitioner (EAP) must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE SCOPING PROCESS

- The objective of the scoping process is, through a consultative process, to:
  - Identify the relevant policies and legislation relevant to the activity;
  - Motivate the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
  - Identify and confirm the preferred activity and technology alternative through an impact and risk assessment and ranking process;
  - Identify and confirm the preferred site, through a detailed site selection process, which includes an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified alternatives focusing on the geographical, physical, biological, social, economic, and cultural aspects of the environment;
  - Identify the key issues to be addressed in the assessment phase;
  - Agree on the level of assessment to be undertaken, including the methodology to be applied, the expertise required as well as the extent of further consultation to be undertaken to determine the impacts and risks the activity will impose on the preferred site through the life of the activity, including the nature, significance, consequence, extent, duration and probability of the impacts to inform the location of the development footprint within the preferred site; and
  - Identify suitable measures to avoid, manage, or mitigate identified impacts and to determine the extent of the residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Digby Wells Environmental (Digby Wells) was appointed by Sibanye Gold Limited (SGL) to conduct the Environmental Impact Assessment (EIA) process for the West Rand Tailings Retreatment Project (WRTRP) in Gauteng, South Africa.

The EIA is considered a tool with which to identify and manage potential impacts on the environment as a result of a particular project. Environmental risks associated with such a project or development are also identified and mitigation measures proposed. The completion of an EIA is a regulatory requirement in terms of the provisions of the National Environmental Management Act, 1998, as amended (NEMA) and the EIA process which is regulated in accordance with the Environmental Impact Assessment Regulations, 2014[1] (the EIA 2014 Regulations). The overarching purpose of the EIA process is to determine, assess and evaluate the consequences (positive and negative) of a proposed development, activity or project.

This Scoping Report forms part of the EIA process and aims to identify those environmental issues and concerns that require investigation as well as determine feasible alternatives. This information is then used to determine the scope of work for the impact assessment phase of the EIA process. During the scoping phase those persons interested or affected by the project were informed of the project as well as provided the opportunity to include their input in terms of issues and concerns they may have. The process diagram for the scoping phase is provided in the figure below.

The objectives of the scoping report are, therefore, to:

- Identify policies and legislation relevant to the activity;
- Motivate the need and desirability of the proposed activity;
- Identify and confirm the preferred activity and alternative(s);
- Identify the key issues to be addressed in the impact assessment phase;
- Define the terms of reference and scope of these specialist studies to sufficiently identify and assess the potential impacts of the proposed project; and
- Agree on the level of assessment and the extent of further consultation to be undertaken to determine the potential impacts and risks of the proposed project.

[1] GN R982 published in Government Gazette 38282 of 4 December 2014

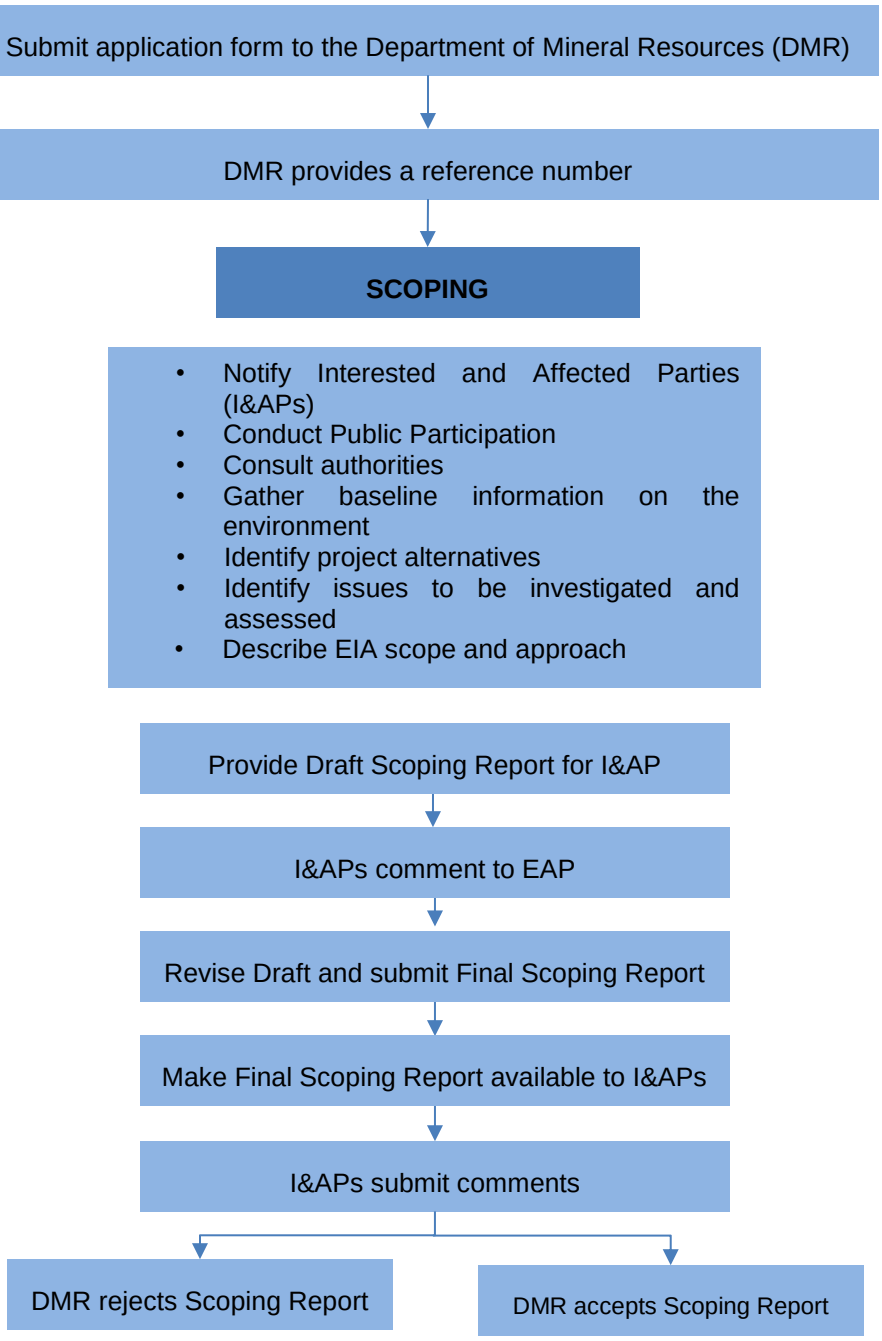

Figure I - Scoping Phase Process

Project Overview

The broader West Rand, including Carletonville in the far west to Randfontein in the northeast and including Westonaria centrally, contains an estimated 1.3 billion tonnes of surface gold and uranium tailings with approximately 170 million pounds of recoverable uranium and 11 million ounces of recoverable gold. SGL, as the current majority owner of these resources, plans to exploit it to develop a strong, long life and high yield surface mining business. Key to the successful execution of this business growth and development strategy is the West Rand Tailings Retreatment Project (WRTRP).

Project Applicant

GFI Mining South Africa (Pty) Limited, (Registration Number 2002/031431/07) was, prior to February 2013, a subsidiary within the Gold Fields Group. In early 2013, Gold Fields unbundled its Kloof Driefontein Complex (KDC) and Beatrix gold mines in the Free State to create SGL (Registration Number 2002/031431/06) and listed them as a fully independent company on both the JSE and the NYSE Stock Exchanges.

In parallel in 2012, Gold One International Limited (Gold One) acquired Rand Uranium Limited (Rand Uranium) and in the same year acquired the Ezulwini Mining Company (Pty) Ltd (Ezulwini) in an agreement with First Uranium Corporation.

Subsequently, in October 2013, SGL acquired the interest held by Gold One in Rand Uranium and Ezulwini. These Gold One assets are now part of Sibanye Gold, and comprise the Cooke Operations (underground mining and reclamation operations), that currently produce gold and uranium.

Table I: Contact details for SGL

Company name:	Sibanye Gold Limited
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Project History

Prior to the creation of SGL, Gold Fields had embarked on a project known as the West Wits Project (WWP), aimed at retreating Tailings Storage Facilities (TSFs) on the West Rand. Its intention was to recover residual gold, uranium and sulfur through a central processing plant, where viable, and storing the residual tailings on a proposed Centralised TSF (CTSF) near South Deep's existing Doornpoort TSF.

Similarly Rand Uranium had embarked on the Cooke Uranium Project (CUP) which endeavoured to treat the Cooke TSF for gold, uranium and sulfur and ultimately deposit the residual tailings on to the proposed Geluksdal TSF. The CUP and WWP were essentially two independent projects with similar broad objectives, processing infrastructure and deposition sites and within a 25 km radius of each other.

Elements of the CUP and WWP projects have been approved and authorised, as indicated in Table II, although not in their entirety. Stakeholders and departments expressed concern over the implementation of two similar projects in proximity of one another and the accumulation of their impacts. It was proposed that these projects be combined to provide a consolidated solution for the region.

The WRTRP therefore integrates the WWP and CUP into one project, where up to 13 current and historical TSFs and current arising tailings will be centrally processed through a new proposed Central Processing Plant (CPP) and the residue deposited onto a new proposed Regional TSF (RTSF). A Return Water Dam (RWD) will be constructed adjacent to the RSTF to contain any potential water runoff, with the water to be treated at an Advanced Water Treatment Facility (AWTF).

As stated, should one of the elements of the WRTRP not be authorised, the entire project will be unable to proceed. In this case SGL will revert back to the CUP and WWP projects and further pursue the approval of the outstanding applications.

Table II: CUP and WWP Authorisation Status

Authorisation/Application	Cooke Uranium project		West Wits Project	
	Title	**Status**	**Title**	**Status**
Environmental authorisation (under the NEMA)	Environmental Impact Assessment (EIA) For The Proposed Uranium Plant And Cooke Dump Reprocessing Infrastructure	Approved never implemented	Final Environmental Impact Report	Approved never implemented
	Geluksdal TSF and Pipeline EIA & EMPR	Approved never implemented		
Water use licence (under the NWA)	Geluksdal TSF and Pipeline IWULA and IWWMP	Suspended upon further investigation	Integrated Water Use Licence Application Proposed new Centralised Tailings Storage Facility and associated infrastructure	Pending approval
	Geluksdal Pipeline General Authorisation	Approved never implemented		
EMP Amendment (under the MPRDA)	Environmental Impact Assessment (EIA) For The Proposed Uranium Plant And Cooke Dump Reprocessing Infrastructure	Approved never implemented	Amendment: Driefontein, Kloof and South Deep Mine West Wits Project Environmental Management Programmes	Suspended upon further investigation
	Geluksdal TSF and Pipeline EIA & EMPR	Suspended upon further investigation		
Authorisation change request	CoR226 Authorisation Change Request -049	Approved never implemented	Unknown	

Project Description

There is a long history of gold and uranium mining in the broader West Rand area which has resulted in tailings containing in excess of 170 million pounds of uranium and 11 million ounces of gold. SGL, through the split from Gold Fields and the acquisition of Gold One and Ezulwini, currently owns the majority of the tailings in the area and its gold and uranium resources.

The key to successfully capitalising these resources relies on the execution of the WRTRP. The concept of the WRTRP is well understood with an 8 year history of extensive metallurgical test work, environmental studies, feasibility studies and design by a number of major mining houses. A pre-feasibility study (PFS) completed during 2013 for the WRTRP has confirmed that there is a significant opportunity to extract value from the SGL surface resources in a cost effective sequence.

The implementation of the WRTRP will be done in phases to achieve the objectives of the ultimate project. The Ultimate Project and the Initial Implementation are detailed below.

Ultimate Project

SGL's historical TSF holdings in the West Rand can be divided into four Mining Rights; the Cooke, Ezulwini, Kloof and Driefontein Mining Rights. Each of these Mining Rights contains a number of historical TSFs which will ultimately be reclaimed during the life of the WRTRP:

- Kloof Mining Right area: Kloof 1 TSF, Kloof 2 TSF, Leeudoorn TSF, Libanon TSF, Venterspost North and Venterspost South TSFs. Venterspost North and South TSFs will be processed with the concurrent construction of Module 2 float and gold plants. The remainder of the TSFs will be processed once Module 3 of the CPP has been constructed;
- Driefontein Mining Right area: Driefontein 1, 2, 3, 4 and 5 TSF. Once the Driefontein 3 and 5 TSFs have been reclaimed, the remainder of the Driefontein TSFs, namely Driefontein 1, 2 and 4 TSFs, will be processed through the CPP;
- Cooke Mining Right area: Cooke TSF and the Millsite Complex (38, 39 and 40/41 and Valley) TSFs. Millsite Complex will be processed with the concurrent construction of Module 2 float and gold plants; and
- Ezulwini mining Right Area: Cooke 4 South TSF, which will be processed subsequent to Driefontein 3 and 5 TSFs and in parallel with the Cooke TSF.

Once commissioned the project will initially reclaim and treat the TSFs at a rate of 1.5 Mt/m (1Mt/m from Driefontein 3 TSF, followed sequentially by Driefontein 5 and C4S TSFs and 0.5 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 4 Mt/m tailings retreatment capacity, each of the Mining Right areas will be reclaimed and processed simultaneously.

The ultimate WRTRP involves the construction of a large-scale CPP for the recovery of gold, uranium and sulfur from the available resources. The CPP, centrally located to the West Rand resources, will be developed in phases/modules to eventually treat up to 4 Mt/month of tailings inclusive of current underground arisings. The resultant tailings will be deposited on a TSF with a modern engineering design called the RTSF.

The tailings material will be centrally treated in the CPP. In addition to gold and uranium extraction, sulfur will be extracted to produce sulphuric acid, an important reagent required for uranium leaching. The CPP footprint will ultimately occupy approximately 75 hectares when fully constructed. The Plant will be developed in phases to eventually treat up to 4 Mt/month of tailings and current underground arisings. The CPP will eventually be comprised of the following:

- Gold Plants;
- Float plants and associated infrastructure;
- Uranium Processing Plants;
- Multiple Roasters and associated infrastructure;
- Acid Plant and associated infrastructure;
- Uranium and sulphide concentrate storage facilities;
- Loading facilities for uranium concentrate; and
- Water storage facilities.

A new deposition site for the residue from the CPP will be located in an area that has been extensively studied as part of the original WWP and CUP (the proposed Geluksdal TSF is associated with the CUP). The “deposition area” on which the project is focussing, has been termed the RTSF and is anticipated to accommodate the entire tonnage from the district. The RTSF will be one large facility as opposed to the two independent deposition facilities proposed by the WWP and CUP respectively.

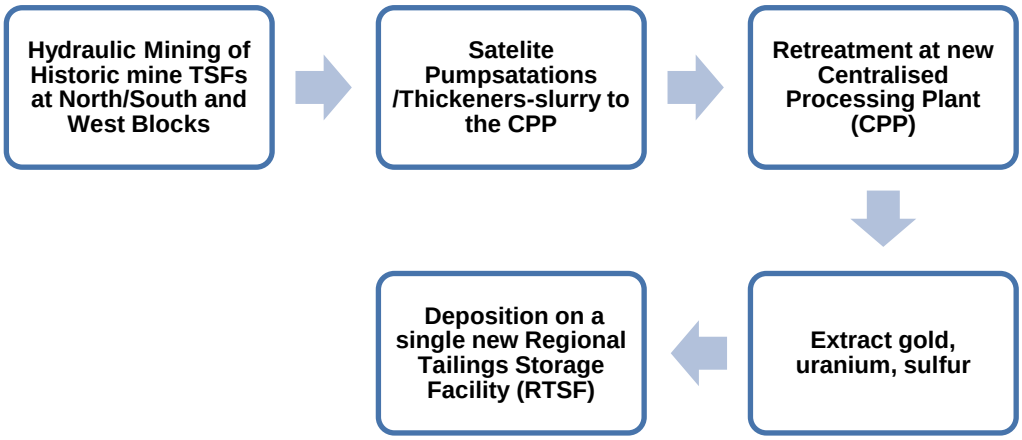

Figure II: Summary of WRTRP

Initial Implementation

To ensure the successful start-up phase, the upfront capital required for the WRTRP will be limited; only essential infrastructure will be developed during Initial Implementation. This entails the design and construction of:

- The hydraulic mining infrastructure at the Driefontein 3 and 5 TSFs, C4S TSF, including slurry and water pump stations;
- Driefontein and Cooke Mining Right area overland inter connecting pipe works and thickeners;
- Process water supply and storage;
- The CPP Module 1 comprising:
  - Gold Plant;
  - Floatation Plant;
  - Uranium Plant,
  - Acid Plant; and
  - A roaster.
- The RTSF, RWD and AWTF.

This first module of the CPP will receive two reclaimed slurry streams and will retreat up to 1.0 Mt/m from the Driefontein 3 and 5 TSFs, C4S TSF in sequence over 11 years. In addition to and concurrently with the Driefontein 3 and 5 and C4S TSFs, up to 0.5 Mt/m from the Cooke TSF will be mined for a period of 16 years. The resultant tailings from the CPP will be deposited onto the first phase of the new RTSF.

A high grade uranium concentrate, produced at the CPP, will be transported to Ezulwini (50 k tonnes per month) for the extraction of uranium and gold. The tailings from this process will be deposited on the existing operational Ezulwini North TSF.

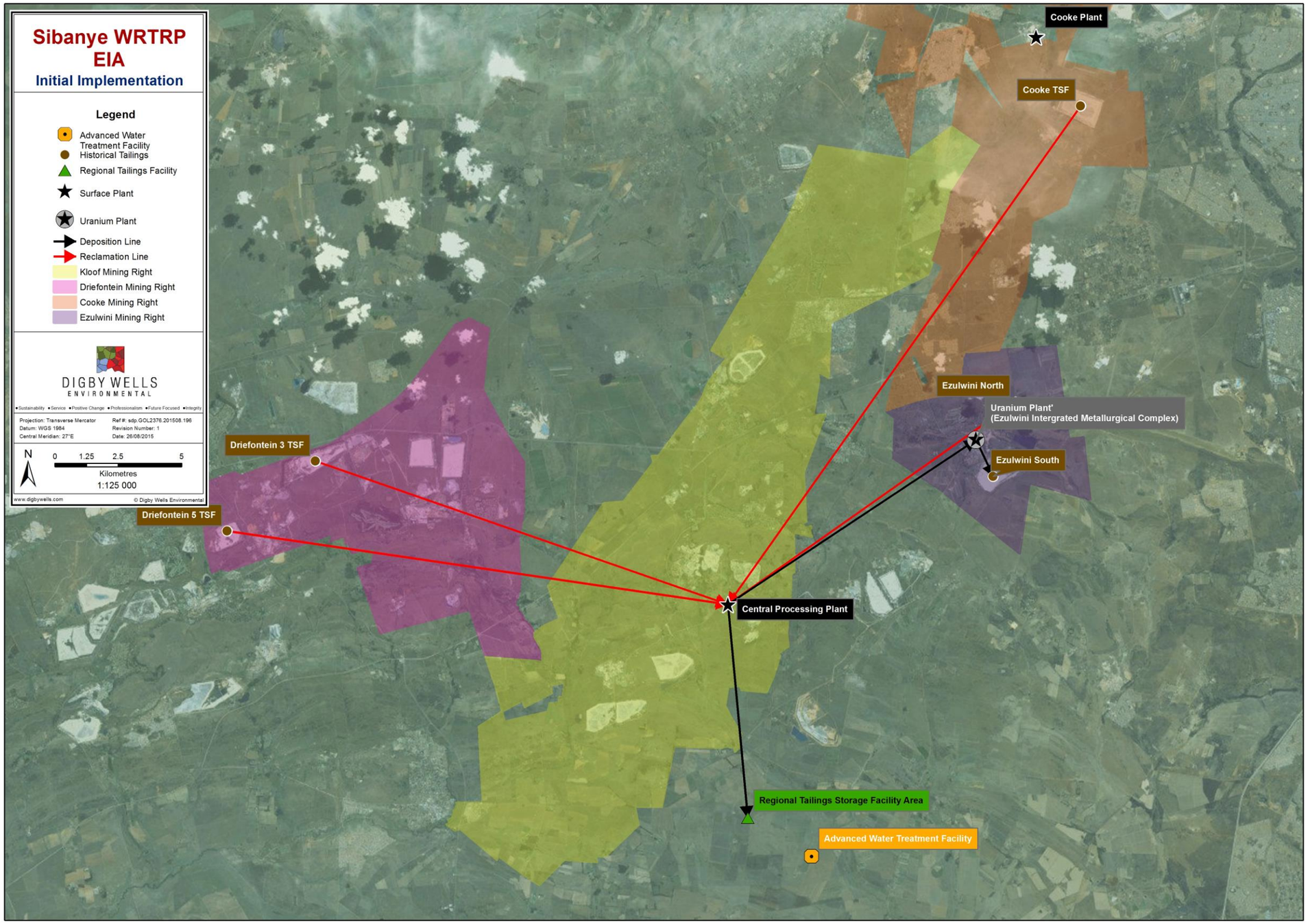

Figure III: Initial Implementation Phase

Kloof Mining Right Area

The focus of this application is the authorisation of those activities associated with the Initial Implementation of the WRTRP that occur within the Kloof Mining Right or are to be included in the Kloof Mining Right. Authorisation for this component of the Initial Implementation phase (Kloof) will require the amendment of the Kloof Mining Right, Mining Work Programme (MWP) and EMP to cover the processing of reclaimed slimes at the CPP and the deposition of the resultant tailings on the RTSF.

The Kloof Mining Right will be amended to include:

- The construction and operation of the CPP including the gold ,uranium and Roaster/acid plants[2];
- The construction and operation of the RTSF and the associated RWD[3];
- Abstraction of makeup water from the K10 shaft;
- The construction and operation of the AWTF;
- The construction and operation of roads, power lines, pipelines and pump stations associated with the above listed infrastructure; and
- The inclusion of Venterspost North and South into the Kloof Mining Right Area.

The intention of this Scoping Report is, therefore, to identify these activities within the current and expanded Kloof Mining Right area, understand the potential impacts that they may have on the receiving environment and to determine the necessary studies that must be undertaken to classify and rank these impacts, both positive and negative, during the EIA phase.

Project Alternatives

Alternatives for the various aspects of the WRTRP have been assessed during the pre-feasibility of the Project. The alternatives considered includes location, technology and processes of the CPP, RTSF and associated RWD and AWTF, the pipeline dimensions and routes, the location and capacities of the BWSFs, thickeners and reclamation of the TSFs. The alternatives for the above activities have been detailed in the scoping reports for the respective Mining Right areas. This scoping report, however, details the alternatives considered specifically for the Kloof Mining Right area.

[2] This application will consider the construction and operation of the entire CPP i.e. Modules I, II and II, so as to determine the impacts of the plant at full operation and avoid incremental authorisation.

[3] This application will consider the construction and operation of the entire RTSF and RWD so as to determine the impacts of the facilities at full operation to avoid incremental authorisation.

RTSF Site Alternatives

Two independent, parallel TSF site selection processes were completed by Golder Associates (Golder, 2010) for Rand Uranium's CUP (Geluksdal TSF) and Metago (Metago, 2009) for Gold Fields' WWP. These processes entailed the selection of a suitable site for a TSF required for the respective proposed projects.

The site selection undertaken by Golder Associates for Rand Uranium, identified the proposed Geluksdal TSF, for which authorisation was applied. As an alternative site, Golder proposed that site 45 North and 45 South be considered. The ranking process indicated that sites 33 and 34 (coinciding with the proposed RSTF site) would be the most suitable sites, but had already been earmarked by Gold Fields as a potential alternative TSF site and were therefore unavailable to Rand Uranium.

In a parallel site selection process undertaken by Metago for Gold Fields, the social, environmental and economic screening and subsequent ranking determined that sites B2/B3 (coinciding with the proposed RTSF site), as well as the Doornpoort TSF contiguous A sites (ultimately selected for the WWP), were the most economically viable and the preferred sites from an environmental and social perspective.

Importantly and fortuitously, the two TSF areas identified by Metago, as B2/B3, overlie areas identified by the Golder Associates site selection process for Rand Uranium, which they called area 33 & 34. These areas, B2/B3 and 33 and 34, represent the proposed area identified for the RTSF for the WRTRP.

In summary the two independent processes resulted in the identification of a common area for the construction of a new TSF that can accommodate the residue from the proposed CPP and therefore based on the outcomes of these two processes it has been concluded that the site, now referred to as the RTSF, will be taken forward as the preferred site.

Treatment Alternatives

A site selection process was undertaken by Golder Associates (Golder, 2013) for the CPP. A total of 100 candidate site areas were identified, of which 25 candidate sites were in compliance with the site selection criteria and taken forward for further analysis. The Top Two sites were then identified as the preferred and alternative sites respectively. The sites were called Site T2 (Preferred Option) and Site T9 (Alternative). The preferred option Site "T2" will be assessed as part of this study.

Technology alternatives were considered purely from a "best fit" and cost effective perspective, particularly in terms of the AWTF and CPP. Considerations to be made in the selection of a suitable AWTF include different potential technologies such as electrodialysis, reverse osmosis, freeze desalination and electrocoagulation.

Pipeline Alternatives

The pipeline routes and supporting infrastructure need to be located where the feed sources, current infrastructure, services and proposed infrastructure, including the WBT, CPP and RTSF, are located. Alternative pipeline routes between the WBT and the CPP and between the CPP and the RTSF have been identified.

No-go Option

In terms of the “No-go” option, the current primary land uses for the region are mining, agriculture, and in some areas, residential. The proposed location of the RTSF is currently being used for agricultural purposes. If not used for mining (the no-go option), possible alternative land uses for the proposed RTSF and associated infrastructure sites include commercial agriculture, grazing, or low-cost housing. The proposed location of the CPP is also currently situated on historical agricultural land between historical TSFs. If not used for mining, the potential contamination from the historical TSFs negates the possibility of viable alternative land uses. Existing/historical TSFs will remain at their present locations together with associated impacts which include the potential of Acid Mine Drainage (AMD), possible radioactive contamination from the uranium and persistent dust fallout.

Public Participation Process

Stakeholders identified who are affected by, or interested in, the proposed project included government departments, parastatals, land owners and occupiers, communities, non-government institutions as well as business and industry. The stakeholders identified as part of the WWP and CUP (Geluksdal TSF) projects were also informed as the WRTRP effectively combines the WWP and CUP projects.

Consultation already undertaken prior to announcing the project (pre-application) includes telephonic discussions, one-on-one meetings and focus group meetings. Stakeholders were provided with project information at these meetings which were also distributed via email, post and hand delivery.

All comments raised by stakeholders during the pre-application phase have been captured in the Comment and Response Report (CRR) and provided to the various specialists. These were used to inform the scope of work for the specialist studies. Responses to the stakeholder comments are also provided in line with the overall project scope and available information.

During the scoping phase further consultation will take place by placing all scoping documents into the public domain for review, having open house meetings, focus group meetings and one-on-one consultations (as necessary). It is envisaged that a total of 6 stakeholder meetings in the form of focus group and open house meetings.

The Public Participation (PP) process for the EIA phase will be similar to the process undertaken for the scoping phase. The premise is to ensure that the various legislative requirements for PP are met and that a single, integrated process is followed. This will limit

stakeholder fatigue and ensure that stakeholders are presented with a single view of the full project and EIA information.

Potential Impacts

It must be noted that the presence of historical TSFs on the landscape are a permanent source of pollution on the surrounding environment. The TSFs are a source of dust generation which reduces the ambient air quality, as well as impacting on surrounding soils, wetlands and surface water resources due to the mobilised contaminants. In addition, the leaching and seepage of contaminants have significant impacts on the groundwater resources, specifically as the historical TSFs are located on sensitive dolomitic aquifers. The reclamation of these historical TSFs will result in long term positive impacts as the permanent pollution source is removed from the regional landscape, although reclamation activities will result in operational impacts,. This scoping report associated with the Kloof Mining area does not include the reclamation of historical TSFs, however it is pertinent to note the potential negative and positive impacts associated with the overall WRTRP and reclamation of numerous TSFs throughout the West Rand.

The activities associated with the Kloof Mining Right area, which may result in potential impacts, includes the construction and operation of the CPP, RTSF, RWD and AWTF and its ancillary infrastructure, such as pipelines, roads and transmission lines, as well as the pumping of mine affected water from K10 Shaft for use during the reclamation activities.

As part of the EIA phase, the impacts identified below will be assessed and evaluated to determine their significance, as well as cumulative impacts identified and qualitatively assessed. These potential impacts include:

- Air quality:
  - The possible impact to the receiving environment during the operation phase through the generation of dust from the RTSF where the tailings from the CPP will be deposited. This could lead to exposure of people to particulate matter in the form of PM_{10}, $PM_{2.5}$, dust deposition and radionuclides; and
  - Deteriorated air quality through the emissions from the CPP.
- Geohydrology:
  - Seepage from the proposed RTSF can potentially influence the groundwater quality in the underlying aquifers (dolomites);
  - Seepage from the proposed RTSF has the potential to impact the quality of nearby streams via groundwater baseflow;
  - Dewatering of aquifers that were or are a source of water supply, should the concept of interception boreholes or similar structures be instituted at the RTSF;

- Seepage/ spillage of untreated water onto the surface from any of the proposed infrastructure may seep into the groundwater environment resulting in water quality impacts; and
- Mine affected water from K10 Shaft will be abstracted and used throughout the reclamation process, through the CPP and eventually deposited with the residual tailings on the RTSF before reporting to the RTSF RWD. Water from the RWD will be treated at the AWTF to potable standards (SANS 241:2011). This is a positive impact as contaminated water will not be discharged at K10 shaft but will be treated, following the project processes, to potable standards (SANS 241:2011), improving water quality.

- Radiation:
  - Contamination of soil and surface water should the pipelines spill; and
  - Although the Uranium will largely be removed from the residual tailings reporting to the RTSF, there is the potential for the material to be radioactive and that it can be distributed by wind, resulting in the possibility of health impacts to nearby communities as well as possible groundwater contamination.

- Soils and land capability:
  - There is the potential for increased soil erosion during the construction of the RTSF and CPP and pipeline routes; and
  - Loss of land capability and land use (agriculture), particularly at the RTSF site.

- Surface water quality:
  - Surface water quality could be compromised due to contaminated runoff emanating from the RTSF, CPP or pipelines reporting into the nearby rivers. Sediments in the runoff may also cause siltation of the water in the rivers;
  - Potential positive impact due to discharge of treated water into the Leeuspruit from the AWTF;
  - Potential short-term local risk should pipelines rupture;
  - Reduction in discharge of mine impacted water quality from the K10 Shaft into the Wonderfonteinspruit. This is a positive impact; and
  - Treated water from the AWTF, which has been treated to potable standards (SANS 241:2011), will be discharged into the Leeuspruit. This is a positive impact as water of an acceptable quality will be discharged into the water resources.

- Surface water quantity:
  - The disturbance or alterations of any drainage lines during pipeline construction at the river crossings may result in potential flow changes in the downstream river regime;
  - Reduction of water quantity into the Wonderfonteinspruit through the abstraction and use of contaminated water from K10 Shaft for use during the reclamation activities; and
  - General impacts on surface water resources. The magnitude of change in monthly and annual catchment yield will be assessed within the study area.
- Aquatic ecology:
  - Potential water quality degradation through pipeline spills or runoff from the CPP/RTSF and resultant negative impacts on aquatic ecology;
  - Discharge of treated water from the AWTF could alter instream and riparian habitat; and
  - Potential to improve water quality of Wonderfonteinspruit and Leeuspruit due to the abstraction of mine affected water and discharge of treated water, respectively, and thus improve ecological status of the rivers. This is a positive impact.
- Fauna and Flora:
  - Potential loss of floral species/vegetation types and biodiversity through the clearing of land for construction of pipeline routes, CPP and RTSF; and
  - Potential for habitat impacts due to pipeline failures and spills.
- Wetlands:
  - Potential loss of wetland habitat through the construction and operation of the CPP and RTSF;
  - Impacts may occur on wetlands where pipelines cross; and
  - The potential for pollution due to pipeline spills.
- Heritage:
  - The potential for the loss of and destruction of heritage resources exists at the sites of infrastructure construction of the CPP and RTSF.

- Socio-economic:
  - Positive impacts of people in the surrounding communities as residents are hired and up skilled during the construction and operational phases of the project;
  - There is the potential that people may be economically displaced due to the construction of the RTSF; and
  - Due to the economic opportunities, there may be an influx of people into the area.
- Visual:
  - The potential for the loss of sense of place exists as the RTSF and CPP are constructed; and
  - The CPP and RTSF will be visible to receptors in the area.

Specialist Studies

To investigate and assess the impacts of the Initial Implementation of the proposed WRTRP project, the following specialist studies have been proposed for the EIA phase:

- Surface water assessment, including:
  - Surface water quality; and
  - Surface water quantity
- Characterisation of the social environment;
- Radiation study;
- Ecological assessment, including:
  - Wetland investigation;
  - Fauna & flora assessment; and
  - Aquatic assessment.
- Geohydrological assessment;
- Archaeology and heritage assessment;
- Economic analysis;
- Soil and land capability assessment; and
- Air quality assessment.

Environmental Consultants

Digby Wells was appointed by SGL as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and EIA processes. The contact details for Digby Wells are set out in Table II.

Table II: Contact Details for Digby Wells

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Information Required To Be Included In A Scoping Report In Terms of the National Environmental Management Act, 1998 (Act 107 Of 1998)

Content	Reference
a) Details of – (i) the EAP who prepared the report; and (ii) the expertise of the EAP to carry out scoping procedures.	Chapter 2
b) Description of the proposed activity	Chapter 1
c) A description of any feasible and reasonable alternatives that have been identified	Chapter 9
d) A description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is – (i) A linear activity, a description of the route of the activity; or (ii) An ocean-based activity, the coordinates where the activity is to be undertaken.	Chapter 3
e) A description of the environment that may be affected by the activity and the manner in which the activity may affect the environment.	Chapter 6
f) An identification of all legislation and guidelines that have been considered in the preparation of the scoping report.	Chapter 6
g) A description of environmental issues and potential impacts, including cumulative impacts that have been identified.	Chapter 9
h) Details of the Public Participation Process conducted in terms of regulation 27(a), including –	Chapter 9

Content	Reference
(i) The steps that were taken to notify potentially interested and affected parties of the application (ii) Proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the application have been displayed, placed or given. (iii) A list of all persons or organisations that were identified and registered in terms of Regulation 55 as interested and affected parties in relation to the application (iv) A summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues	
i) A description of the need and desirability of the proposed activity.	Chapter 7
j) A description of identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity	Chapter 9
k) Copies of any representations any comments received in connection with the application or the scoping report from interested and affected parties.	Chapter 9
l) Copies of the minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants.	Appendix 5
m) Any responses by the EAP to those representations and comments and views.	Appendix 5
n) A plan of study for the environmental impact assessment which sets out the proposed approach to the environmental impact assessment of the application, which must include – (i) A description of the tasks that will be undertaken as part of the environmental impact assessment process, including any specialist reports or specialised processes and the manner in which such tasks will be undertaken (ii) An indication of the stages at which the competent authority will be consulted (iii) A description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity; and (iv) Particulars of the public participation process that will be conducted during the environmental impact assessment process.	Chapter 10
o) Any specific information required by the competent authority.	Chapter 12
p) Any other matters required in terms of Section 24(4)(a) and (b) of the Act.	Chapter 12

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Description
ADU	Animal Demography Unit
AMD	Acid Mine Drainage
ARC	Agricultural Research Council
AWTF	Advanced Water Treatment Facility
BWSF	Bulk Water Storage Facility
C4S	Cooke 4 Dam South
CIL	Carbon In Leach
CPP	Central Processing Plant
CTSF	Central Tailings Storage Facility
CUP	Cooke Uranium Project
Digby Wells	Digby Wells Environmental
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Integrity and Sensitivity
EMP	Environmental Management Programme
Ezulwini	Ezulwini Mining Company (Pty) Ltd
FRAI	Fish Response Assessment Index (FRAI)
GAC	Granular Activated Carbon
GFIMSA	Gold Fields International Mining South Africa Proprietary Limited
Gold One	Gold One International Limited
Harmony	Harmony Gold Mining Company Limited
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
IHAS	Invertebrate Habitat Assessment System
IHIA	Intermediate Habitat Integrity Assessment
ISCW	Institute for Soil Climate and Water
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan

Acronym/Abbreviation	Description
JSE	Johannesburg Stock Exchange
KDC	Kloof Driefontein Complex
Kloof Complex	Kloof Tailings Storage Facilities 1 and 2, Venterspost North and South and related infrastructure
MAE	Mean Annual Evaporation
mamsl	metres above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mbgl	metres below ground level
MIRAI	Macro – Invertebrate Response Assessment Index
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MRA	Mining Right Application
MWP	Mine Works Programme
NAAQS	National Ambient Air Quality Standards
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NID	Notice of Intent to Develop
NWA	National Water Act, 1998 (Act No. 36 of 1998)
NYSE	New York Stock Exchange
PCDs	Pollution Control Dams
PES	Present Ecological State
PFS	Pre-Feasibility Study
PHRA-G	Gauteng Provincial Heritage Resources Authority
PM_{10}	Particle Matter 10 micrometres in diameter
$PM_{2.5}$	Particle Matter 2.5 micrometres in diameter

Acronym/Abbreviation	Description
PoS	Plan of Study
POSA	Plants of South Africa
PPP	Public Participation Process
PSU/NCAR	Pennsylvania State University / National Centre for Atmospheric Research
QDS	Quarter Degree Square
RO	Reverse Osmosis
RTSF	Regional Tailings Storage Facility
RWD	Return Water Dam
SABAP	South African Bird Atlas Project
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SARCA	South African Reptile Conservation Assessment
SASS5	South African Scoring System version 5
SGL	Sibanye Gold Limited
SLP	Social and Labour Plan
SQR	Sub Quaternary Reaches
SSC	Species of Special Concern
TSF	Tailings Storage Facility
WAD	Weak Acid Dissociable
WBT	West Block Thickener
WMA	Water Management Areas
WRTRP	West Rand Tailings Retreatment Project
WULA	Water Use Licence Application
WWP	West Wits Project

1 Introduction

Digby Wells Environmental (Digby Wells) was appointed by Sibanye Gold Limited (SGL) to conduct the Environmental Impact Assessment (EIA) process, which includes the compilation of an EIA and Scoping Report, for the West Rand Tailing Retreatment Project (WRTRP) in the Gauteng Province, South Africa, as shown in Plan 1.

1.1 Company Background

GFI Mining South Africa (Pty) Limited, Registration Number 2002/031431/07) was, prior to February 2013, a subsidiary within the Gold Fields Group. In early 2013 Gold Fields unbundled its Kloof Driefontein Complex (KDC) and Beatrix gold mines in the Free State to create a separate entity in SGL and listed SGL as a fully independent company on both the JSE and the NYSE Stock Exchanges.

Subsequently, in October 2013, SGL purchased the interest held by Gold One International Limited (Gold One) in Rand Uranium Limited (Rand Uranium) and Ezulwini Mining Company Limited (Ezulwini). These interests were held through a 74% shareholding in Newshelf 1114 (Pty) Limited (Newshelf), which owns 100% of Rand Uranium and Ezulwini. The purchase consideration was 150 million SGL shares, amounting to a shareholding of about 17%. The transaction was subject to various conditions, including the approval of the Competition Commission and the approval of the Minister of Mineral Resources. These approvals have been granted and the merger is now unconditional. The Gold One assets which have become part of Sibanye included the Cooke Operations (underground mining and surface reclamation operations) for gold and uranium production, and after completion of the transaction, SGL consolidated all of its and Gold One's operations for the reclamation of tailings to produce gold, uranium and sulphur on the West Rand.

1.2 Project History

The treatment of historical tailings in the West Rand area has a long history with Gold Fields, Rand Uranium, Harmony Gold Mining Company Limited (Harmony), Gold One and SGL completing a number of parallel, independent studies relating to the treatment of these historical tailings.

In late 2009, Gold Fields and Rand Uranium met to evaluate the potential synergy of an integrated flow sheet for the Cooke Uranium Project (Rand Uranium) and the West Wits Tailings Treatment Project (Gold Fields), both of which were nearing feasibility completion. A significant amount of re-engineering and confirmatory test work would have been required to achieve this and, given the momentum of the respective projects, it was agreed that the investment would not be justified at that point in time. After the completion of the respective projects they were put on hold because of economic circumstances at the time.

From 2010 through to 2012, Rand Uranium completed the Cooke Uranium Project (CUP) and the Cooke Optimisation Project (COP) for which various applications were made to the authorities with authorisation on certain aspects being received and others remain pending.

In 2012, Gold One acquired Rand Uranium and in the same year acquired the Ezulwini Mining Company (Pty) Ltd (Ezulwini) in an agreement with First Uranium Corporation. The company, during the same year, completed an application and relevant studies for the Geluksdal TSF Project.

In early 2013 Gold Fields unbundled its Kloof Driefontein Complex (KDC) and Beatrix gold mines to create SGL.

1.3 Project Description

The broader West Rand area[4] contains an estimated 1.3 billion tonnes of surface gold and uranium tailings, with approximately 170 million pounds of recoverable uranium and 11 million ounces of recoverable gold. SGL, as the current majority owner of these resources, plans to exploit it to develop a strong, long life and high yield surface mining business. Key to the successful execution of this development strategy is the WRTRP. The concept of the WRTRP is well understood with an 8 year history of extensive metallurgical test work, feasibility studies and design by a number of major mining houses. A pre-feasibility study (PFS) completed during 2013 for the WRTRP has confirmed that there is a significant opportunity to extract value from the SGL surface resources in a cost effective sequence.

The ultimate WRTRP or “Ultimate Project” involves the construction of a large-scale Central Processing Plant (CPP) for the recovery of gold, uranium and sulfur from the available resources. The CPP, centrally located to the West Rand resources, will be developed in phases to eventually treat up to 4 Mt/month of tailings inclusive of current underground arisings. The resultant tailings will be deposited on a Tailings Storage Facility (TSF) with a modern engineering design called the Regional TSF (RTSF). The regional and local project settings are indicated on Plan 1 and Plan 2.

The Ultimate Project will be implemented in a number phases. Of these phases, phase 1 or the “Initial Implementation”, entails the reclamation of certain TSFs as well as the construction and operation of the first phase section of the RTSF, Gold Module 1 of the CPP and the first uranium roaster and acid plants. The Ultimate Project and Initial Implementation are explained in more detail below (Plan 3).

[4] The broader West Rand area includes Carletonville in the far west, Westonaria and Randfontein in the northeast.

Plan 1: Regional Setting

Plan 2: Ultimate Primary Infrastructure Layout

1.3.1 Ultimate Project

Simplistically, SGL's historical TSF holdings in the West Rand can be divided into four Mining Right area; the Cooke, Ezulwini, Kloof and Driefontein Mining Right areas as shown in Plan 4a – Plan 4c. Each of these Mining Right areas contains a number of historical TSFs as detailed below:

- Kloof Mining Right area: Kloof 1 TSF, Kloof 2 TSF, Leeudoorn TSF, Libanon TSF, Venterspost North and Venterspost South TSFs. Venterspost North and South TSFs will be processed with the concurrent construction of Module 2 float and gold plants. The remainder of the TSFs will be processed once Module 3 of the CPP has been constructed;
- Driefontein Mining Right area: Driefontein 1, 2, 3, 4 and 5 TSF. Once the Driefontein 3 and 5 TSFs have been depleted the remainder of the Driefontein TSFs, namely Driefontein 1, 2 and 4 TSFs, will be processed through the CPP;
- Cooke Mining Right Area: Cooke TSF C4S TSF, and the Millsite Complex (38, 39 and 40/41 and Valley) TSFs. C4S will be processed subsequent to Driefontein 3 and 5 TSFs and in parallel with the Cooke TSF. Millsite Complex will be processed with the concurrent construction of Module 2 float and gold plants; and
- Ezulwini mining Right Area: during initial implementation no Ezulwini TSFs will be reclaimed. The Ezulwini uranium plant will however be used to treat 50 000 k/m of concentrated uranium slurry.

Each of the Mining Right areas will be reclaimed in a phased approach (Plan 3). The Driefontein 3 TSF, concurrently with the Cooke TSF, will be reclaimed first. Following reclamation of Driefontein 3 TSF, Driefontein 5 TSF and Cooke 4 Dam south (C4S) will be reclaimed.

Once commissioned the project will initially reclaim and treat the TSFs at a rate of 1.5 Mt/m; 1 Mt/m from Driefontein 3 TSF, followed sequentially by Driefontein 5 and C4S TSFs and 0.5 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 4 Mt/m tailings retreatment capacity, each of the Mining Right area TSFs will be reclaimed and processed simultaneously as well as the underground arisings being accommodated.

The tailings material will be centrally treated in a CPP. In addition to gold and uranium extraction, sulfur will be extracted to produce sulphuric acid which in turn will be re used in the uranium plant leach section.

To ensure the economic viability of the project the upfront capital required for the WRTRP will be minimised, only essential infrastructure will be developed during initial implementation. Use of 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 authorisation, construction and operation of a new deposition site for the residue from the CPP will be located in an area that has been extensively studied as part of the original Gold Fields WWP and the Rand Uranium CUP and Geluksdal TSF. The “deposition area” on which the project is focussing, has been termed the RTSF and is anticipated to accommodate the entire tonnage from the district. The RTSF if proved viable will be one large facility as opposed to the two independent deposition facilities proposed by the WWP and CUP respectively.

SGL has various authorisations and approvals for elements of the WWP and CUP projects, with authorisations and approvals for certain aspects of the respective projects still outstanding. The WRTRP aims to combine the WWP and CUP projects, as per stakeholder concerns and suggestions based on the WWP and CUP projects. Should the WRTRP not proceed, SGL will continue with the CUP and WWP projects for activities that have been authorised, as well as proceeding with the application processes for the outstanding authorisations.

Plan 3: Initial Implementation

Plan 4a: Kloof Mining Right Area

Plan 4b: Driefontein Mining Right Area

Plan 4c: Cooke Mining Right Area

Plan 4d: Ezulwini Mining Right Area

1.3.1.1 Water Sources

A number of mine impacted water sources have been identified and from which water can be supplied to the reclamation operations. SGL has recognised that water is a scarce and strategic commodity and hence currently impacted mine water will be used preferentially over Rand Water or other higher quality sources. Water will be supplied to the reclamation areas from the identified sources via pipelines and bulk water storage facilities (BWSF).

Once the impacted mine water, supplemented by recovered water from the various thickeners, has been used in the hydraulic reclamation process, it will find its way to the RTSF as carrier water for the retreated tailings. As process and rain water builds up on the RTSF it will be drained to the RWD and treated through the AWTF.

1.3.1.2 Reclamation of Tailings

The tailings reclamation process is essentially a water hydraulic mining operation, where the TSFs will be hydraulically reclaimed to the natural ground level in nominal 12 to 15 m benches and the foot print rehabilitated to a suitable end land use.

Water will be supplied to the various reclamation sites, from existing impacted mine water sources, and then pressurised through a high pressure pumping system before reporting to the monitoring guns at the top of the historical TSFs. Monitoring guns will be used at the reclamation site mining face to slurry the tailings material.

The reclaimed material, in the form of slurry, will flow through open channels over screens to remove oversized debris from the slurry before it enters a tank. A series of pumps will then pump the slurry from the tanks via thickeners to the CPP for gold, uranium and sulfur extraction. The historical TSFs proposed for reclamation cover a total of approximately 1 660 ha, as shown in Table 1-1. The RTSF footprint will be approximately 1 350 ha, liberating a nett 310 ha of currently sterilised land.

Table 1-1: Total Area Covered by the TSFs that will be reclaimed

Block	Name	Area (ha)	Block	Name	Area (ha)
Northern Block	Venterspost N TSF	60.68	Western Block	Driefontein 1 TSF	87.15
	Venterspost S TSF	30.51		Driefontein 2 TSF	85.26
	Millsite Complex	315.47		Driefontein 3 TSF	72.76
	Cooke TSF	178.99		Driefontein 4 TSF	165.66
	Total	**585.65**		Driefontein 5 TSF	67.72
Southern Block	Kloof 2 TSF	72.76		Libanon TSF	93.64
	Kloof 1 TSF	86.99		**Total**	**572.19**
	Leeudoorn TSF	186.27			

Block	Name	Area (ha)	Block	Name	Area (ha)
	Ezulwini South	157.99	Potential future TSFs[5]	South shaft and Twin shaft TSFs	107.66
	Total	**504.01**			

1.3.1.3 Pipelines

The overland slurry and water piping required for the project will ultimately consist of approximately 120 km of pipeline (many of which will be parallel and in the same servitude). Existing mine servitudes will be utilised as far as possible for the overland piping. The following pipelines will be required:

- Water supply pipelines (from K10 shaft to the west BWSF, Cooke 1 and 2 water to the Cooke BWSF Cooke 4 shaft to the south BWSF and from the respective BWSFs to the historical TSFs);
- Slurry pipelines (from the historical TSFs to the West Block Thickener (WBT), North Block Thickener (NBT) and Cooke Thickener);
- Thickened slurry pipeline (from the WBT, NBT and Cooke Thickener to the CPP.);
- Uranium and sulfide rich slurry pipeline (from the CPP to Ezulwini);
- Tailings pipeline (from the CPP to the RTSF); and
- Treated water pipeline (from the AWTF to a discharge point on the Leeuspruit).

1.3.1.4 Thickeners

A WBT, NBT and Cooke Thickener will be constructed for the respective Mining Right areas. The thickeners will be used to thicken reclaimed tailings from the TSFs before it is pumped to the CPP for processing. The thickeners provide slurry of consistent density to the CPP and are critical in the optimisation of the operating of the plant. The thickeners also aid in minimising pumping costs by optimising the amount of water pumped around the circuit.

1.3.1.5 The Central Processing Plant

The anticipated location for the CPP is mid-way between Kloof Main and Kloof 4 shaft central to all the resources, water and power supply, as well as existing and planned infrastructure (Plan 5). The Plant will be developed in phases to eventually treat up to 4 Mt/month of historical tailings and current underground arisings. The CPP will eventually be comprised of (Plan 6):

- Gold Plant Modules (3);
- Float plants and associated infrastructure (one associated with the uranium plants);

[5] The South Shaft and Twin Shaft TSFs will be part of a future application.

- Roasters and associated infrastructure;
- Acid plants and associated infrastructure;
- Uranium processing plants (2);
- Bulk sulfuric acid storage facility;
- Loading facilities for uranium concentrate, bulk sulfuric acid and reagents;
- Bulk Water storage facilities; and
- Pollution control dams.

1.3.1.6 Regional Tailings Storage Facility

This RTSF has been positioned and sized as a facility that can cater for both the tailings generated by the WRTRP as well as other tailings located in the region approximating 1.3 billion tonnes.

During the pre-feasibility study (PFS) the use of the DEA/GDARD/NEMA authorised Gold Fields CTSF and the Gold One Geluksdal TSF were considered for the WRTRP. Following an optimisation exercise requiring an ultimate deposition rate of 4 Mt/m, it was recognised that the CTSF and Geluksdal sites alone and collectively were insufficient to accommodate the desired tonnage profile for the project, both in deposition rates and in tonnage capacity for the proposed RTSF. The optimal location of the RTSF has been positioned between these two facilities, an area that has been extensively studied by the WWP and CUP but requires further investigation (Plan 7). It is likely that the construction of the RTSF will be phased to suit the envisaged tonnage build up. The RTSF will be sized, assessed and permitted on the basis of accommodating the long term requirements of the region. The RTSF will consolidate and mitigate the potential impacts of the historical TSFs currently scattered throughout the West Rand.

1.3.1.7 Return Water Dam

The design and management of the RTSF Return Water Dam (RWD) will need to be undertaken in line with the requirements of the GN 704 regulations. The RWD has therefore been sized to ensure that it is unlikely to spill into any clean water system more than once in 50 years, given a certain return water and/or water treatment rate.

The ultimate RWD arrangement, which will consist of a series of compartments due to the phased development of the RTSF, will require a total storage capacity of at least 3 million m3 and is likely to have outer wall heights not exceeding 5m. To limit seepage of process water, the RWD will be lined with a geocomposite liner consisting of a 2mm HDPE geomembrane underlain by a 300 mm thick layer of clayey material won from site. A leakage detection system will also be provided to intercept and identify any leakage.

1.3.1.8 Advanced Water Treatment Facility

The design by Watercare Mining (WCM) consists of a multiple stage softening and membrane separation process. The method of softening uses a Crystalactor® process for softening which reduces the incoming water hardness by the precipitation of calcium pellets. Through pH control and a feed crystal source of fine quartz sand, precipitation is controlled and creates fine pellets which are highly stable and easy to handle. This effectively combines the softening and clarifying stage in one process. This is followed by GAC (granular activated carbon) and Nano-filtration to remove all solids as well as organic compounds to protect the Reverse osmosis (RO) membranes from damage and fouling. The filtrate from the first stage membranes is below the prescribed quality and the brine is sent to a secondary Crystalactor® for softening again and follows the same processes as described by Stage 1. Three stages are used to create an overall water recovery of 93% with the solid waste discharged as stable pellets at an approximate water content of only 5%. Each stage of RO membrane recovery ranges from 65% to 50%, with each consecutive stage being lower recovery due to the saturation limit as well as the operating pressure being kept as low as possible to conserve energy.

The options for disposal of the pellets is either by creating a slurry that is pumped to the RTSF, or it needs to be collected on a drying bank and collected with a tipper and driven to the RTSF for disposal. The footprint of the proposed plant is approximate area of 3 600 ha and will cater for the scope of the Ultimate Project.

Plan 5: CPP Location

Plan 6: CPP Layout

Plan 7: RTSF Location

1.3.1.9 Mining Rights Concerned

1.3.1.9.1 Cooke Mining Right Area

Rand Uranium holds 2 mining rights (GP 7 MR and GP 173 MR) and two prospecting rights (GP 241 PR and GP 238 PR). These rights relate to the Cooke operations (1, 2 & 3) and Old Randfontein. This, after the prospecting rights have been converted into mining rights, will be referred to as the Cooke Mining Right Area.

1.3.1.9.2 Ezulwini Mining Right Area

Ezulwini holds Cooke 4 under GP 38 MR and a prospecting right (GP 307 PR). These will be known as the Ezulwini Mining Right Area.

1.3.1.9.3 Kloof Mining Right Area

Kloof holds in its own right, GP 66 MR (within which the CPP, RTSF and K10 water supply will from part), and adjacent to it are Venterspost TSFs (North and South) that will be incorporated into the right as part of this application.

1.3.1.9.4 Driefontein Mining Right Area

Driefontein holds mining right GP 51 MR. Currently the Driefontein No 4 TSF lies outside of the MR area and needs to be incorporated through a Section 102 amendment process. This is the Driefontein Mining right Area.

Table 1-2 provides a summary of the ultimate project and Figure 1-1 shows the geographical extent of the ultimate project.

Table 1-2: Scheduled Activities of the WRTRP – Ultimate Project

Proposed Construction Start Date*	**2016**	**2018**	**2020**
Operation Date	**2019**	**2021**	**2024**
Activities	▪ Treat Driefontein 3 and 5, C4S TSF (1Mt/m) and Cooke TSFs at0.5Mt/m totalling 1.5 Mt/m through Gold Module 1, uranium, roaster and acid plants of the new Central Processing Plant (CPP) with deposition onto the Regional Tailings Storage Facility (RTSF). ▪ High grade uranium concentrate (50 kt/m) transported and treated at Ezulwini uranium plant.	▪ Kloof 1 and 2 TSFs and current arisings ▪ Reclaim Leeudoorn and associated Mine Dumps ▪ Potentially South Deep Mine Dumps (future) and current arisings tail will go through CPP (high Uranium) ▪ Reclaim Millsite TSF	▪ Continue to reclaim Millsite TSF (39, 40, 41 and Valley) ▪ Reclaim Venterspost North and South Mine Dumps
Existing infrastructure to be leveraged	▪ Ezulwini Uranium Plant (50 kt/m) to treat concentrate from the CPP		

New infrastructure required	▪ CPP Gold Module I (footprint of full capacity to be authorised now):
	  ▪ Gold Plant I
	  ▪ Sulphide and oxide Floatation Plant
	  ▪ Uranium Plant 1
	  ▪ Acid Plant
	  ▪ Roaster 1
	▪ RTSF (footprint of full capacity to be authorised now)
	▪ West Block Thickener (WBT) and bulk water storage
	▪ Pipelines between D3, D5, C4S, Cooke TSF, WBT, CPP and RTSF
		▪ CPP Gold Module II:
		  ▪ Gold Plant II
		  ▪ Pipelines, roads and pumps
			▪ CPP Gold Module III:
			  ▪ Gold Plant III
			  ▪ Uranium Plant II
			  ▪ Pipelines, roads and pumps
			  ▪ Thickener

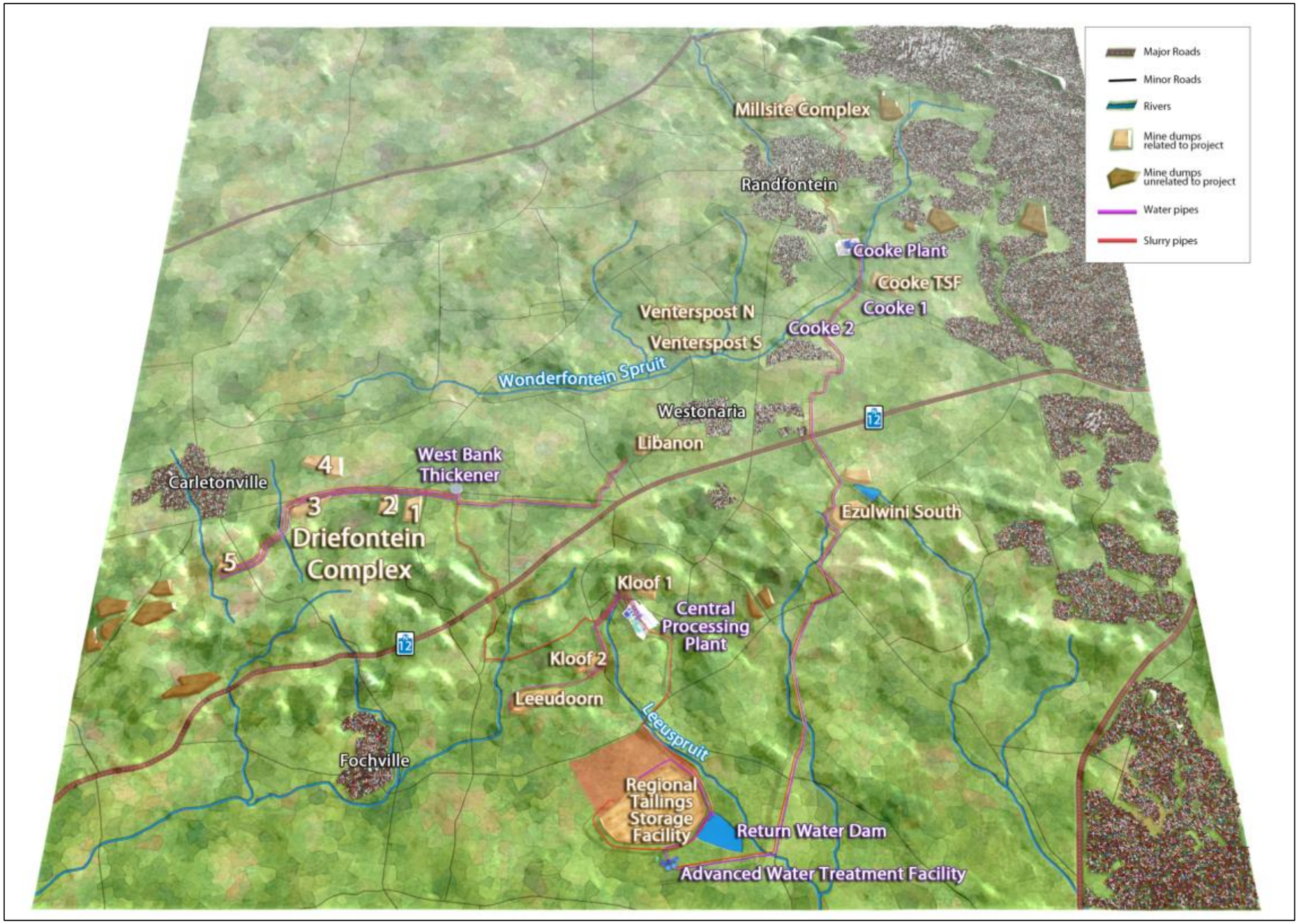

Figure 1-1: Geographical extent of the Ultimate Project - WRTRP

1.3.2 Initial Implementation

Due to commercial imperatives in developing a project of this magnitude, it needs to be implemented over time. The initial investment and development will be focused on those assets that will put the project in a position to partially fund the remaining development.

This entails the design and construction of the initial components of the CPP (gold module, floatation plant, uranium plant, acid plant and a roaster), to retreat up to 1.5 Mt/m concurrently from the Driefontein 3 and 5 TSFs, C4S TSF (1Mt/m) and the Cooke TSF (0.5Mt/m). Driefontein 3, 5 and C4S TSFs will be mined sequentially over 11 years, whilst the Cooke TSF will be mined concurrent to these for a period of 16 years. The resultant tailings will be deposited onto the first stage of the new RTSF.

A high grade uranium concentrate, produced at the CPP, will be transported to Ezulwini (50 k tonnes per month) for the extraction of uranium. The tailings from this process will be deposited on the existing operational Ezulwini North TSF.

Figure 1-2 provides a high-level overview of the process to be undertaken Initial Implementation of the WRTRP whilst Plan 3 provides a visual overview of the project to be implemented in the various phases.

Figure 1-2: Initial Implementation Process Summary

The CPP and RTSF are likely to be the two components of the project with the most significant potential environmental impacts and will be developed as the project progresses. The CPP will be developed in 3 phases over a period of approximately eight years, however this application is for the entire CPP site i.e. Modules I, II and III, uranium plants, roasters and acid plant. Similarly the RTSF will be developed in two phases over the life of the project, but this application is for the entire RTSF footprint and will be assessed as such. The decision to take this approach, as opposed to authorising these components in stages as they are developed, is to provide the regulators and the public with an impact assessment that takes the whole project into consideration. This approach allows the authorities to make a decision based on a complete impact assessment as opposed to incremental applications for each new phase.

The primary activities to take place during the *Initial Implementation* of the WRTRP are listed in Table 1-3, with the pipeline routes outlined in Table 1-4.

Table 1-3: Primary Activities of the WRTRP initial implementation

Category	Activity
Kloof Mining Right area	
Infrastructure	Pipeline Routes (residual tailings).
	Central processing Plant (CPP) incorporating Module 1 float and gold plants and uranium, roaster and acid plants.
	The Regional Tailings Storage Facility (RTSF), RTSF Return Water Dam (RWD) and the Advanced Water Treatment Facility (AWTF). Collectively known as the RTSF complex.
Processes	Abstraction of water from K10 shaft
	Disposal of the residue from the AWTF.
	Gold, uranium and sulfur extraction at the CPP (tailings to RTSF)
	Water distribution at the AWTF for discharge.
Pumping	Pumping of up to 1.5 Mt/m of tailings to the RTSF.
	Pumping water from the RTSF return water dams to the AWTF.
	Discharging treated water to the Leeuspruit.
Electricity supply	Power supply from Kloof 1 substation to the CPP.
	Power supply from Kloof 4 substation to the RTSF and AWTF.
Driefontein Mining Right area	
Infrastructure	Pipeline Routes (water, slurry and thickened tailings).
	West block Thickener (WBT) and Bulk Water Storage Facility (BWSF) complex.
	Collection sumps and pump stations at the Driefontein 3 and 5 TSFs

Category	Activity
Processes	Hydraulic reclamation of the Driefontein 3 and 5 TSFs.
Pumping	Pumping water from K10 to the BWSF located next to the WBT.
	Pumping water from the BWSF to the Driefontein TSFs that will be reclaimed.(Dri3 & 5 TSFs)
	Pumping slurry from the TSF sump to the WBT (for Driefontein 3 and 5 TSFs).
	Pumping the thickened slurry from the WBT to the CPP.
Electricity supply	Power supply from West Driefontein 6 substation to Driefontein 3 TSF.
	Power supply from West Driefontein Gold substation to Driefontein 5 TSF.
	Power supply from East Driefontein Shaft substation to WBT and BWSF.
Cooke Mining Right area	
Infrastructure	Pipeline Routes (water, slurry and thickened tailings).
	Cooke thickener and BWSF.
	Collection sumps and pump stations at the Cooke TSF.
Processes	Abstraction of water from Cooke 1 shaft.
	Hydraulic reclamation of the Cooke TSF (which include temporary storage of the slurry in a sump).
Pumping	Pumping 500 kt/m of tailings from the Cooke TSF to the Cooke thickener.
	Pumping from the Cooke thickener to the CPP via Ezulwini.
Electricity supply	Power supply from the Cooke substation to the Cooke thickener.
	Power supply from the Cooke Plant to the Cooke TSF
Ezulwini Mining Right area	
Processes	Uranium extraction at Ezulwini (tailings to Ezulwini North Dump).
	Abstraction of water from Cooke shaft.
Pumping	Pumping water from Cooke 4 Shaft to the C4S TSF for reclamation.
	Pumping slurry from the TSF sump to the CPP.
Electricity supply	Power supply from Ezulwini plant to the C4S TSF

Table 1-4: Pipeline Route Lengths

Name	Length (m)	Type
Driefontein 3 TSF to WBT	7 665	Slurry Pipeline -dilute
Driefontein 5 TSF to Driefontein 3 TSF	6 646	Slurry Pipeline -dilute
WBT to CPP	17 473	Slurry Pipeline -thickened
Cooke TSF to Cooke Thickener	TBC	Slurry Pipeline-dilute
Cooke Thickener to CPP	TBC	Slurry Pipeline-thickened-existing approved route GDARD,NNR
Ezulwini South TSF to CPP	TBC	Slurry Pipeline-thickened
CPP to RTSF	17 908	Tailings Pipeline – thickened (alternate routes)
CPP to Ezulwini	18 502	Tailings Pipeline (Uranium Rich) - dilute
BWSF to DRI3	7 699	Water Pipeline
BWSF to DRI5	14 168	Water Pipeline
K10 to west BWSF	10 477	Water Pipeline
Cooke shafts to Cooke TSF	TBC	Water Pipeline – existing approved route GDARD , NNR
Cooke 4 shaft to C4S TSF	TBC	Water Pipeline
RWD to AWTF	1 960	Water Pipeline
WBT to CPP (Alternative Route)	13 284	Slurry Pipeline (Alternative Route)

Amendments to various MWPs and EMPs will be applied for in due course pending the inclusion of additional TSFs as the WRTRP expands to process 4 Mt/m. The RTSF and CPP will be assessed for the complete footprint to ensure suitability for all future deposition requirements and envisaged process plant requirements in the CPP area. This application, however, deals with the amendment of the Kloof Mining Right to include the Initial Implementation activities occurring within or associated with this right.

1.3.3 Amendment of the Kloof Mining Right

This application and Scoping Report relates to the required environmental authorisations for initial implementation relevant to the Kloof Mining Right Area which entails:

- The inclusion of Venterspost North and South TSFs into the Kloof Mining Right Area;
- Abstraction of makeup water from the K10 shaft; and

- The construction and operation of:
  - The CPP;
  - The RTSF;
  - The Return Water Dam (RWD);
  - The Advanced Water Treatment Facility; and
  - Roads, power lines, pipelines and pump stations associated with the above listed infrastructure.

The activities associated with the Kloof application are listed in Table 1-5.

Table 1-5: Kloof Activities

Category	Activity
Kloof Mining Right area	
Infrastructure	Pipeline Routes (residual tailings).
	Central processing Plant (CPP) incorporating Module 1 float and gold plants and uranium, roaster and acid plants.
	The Regional Tailings Storage Facility (RTSF), RTSF Return Water Dam (RWD) and the Advanced Water Treatment Facility (AWTF). Collectively known as the RTSF complex.
Processes	Abstraction of water from K10 shaft
	Disposal of the residue from the AWTF.
	Gold, uranium and sulfur extraction at the CPP (tailings to RTSF)
	Water distribution at the AWTF for discharge.
Pumping	Pumping of up to 1.5 Mt/m of tailings to the RTSF.
	Pumping water from the RTSF return water dams to the AWTF.
	Discharging treated water to the Leeuspruit.
Electricity supply	Power supply from Kloof 1 substation to the CPP.
	Power supply from Kloof 4 substation to the RTSF and AWTF.

2 Project Applicant

SGL has appointed Digby Wells as the independent Environmental Assessment Practitioner (EAP) to conduct the EIA and associated specialist studies for the WRTRP, as well as the required Public Participation Process (PPP).

2.1 Item 2(a)(i): Details of EAP

Table 2-1 below provides the details of the Environmental Assessment Practitioner (EAP) working on the proposed Project.

Table 2-1: Contact details of the EAP

Name of Practitioner:	Mr Marcelle Radyn
Telephone:	+27 11 789 9495
Fax:	+27 11 789 9498
Email:	marcelle.radyn@digbywells.com

2.2 Item 2(a)(ii): Expertise of the EAP

2.2.1 The Qualifications of the EAP

Marcelle completed his BSc at the University of the Witwatersrand. He then completed a BSc (Hons) through the University of South Africa. Refer to Appendix 1 for proof of these qualifications.

2.2.2 Summary of the EAP's Past Experience

Marcelle is a Senior Environmental Consultant at Digby Wells within the Environmental Management Services Department. Marcelle has been with Digby Wells since 2012 and has managed many projects within South Africa. During his employment at Digby Wells, Marcelle has been extensively involved in the management of the Environmental Impact Assessment (EIA) process as well as with the compilation of Environmental Management Programmes (EMPr). This includes the completion of the EIA/EMPs for mining related projects in accordance with the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA). The projects involved managing the Public Participation Process (PPP), Project Meetings and resource allocation and management. He has also compiled numerous Prospecting Right Applications and Water Use License Applications (WULA). In addition he possesses experience in conducting due diligence investigations and EMP compliance auditing.

Refer to Appendix 2 for Marcelle's Curriculum Vitae (CV).

3 Item 2(b): Description of the Property

In terms of the Kloof Mining Right area (which includes Leeudoorn, Venterspost and Libanon), SGL holds a converted mining right GP 66 MR (registered in the MPRRO under 44/2007 MR) in respect of portions listed in Table 3-1.

Table 3-1: Farms Associated with the Kloof Mining Right Area

Kraalkop 147 IQ	Middelvlei 255 IQ	Uitval 280 IQ	Venterspost 284 IQ
Foch 150 IQ	Nelshoogte 246 IQ	Gemspost 288 IQ	Gemsbokfontein 290 IQ
Luipaardsvlei 243 IQ	Panvlakte 291 IQ	Bekkersdal 294 IQ	Elandsfontein 346 IQ
Doornpoort 347 IQ	Doornkloof 348 IQ	Doornkloof 350 IQ	Rietfontein 349 IQ
Leewdoorn 351 IQ	Leeuwpoort 356 IQ	Weltevreden 357 IQ	Wildebeestkuil 360 IQ
Davonia 363 IQ		Rietfontein 519 IQ	

This Mining Right includes the mines previously known as Kloof, Libanon, Leeudoorn and Venterspost.

The amendment of the Kloof Mining Right to include new activities and infrastructure will entail development on a number of properties (Plan 8). The aspects of the Initial Implementation of the WRTRP relevant to the Kloof Mining Area and the properties these will take place on are detailed in Table 3-2 to Table 3-9.

Table 3-2: AWTF Property Descriptions

	Description	**General Surveyor's Cadastral code**
Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Portion 13 of the farm Cardoville 364 IQ	T0IQ00000000036400013
Application Area (Ha):	0.36	
Magisterial District:	Vanderbijlpark Magisterial District	
Distance and direction from nearest town:	30 km SW of Carletonville	

Table 3-3: CPP Property Descriptions

Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Portion 0 of the farm Doornkloof 348 IQ Portion 5 of the farm Rietfontein 349 IQ Portion 11 of the farm Rietfontein 349 IQ Portion 35 of the farm Rietfontein 349 IQ Portion 36 of the farm Rietfontein 349 IQ	T0IQ00000000034800000 T0IQ00000000034900005 T0IQ00000000034900011 T0IQ00000000034900035 T0IQ00000000034900036
Application Area (Ha):	65	
Magisterial District:	Westonaria Magisterial District	
Distance and direction from nearest town:	22.46 km SW of Carletonville	

Table 3-4: RTSF and Return Water Dam (RWD) Property Descriptions

Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Portion 0 of the farm Cardoville 358 IQ Portion 3 of the farm Cardoville 358 IQ Portion 4 of the farm Cardoville 358 IQ Portion 1 of the farm Cardoville 364 IQ Portion 3 of the farm Cardoville 364 IQ Portion 4 of the farm Cardoville 364 IQ Portion 7 of the farm Cardoville 364 IQ Portion 8 of the farm Cardoville 364 IQ Portion 11 of the farm Cardoville 364 IQ Portion 13 of the farm Cardoville 364 IQ Portion 2 of the farm Droogheuvel 521 IQ Portion 2 of the farm Wildebeestkuil 360 IQ Portion 7 of the farm Wildebeestkuil 360 IQ Portion 18 of the farm Wildebeestkuil 360 IQ	T0IQ00000000035800000 T0IQ00000000035800003 T0IQ00000000035800004 T0IQ00000000036400001 T0IQ00000000036400003 T0IQ00000000036400004 T0IQ00000000036400007 T0IQ00000000036400008 T0IQ00000000036400011 T0IQ00000000036400013 T0IQ00000000052100002 T0IQ00000000036000002 T0IQ00000000036000007 T0IQ00000000036000018
Application Area (Ha):	1 380	
Magisterial District:	Vanderbijlpark Magisterial District (Cardoville) Potchefstroom Magisterial District (Droogheuvel and Wildebeestkuil)	
Distance and direction from nearest town:	35 km SW of Carletonville	

Table 3-5: K10 Shaft

Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Portion 31 of the farm Venter post 284 IQ	T0IQ00000000028400031
Application Area (Ha):	0.005	
Magisterial District:	Oberholzer Magisterial District	
Distance and direction from nearest town:	22 km SE of Carletonville	

Table 3-6: Venterspost North and South Property Descriptions

Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Remaining extent of the farm Gemspost 288 IQ Portion 13 of the farm Gemsbokfontein 290 IQ	T0IQ00000000028800000 T0IQ00000000029000013
Application Area (Ha):	60.68 (North), 30.5 (South)	
Magisterial District:	Oberholzer Magisterial District	
Distance and direction from nearest town:	22 km SE of Carletonville	

Table 3-7: Transmission Lines Property Descriptions

Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Portion 6 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600006
	Portion 7 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600007
	Portion 8 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600008
	Portion 24 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600024
	Portion 3 of the farm Cardoville 358 IQ	T0IQ00000000035800003
	Portion 1 of the farm Cardoville 364 IQ	T0IQ00000000036400001
	Portion 3 of the farm Cardoville 364 IQ	T0IQ00000000036400003
	Portion 4 of the farm Cardoville 364 IQ	T0IQ00000000036400004
	Portion 8 of the farm Cardoville 364 IQ	T0IQ00000000036400008
	Portion 13 of the farm Cardoville 364 IQ	T0IQ00000000036400013
	Portion 1 of the farm Cardoville 365 IQ	T0IQ00000000036400001
	Portion 20 of the farm Doornkloof 350 IQ	T0IQ00000000035000020
	Portion 73 of the farm Doornpoort 347 IQ	T0IQ00000000034700073
	Portion 1 of the farm Driefontein 113 IQ	T0IQ00000000011300001
	Portion 2 of the farm Driefontein 113 IQ	T0IQ00000000011300002
	Portion 2 of the farm Driefontein 355 IQ	T0IQ00000000035500002
	Portion 8 of the farm Driefontein 355 IQ	T0IQ00000000035500008
	Portion 10 of the farm Driefontein 355 IQ	T0IQ00000000035500010
	Portion 11 of the farm Driefontein 355 IQ	T0IQ00000000035500011
	Portion 15 of the farm Driefontein 355 IQ	T0IQ00000000035500015
	Portion 7 of the farm Rietfontein 349 IQ	T0IQ00000000034900007
	Portion 12 of the farm Rietfontein 349 IQ	T0IQ00000000034900012
	Portion 20 of the farm Rietfontein 349 IQ	T0IQ00000000034900020
	Portion 25 of the farm Rietfontein 349 IQ	T0IQ00000000034900025
	Portion 32 of the farm Rietfontein 349 IQ	T0IQ00000000034900032
	Portion 35 of the farm Rietfontein 349 IQ	T0IQ00000000034900035
	Portion 1 of the farm Springbok Kraal 359 IQ	T0IQ00000000035900001
	Portion 1 of the farm Wildebeestkuil 360 IQ	T0IQ00000000036000001
	Portion 2 of the farm Wildebeestkuil 360 IQ	T0IQ00000000036000002
	Portion 5 of the farm Wildebeestkuil 360 IQ	T0IQ00000000036000005
	Portion 7 of the farm Wildebeestkuil 360 IQ	T0IQ00000000036000007
	Portion 18 of the farm Wildebeestkuil 360 IQ	T0IQ00000000036000018
Application Area (Ha):	325	
Magisterial District:	Oberholzer Magisterial District (Blyvooruitzicht and Driefontein) Vanderbijlpark Magisterial District (Cardoville) Westonaria Magisterial District (Doornkloof, Doornpoort and Rietfontein) Potchefstroom Magisterial District (Springbok Kraal and Wildebeestkuil)	
Distance and direction from nearest town:	4 to 25 km SE from Carletonville	

Table 3-8: Pipeline Routes Property Descriptions

Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Portion 6 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600006
	Portion 7 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600007
	Portion 8 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600008
	Portion 24 of the farm Blyvooruitzicht 116 IQ	T0IQ00000000011600024
	Portion 3 of the farm Cardoville 358 IQ	T0IQ00000000035800003
	Portion 1 of the farm Cardoville 364 IQ	T0IQ00000000036400001
	Portion 3 of the farm Cardoville 364 IQ	T0IQ00000000036400003
	Portion 4 of the farm Cardoville 364 IQ	T0IQ00000000036400004
	Portion 7 of the farm Cardoville 364 IQ	T0IQ00000000036400007
	Portion 11 of the farm Cardoville 364 IQ	T0IQ00000000036400011
	Portion 13 of the farm Cardoville 364 IQ	T0IQ00000000036400013
	Portion 0 of the farm Doornkloof 348 IQ	T0IQ00000000034800000
	Portion 1 of the farm Doornkloof 350 IQ	T0IQ00000000035000001
	Portion 4 of the farm Doornkloof 350 IQ	T0IQ00000000035000004
	Portion 5 of the farm Doornkloof 350 IQ	T0IQ00000000035000005
	Portion 6 of the farm Doornkloof 350 IQ	T0IQ00000000035000006
	Portion 12 of the farm Doornkloof 350 IQ	T0IQ00000000035000012
	Portion 13 of the farm Doornkloof 350 IQ	T0IQ00000000035000013
	Portion 21 of the farm Doornkloof 350 IQ	T0IQ00000000035000021
	Portion 22 of the farm Doornkloof 350 IQ	T0IQ00000000035000022
	Portion 33 of the farm Doornkloof 350 IQ	T0IQ00000000035000033
	Portion 2 of the farm Doornpoort 347 IQ	T0IQ00000000034700002
	Portion 5 of the farm Doornpoort 347 IQ	T0IQ00000000034700005
	Portion 7 of the farm Doornpoort 347 IQ	T0IQ00000000034700007
	Portion 11 of the farm Doornpoort 347 IQ	T0IQ00000000034700011
	Portion 12 of the farm Doornpoort 347 IQ	T0IQ00000000034700012
	Portion 18 of the farm Doornpoort 347 IQ	T0IQ00000000034700018
	Portion 19 of the farm Doornpoort 347 IQ	T0IQ00000000034700019
	Portion 26 of the farm Doornpoort 347 IQ	T0IQ00000000034700026
	Portion 35 of the farm Doornpoort 347 IQ	T0IQ00000000034700035
	Portion 39 of the farm Doornpoort 347 IQ	T0IQ00000000034700039
	Portion 40 of the farm Doornpoort 347 IQ	T0IQ00000000034700040
	Portion 73 of the farm Doornpoort 347 IQ	T0IQ00000000034700073
	Portion 1 of the farm Driefontein 113 IQ	T0IQ00000000011300001
	Portion 2 of the farm Driefontein 113 IQ	T0IQ00000000011300002
	Portion 0 of the farm Driefontein 355 IQ	T0IQ00000000035500000
	Portion 4 of the farm Driefontein 355 IQ	T0IQ00000000035500004

	Portion 5 of the farm Driefontein 355 IQ	T0IQ00000000035500005
	Portion 8 of the farm Driefontein 355 IQ	T0IQ00000000035500008
	Portion 10 of the farm Driefontein 355 IQ	T0IQ00000000035500010
	Portion 11 of the farm Driefontein 355 IQ	T0IQ00000000035500011
	Portion 15 of the farm Driefontein 355 IQ	T0IQ00000000035500015
	Portion 22 of the farm Driefontein 355 IQ	T0IQ00000000035500022
	Portion 0 of the farm Leeudoorn 351 IQ	T0IQ00000000035100000
	Portion 0 of the farm Libanon 283 IQ	T0IQ00000000028300000
	Portion 0 of the farm Modderfontein 345 IQ	T0IQ00000000034500000
	Portion 10 of the farm Modderfontein 345 IQ	T0IQ00000000034500010
	Portion 23 of the farm Modderfontein 345 IQ	T0IQ00000000034500023
	Portion 24 of the farm Modderfontein 345 IQ	T0IQ00000000034500024
	Portion 28 of the farm Modderfontein 345 IQ	T0IQ00000000034500028
	Portion 30 of the farm Modderfontein 345 IQ	T0IQ00000000034500030
	Portion 41 of the farm Modderfontein 345 IQ	T0IQ00000000034500041
	Portion 44 of the farm Modderfontein 345 IQ	T0IQ00000000034500044
	Portion 52 of the farm Modderfontein 345 IQ	T0IQ00000000034500052
	Portion 63 of the farm Modderfontein 345 IQ	T0IQ00000000034500063
	Portion 65 of the farm Modderfontein 345 IQ	T0IQ00000000034500065
	Portion 69 of the farm Modderfontein 345 IQ	T0IQ00000000034500069
	Portion 2 of the farm Rietfontein 349 IQ	T0IQ00000000034900002
	Portion 5 of the farm Rietfontein 349 IQ	T0IQ00000000034900005
	Portion 11 of the farm Rietfontein 349 IQ	T0IQ00000000034900011
	Portion 12 of the farm Rietfontein 349 IQ	T0IQ00000000034900012
	Portion 13 of the farm Rietfontein 349 IQ	T0IQ00000000034900013
	Portion 14 of the farm Rietfontein 349 IQ	T0IQ00000000034900014
	Portion 35 of the farm Rietfontein 349 IQ	T0IQ00000000034900035
	Portion 36 of the farm Rietfontein 349 IQ	T0IQ00000000034900036
	Portion 41 of the farm Rietfontein 349 IQ	T0IQ00000000034900041
	Portion 42 of the farm Rietfontein 349 IQ	T0IQ00000000034900042
	Portion 47 of the farm Rietfontein 349 IQ	T0IQ00000000034900047
	Portion 0 of the farm Uitval 280 IQ	T0IQ00000000028000000
	Portion 8 of the farm Uitval 280 IQ	T0IQ00000000028000008
	Portion 9 of the farm Uitval 280 IQ	T0IQ00000000028000009
	Portion 4 of the farm Waterpan 292 IQ	T0IQ00000000029200004
	Portion 13 of the farm Waterpan 292 IQ	T0IQ00000000029200013
	Portion 24 of the farm Waterpan 292 IQ	T0IQ00000000029200024
	Portion 26 of the farm Waterpan 292 IQ	T0IQ00000000029200026

	Portion 1 of the farm Wildebeestkuil 360 IQ Portion 2 of the farm Wildebeestkuil 360 IQ Portion 7 of the farm Wildebeestkuil 360 IQ Portion 18 of the farm Wildebeestkuil 360 IQ	T0IQ00000000036000001 T0IQ00000000036000002 T0IQ00000000036000007 T0IQ00000000036000018
Application Area (Ha):	8 500	
Magisterial District:	Oberholzer Magisterial District (Driefontein and Blyvooruitzicht) Potchefstroom Magisterial District (Wildebeestkuil) Vanderbijlpark Magisterial District(Cardoville and Doornpoort) Westonaria Magisterial District (Doornkloof, Leeudoorn, Libanon, Modderfontein, Uitval and Waterpan)	
Distance and direction from nearest town:	15 km SE of Westonaria	

Table 3-9: Pump Stations Property Descriptions

Farm Name(s) and 21 digit Surveyor General Code(s) for each farm portion:	Portion 8 of the farm Blyvooruitzicht 116 IQ Portion 24 of the farm Blyvooruitzicht 116 IQ Portion 1 of the farm Driefontein 113 IQ Portion 10 of the farm Driefontein 355 IQ Portion 11 of the farm Driefontein 355 IQ	T0IQ00000000011600008 T0IQ00000000011600024 T0IQ00000000011300001 T0IQ00000000035500010 T0IQ00000000035500011
Application Area (Ha):	0.05	
Magisterial District:	Oberholzer Magisterial District	
Distance and direction from nearest town:	4.5 km E of Carletonville	

Plan 8: Land Tenure

4 Item 2(c): Locality Map

The WRTRP ultimate scope is located across the West Rand District Municipality (WRDM) in Gauteng Province. The WRDM includes four local municipalities (LMs): Mogale City, Westonaria, Randfontein and Merafong City. Towns and larger settlements located in the broader project area include Randfontein, Toekomsrus, Fochville, Carletonville, Westonaria, Venterspost, Modderfontein, Rietvallei, Bekkersdal and Mohlakeng.

Although sections of the RTSF traverse the Merafong City Local Municipality (LM), the Kloof Mining Right area falls predominantly within the Westonaria City Local Municipality. Land uses in the Westonaria LM can be categorised in three main divisions, i.e. agriculture, mining, and residential. Agriculture is the dominant land use in the LM, followed by mining and residential land uses, with the latter accounting for approximately 8% of the total land area of the LM. The municipality's human settlements are relatively scattered due to the mining activities taking place. The LM's residential development is generally dispersed with the dominant townships including:

- Westonaria;
- Bekkersdal;
- Hillshaven;
- Glenharvie;
- Venterspost;
- Simunye; and
- Mining towns such as Libanon and Waterpan.

The most significant land uses within the project area are mining, agriculture, residential and businesses. Of these, agriculture covers the largest portion of the area, followed by mining and residential uses. The area includes a large number of both historical and existing mining activities.

As indicated in (Plan 1), the Kloof Mining Right area is situated West of the R28 regional road and north of the R54, in Westonaria.

5 Item 2(d): Description of the Scope of the Proposed Overall Activity

While the ultimate project activity is described in section 1.3.1 above, the required environmental authorisations for initial implementation relevant to envisaged activities pertaining to the Kloof Mining Right area include:

- The inclusion of Venterspost North and South into the Kloof Mining Right Area;
- Abstraction of makeup water from the K10 shaft; and
- The construction and operation of:
  - The CPP;
  - The RTSF;
  - The Return Water Dam (RWS);
  - The Advanced Water Treatment Facility; and
  - Roads, power lines, pipelines and pump stations associated with the above listed infrastructure.

The activities listed above are described in more detail in Section 5.2 below.

5.1 Listed and Specified Activities

5.1.1 Environmental Authorisation

The primary authorisation to consider will be an Environmental Authorisation to be granted in accordance with the Environmental Impact Assessment Regulations, 2014 (the EIA 2014 Regulations) promulgated in terms of the provisions of the National Environmental Management Act, 1998, as amended (NEMA). NEMA identifies two classes of activities requiring authorisation, those of a less significant nature requiring evaluation by what is described as a Basic Assessment process (BA), and those with substantial impact with require a more detailed scoping and environmental impact assessment (S&EIA) process. In addition to the EIA 2014 Regulations, the Minister of Environmental Affairs (DEA) has published two notices identifying activities that require a BA process (Listing Notice 1) and a full Environmental Impact Assessment process (Listing Notice 2). The proposed activities should be assessed against the activities listed in the two listing notices to determine what which of the Listed Activities will be triggered. As this project triggers activities under both Listing Notice 1 and 2, a Full EIA process will be undertaken.

The listed and specified activities are set out in Table 5-1 below.

Part 3 of Chapter 4 of the EIA 2014 Regulations sets out the timeframe for applying for and obtaining an Environmental Authorisation (EA). In brief, this requires:

- Compilation of a Scoping Report: within 44 days from date of submission of the application for the EA, a Scoping Report must be submitted to the competent authority;
- Consideration of the Scoping Report by the competent authority: the competent authority must reach a decision on the Scoping Report within 43 days and either accepts it and directs the applicant to proceed with the EIA, or refuse it under defined circumstances;
- Preparation of the EIA: the applicant must prepare a detailed EIA and an Environmental Management Programme (EMPr)in accordance with the Scoping Report and submit it to the competent authority within 106 days after being directed to do so; and
- Decision on the application: the competent authority must reach a decision on the EIA and the EMPr and either grant authorisation or refuse it.

5.1.2 Waste Management

The Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 were published on Friday 24 July 2015 in GN R632 in GG 39020. These Regulations provide the framework for the management of TSFs in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA), in place of the Regulations previously in place in terms of the MPRDA. Although the DMR will remain the competent authority, residue stockpiles and residue deposits will now be governed by the new NEM:WA Regulations.

The implications in brief are as follows:

- The identification and assessment of environmental impacts arising from residue stockpiles and residue deposits must be done as part of the environmental impact assessment;
- The management of residue stockpiles and residue deposits must be in accordance with any conditions and management measures in the EMP and waste management licence;
- A risk analysis based on the identified characteristics and the classification must be used to determine the appropriate mitigation and management measures;
- Residue stockpile and residue deposit must be characterised to identify any potential risk to health, safety and environmental impacts that may be associated with the residue when stockpiled or deposited, in terms of its physical characteristics, chemical characteristics and mineral content; and

- The required pollution control barrier system shall be defined by the National Norms and Standards for the Assessment of Waste for Landfill Disposal and the National Norms and Standards for Disposal of Waste to Landfill.

As far as the design of TSFs is concerned, the Regulations provide that the design must be undertaken by a professional civil or mining engineer, an assessment of the typical soil profile on the site is required for all residue stockpile and residue deposit must be made and the design of a residue stockpile and residue deposit must take into account all phases of the life cycle of the residue stockpile and residue deposit, from construction through to post closure

The List of waste management activities that have, or are likely to have, a detrimental effect on the environment published in GN 921 in GG 37083 of 29 November 2013 have been amended in terms of GN R633 in GG 39020 of 24 July 2015 to include residue deposits and residue stockpiles.

Further details pertinent to the policy and legislative context of this project is set out in Section 6 of this report.

Table 5-1: Project Activities

Listed Activity		Description of Activity	Aerial extent of the activity
Listing notice GNR 983 (Basic Assessment) (NEMA)			
Activity 9	The development of infrastructure exceeding 1 000 m in length for the bulk transportation of water or storm water- ▪ with an internal diameter of 0.36 metres or more; or ▪ with a peak throughput of 120 litres per second or more.	Transportation of water from K10 Shaft to the Bulk Water Storage Facility (BWSF). The pipeline will have a diameter of at least 0.36 m with a daily throughput of approximately 230 l/s.	The total aerial extent of envisaged pipelines will cover approximately 8 500 ha.
Activity 10	The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes- ▪ with an internal diameter of 0,36 metres or more; or ▪ with a peak throughput of 120 litres per second or more.	Pipelines will be installed to convey slurry and process water between the RWD and RTSF.	
Activity 11	The development of facilities or infrastructure for the transmission and distribution of electricity- ▪ outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.	The development of facilities or infrastructure for the transmission and distribution of electricity. The electrical switch gear will be 132 kV (transmission will be either 6.6 kV or 11 kV).	The total aerial extent of envisaged power lines will cover approximately 325 ha.

Listed Activity		Description of Activity	Aerial extent of the activity
Activity 12	The development of- ▪ infrastructure or structures with a physical footprint of 100 square metres or more where such development occurs- ▪ within a watercourse; ▪ in front of a development setback; or ▪ if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	Where the pipeline routes traverse watercourses. There are approximately 25 watercourse crossings.	250 m^2
Activity 14	The development of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	Diesel and reagents storage for the CPP. Diesel storage on site will be at least 80 m^3 and in horizontal tanks. Total cyanide storage will be approximately 150 m^3; caustic storage 80 m^3 and acid storage 40 m^3.	65 ha
Activity 16	The development and related operation of facilities for the desalination of water with a design capacity to produce more than 100 cubic metres of treated water per day.	Desalination works at AWTF.	3 600 m^2
Activity 19	The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- ▪ a watercourse.	Wherever pipelines route cross over watercourses.	250 m^2

Listed Activity		Description of Activity	Aerial extent of the activity
Activity 24	The development of a road with a reserve wider than 13.5 m, or where no reserve exists, the road is wider than 8 m.	Additional roads to be constructed to allow for access to new infrastructure such as the RTSF and CPP.	TBC
Activity 45	The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure- ▪ has an internal diameter of 0.36 metres or more; or ▪ has a peak throughput of 120 litres per second or more; and ▪ where the facility or infrastructure is expanded by more than 1 000 metres in length; or where the throughput capacity of the facility or infrastructure will be increased by 10% or more.	Upgrade of pipelines at K10 Shaft.	The total aerial extent of envisaged pipelines will cover approximately 8 500 ha.
Activity 67	Phased activities for all activities ▪ listed in this Notice, which commenced on or after the effective date of this Notice; or ▪ similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices	Construction of the CPP and RTSF. The CPP will be constructed in phases over an eight year period. The RTSF will be constructed as required over the life of the project.	1 380 ha

Listed Activity		Description of Activity	Aerial extent of the activity
Listing notice GNR 984 (Full Scoping and EIA) (NEMA)			
Activity 6	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.	Applications for authorisation will need to be submitted in terms of the NNRA, NWA and NEM: AQA.	N/A
Activity 15	The clearance of an area more than 20 hectares of indigenous vegetation.	Clearing of land for the construction of the CPP, RTSF and AWTF.	More than 20 hectares of indigenous vegetation will be cleared.
Activity 16	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high water mark of the dam covers an area of 10 hectares or more.	Construction of the RTSF and the RWD. The RTSF will have a final height of 100 m and cover an area of 1 350 ha. The RTSF's RWD will have a wall height of 5 m to 10 m, and with a total storage volume of at least 3.5 Million m^3.	1 380 ha
Activity 17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	A Section 102 Amendment will be applied for to include the additional mining operations into the existing Kloof mining right.	N/A

Listed Activity		Description of Activity	Aerial extent of the activity
Activity 21	Any activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing but excluding the smelting, beneficiation, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.	Reprocessing of gold and uranium tailings at the CPP.	65 ha
Activity 25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of 15 000 cubic metres or more.	Operation of the AWTF.	3 600 m^2
Activity 28	Commencing of an activity, which requires an atmospheric emission license in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004).	Applications for authorisation will need to be submitted in terms of the NNRA, NWA and NEM: AQA.	N/A
Listing notice GNR 921 (Full Scoping and EIA, Category B) (NEM: WA)			
Activity 1	The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage.	Construction and operation of the RTSF and the sewage treatment plant.	1 380 ha
Activity 7	The disposal of any quantity of hazardous waste.	Operation of RTSF.	1 380 ha
Activity 11	The establishment or reclamation of a residue stockpile or residue deposit.	Establishment of the RSTF	1 380 ha

5.2 Description of the Activities to be undertaken

This section describes in detail the envisaged activities to be undertaken and includes, including (Plan 4):

- Abstracting water from K10 shaft;
- Construction of pipelines;
- Construction of transmission lines;
- Construction and operation of
  - Pump stations;
  - The CPP;
  - The AWTF;
  - The RTSF; and
  - The RWD.

Existing infrastructure to be leveraged off of includes:

- Kloof 1 and Kloof 4 electrical substations;
- The K10 shaft (as makeup water source);
- Kloof processing plants if required; and
- Pollution control and return water dams at the existing Kloof operation.

During the construction phase of the project the environmental aspects of land transformation, job creation and spending may need to be investigated further. Land transformation was seen to have an influence on the heritage landscape, land use and biophysical (wetlands and fauna & flora) of the project areas. This applies to all the areas of surface disturbance; pipelines, RTSF, CPP and support infrastructure.

The creation of jobs was seen to link to the characterisation of the social environment of the study area and this would need to be studied to identify possible impacts; positive and negative. The capital expenditure as well as the operational costs for the project are linked to the economic analysis of the project.

The activities associated with the construction phase are summarised in Figure 5-1.

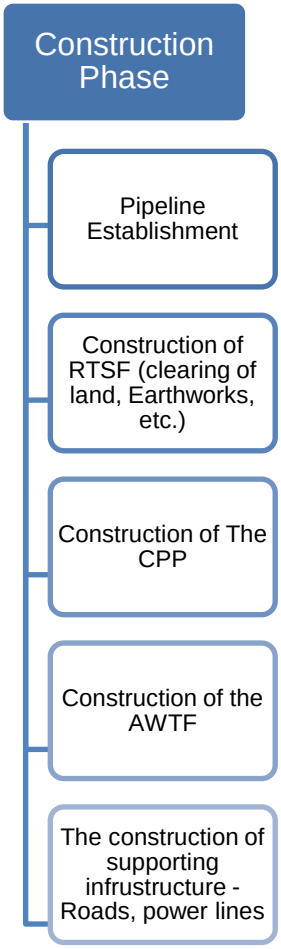

Figure 5-1: Summary of construction activities - Kloof

It is during the operational phase that a number of activities, with associated environmental aspects and impacts, will take place. These can be linked to the 6 main project activities as summarised in Figure 5-2.

Note: The processing of the uranium concentrate at Ezulwini has been authorised as part of the Ezulwini Mining Right and EMP. This project is concerned with the proposed pipeline to Ezulwini which has not been authorised and as such forms part of this application.

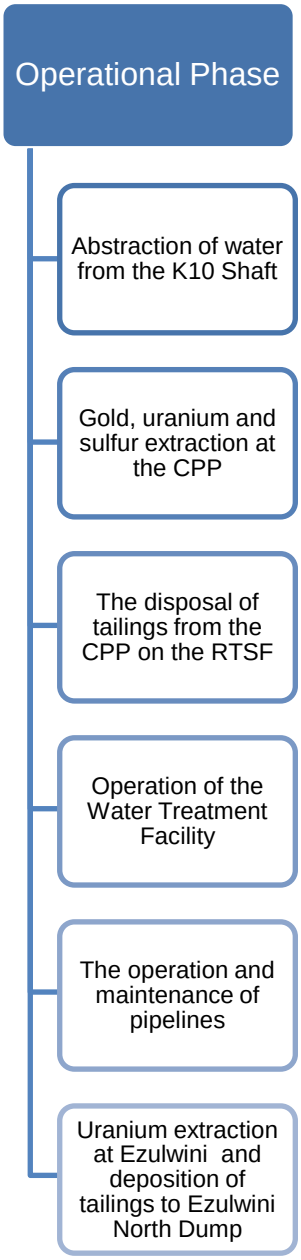

Figure 5-2: Main activities associated with the operational phase of the project – Kloof

The project spans several mining right areas with pipelines often required to traverse areas where no mining right is held. To ensure the liability of project infrastructure is attributed to SGL's mining right areas, the following principles were adopted:

- The mining right area within which infrastructure is situated will be liable for said infrastructure;
- Where pipelines traverse non-mining areas, the mining right area whose activities necessitate the pipeline, will accept liability; and
- The Kloof mining right area will be extended to include RTSF complex footprint.

Plan 2 shows the infrastructure and the mining right area liable for it.

5.2.1 Water from K10 Shaft

A number of water sources have been identified, from which water can be supplied to the surface reclamation operations, one such source is the K10 Shaft, located just west of Westonaria. The WRTRP has recognised that water is a scarce and strategic commodity and hence mine impacted water will be used preferentially over Rand Water or other higher quality sources. Water will be supplied to the reclamation areas from the identified sources via water storage facilities.

Once the impacted mine water has been used in the hydraulic reclamation process, it will find its way to the RTSF. As water builds up in the RTSF it will be drained to the RWD and treated at the AWTF. The water can then either be treated to potable standards (SANS 241:2011), depending on the final use.

5.2.2 Central Processing Plant

The anticipated location for the CPP is mid-way between Kloof main and Kloof 4 shaft central to all the resources, water and power supply as well as existing and planned infrastructure (Plan 5). The Plant will be developed in phases to eventually treat up to 4 Mt/month of historical tailings and current arisings. The CPP will eventually be comprised of (Plan 6):

- Gold Plant Modules;
- Float plants and associated infrastructure (one associated with the uranium plants);
- Roasters and associated infrastructure;
- Acid plants and associated infrastructure;
- Uranium processing plants;
- Bulk sulfuric acid storage facility;
- Loading facilities for uranium concentrate, bulk sulfuric acid and reagents;
- Bulk Water storage facilities; and
- Pollution control dams.

The process flow of the CPP is as follows:

- Screened and thickened slurry will be delivered to the CPP by overland pipeline from the West Block Thickener (WBT) at a high slurry density (RD 1.6) at a rate of 1Mt/m. Upon arrival, the slurry will be diluted to an RD of 1.3 or 35% solids, using recirculated process water, and will then be subjected to a flotation process using a combination of sulphide and oxide flotation reagents. The first 5% concentrate mass pull (50 000 t/month), containing the naturally floatable gold, as well as most of the gold associated with sulphide minerals and uranium, will be subjected to ultra-fine

grinding to liberate locked up gold, following which it will be thickened and pumped to the Ezulwini Plant for uranium.

- A further 15% flotation concentrate mass pull (150 000 t/month), containing the balance of the sulphide-associated gold as well as the oxide-associated gold, will be thickened and pumped to a new Carbon In Leach (CIL) gold plant to be constructed within Module 1 of the CPP (refer to Plan 6).
- In the CIL Gold Plant, slaked lime will be added to the feed slurry to maintain a pH of 10.5. The slurry will then be leached with cyanide to enable the gold to be adsorbed onto activated carbon in the 7-stage CIL plant. The loaded carbon will be acid treated and eluted in a Zadra elution plant.
- Gold will be recovered from the eluate in an electro winning plant located inside the Gold Room (smelt house). Regenerated carbon will be recycled to the CIL plant.
- CIL tailings will be subjected to a Weak Acid Dissociable (WAD) cyanide destruction process before being mixed with flotation tailings. These tailings will then be thickened and pumped to the Regional Tailings Storage Facility (RTSF).
- A common reagent offloading, storage and mixing facility will be provided at a designated area at the plant boundary.

5.2.3 Regional Tailings Storage Facility

The RTSF will be located on a site originally known as B2/B3 as part of the WWP (site 33/34 from the CUP (Geluksdal project), which was the alternate site for the West Wits CTSF, shown in Plan 7. The RTSF is situated south west of the current Doornpoort TSF which is operated by Gold Fields.

This new Tailings Facility is seen to be a facility that will cater for both the tailings generated by the WRTRP as well as possibly for other tailings produced in the region. It is likely that the construction of the Regional Tailings Storage Facility will be phased (initial 1.5 Mt/m progressing to up to 4 Mt/m) to suit the envisaged tonnage build up. This RTSF has been positioned and sized as a facility that can cater for both the tailings generated by the WRTRP as well as other tailings located in the region approximating 1.3 billion tonnes.

Auxiliary infrastructure to be constructed as part of the RTSF complex includes:

- A penstock tower;
- Penstock outlet pipeline;
- Silt traps;
- Cascade ponds; and
- The RWD.

It is likely that the construction of the RTSF will be phased to suit the envisaged tonnage build up from the initial 1.5 to 4 Mt/m. The RTSF will be sized, assessed and permitted on the basis of accommodating the long term requirements for the region both in tonnage capacity and a deposition rate of 4 Mt/m.

There are various aspects pertaining to the operation and maintenance of the RTSF and include:

- Method of deposition;
- Wall raising procedure;
- On-dam pipework;
- Decant management;
- Operation of on-site pump stations;
- General maintenance;
- Concurrent Rehabilitation;
- Installation of Infrastructure during Step-in Phase;
- Annual drainage enhancement installations; and
- Monitoring.

5.2.3.1 Return Water Dam

The design and management of the RTSF RWD will need to be undertaken in line with the requirements of the GN 704 regulations. The RWD has therefore been sized to ensure that it is unlikely to spill into any clean water system more than once in 50 years, given a certain return water and/or water treatment rate.

The ultimate RWD arrangement, which will consist of a series of compartments due to the phased development of the RTSF, will require a total storage capacity of at least 3.5 million m^3. To limit seepage of process water, the RWD will be lined with a geocomposite liner consisting of a geomembrane underlain by a 300 mm thick layer of clayey material won from site. A seepage collection system will also be provided to intercept and identify any leakage.

5.2.4 Advanced Water Treatment Facility

The AWTF will treat the return water generated from the RTSF and will essentially replace the normal return water systems conventionally adopted with a view to optimising capital and aligning the WRTRP with SGL's overall water management strategy (to be detailed in the EIA Report).

Following the production of a comprehensive water and salt balance, various parameters which would influence the selection of water treatment technologies were identified and are discussed under Section 9 of this document.

As for the preferred option, a design by Watercare Mining will be pursued (Plan 9: Pipelines Alternatives

). The design consists of a multiple stage softening and membrane separation process. The method of softening uses a Crystalactor® process for softening which reduces the incoming water hardness by the precipitation of calcium pellets. Through pH control and a feed crystal source of fine quartz sand, precipitation is controlled and creates fine pellets which are highly stable and easy to handle. This effectively combines the softening and clarifying stage in one process. This is followed by GAC (Granular Activated Carbon) and Nano-filtration to remove all solids as well as organic compounds to protect the Reverse Osmosis (RO) membranes from damage and fouling. The filtrate from the first stage membranes is below the prescribed quality and the brine is sent to a secondary Crystalactor® for softening again and follows the same processes as described by Stage 1. Three stages are used to create an overall water recovery of 93% with the solid waste discharged as stable pellets at an approximate water content of only 5%. Each stage of RO membrane recovery ranges from 65% to 50%, with each consecutive stage being lower recovery due to the saturation limit as well as the operating pressure being kept as low as possible to conserve energy.

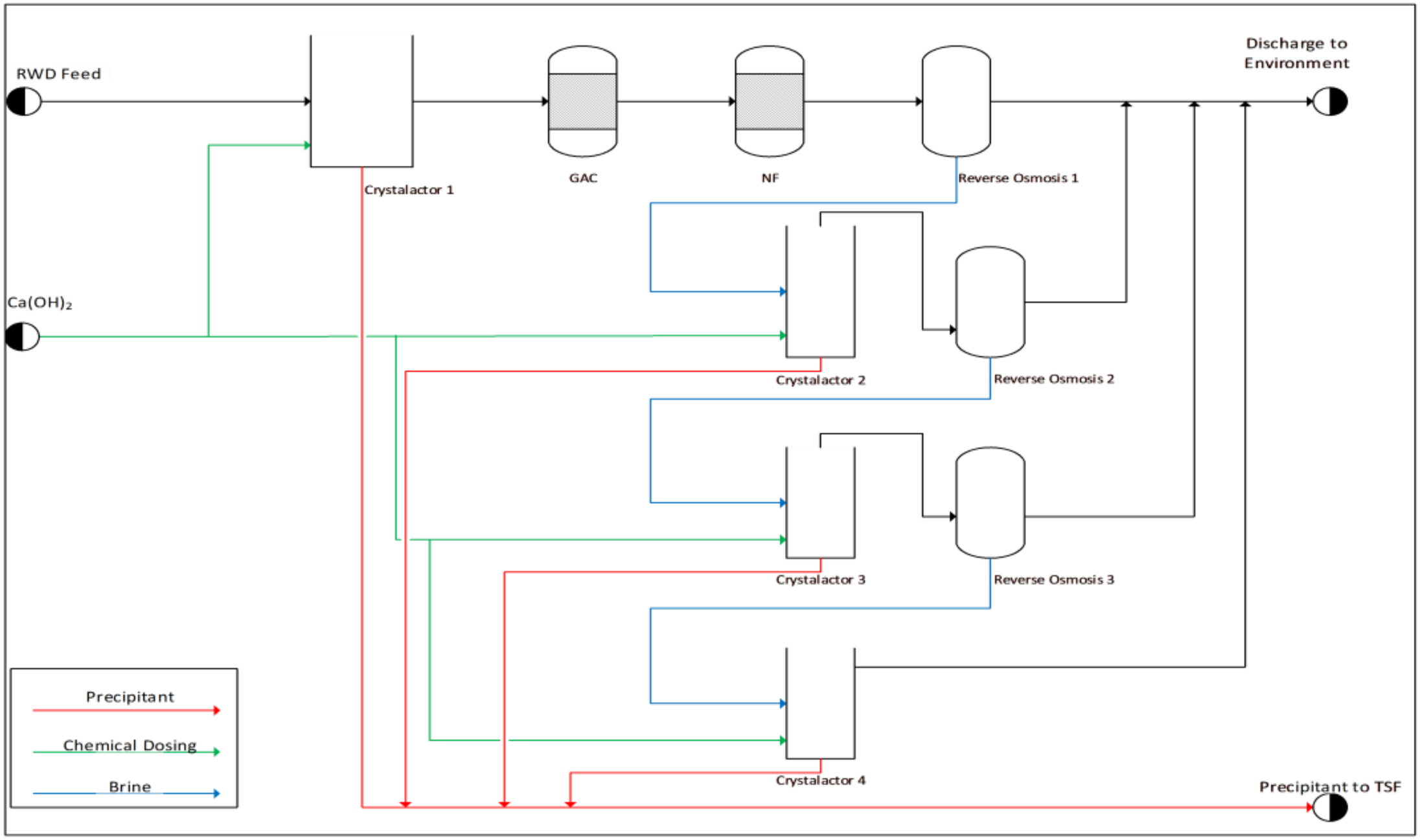

Figure 5-3: Process Flow Diagram of Watercare Mining Treatment Process

The options for disposal of the pellets is either by creating a slurry that is pumped to the RTSF, or it needs to be collected on a drying bank and collected with a tipper and driven to the RTSF for disposal. The footprint of the proposed plant is approximate area of 3 600 m^2.

5.2.5 Pipeline Routes (Kloof Mining Right area only)

Existing mine servitudes will be utilised as far as possible for the overland piping. The following pipeline routes are relevant to this application (refer to Plan 4 and Table 5-2 for routes and lengths):

- Slurry pipeline from the CPP to the RTSF; and
- Water pipeline from the RWD to the AWTF.

The total pipeline route length for Kloof is 19 868m. The pipeline routes have been developed to take cognisance of the existing servitudes, the location of the TSFs and the locations of the proposed infrastructure, such as the CPP, RTSF and thickeners. In addition, sensitive environments have been taking into consideration, as well as mine owned land and already disturbed areas. The overall pipeline route alternatives that were considered are provided in Plan 9.

Table 5-2: Pipeline Route Lengths

Name	Length (m)	Type
CPP to RTSF	17 908	Slurry Pipeline
RWD to AWTF	1 960	Water Pipeline

5.2.6 Transmission Lines

Transmission lines will be constructed to convey electricity from the existing Kloof 1 substation to the CPP (3 405 m) and from Kloof 4 substation to the RTSF / AWTF (12 893 m). The design specifications of these lines are still underway but currently the switch gear will be 132 kV and the transmission lines either 6.6 or 11 kV to the CPP.

5.2.7 Pump Stations

Pump stations or booster pump stations will be constructed to convey water and slurry as required.

Plan 9: Pipelines Alternatives

6 Item 2(e): Policy and Legislative Context

This section (Table 6-1 and Table 6-2), although also applicable to the Ultimate WRTRP, relates specifically to the Kloof Mining Right in the context of this Scoping Report. It aims to provide a description of the policy and legislative context within which the project is being proposed. This section has been divided into national, provincial and local legislation and policies, plans, guidelines and development planning frameworks and tools.

Table 6-1: Relevant National Legislation

Applicable legislation and guidelines used to compile the report	Reference where applied
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Under Section 24 of the Constitution of the Republic of South Africa, it is clearly stated that: *Everyone has the right to (a) an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -* *(i) Prevent pollution and ecological degradation;* *(ii) Promote conservation; and* *(iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*	An EIA process is being undertaken to determine the impacts associated with the project. As part of the EIA process, mitigation measures and monitoring plans will be recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.

Applicable legislation and guidelines used to compile the report	Reference where applied
National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA) and EIA Regulations (December 2014) The National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA), as amended was set in place in accordance with Section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The Environmental Impact Assessment (EIA) Regulations, Government Notice Regulation (GN) R982 were published on 04 December 2014 and promulgated on 08 December 2014 (the EIA 2014 Regulations). Together with the EIA 2014 Regulations, the Minister also published GN R 983 (Listing Notice No. 1), GN 984 (Listing Notice No. 2) and GN R 985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended.	The EIA process will be undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA 2014 Regulations, promulgated in terms of NEMA. These Listed Notices have been reviewed against the project activities to determine the likely triggers. The listed activities which are potentially triggered under the Listing Notices are provided in Table 5-1. Based on the activities listed, it has been identified that a full EIA process is required for the project. An application for the listed activities will be submitted to the DMR who is the relevant Competent Authority in terms of this application for Environmental Authorisation.

Applicable legislation and guidelines used to compile the report	Reference where applied
<u>GN R. 982 National Environmental Management Act, 1998 (Act No. 107 of 1998): Environmental Impact Assessment Regulations, 2014</u> These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: ▪ Regulation GN R. 983 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process. ▪ Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process. ▪ Regulation GN R. 985 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	Refer to Table 5-1 above for the listed activities which could potentially be triggered by the proposed project.

Applicable legislation and guidelines used to compile the report	Reference where applied
National Water Act, 1998 (Act No. 36 of 1998) (NWA) The National Water Act, 1998 (Act No. 36 of 1998) (NWA) provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. **GN R704 National Water Act, 1998 (Act No. 36 of 1998)** Regulations 4 and 5 of the regulation on use of water for mining and related activities aimed at the protection of water resources, Government Notice Regulation 704 (GN R No. 704) published in June 1999, states the following: ▪ Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution. ▪ Regulation 5: No person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution. ▪ Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, while Regulation 7 details the requirements necessary for the protection of water resources.	An Integrated Water Use Licence Application (IWULA) and Integrated Water and Waste Management Plan (IWWMP) will be compiled and submitted to the Department of Water and Sanitation (DWS) as the decision making authority. The water uses which may be triggered under Section 21 of the NWA in relation to the proposed project are listed below: ▪ S21(c) – Impeding or diverting the flow of water in a watercourse; ▪ S21 (g) – Disposing of waste in a manner which may detrimentally impact on a water resource; ▪ S21 (i) – Altering the bed, banks, course or characteristics of a watercourse; ▪ S21 (j) - Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

Applicable legislation and guidelines used to compile the report	Reference where applied
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) (MPRDA) A Mining Right Application (MRA) submitted to the Department of Mineral Resources (DMR) in terms of the Mineral and Petroleum Resources Act, 2002 (Act No.28 of 2002) (MPRDA) must be succeeded by various documents including a Scoping Report, EIA Report and an EMP. The MPRDA requires that mining companies assess the socio-economic impacts of their activities from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts.	This Scoping Report, which relates specifically to the Kloof Mining Right (although it is generally applicable to the WRTRP as a whole) has been compiled in accordance with the MPRDA read with the EIA 2014 Regulations.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance: ▪ Alien and Invasive Species Lists, 2014 published (GN R599 in GG 37886 of 1 August 2014) ; ▪ National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; ▪ National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN 1002, 9 December 2011).	As part of this project, a flora, fauna, wetlands and aquatic assessment will be undertaken to determine the current status of the environment and to determine any potential ecological sensitivities to be avoided and/or mitigated. There are currently no applications submitted in terms of NEM:BA for the project. This will be confirmed during the detailed specialist investigations.

Applicable legislation and guidelines used to compile the report	Reference where applied
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) According to the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA) the Department of Environmental Affairs (DEA), the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA is the establishment of National Ambient Air Quality Standards (NAAQS) (GN R 1210 of 2009). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.	An Air Quality Assessment will be undertaken to determine the baseline conditions of the air prior to the implementation of the proposed activities at the CPP and RTSF. The project activities will be set out to abide by the NEM: AQA and standards set out in the National Ambient Air Quality Standards. The required measures will be included in the EMPr.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agency's in this case the South African Heritage Resources Agency (SAHRA) and Limpopo Provincial Heritage Resources Authority (LIHRA), be notified as early as possible of any developments that may exceed certain minimum thresholds. This act is enforced through the National Heritage Regulations GN R 548 (2000).	A Notice of Intent to Develop (NID) will be submitted, as part of this report, to the Gauteng Provincial Heritage Resources Authority (PHRA-G) and the South African Heritage Resources. Furthermore, a Heritage Impact Assessment (HIA) will be undertaken.
The Provincial Heritage Resources Authority Gauteng (PHRA-G) The Provincial Heritage Resources Authority Gauteng (PHRA-G) is responsible for the identification, conservation and management of heritage resources throughout the province. The Agency was established in terms of the NHRA.	An HIA will be undertaken in respect of these regulations to determine whether a permit will be required as a result of the proposed activities.

Applicable legislation and guidelines used to compile the report	Reference where applied
Environmental Conservation Act, 1989 (ECA), (Act No. 73 of 1989) - National Noise Control Regulations, GN R.154 (10 January 1992) These regulations make provision for guidelines pertaining to noise control and measurements. The regulations make reference to the use of the South African National Standards 10103:2008 (SANS) guidelines for the Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication. The National Environmental Management: Air Quality Act, 2004 (Act No 39 of 2004) also provides for noise control.	A Noise Impact Assessment will be undertaken as part of the EIA process to understand the impacts that the proposed activities to be undertaken.

Table 6-2: Local By-Laws

Applicable legislation and guidelines used to compile the report	Reference where applied
Spatial Planning and Land Use Management Act, 2013 (Act No 16 of 2013) (SPLUMA) SPLUMA is a framework act for all spatial planning and land use management legislation in South Africa and came into force on 1 July 2015. Municipalities will as a result of the new legislation be solely responsible for processing and dealing with land use applications and the appeals relating thereto. Municipalities will have 5 years from commencement of the Act to adopt and approve a single land use scheme for all of its municipal area. The land use scheme must include appropriate categories of land use zoning and regulations for the entire municipal area, including areas not previously subject to a land use scheme. Rezoning will be required for land that was previously excluded from town planning schemes and zoned as “undetermined”.	This Act will be relevant in terms of the required re-zoning applications related to this project. Mining companies will have to rezone mine property to comply with any new land use scheme of the Municipality, which would have an implication on rates and taxes after rezoning. Notwithstanding that land was previously zoned as mining land (such as Kloof), it may fall within a new land use scheme once this is developed by the municipality.

7 Item 2(f): Need and Desirability of the Proposed Activities

The objectives of the WRTRP is to reprocess historical TSFs to economically recover gold, uranium and sulfur, while implementing concurrent rehabilitation of their footprints for long term sustainability. By removing the existing historical TSF liabilities located on ecologically sensitive dolomitic structures, sulfur and uranium constituents will reduce significantly and will consequently reduce any future pollution potential and acid mine drainage, as well as eliminate residual cyanide trapped in the historical TSFs. The following benefits are envisioned as a result of the implementation of the WRTRP:

- Investment of approximately R 9 billion into the West Rand District Municipality's economy;
- Significant job creation; it is estimated that 2 000 temporary opportunities will be created during the construction phase, with an estimated 500 sustainable employment opportunities once the project is operational;
- Protection of sensitive dolomitic aquifers and water resources through:
  - The removal of the historical TSFs, currently located on the dolomites.
  - The deposition of the reclaimed and reprocessed tailings onto the RTSF, which is to be constructed on impermeable bedrock, away from sensitive dolomitic areas.
- Removal of impacts associated with existing historical gold tailings facilities by reducing sulfur and uranium concentrations. The reduction in sulfur concentrations will in turn lower the risk of Acid Mine Drainage (AMD);
- Reduction of health risk to surrounding communities by addressing persistent dust fallout from TSF's spread over a vast area, into a single well-managed best practice designed RTSF;
- Release of valuable land under the historical TSFs for residential, commercial, and agricultural needs. The final land uses of the TSF footprints will be determined based on a Closure Plan for the respective Mining Right areas;
- Treatment of currently impacted water with the proposed AWTF, which could potentially provide potable water for domestic and agricultural users, mitigating existing shortages.

7.1 Kloof Specific Components

7.1.1 RTSF

The existing TSFs to be reclaimed currently reside on sensitive dolomitic areas which may potentially impacted by seepage and runoff from these TSFs. Furthermore, the remnant radioactive materials contained within the TSFs may pose a health risk to surrounding communities.

The RTSF, on the contrary, will be constructed bedrock with low permeability and away from the dolomitic areas which, in turn, will decrease potential impacts on the underground water resources in the area.

In addition, due to the incorporation of the CPP, reclaimed tailings destined to report to the RTSF will have reduced sulfur and uranium concentrations, resulting in the reduction of AMD potential, as well as a decrease in the risk of radioactive exposure to the surrounding communities and environment alike.

7.1.2 CPP

In conjunction with the gold extraction process, The CPP will remove substantial amounts of sulfur and uranium from the reclaimed slurry before being pumped onto the RTSF. The CPP will also ensure that the cyanide using during the gold extraction process is minimised before the slurry reports to the RTSF.

7.1.3 AWTF

The AWTF will treat process water from the RTSF to a standard that will be suitable for discharge back into the Leeuspruit. This will potentially improve the current ecological status of the spruit and associated catchment due to an increase of water quantity. Considerations are also being made towards treating the process water to potable standards (SANS 241:2011), which could be utilised by surrounding communities.

8 Item 2(g): Period for which the Environmental Authorisation is required

To allow for the processing of all the dumps associated with the Ultimate WRTRP through the CPP and to promote the sustainability of the WRTRP, the environmental authorisation must be valid for a period of at least 30 years.

9 Item 2(h): Description of the Process Followed to Reach the Proposed Preferred Site

9.1 Item 2(h)(i): Details of all Alternatives Considered

With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, this section provides details of the alternatives considered for the infrastructure relevant to the Kloof mining right area. The criteria used to assess the alternatives include:

- the property on which or location where it is proposed to undertake the activity;
- the type of activity to be undertaken;
- the design or layout of the activity;
- the technology to be used in the activity;

- the operational aspects of the activity; and
- the option of not implementing the activity.

Alternatives in terms of the site location of key infrastructure were limited as SGL prioritised placing infrastructure not only on properties that they owned and/or fell within their current Mining Right areas, but also on properties and servitudes that made economic, environmental and social sense. Furthermore, it was crucial that infrastructure is placed within reasonable distances of the resources (i.e. historical tailings facilities) and the ultimate deposition site at the RTSF.

In addition to the above, a site selection process was undertaken in terms of the placement of the CPP as well as the RTSF. Essentially the site selection process considered not only environmental and social aspects, but also sensible economics as mentioned.

9.1.1 RTSF

Two independent, parallel TSF site selection processes were completed by Golder Associates (Golder, 2010) for Rand Uranium's CUP and Metago (Metago, 2009) for Gold Fields' WWP. These processes entailed the selection of a suitable site for a TSF required for the respective proposed projects.

Both processes used environmental, economic and social screening criteria to aid in the selection process. These criteria included:

- Presence of dolomites;
- Urban development;
- Protected areas such as ridges, rivers, wetlands and conservation areas. For Gauteng, the C-plan data from the GDACE (now GDARD) was used;
- Factors impacting on the economic viability including capex, opex for the reclamation, processing and deposition of the feed material; and
- Open areas suitable for the required footprint size based on the life of mine tonnage.

Based on the above criteria a shortlist of sites was defined after which environmental and social screening exercises took place. The findings of the screening assessment were used to rank the sites and provide an overall score for each of the sites.

The site selection undertaken by Golder Associates for Rand Uranium, identified the proposed Geluksdal TSF, for which authorisation was applied. As an alternative site, Golder proposed that site 45 North and 45 South be considered. The ranking process however indicated that sites 33 and 34 would be the most suitable sites, but had already been earmarked by Gold Fields as a potential alternative TSF site and were therefore unavailable to Rand Uranium at the time.

In a parallel site selection process undertaken by Metago for Gold Fields, the social, environmental and economic screening and subsequent ranking determined that sites B2/B3 as well as the Doornpoort TSF contiguous A sites (ultimately selected for the WWP) were the most economically viable and the preferred sites from an environmental and social perspective.

Importantly and fortuitously, the two TSF areas identified by Metago, as B2/B3, overlie areas identified by the Golder Associates site selection process, which they called area 33 & 34. In relation to the WRTRP these areas represent the proposed area identified for the RTSF.

In summary the two independent processes resulted in the identification of a common area for the construction of a new TSF that can accommodate the residue tonnage and deposition rate from the proposed CPP and will be taken forward into the impact assessment phase. Refer Plan 10 for these layouts.

9.1.2 CPP

A site selection process was undertaken by Golder Associates (Golder, 2013) for the CPP (referred to in the report as the CTP). A total of 100 candidate site areas were identified, of which 25 candidate sites were in compliance with the site selection criteria and taken forward for further analysis.

After screening the 25 top listed candidate sites, 15 candidate sites remained and were taken forward for assessment by the specialists through a high-level desktop analysis to investigate the social, environmental, regulatory and engineering viability of the sites. The inputs from the specialists collectively resulted in 9 of the 15 candidate sites being fatally flawed. After assessing each site collaboratively including a risk assessment, 4 sites remained as the options for final assessment. The Top Two sites were then identified as the preferred and alternative site respectively. The sites were called Site T2 (Preferred Option) and Site T9 (Alternative). The preferred option, Site T2, will be assessed as part of this environmental impact assessment.

9.1.3 Pipeline Routes

The pipeline routes and supporting infrastructure need to be located where the feed sources, current infrastructure, services and proposed infrastructure including the WBT, CPP and RTSF are located. Alternative pipeline routes between the WBT and the CPP and between the CPP and the RTSF have been identified.

9.1.4 AWTF

In terms of the AWTF, a desktop trade-off study was conducted by Paterson & Cooke to compare the capital costs, operational costs and total cost of ownership of two options namely:

- Re-using the return water for re-mining; and
- Treating the return water to discharge compliance, using the location at the RWD.

The outcome of the trade-off showed that AWTF option will have a lower life cycle cost in comparison with the return water pumping system for a range of flow rates.

Technology alternatives were considered purely from a “best fit” and cost effective perspective. In terms of the AWTF, there is a wide range of technologies available for the treatment of high salt and heavy metal load mine affected water. For the specific return water dam product by the RTSF, various options regarding the appropriate technology and the business case were considered. The list below shows a summary of the applicable technologies available for treatment of this water:

- Biological Reduction of heavy metals and sulfates;
- Electrodialysis Reversal Technology;
- Ion Exchange Technology;
- Reverse Osmosis Membrane Technology;
- Electrocoagulation; and
- Freeze Desalination.

Each of the mentioned technologies has their own niche applications, and the respective advantages and disadvantages have been taken into account when the appropriate technology was chosen. The preferred technology is an advanced combination of Crystilactor and Reverse Osmosis.

9.1.5 The Option of Not Implementing the Activity

In terms of the “No-go” option, the primary land uses for the region are mining, agriculture, and in some areas, residential. The proposed location of the RTSF is currently used for agriculture. If not used for mining (the no-go option), possible alternative land uses for the proposed RTSF and associated infrastructure site include commercial agriculture, grazing, or low-cost housing.

Existing / historical TSFs will remain *in situ* and continues to impact on the environmental and social landscapes, as per the status quo. None of the envisioned benefits (described in Section 7) will come to fruition, such as environmental clean-up, job opportunities, investment into the local and regional economy, treatment of currently impacted water and a reduction in the health impacts posed by the historical TSFs.

The existing impacts include:

- Leaching contaminants e.g. uranium and sulfur, into the sensitive dolomitic aquifers;
- Risk to community health and an increased potential for AMD in the Western Basin;
- Further weakening of the West Rand's economy as mining declines; and
- The AWTF will not be funded which will result in mine affected water not being treated potable standards (SANS 241:2011). This results in water quality resources continuing to be impacted upon by contaminated water, impacting on the receiving environment and downstream water users.

The Kloof Mining Right area houses the primary infrastructure required for the implementation of the WRTRP. If any component of it is not approved the entire project will be abandoned.

Plan 10: RTSF Alternatives

9.2 Item 2(h)(ii): Details of the Public Participation Process Followed

The Public Participation Process (PPP) was developed to ensure compliance with environmental regulatory requirements and to provide Interested and Affected Parties (I&APs) with an opportunity to evaluate the proposed project. During this process stakeholders are able to provide inputs and to receive feedback from the environmental specialists and/or proponent. This section provides an overview of the PPP undertaken and full details thereof are included in the Public Participation (PP) Report under Appendix 5.

9.2.1 Stakeholder Identification

To ensure a proper representation of all stakeholders, the following identification methods were utilised to develop a comprehensive stakeholder database:

- Conduct Windeed searches for farm portions in and around the project site to verify land ownership and obtain contact details;
- Use of existing stakeholder databases available from SGL, Digby Wells and Gold Fields;
- Desktop and online research; and
- Stakeholder networking and discussions to source additional stakeholder details.

Stakeholders identified who are effected by or interested in the proposed project were grouped into the following broad categories:

- **Government:** National, Provincial, District and Local Authorities;
- **Parastatals:** Various semi-Government entities;
- **Landowners:** Directly or indirectly affected and adjacent;
- **Land occupiers:** Directly or indirectly affected and adjacent;
- **Communities:** Directly affected and adjacent communities;
- **Agriculture:** Farmers associations;
- **Non-Governmental Organisations (NGOs):** Environmental organisations, community-based organisations; and
- **Business and industry:** small to medium enterprises, mines, industrial and large business organisations.

A detailed description of the various stakeholder categories are provided in further detail in the Public Participation Report and a full list of stakeholders is categorised and included in the stakeholder database.

9.2.1.1 Directly Affected Landowners

The following directly affected landowners have been identified, as per Table 9-1, and included into the stakeholder database.

Table 9-1: Landowners and Properties Directly Affected

Farm	Portion	Registered Landowner
BLYVOORUITZICHT 116-IQ	6	Driefontein Consolidated (Pty) Ltd (SGL)
BLYVOORUITZICHT 116-IQ	7	Driefontein Consolidated (Pty) Ltd (SGL)
BLYVOORUITZICHT 116-IQ	8	Nortjie Elizabeth Margaritha
BLYVOORUITZICHT 116-IQ	24	Blywonder Trust Pty Ltd
DOORNKLOOF 350-IQ	RE/6	Mamellong General Trading
DOORNKLOOF 350-IQ	RE/1	Kloof Gold Mining Company Limited (SGL)
DOORNKLOOF 350-IQ	R	Kloof Gold Mining Company Limited (SGL)
DOORNKLOOF 350-IQ	4	Kloof Gold Mining Company Limited (SGL)
DOORNKLOOF 350-IQ	5	Far West rand Dolomitic Water Association
DOORNKLOOF 350-IQ	12	Kloof Gold Mining Company Limited (SGL)
DOORNKLOOF 350-IQ	13	Kloof Gold Mining Company Limited (SGL)
DOORNKLOOF 350-IQ	21	Kloof Gold Mining Company Limited (SGL)
DOORNKLOOF 350-IQ	22	Bergdeel CC
DOORNKLOOF 350-IQ	33	Kloof Gold Mining Company Limited (SGL)
DRIEFONTEIN 113-IQ	RE\1	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 113-IQ	2	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	R	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	4	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	5	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	8	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	10	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	11	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	15	Driefontein Consolidated (Pty) Ltd (SGL)
DRIEFONTEIN 355-IQ	20	Murray and Roberts Cementation Pty Ltd
DRIEFONTEIN 355-IQ	21	Golden Dries Developments CC
DRIEFONTEIN 355-IQ	22	Driefontein Consolidated (Pty) Ltd (SGL)
GEMSBOKFONTEIN 290	13	SGL

Farm	Portion	Registered Landowner
GEMSPOST 288	RE	SGL
LEEUDOORN 351-IQ	RE	Kloof Gold Mining Company Limited (SGL)
LEEUDOORN 351-IQ	1	Kloof Gold Mining Company Limited (SGL)
LEEUWPOORT 356-IQ	70	Far West rand Dolomitic Water Association
LEEUWPOORT 356-IQ	71	Far West rand Dolomitic Water Association
LIBANON OR WITKLEIGAT 283-IQ	R	Kloof Gold Mining Company Limited (SGL)
RIETFONTEIN 349-IQ	5	Kloof Gold Mining Company Limited (SGL)
RIETFONTEIN 349-IQ	35	Kloof Gold Mining Company Limited (SGL)
RIETFONTEIN 349-IQ	36	Kloof Gold Mining Company Limited (SGL)
RIETFONTEIN 349-IQ	73	Kloof Gold Mining Company Limited (SGL)
UITVAL 280-IQ	RE	Far West rand Dolomitic Water Association
UITVAL 280-IQ	8	Far West rand Dolomitic Water Association
UITVAL 280-IQ	9	Far West rand Dolomitic Water Association

9.2.1.2 Adjacent Landowners

The various adjacent landowners for the project are reflected in Table 9-2 below.

Table 9-2: Adjacent Property Details

Farm	Portion	Registered Landowner
BLYVOORUITZICHT 116-IQ	9	Blywonder Trust Pty Ltd
DRIEFONTEIN 355-IQ	23	Corobrik Pty Ltd
DRIEFONTEIN 355-IQ	28	Eskom Holdings Ltd
GEMSBOKFONTEIN 290	6	Rand Uranium (SGL)d
GEMSBOKFONTEIN 290	8	Molly Becker
GEMSBOKFONTEIN 290	12	Far West rand Dolomitic Water Association
GEMSBOKFONTEIN 290	12	SGL
GEMSBOKFONTEIN 290	14	Far West rand Dolomitic Water Association
GEMSBOKFONTEIN 290	20	SGL
GEMSBOKFONTEIN 290	23	Westonaria Local Municipality
GEMSPOST 288	RE	SGL
GEMSPOST 288	4	SGL
GEMSPOST 288	5	SGL

Farm	Portion	Registered Landowner
GEMSPOST 288	7	Mun Venterspost
GEMSPOST 288	11	National government of the Republic of South Africa
GEMSPOST 288	19	Far West rand Dolomitic Water Association
GEMSPOST 288	29	Westrand District Municipality
GEMSPOST 288	33	Westonaria Local Municipality
GEMSPOST 288	34	Westonaria Local Municipality
GEMSPOST 288	35	Far West rand Dolomitic Water Association
GEMSPOST 288	37	Unknown
GEMSPOST 288	40	Unknown
GEMSPOST 288	43	Mun Bekkersdal
GEMSPOST 288	44	Transnet Ltd
GEMSPOST 288	45	Transnet Ltd
GEMSPOST 288	49	Westonaria Local Municipality
MIDDELVLEI 255	2	Impafa Resources Pty Ltd
MIDDELVLEI 255	6	Montrose Farms Pty Ltd
UITVAL 280-IQ	4	Far West rand Dolomitic Water Association
UITVAL 280-IQ	5	Far West rand Dolomitic Water Association
UITVAL 280-IQ	6	Far West rand Dolomitic Water Association
VENTERSPOST	103	Transnet Ltd
VENTERSPOST 284	4	Far West rand Dolomitic Water Association
VENTERSPOST 284	59	Westonaria Local Municipality
VENTERSPOST 284	60	Westonaria Local Municipality
VENTERSPOST 284	66	Unknown
VENTERSPOST 284	67	Unknown
VENTERSPOST 284	76	Far West rand Dolomitic Water Association
VENTERSPOST 284	77	Far West rand Dolomitic Water Association

9.2.1.3 Authorities

As indicated in Table 9-3, various authorities are listed who have been engaged during the pre-application phase.

Table 9-3: Authorities Engaged

Authority	Representative
Department of Water Affairs and Sanitation (DWS)	Marius Keet Acting Provincial Head
	Bashan Govender Water Quality Manager
Department of Mineral Resources (DMR)	Dimakatso Ledwaba Acting Regional Manager
	Jimmy Sekgale Assistant Director
	Rudzani Mabogo Assistant Director
	Moleseng Tlaila Assistant Director
Gauteng Department of Agriculture and Rural Development (GDARD)	Jacob Legadima Director - Air Quality Management
	Dan Motaung Deputy Director: EIA
National Department of Environmental Affairs (DEA)	Lucas Mahlangu Deputy Director: Licensing Systems Management
National Nuclear Regulator (NNR)	Patle Mohajane Manager: Naturally Occurring Radioactive Material(NORM)
West Rand District Municipality	Musa Zwane Environment and Green Manager
	Suzan Stoffberg Environmental Specialist

9.2.2 Land Claimants

A formal enquiry, which contained all the directly and indirectly affected land portions, was submitted via letter to Ms Rachel Masango of the Gauteng Department of Rural Development and Land Reform, Land Claims Commission, on Friday, 13 February 2015. Feedback was received by means of letter on Friday, 13 March 2015 which indicated that no existing land claims reside over the direct affected and adjacent land portions.

9.2.3 Consultation with I&APs to Date

A summary of consultation activities is provided in Table 9-4 and provides an overview of the various consultation methods already undertaken as part of the Pre-Application Phase. Consultation with stakeholders was focussed toward one-on-one meetings and focus group meetings with authorities, landowners and NGOs.

The needed verbal translation has been and will continue to be given during the various stakeholder meetings. All comments raised by stakeholders pre-application up unto the end of the scoping report public review period will be captured in the Comment and Response Report (CRR). The CRR is provided to the various specialists for incorporation into the EIA phase. It is also provide to the competent authority to enable informed decision making. Responses to comments are provided in line with the overall project scope and available information.

Consultation prior to the application was submitted was aimed at providing stakeholders with an overview of the WRTRP. This was driven by SGL, with support from Digby Wells. One-on-one and focus group meetings were held along with telephonic discussions with invited stakeholders that could not attend. Engagement with the authorities also aimed to obtain an understanding of the regulatory requirements in lieu of the changes promulgated in December 2014. Table 9-4 details activities that formed part of the Pre-Application Phase.

Table 9-4 Summary of PP Activities during the Pre-Application Phase

Activity	Details	Reference in PP Report
Pre-Application Phase		
Identification of stakeholders	Stakeholders, with associated details, were identified by means of Windeed searches, available existing information, stakeholder networking and research for the compilation of a database.	**PP Report Appendix 5** Stakeholder database.
Identification of land claims	A request to identify potential land claims over affected land portions was submitted to the Development and Land Reform, Land Claims Commission on 13 February 2015 and feedback indicated there are no existing land claims.	**PP Report Appendix 5** Land claims letters.
Development of information materials	Various material pieces were developed to be used as part of stakeholder meetings and for ad-hoc requests to provide project details.	**PP Report Appendix 5** Pre-application information materials.

Activity	Details	Reference in PP Report
Stakeholder meetings	Meetings with stakeholders were arranged as one-on-one meetings and focus group meetings. These are listed below: ▪ One-on-one Authorities Meetings ▪ Department of Water and Sanitation – 2 & 11 December 2014 ▪ National Nuclear Regulator – 2 December 2014 ▪ Department of Environmental Affairs – 2 December 2014 ▪ Gauteng Department of Agriculture and Rural Development – 3 & 11 December 2014 ▪ West Rand District Municipality – 3 December 2014 ▪ Department of Mineral Resources – 10 December 2014 ▪ Section 80 Committee, West Rand District Municipality (Environmental Portfolio) – 3 February 2015 & 15 April 2015 ▪ Focus Group Meeting with Authorities – 16 April 2015 ▪ Focus Group Meeting with Landowners – 16 April 2015 ▪ Focus Group Meeting with Environmental NGOs – 21 April 2015 A high level overview of the full project was mainly discussed and stakeholder inputs captured. All stakeholder comments have been responded to in the CRR.	**PP Report Appendix 5** Comment and Response Report.

Stakeholders were provided with project information as part of the engagement process which were distributed via email, post and hand delivery or presented at stakeholder meetings. An overview of each are detailed below.

- **Positioning document:** this document was the first piece of information distributed to stakeholders. It contained the project intention, a broad overview of the various components and highlighted project benefits.
- **Letters:** various letters were distributed to stakeholders and were mainly for invitations to meetings and providing brief details about the project and relevant contact details. Letter were also accompanied by meeting agendas where required.
- **Information pack:** the following documents were included as part of the pack:
  - ***Project description document:*** the project description provided details of the project intention, background and history, regional location by means of a map, various project components, reclamation process with individual components, next steps in the process and contact details. These details were depicted in the text format but also through visual illustrations; and
  - ***Invitation letter with registration and comment form and agenda:*** information sent to stakeholders via email was provided in print also.
- **Maps:** illustrative maps were displayed at the stakeholder meetings which provided context to the regional setting of the full project. A land tenure map was also made available at the landowners meeting.
- **Animation:** the animation is a dynamic representation of the reclamation process with its associated individual components and infrastructures.
- **Presentations:** the presentation used as part of the various stakeholder meetings varied. The presentation for meetings held in December 2014 included a map detailing the various project components and regional setting. Information contained in the presentations made to the Section 80 Committee were limited to project-only details due to time constraints and the content of the Application presentation included more refined content on the following:
  - Project history and motivation;
  - Overview of full project with various phases;
  - Regional locality of the full project;
  - Different infrastructure and process flow of reclamation;
  - Applicable legislation for the various licence applications;
  - List of specialist studies to be undertaken;
  - Timing of the environmental regulatory process; and
  - Contacts details for Digby Wells and Sibanye Gold.

- **Background Information Document:** the BID provides a detailed description of the full WRTRP, regional setting map, EIA process, specialist studies to be undertaken, PP process and relevant contact details.
- **Site notice and advertisement:** similar to the BID, the site notice and advertisement provides an overview of the project and highlights the applicable legislation for the EIA process. It also stipulates the competent authority, PP process and where relevant information can be obtained from.

9.2.4 Consultation during the Scoping Phase

The aim of consultation during the Scoping Phase is centred on the formal EIA process, specialist impact studies and addressing stakeholder comments already submitted. A combination of focus group meetings and an open house will be prominent methods to facilitate stakeholder dialogue between the project team and landowners, authorities, NGOs and communities.

In Table 9-5 below details Public Participation (PP) activities that will be undertaken as part of the Scoping Phase have been detailed.

Table 9-5 Summary of PP Activities during the Scoping Phase

Activity	Details	Reference in PP Report
Scoping Phase		
Update of stakeholder information	The stakeholder database will be updated with new I&APs who formally register, attend stakeholder meetings or submit comments.	**PP Report Appendix 5** Stakeholder database.
Distribution announcement materials	A BID, announcement letter with registration and comment form was email and posted to stakeholders on *Tuesday, 1 September 2015*. *An SMS to announce the project was sent to the full database on Tuesday, 1 September 2015.* The Background Information Document was also available on www.digbywells.com (under Public Documents) on *Tuesday, 1 September 2015.* The announcement letter also included information of the stakeholder meetings that will be held, where the Scoping Reports will be available for comment and the allowed public comment period.	**PP Report Appendix 5** BID, letter with registration and comment form.
Placing of advertisements	Advertisements were placed in the following newspapers: ▪ Randfontein Herald (Local Newspaper), Friday 11 September 2015. ▪ Carletonville Herald (Local Newspaper), Thursday, 3 September 2015. ▪ Roodepoort Record (Local Newspaper), Friday, 4 September 2015	**PP Report Appendix 5** Advertisement.

Activity	Details	Reference in PP Report
Placing of site notices	Site notices were put up at various places within proposed project site, local libraries and publically accessible venues within close proximity of the project area on *Tuesday, 1 September 2015.* These places are: ▪ City of Johannesburg Metropolitan Library ▪ Randfontein Public Library ▪ Westonaria Public Library ▪ Toekomsrus Public Library ▪ Fochville Public Library ▪ Carletonville Public Library ▪ Bekkersdal Public Library A site notice placement report and map has been developed, indicating the exact locations where site notices were placed, with photos and GPS coordinates.	**PP Report Appendix 5** Site notice map and placement report.
Identification of land claims	A request to identify potential land claims over affected land portions was submitted to the Development and Land Reform, Land Claims Commission on 13 February 2015. Feedback indicated there are land claims on the following properties Doornkloof 350 Ptn 5, Leeuwpoort 356 Ptn 71, Leeuwpoort 356 Ptn 70, Gemspost 288 Ptn 19, Doornfontein 522 Ptn 15, Waterpan 292 Ptn 4, Kalbasfontein 365 Ptn 4. A response on some of the properties is still outstanding.	**PP Report Appendix 5** Land claims letters.

Activity	Details	Reference in PP Report
Placement of Scoping Reports	The Scoping Reports has been made available to stakeholders at the following public places: ▪ City of Johannesburg Metropolitan Library ▪ Randfontein Public Library ▪ Westonaria Public Library ▪ Toekomsrus Public Library ▪ Fochville Public Library ▪ Carletonville Public Library ▪ Bekkersdal Public Library The Scoping Reports are also available on the Digby Wells website www.digbywells.com (under Public Documents) and will also be available at the various stakeholder meetings. *(Public comment period: 15 September to 15 October 2015)*	**PP Report Appendix 5** Placement map.
Stakeholder Meetings	A series of stakeholder meetings will be held early in October 2015. It is scheduled that focus group meetings be held with authorities, landowners and occupiers, NGOs and communities. An open house meeting is also scheduled and all stakeholders on the database will be invited to attend. All comments received at these meetings will be captured and responded to in the CRR.	**PP Report Appendix 5** Comment and Response Report.
Announcement of the updated Scoping Reports	A letter will be emailed and posted to the full database to announce availability of the updated Scoping Reports so that stakeholders can confirm that their comments have been addressed. *An SMS to notify stakeholders that the updated Scoping Reports are available for comment will be sent to the full database.*	

Activity	Details	Reference in PP Report
Placement of updated Scoping Reports	The updated Scoping Reports will be made available on 26 October 2015 at the following public places: ▪ City of Johannesburg Metropolitan Library ▪ Randfontein Public Library ▪ Westonaria Public Library ▪ Toekomsrus Public Library ▪ Fochville Public Library ▪ Carletonville Public Library ▪ Bekkersdal Public Library The updated Scoping Reports will include the amended CRR, which contains new stakeholder comments and responses, and the inclusion of new PP activities undertaken as part of the Scoping phase. The updated Scoping Reports will also be available on the Digby Wells website www.digbywells.com (under Public Documents).	**PP Report Appendix 5** Placement map.

9.3 Item 2(h)(iii): Summary of Issues Raised by I&APs

This section, and Table 9-6 to Table 9-8, discusses the primary comments that have arisen from the PPP thus far.

Table 9-6: Interested and Affected Parties

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Landowners, Lawful occupier/s of the land, Landowners or lawful occupiers on adjacent properties					
Nicci Simpson	Yes	25 March 2015, 17 April 2015	It is requested that more effort be made to inform landowners for the attendance of stakeholder meetings, specifically previously disadvantaged farmers. The Public Participation process must also be managed in a more transparent manner.	A fair amount of landowners have already been identified either interested in or affected by the proposed project, and since the formal EIA process is only aimed to start in September 2015, we are continuing our efforts to identify more landowners by means of various channels. Also, adverts will be placed as part of the formal EIA process. Please feel free to provide details of specific landowners you would want us to include as part of the process.	Not yet finalised and under investigation
Peet Bornman, Jaco Taute	Yes	16 April 2015	When the west wind blows the whole area is white with dust and trucks do not always water for dust suppression. Breathing in the dust causes health issues.	With dedicated mitigation measure in place, dust emission will be reduced drastically, hence lowering exposure to repairable fractions that result in health problems-this material is likely sourced from the historical dams which are planned to be removed. The newly planned RTSF will be concurrently rehabilitated.	Not yet finalised and under investigation
Piet Rheeder, Armand de Villiers	Yes	16 April 2015	Pollution of groundwater and surface sources, specifically the Leeuspruit, is a concern. This will also disturb the water balance of our water.	Any water discharged into the Leeuspruit, will be treated to SANS 241 drinking standards and will enhance the quality therein. These guidelines are very stringent, so therefore, any water discharged will be of a benefit as it will serve to promote dilution, of the current water quality of the Leeuspruit.	Not yet finalised and under investigation
Peet Bornman, Piet Rheeder	Yes	16 April 2015	The Regional Tailings Storage Facility (RTSF) will have a negative impact on surrounding fauna; nothing will be left e.g. fish and cattle.	Through the groundwater and fauna specialist assessment impacts will be assessed for the regulator review.	Not yet finalised and under investigation
Dre Schalekamp, Nicci Simpson	Yes	16 April 2015	Why pollute new agricultural land? Other Tailings Storage Facilities (TSFs) can be used. Sibanye need to do what is good for the community.	This project is attempting to combine the proposed Geluksdal and West Wits project TSFs into a single deposition site based on request made by the community and the DMR. The historic dumps are not designed to today's best practice standards. Their size limits the deposition rates and tonnage storage required to retreat these dumps economically. They do not have adequate pollution prevention measures in place and are a source of pollution to the groundwater aquifers of the dolomites. The socio-economic assessments will take an overall view of the project from a community perspective - positively and negatively.	Not yet finalised and under investigation

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Armand de Villiers	Yes	16 April 2015	Will mined areas be rehabilitated and if so, what are the timelines?	The intention is to rehabilitate back to a suitable land use, as determined by the LED plans and from community consultation. Some concurrent rehabilitation is envisaged with final rehabilitation being completed after removal of the final layer of tailings and will be completed within 2/3 years.	Not yet finalised and under investigation
Coetsee Badenhorst, Alf Rudman	Yes	16 April 2015	How will compensation be managed for the project, since no agreements have been put in place yet?	The specialist studies are not directly involved in decisions around the actual buy-out of farms which have to be considered at the appropriate timelines as the project unfolds and meets social, commercial and environmental imperatives.	Not yet finalised and under investigation
Barry van Wyk, Peet Bornman	Yes	16 April 2015	Cattle's meat will be contaminated as a result of the project and people have been very ill as a result of drinking contaminated water.	The impact assessment phase will assess the current status of the boreholes and other pathways and assess the potential contamination zones from the facility.	Not yet finalised and under investigation
Sarel Cilliers, Barry van Wyk	Yes	16 April 2015	We are not in support of the proposed project and object to it strongly. Promises are being made and nothing is delivered. Our environment and lives are destroyed because of the mines.	Thank you for the comment. The legislative process will allow all stakeholders to raise their grievances.	Not yet finalised and under investigation
Municipal councillor					
Clr Vincent Mfazi *West Rand District Municipality, Section 80 Committee*	Yes	3 February 2015	The reclamation process uses water, but Acid Mine Drainage (AMD) is a concern and will be used as part of the process.	Government funds with regard to AMD are largely targeted at legacy or abandoned areas. The WRTRP will use impacted water from current operations No inter connected mine activities exist between the western and far western basins.	Not yet finalised and under investigation
Clr Vincent Mfazi *West Rand District Municipality, Section 80 Committee*	Yes	3 December 2014, 15 April 2015	The clay structure will collapse during the reclamation process and new chemical structures will be formed which can be harmful to people and the environment. How will the particulates be prevented from floating into the air once the clay structure is destroyed?	The reclamation is a waterborne process. The slurry will be processed through a number of chemical processes before going to the RTSF. The resultant tailings will undergo a very specific geochemical analysis as part of the specialist impact studies to ensure that the chemical components of the process is understood in detail once the elements in the tailings are exposed to the various processes. The specialists addressing the geochemical analysis and doing the design of the RTSF are highly specialized. Collection of samples from a composite and individual sample of the TSFs to be treated and analysis thereof after metallurgical testwork has been done over the last six months in order to understand all the elements including the clay structures. Air quality modelling will be used and integrated with the geochemical findings in order to prescribe mitigation measures to be included in the EMP.	Not yet finalised and under investigation

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Municipality					
Susan Stoffberg *West Rand District Municipality,*	Yes	3 December 2014	What are the potential land uses that can be considered? This will assist the West Rand District Municipality for future development and associated planning.	The SIA will include an assessment of the potential opportunities for enhancing project benefits and mitigation social impacts associated with end land uses- ongoing interaction with the relevant Section 80 committees will assist in integrating planning.	Not yet finalised and under investigation
Olivia Calderia *West Rand District Municipality, Section 80 Committee*	Yes	15 April 2015	There are a lot of health issues because of the amount of dust and this is an issue/concern. A lot of watering will need to be done.	Dust and PM_{10} monitoring is in place already to assess current scenario and future impacts associated with those pollutants. A dispersion model will be run during the EIA phase, after which mitigation measures will be recommended to curtail potential impacts. Mitigation measures will be put in place to curtail dust i.e. concurrent covering and vegetation of tailings slopes, application of dust suppressants on mine dirt road – water, dust-a-side etc. Suitable quality water will be available.	Not yet finalised and under investigation
Tokky Mosolo *Westonaria Local Municipality*	Yes	16 April 2015	Ad hoc projects for community development originating from other mining houses in the area are underway and a consolidated Social and Labour Plan (SLP) for the area and the project should be developed (incorporating other mining houses in the area).	The SLPs must be tied to a mining right issued by the DMR.SGL is attempting to consolidate these as the legislation requires them to be separate.	Not yet finalised and under investigation
Organisations of state (Responsible for Infrastructure that may be affected Roads Department, Eskom, Telkom, DWA etc.)					
Will be consulted during the Scoping and EIA phases.					
Communities					
Lucas Misapitso *Interested Community Member*	Yes	21 April 2015	Some of the communities are irresponsible and uses AMD water to irrigate crops and are also using sludge to manufacture bricks. It is a huge problem and a health risk. Communities need to be educated and mitigation measures put in place.	The SIA will assess the potential impacts of the project on neighbouring communities and make recommendations in this regard. The assessment will include recommendations pertaining to community health and safety issues and could possibly form part of a larger SGL information session. NGOs are also supported in the area with ongoing education on these matters.	Not yet finalised and under investigation

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Lucas Misapitso *Interested Community Member*	Yes	21 April 2015	Which mitigation strategies will Sibanye use to reduce the radiation levels? The Westrand already has high level of radiation.	The remaining footprint after reclamation is the biggest challenge, but the needed closure and rehabilitation plans will be developed in collaboration with the relevant competent authorities. This will also include end land use which will be considered as part of the social studies to be undertaken. One of the reasons the project is being undertaken is to remove the latent radiation found in these tailings facilities. This will reduce the risk and exposure for communities. NNR approvals for the project require assessments to be done for workers and public in and around the TSFs to be reclaimed.	Not yet finalised and under investigation
Traditional Leaders					
No traditional leaders are involved in the project.					
Department of Land Affairs					
Will be consulted during the Scoping and EIA phases.					
Department of Environmental Affairs					
Lucas Mahlangu *Department of Environmental Affairs*	Yes	2 December 2014	For listed activities it needs to be ensured that the correct department or level is consulted.	Noted - however we understand that at the present these interactions will be channelled through the DMR.	Not yet finalised and under investigation
Majalele Pholudi *Department of Environmental Affairs*	Yes	16 April 2015	Environmental liability is important; who will be held responsible?	A closure costing estimate will be undertaken as part of the EIA process, approved by the DMR and it will be Sibanye Gold's responsibility to provide sufficient funds to undertake rehabilitation prior to approval of the project.	Not yet finalised and under investigation
Other Competent Authorities Affected					
Victor Nkuna, Portia Chawane, Bashan Govender *Department of Water and Sanitation*	Yes	2, 11 December 2014, 4 June 2015	How will water use be managed or treated and where will water be sourced from used for reclamation?	The removal of historic dumps on dolomite as part of the tailings reclamation is expected to improve the water quality by removing the sources of contamination. The geochemistry of the proposed RTSF has been conducted and the seepage rate has been calculated. Appropriate monitoring and management plans will be implemented at each site that is being reclaimed.	Not yet finalised and under investigation
Patle Mahonjane *National Nuclear Regulator*	Yes	2 December 2014	A radiation protection function needs to be integrated as part of the EIA and associated processes.	The EIA process as well as a public and worker assessment is required to be carried out for approval of the NNR which will require monitoring and reporting. Sibanye have a dedicated radiation protection team that will work on the WRTRP.	Not yet finalised and under investigation

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Mwinsa Mpundu *National Nuclear Regulator* Rina Taviv, Christopher Rakuambo *Gauteng Department of Agriculture and Rural Development*	Yes	2, 3 December 2014	Are there other options for the project? For example decentralised plants, rather expanding the existing ones e.g. Geluksdal Central Tailings Storage Facility (CTSF)?	The technical viability of the processes to be employed for gold, uranium and sulphur are the result of extensive metallurgical test work, based on this outcome the position of all the components of the necessary infrastructure are then subjected to alternatives in terms of location and are presented for scrutiny as part of the EIA process.	Not yet finalised and under investigation
Moleseng Tlaka *Department of Mineral Resources*	Yes	10 December 2014	Will the RTSF be able to accommodate all the tailings facilities in the area and will it be jointly owned by Sibanye Gold and Gold Fields?	The RTSF will be able to accommodate SGL and other TSFs in the area to a total of 1.3 billion tonnes.	Not yet finalised and under investigation
Bashan Govender *Department of Water and Sanitation*	Yes	11 December 2014	The Department of Water and Sanitation look to address issues coming from underground/surface water AMD experienced currently.	The water management will be integrated with the technology and recovery will be the focus for the area. Water migrating to groundwater resources will be reduced and it is aimed to close shafts and mines where required. For the WRTRP the use of Rand Water will be replaced with treatment of existing water resources to be used as part of the reclamation process. It is also envisaged that municipality(s) will be assisted with the management of their water.	Not yet finalised and under investigation
Dan Motaung *Gauteng Department of Agriculture and Rural Development* Marius Keet *Department of Water and Sanitation*	Yes	11 December 2014, 4 June 2015	Concern is that the new area is in a rural setting used for farming and this will be removing agricultural land in Gauteng.	The impact will be assessed by the soil and water specialist. The socio - economic impacts of the project will be assessed as part of the EIA The DAFF is also being engaged as part of the project. The historical TSF sites will be removed, making previously unusable land available.	Not yet finalised and under investigation
Bashan Govender *Department of Water and Sanitation* Rudzani Mabogo *Department of Mineral Resources*	Yes	11 December 2014, 16 April 2015	Close consideration must be given to the liner option or rather how to go about securing that water does not leak into the underground water resources e.g. High Density Polyethylene (HDPE) liner	It is likely that lining a facility of this size will make the project economically unfeasible however a number of options are being explored.	Not yet finalised and under investigation
Eric Mulibana, *Gauteng Department of Agriculture and Rural Development* Portia Chawane, Victor Nkuna *Department of Water and Sanitation*	Yes	2 December 2014,16 April 2015	Where will the water to be used for reclamation be sourced from? It is proposed that existing mine water for the reclamation process.	The water will be sourced from existing impacted water from underground operations at the Kloof, and Cooke shafts. Currently 35 Mℓ/day is discharged from the Kloof 10 shaft, into the Wonderfonteinspruit, and 20 Ml/d from Cooke under licence. The first phase (1.5Mt/m) of this project will take 30 Ml/d of that for hydraulic reclamation and once it has gone through the process, it will be treated through an advanced water treatment facility (AWTF) at the toe of the RTSF. The treated water will either be discharged to the Leeuwspruit or can be supplied to nearby communities. It is not likely that there will be a significant impact on downstream users where water is being discharged into the Wonderfonteinspruit.	Not yet finalised and under investigation

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Wilcot Speelman *National Nuclear Regulator*	Yes	16 April 2015	Clarity on the full project needs to be provided, not just phase one. The WRTRP must be well thought through considering that it will be a 25 year project sot that potential negative impacts do not become a reality in the future and is irreparable.	The project will be presented as a whole to demonstrate long term viability with authorisation being sought for initial implementation.	Not yet finalised and under investigation
Dan Motaung *Gauteng Department of Agriculture and Rural Development*	Yes	16 April 2015	How will rehabilitation for the project and RTSF be managed?	Consideration of alternate are a requirement for all sites proposed in the WRTRP. The specific rehabilitation measures for the RTSF and historic facilities will be addressed within the rehabilitation plan that will compiled including appropriate re-vegetation techniques and post rehabilitation monitoring.	Not yet finalised and under investigation
Marius Keet *Department of Water and Sanitation*	Yes	4 June 2015	Sibanye can potentially assist in supplying water to people in the broader region.	Sibanye is more than willing to engage with the Department on these matters.	Not yet finalised and under investigation

Table 9-7: Other Affected Parties

Other Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
No other affected parties have commented.					

Table 9-8: Interested Parties

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
Mariette Liefferink *Federation for a Sustainable Environment*	Yes	21 April 2015	What type of water treatment will be used and how many megalitres will be treated a day?	Chrystalactic/Reverse osmosis process is proposed for the water treatment. Between 10 and 15 megalitres will be treated per day and options for the use thereof is being investigated.	Not yet finalised and under investigation
Mariette Liefferink *Federation for a Sustainable Environment*	Yes	21 April 2015	Communities in the area need to be educated on the issues associated with AMD in order to assist in awareness creation. There must be mitigation measures put in place when the mine is busy with reclamation.	This will be further assessed in the social and economic assessments.	Not yet finalised and under investigation

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
Emily Taylor *Endangered Wildlife Trust (EWT)*	Yes	21 April 2015	The EWT would like to be involved and assist with information relating to the identification of species, where possible.	Thank you for your comment, at this stage, the wet season field survey has been completed the full species list (both fauna and flora) is in the F&F report. EWT are welcome to accompany the team during their next site visit. The report will also be made available to EWT for review.	Not yet finalised and under investigation
Mariette Liefferink *Federation for a Sustainable Environment*	Yes	21 April 2015	The DMR's regional mine closure strategies needs to be closely considered and the required closure funds needs to be available. While the FSE is in support of the re-mining of historical tailings storage facilities and reclamation, a precautionary approach needs to be adopted and consideration should be given to risks when determining re-mining, rehabilitation, closure and financial provisions for rehabilitation and closure. The primary objective of regional TSFs and regional mine closure must be to prevent or minimize adverse long term environmental and socio-economic impacts, and to leave the environment in a state where sustainable development can take place.	The DMR's closure guideline document and Dr Phil Tanner's Report and guideline will be considered in the compilation of rehabilitation plan report. This will ensure that all the proposed mitigation measures are implemented accurately to minimize any residual impacts. The reclamation process will ensure controlled exposure of the material to air and water and contained within the existing foot print of the TSF. The closure provision fund will be put in place and managed according to legal requirements which provides for assessing these aspects.	Not yet finalised and under investigation
Mariette Liefferink *Federation for a Sustainable Environment*	Yes	21 April 2015	Radiometric surveys over previously reprocessed mine residue deposit footprints have, in some cases, shown elevated levels of residual radioactivity in soils.	This is a valuable comment and will definitely be taken into account. It is understood that the land use can only be determined once the historical TSFs are removed. The radioactive material and impact on the underlying soils will vary for each footprint; therefore the end land use potentials will be different.	Not yet finalised and under investigation
Mariette Liefferink *Federation for a Sustainable Environment* Judith Taylor *Earthlife Africa* Bashan Govender *Department of Water and Sanitation*	Yes	21 April 2015, 4 June 2015	Social and economic benefits are very important and communities need to benefit, and not just in terms of jobs, but benefits must be applicable to communities over the long term. They need to be involved to ensure short to long term benefits that are sustainable.	The SIA will address the potential social impacts associated with the proposed project for all project phases. This will include an assessment of the potential opportunities for enhancing project benefits.	Not yet finalised and under investigation

9.4 Item 2(h)(iv): The Environmental Attributes Associated with the Sites

This section describes the baseline environmental conditions prior to the proposed project commencing. Furthermore, this section also contains a description of the current land uses and specific environmental features relevant to the project area.

9.4.1 Baseline Environment: Type of Environment Affected by the Proposed Activity

9.4.1.1 Air Quality

9.4.1.1.1 Climate

Ambient air quality in this region of South Africa is strongly influenced by regional atmospheric movements, together with local climatic and meteorological conditions. The most important of these atmospheric movement routes are the direct transport towards the Indian Ocean and the recirculation over the sub-continents.

The country experiences distinct weather patterns in summer and winter that affect the dispersal of pollutants in the atmosphere. In summer, unstable atmospheric conditions result in mixing of the atmosphere and rapid dispersion of pollutants. Summer rainfall also aids in removing pollutants through wet deposition. In contrast, winter is characterised by atmospheric stability caused by a persistent high pressure system over South Africa. This dominant high pressure system results in subsidence, causing clear skies and a pronounced temperature inversion over the Highveld. This inversion layer traps the pollutants in the lower atmosphere, which results in reduced dispersion and a poorer ambient air quality. Preston-Whyte and Tyson (1988) describe the atmospheric conditions in the winter months as highly unfavourable for the dispersion of atmospheric pollutants.

Site specific MM5 modelled meteorological data set for full three calendar years (2012 – 2014) was obtained from the Lakes Environmental Consultants in Canada to determine local prevailing weather conditions. This dataset consists of surface data, as well as upper air meteorological data that is required to run the dispersion model.

Modelled meteorological data for the period January 2012 to December 2014 was obtained for a point in the proposed project area near Westonaria (26.317775°S, 27.650683° E).

9.4.1.1.2 Wind

Dispersion of atmospheric pollutants is a function of the prevailing wind characteristics at any site. The vertical dispersion of pollution is largely a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is similarly a function of the wind speed, in combination with the surface roughness.

The amount of particulate matter generated by wind is highly dependent upon the wind speed. Below the wind speed threshold for a specific particle type, no particulate matter is liberated, while above the threshold, particulate matter liberation tends to increase with the wind speed. The amount of particulate matter generated by wind is also dependent on the material's surface properties. This includes whether the material is crusted, the amount of non-erodible particles and the particle size distribution of the material.

The spatial and annual variability in the wind field for the West Rand area calculated from the modelled data is clearly evident in Figure 9-1. The predominant winds are coming from north northeast and north with an average wind speed of 3.86 m/s. Wind class frequency distribution per sector (wind direction) is given in Figure 9-2 and Table 9-9.

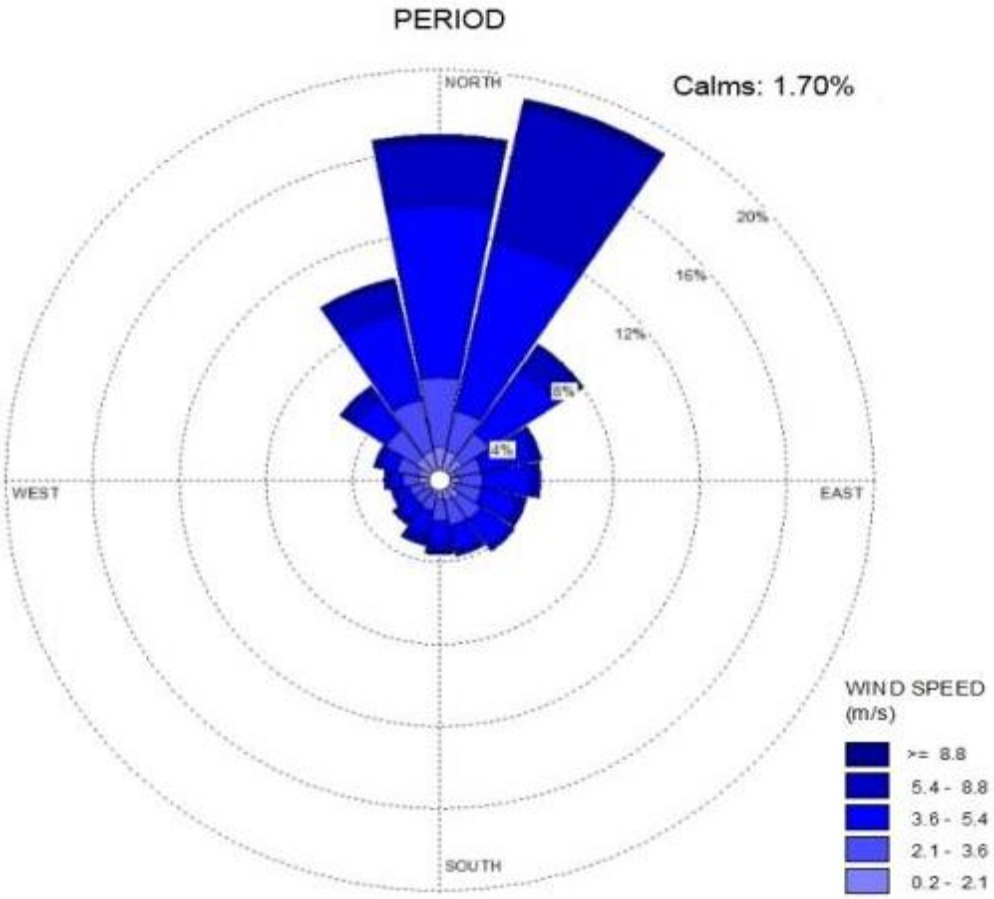

Figure 9-1: Surface Wind Rose for Sibanye Project Area

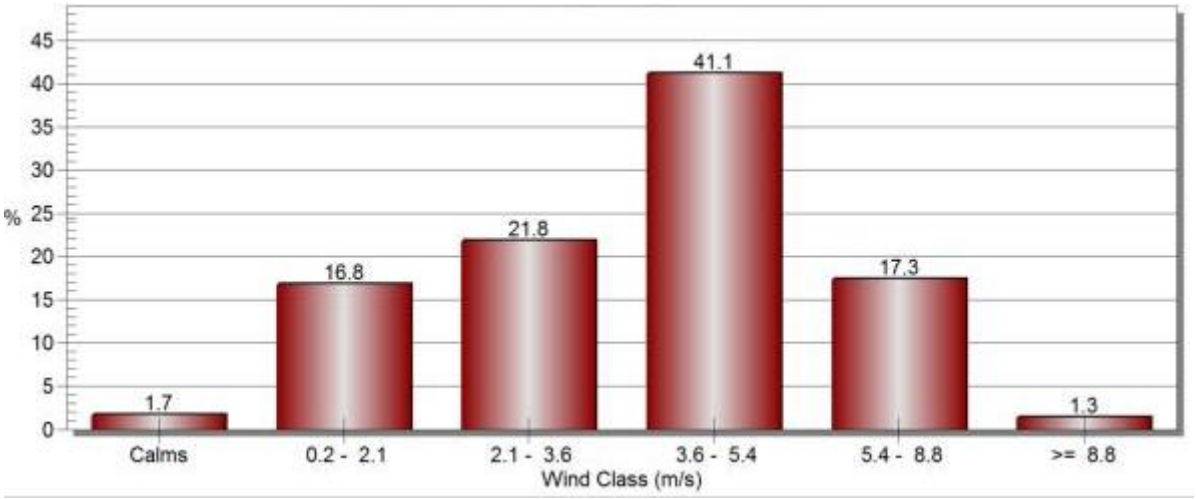

Figure 9-2: Wind Class Frequency Distribution

Table 9-9: Wind Class Frequency Distribution per Direction

No.	Directions	0.2 -2.1	2.1 -3.6	3.6 -5.4	5.4 -8.8	>= 8.8	Total (%)
1	N	1.6	3.4	8.4	3.1	0.4	16.8
2	NNE	1.5	2.0	8.4	6.6	0.4	18.9
3	NE	1.3	1.5	3.8	1.4	0.1	8.0
4	ENE	0.8	1.2	2.4	0.4	0.0	4.8
5	E	0.9	1.0	2.2	0.5	0.0	4.7
6	ESE	0.8	1.2	1.7	0.4	0.0	4.1
7	SE	1.1	1.2	1.6	0.3	0.0	4.2
8	SSE	1.0	1.2	1.2	0.3	0.0	3.8
9	S	0.9	1.0	1.1	0.5	0.1	3.6
10	SSW	0.7	0.8	1.2	0.5	0.0	3.2
11	SW	0.6	0.8	0.8	0.4	0.0	2.6
12	WSW	0.8	0.7	0.6	0.2	0.0	2.3
13	W	1.0	0.7	0.6	0.2	0.0	2.6
14	WNW	1.0	1.0	0.8	0.3	0.0	3.1
15	NW	1.3	1.6	1.8	0.7	0.1	5.6
16	NNW	1.5	2.5	4.4	1.5	0.2	10.0
Sub-Total		**16.8**	**21.8**	**41.1**	**17.3**	**1.3**	**98.3**
	Calms						1.7
	Missing/Incomplete						0
Total							**100**

9.4.1.1.3 Temperature

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers.

The monthly distribution of average daily maximum temperatures indicate that the average midday temperatures for Westonaria range from 16.6°C in June to 26.7°C in January. The region is the coldest during July with temperatures of 0.1°C on average during the night.

9.4.1.1.4 Relative Humidity

The data in Table 9-10 is representative of the relative humidity for the proposed WRTRP area. The annual maximum, minimum and average relative humidity is given as 66.4%, 61.6% and 63.8%, respectively. The daily maximum relative humidity remains above 60 % for most of the year, and range from 57.9 % in November to 74.2 % in March. The daily minimum relative humidity on the other hand is above 56 % for the whole year, with the highest minimum (67.2 %) observed in June and the lowest (55.6 %) occurring in November.

Table 9-10: Monthly Average Relative Humidity Values

Relative Humidity (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	67.1	65.6	74.2	63.3	64.0	72.2	69.9	67.7	67.7	64.0	57.9	63.8	66.4
Monthly Min.	62.1	60.9	60.6	62.5	61.5	67.2	63.0	63.6	61.8	60.8	55.6	59.1	61.6
Monthly Ave.	64.5	63.1	66.5	62.8	62.6	69.1	66.7	65.2	64.1	62.0	56.5	62.2	63.8

9.4.1.1.5 Precipitation

As shown in Table 9-11, for the three years data considered, the total monthly rainfall (max) and average total monthly rainfall are reported. The annual totals, maximum and average of 1 065 mm and 591 mm are reported.

Table 9-11: Total Monthly and Average Precipitation Values

Precipitation (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Total Monthly Rainfall (Max).	204.2	115.1	70.9	46.2	6.9	4.1	0.5	8.6	53.1	178.3	148.6	228.1	1065
Average Total Monthly Rainfall	122.0	64.1	35.8	25.1	2.6	1.4	0.3	5.8	19.2	72.9	99.1	142.5	591

9.4.1.1.6 Evaporation

As shown in Table 9-12, the annual averages for maximum, minimum and mean monthly evaporation rates for Westonaria area are 263 mm, 113 mm and 178 mm, respectively. The highest monthly maximum evaporation (322 mm) occurred in October. The rate decreases to the lowest in 68 mm in April. The monthly minimum evaporation ranges between 68 mm (April) and 180 mm in October.

Table 9-12: Monthly Evaporation Rates for Westonaria

Evaporation (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	289	262	224	190	223	244	257	261	288	322	277	320	263
Monthly Min.	88	120	93	68	79	70	85	111	155	180	178	128	113
Monthly Mean	206	177	171	141	124	109	126	170	224	253	224	212	178

9.4.1.1.7 Emissions and Particulates

Dust deposition results confirm that the area experiences dust deposition rates that are generally within the recommended residential limit specified by the National Dust Control Regulations (NDCR, 2013). Some sites were observed to be in violation of the recommended frequency of exceedance. At some sites, three or more sequential months are in exceedance, which violates the two permissible and non-sequential months allowed in a year (NDCR, 2013).

Dust deposition rates measured between 2010 and 2013 were compliant at all sites, with the exception of August and September 2010 (two sequential months that exceeded the standard - 600 mg/m^2/day (NDCR, 2013). In 2014, all sites (Venterspost Primary, Manyano Shaft, Ikamva Shaft Thuthukane Shaft, Bekkersdal Community Clinic and Hills Hhaven) were in violation of the permissible frequency of exceedance (two within a year). These sites exceeded the recommended standard for four sequential months. A detailed dust deposition baseline for the project area will be provided as part of the Air Quality Impact Assessment report to be attached as an appendix to the EIA report.

9.4.1.2 Geology

9.4.1.2.1 Regional Geology

The Karoo Supergroup is underlain by the Transvaal Supergroup, which is preserved in three structural basins. Of these basins, the Transvaal Basin is of consequence here and dates from 2650 – 290 Ma (*The Vaalian Erathem*). The Transvaal Supergroup comprises of the Pretoria and Chuniespoort Group formations.

The regional geology based on the 1:250 000 Geological Map 2626 West Rand series suggests that the lithographies are associated with the Pretoria Group. The Pretoria Group comprises of several formations including Rooihoogte, Timeball Hill, Boshoek, Hekpoort, Strubenkop, Daspoort and Silverton. The upper Pretoria Group is approximately 6 – 7 km thick and comprises of predominant mudrock alternating with quartzitic sandstone, significant interbedded basaltic-andesitic lavas and subordinate conglomerate, diamictite and carbonate rocks, all of which have been subject to low-grade metamorphism (Eriksson, Altermann & Hartzer, 2006). This group forms a prominent east-west trending ridges in the vicinity of the WRTRP. Extensive diabase sill intrusions, as characterised by its highly positive magnetic signature in the aeromagnetic survey, is evident as intrusions in the Silverton shale and Timeball Hill siltstone-shale sequences.

The Malmani Subgroup dolomite of the Chuniespoort Group has an inherent stromatolitic nature and has the potential for karst topography to develop. Karst topography refers to landscapes formed from the dissolution of soluble rocks, including dolomite and limestone. Dissolution of these soluble Malmani dolomites created voids – karst caves – that filled with fine- to coarse-grained alluvium during periodic flooding. The alluvium may be represented by bodies of breccia, sandstone and siltstone.

The Witwatersrand Supergroup lithostratigraphy dates to 2800 – 2650 Ma. The West Rand Group of the Witwatersrand Supergroup comprise of formations consisting of quartzite, shale and minor / subordinate conglomerate.

9.4.1.2.2 Local Geology

The geological map of the area indicates that the site is covered with Quaternary age sediment (Plan 11). However, the quaternary sediment was only found partially on site while shale and diabase outcrop are common. Information regarding the local geology of the WRTRP was obtained from percussion-drilled borehole logs for this project and data collected by Golder in 2009. Twenty-eight boreholes from around the vicinity of the proposed development footprint of the RTSF were drilled.

The WRTRP area is underlain by a gentle sloping stratum, dipping toward the south at angles between 10˚ to 20˚. The stratigraphic succession along three deep exploration boreholes (more than 3000 m) in a north-south geological cross section.

The geological profiles of the boreholes show that the development footprint of the proposed RTSF is underlain (from north to south) by Strubenkop shale, Daspoort quartzite and Silverton shale units. In addition to shales, sills of diabase intrusions were also encountered in some boreholes. No dolomite was encountered in any of the boreholes. The dolomite is expected to be more than 1500 km underneath the proposed RTSF development footprint, based on deep exploration boreholes drilled at the Goldfields TSF site.

In addition to this stratigraphic profile, two north-south striking negative magnetic diabase dykes (Gemsbokfontein No.1 and No.2 dykes), associated with the Pilanesburg tectonic event (~1 300 Ma) pass approximately 1 km east of the proposed RTSF development footprint area.

9.4.1.3 Groundwater

The groundwater baseline environment described below is specific for the RTSF area.

9.4.1.3.1 Current Groundwater Usage

Water uses identified during the hydrocensus (refer to Plan 12) include human consumption, livestock watering and agricultural uses.

A total of 146 water sources were located within the area of interest, of which 118 were private boreholes and 28 were monitoring boreholes drilled by SGL (and Gold One).

9.4.1.3.2 Baseline Groundwater Quality

The water samples collected were compared to the South African National Standards (SANS) 241: 2005 Standards for Drinking Water, and were grouped into Class I, Class II or Class III in accordance with the above stated Standard.

In general, the water quality of the area is good, with the majority of the samples collected falling within Class I, which is safe for human consumption, as indicated in Table 9-13.

Table 9-13: Hydrocensus Groundwater Quality Results benchmarked against the SANS 241:2005 Drinking Water Standards

		Total Dissolved Solids	Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as Al	Free and Saline Ammonia as N	Fluoride as F	Uranium as U
Class I	(Recommended)	<1000	<10	<200	N/S	<400	<150	<70	<200	<50	<0.2	<0.1	<150	5-9.5	<0.3	<1	<1	<0.015 (WHO)
Class II	(Max. Allowable)	1000-2400	10-20	200-600	N/S	400-600	150-300	70-100	200-400	50-100	0.2-2	0.1-1	150-370	4-5 or 9.5-10	0.3-0.5	1-2	1-1.5	
	Duration	7 years	7 years	7 years	N/S	7 years	7 years	7 years	7 years	7 years	7 years	7 years	7 years	No Limit	1 year	None	1 year	
Class III	(Not recommended)	>2400	>20	>600	N/S	>600	>300	>100	>400	>100	>2	>1	>370	<4 or >10	>0.5	>2	>1.5	
DM11	2015/01/31	296.00	7.90	9.80	214.00	12.90	41.00	25.00	39.00	3.70	0.01	0.00	48.20	7.90	0.01	-0.10	0.20	-0.004
CDVBH4	2015/01/31	90.00	0.20	2.90	84.00	5.00	9.70	12.00	9.80	3.20	0.03	0.00	17.30	8.20	0.01	-0.10	0.20	-0.004
DGV02	2015/01/31	198.00	4.70	9.50	133.00	9.50	28.00	17.50	21.00	3.60	0.01	0.00	32.70	7.80	0.01	-0.10	0.20	-0.004
CDVBH6	2015/01/31	164.00	1.40	6.20	127.00	6.40	23.00	13.90	19.40	2.00	0.11	0.00	27.00	7.40	0.02	-0.10	0.20	-0.004
CDVBH2	2015/01/31	182.00	-0.10	25.00	167.00	0.50	34.00	14.40	19.80	3.70	0.06	0.15	39.10	7.60	0.01	3.20	0.10	-0.004
COVBH7	2015/01/31	244.00	5.00	26.00	123.00	5.10	34.00	15.10	19.50	2.70	0.04	0.01	36.30	8.00	0.01	-0.10	0.10	0.004
WDBBH1	2015/01/31	54.00	-0.10	3.70	44.00	7.00	4.70	5.20	12.40	1.70	0.01	0.00	10.60	7.10	0.03	-0.10	0.20	-0.004
WDBBH2	2015/01/31	152.00	3.20	5.40	98.00	3.00	19.00	10.70	14.80	0.88	0.05	0.02	24.00	7.50	0.01	-0.10	0.40	-0.004
WDBBH7	2015/01/31	156.00	3.00	2.00	116.00	1.50	21.00	12.50	16.10	1.40	0.00	0.01	25.20	7.60	0.01	-0.10	0.20	-0.004
WDBBH6	2015/01/31	182.00	-0.10	5.00	165.00	1.60	32.00	17.50	11.90	2.30	0.02	0.00	31.40	7.50	0.01	0.20	0.10	-0.004
RTNBH12	2015/01/31	76.00	0.20	1.30	69.00	3.90	5.40	11.90	9.00	1.10	0.04	0.00	14.20	7.40	0.01	-0.10	0.40	-0.004

		Total Dissolved Solids	Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminium as Al	Free and Saline Ammonia as N	Fluoride as F	Uranium as U
Class I	(Recommended)	<1000	<10	<200	N/S	<400	<150	<70	<200	<50	<0.2	<0.1	<150	5-9.5	<0.3	<1	<1	<0.015 (WHO)
Class II	(Max. Allowable)	1000-2400	10-20	200-600	N/S	400-600	150-300	70-100	200-400	50-100	0.2-2	0.1-1	150-370	4-5 or 9.5-10	0.3-0.5	1-2	1-1.5	
	Duration	7 years	7 years	7 years	N/S	7 years	7 years	7 years	7 years	7 years	7 years	7 years	7 years	No Limit	1 year	None	1 year	
Class III	(Not recommended)	>2400	>20	>600	N/S	>600	>300	>100	>400	>100	>2	>1	>370	<4 or >10	>0.5	>2	>1.5	
RTNBH1	2015/01/31	228.00	2.00	11.70	189.00	8.40	39.00	19.10	18.60	3.50	0.01	0.00	39.50	7.80	0.01	-0.10	0.10	-0.004
RTNBH3	2015/01/31	324.00	7.20	19.70	188.00	22.00	50.00	26.00	19.90	1.60	0.01	0.00	50.20	7.80	0.00	-0.10	0.10	-0.004
RTNBH7	2015/01/31	326.00	6.60	19.90	182.00	32.00	31.00	35.00	18.90	1.20	0.00	0.00	48.40	7.80	0.00	-0.10	0.30	-0.004
RTNBH9	2015/01/31	158.00	3.80	5.50	89.00	4.50	20.00	10.50	11.20	2.40	0.02	0.00	21.70	7.50	0.02	-0.10	0.10	-0.004

Concentrations falling within Class II thresholds are highlighted in orange, with concentration exceeding Class II standards highlighted in red.

9.4.1.3.3 Aquifer Characterisation

Water levels from 181 boreholes located within a 10 km radius of the RTSF site were used to evaluate the water level and flow direction. A comparison of the water elevation with topography shows a good correlation of 97.11%. This means that groundwater flow mimics the topography and is towards surface water drainage courses as base flow, generally from the west to east.

Plan 11: Geology

Plan 12: Hydrocensus

9.4.1.3.4 Aquifer Property

The underlying aquifer is characterised as a low yielding, semi-confined weathered (and fractured) aquifer system mostly composed of the Pretoria group geology. This is based on the hydrogeological borehole information obtained from the borehole drilling and aquifer testing of the boreholes in proximity of the RTSF during 2015.

Comparison of groundwater levels with the water strikes indicates that the depth of water strikes are in most cases below the measured groundwater levels, which is indicative of confining groundwater flow conditions. The difference varies from a few centimetres to 52 m. However, a continuous confining layer appears to be absent and the aquifer underlying the site has been classified as being semi-confined.

9.4.1.3.5 Aquifer Layers and Thickness

The water strikes are encountered at depths between 10 and 60 m below ground level (mbgl), with the majority occurring between 20 and 40 mbgl.

Half of the percussion boreholes drilled by Golder are shallow (12 to 24 m deep) and the remaining half are deep (70 m). As stated in the Golder (2009) report, the differences between the water levels of the shallow and deep boreholes are generally less than 0.1 m. This implies that there is no major head difference between the shallow and deep boreholes, which is a further confirmation that they are intersecting the same aquifer. The water qualities in the shallow and deep boreholes also display the character of recent recharge from rainfall which is consistent with the connectivity between the two sets of boreholes, also indicated by the aquifer testing.

9.4.1.4 Noise

9.4.1.4.1 Current Ambient Environment

The current noise soundscape of the study area has been characterised by means of baseline noise measurements near the major noise emitting components from the WRTRP. The measurements were carried out in accordance with the Gauteng Noise Control Regulations. The measured baseline will be compared to the guidelines of the SANS 10103:2008 which compares environmental noise with respect to annoyance and speech communication (refer to Table 9-14).

Table 9-14: Acceptable Rating Levels for Noise in Districts (SANS 10103, 2008)

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	Night-time
	$L_{R,dn}$ [a]	$L_{Req,d}$ [b]	$L_{Req,n}$ [b]	$L_{R,dn}$ [a]	$L_{Req,d}$ [b]	$L_{Req,n}$ [b]
RESIDENTIAL DISTRICTS						
a) Rural districts	45	45	35	35	35	25
b) Suburban districts with little road traffic	50	50	40	40	40	30
c) Urban districts	55	55	45	45	45	35
NON-RESIDENTIAL DISTRICTS						
d) Urban districts with some workshops, with business premises, and with main roads	60	60	50	50	50	40
e) Central business districts	65	65	55	55	55	45
f) Industrial districts	70	70	60	60	60	50
NOTE 1 If the measurement or calculation time interval is considerably shorter than the reference time intervals, significant deviations from the values given in the table might result.						
NOTE 2 If the spectrum of the sound contains significant low frequency components, or when an unbalanced spectrum towards the low frequencies is suspected, special precautions should be taken and specialist advice should be obtained. In this case the indoor sound levels might significantly differ from the values given in columns 5 to 7.						
NOTE 3 In districts where outdoor $L_{R,dn}$ exceeds 55 dBA, residential buildings (e.g. dormitories, hotel accommodation and residences) should preferably be treated acoustically to obtain indoor $L_{Req,T}$ values in line with those given in table 1.						
NOTE 4 For industrial districts, the $L_{R,dn}$ concept does not necessarily hold. For industries legitimately operating in an industrial district during the entire 24 h day/night cycle, LReq,d = LReq,n =70 dBA can be considered as typical and normal.						
NOTE 5 The values given in columns 2 and 5 in this table are equivalent continuous rating levels and include corrections for tonal character, impulsiveness of the noise and the time of day.						
NOTE 6 The noise from individual noise sources produced, or caused to be produced, by humans within natural quiet spaces such as national parks, wilderness areas and bird sanctuaries, should not exceed a maximum Weighted sound pressure level of 50 dBA at a distance of 15 m from each individual source.						

Type of District	Equivalent continuous rating level ($L_{Reg.T}$) for noise (dBA)					
	Outdoors			Indoors, with open windows		
	Day-night	Day-time	Night-time	Day-night	Day-time	Night-time
	$L_{R,dn}$ [a]	$L_{Req,d}$ [b]	$L_{Req,n}$ [b]	$L_{R,dn}$ [a]	$L_{Req,d}$ [b]	$L_{Req,n}$ [b]
a The values given in columns 2 and 5 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness of the noise and the time of day.						
b The values given in columns 3, 4, 6 and 7 are equivalent continuous rating levels and include corrections for tonal character and impulsiveness.						

The criteria used to site the measurement locations are (refer to Plan 13):

- The locations nearest noise sensitive receptors to the Driefontein TSF 5 and Driefontein TSF 3, as well as nearest to the proposed CPP and RTSF; and
- The locations served as suitable reference points for the measurement of ambient sound levels surrounding the proposed project area. The noise measurement locations cover rural as well as suburban and urban areas that represent a comprehensive soundscape of the area.

The list of noise measurement locations can be seen in Table 9-15.

Table 9-15: Noise Measurement Locations

Site ID	Farm/location	Category of Receiver	GPS Coordinates
N1	Leslie Williams Private Hospital	Urban/industrial	26° 24.077'S & 27° 25.322'E
N2	Wildebeestkuil 360 IQ portion 6	Rural	26° 28.459'S & 27° 36.615'E
N3	Letsatsing Village	Suburban	26°15'17.95"S & 28°29'22.04"E
N4	Rietfontein 349 IQ portion 42	Rural	26° 25.346'S & 27° 37.832'E

The results from the noise meter recordings for all the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 9-16.

Table 9-16: Results of the Baseline Noise Measurements

Sample ID	SANS 10103:2008 Rating Limit					
	Type of district	Period	Acceptable rating level dBA	$L_{Areq,T}$ dBA	Maximum/Minimum dBA	Date
N1	Urban	Daytime	60	52	80/ 39	23/02/2015
		Night time	50	52	68 / 41	23/02/2015
N2	Rural	Daytime	45	51	87 / 29	26/02/2015
		Night time	35	43	67 / 28	26/02/2015
N3	Suburban	Daytime	50	44	77 / 38	02/03/2015
		Night time	40	40	66 / 37	02/03/2015
N4	Rural	Daytime	45	45	72 / 29	05/03/2015
		Night time	35	48	70 / 37	05/03/2015
	Indicates current $L_{Aeq,T}$ levels above either the daytime rating limit or the night time rating limit					

Plan 13: Noise Monitoring Points

9.4.1.5 Soils

The land type data gathered during the scoping phase suggested the following dominant soils:

- Red well-drained soils on foot slopes of Land Type Ab;
- Shallow rocky soils on the steep escarpment of Land Type Fb;
- Red soils and rocky soils on crests of Land Type Ba; and
- Various hydromorphic and shallow soils on rock in midslopes and foot slopes of Land Type Bb.

9.4.1.5.1 Land Type Data

The soils found in the project area are represented by four possible land types as summarised in Table 9-17 and shown in Plan 14. The land uses and land capabilities are shown in Plan 15 and Plan 16 respectively.

Table 9-17: Dominant Soil Types and Slopes occurring within the Project Area

Dominant Land Type	Description	Dominant soil types	Dominant Land Capability	Potential occurrence % per land type
Ab	Land Type Ab is dominated by the foot slope landscape position (82%). Red well drained soils are common in this landscape position.	Red well drained soils for example Hutton soils.	II	90
Fb	Land Type FB is dominated by midslope (33%) and footslope (42%) positions but also contains scarp (5%) landscape positions due to the presence of rocky outcrops.	Shallow stony soils and rocks are common in this Land Type.	VI	59
Ba	Land Type Ba is dominated by crest (30%) and midslope (55%) landscape positions. The crest positions are dominated by red soils but also contain a fair amount of rock outcrops.	Deep red and shallow stony soils for example Hutton and Mispah soils respectively.	III	47
Bb	Land Type Bb is dominated by midslope (38%) and footslope positions (42%).	This Land Type is characterised by mixed soils such as shallow Mispah soils, wet soil such as Longlands and Wasbank soils as well as heavy clay soils such as Valsrivier and Sterkspruit soils.	III	59

Plan 14: Land Types

Plan 15: Land Use

Plan 16: Land Capability

9.4.1.6 Surface Water

South Africa is divided into 19 Water Management Areas (WMA), managed by its respective water boards. Each of the WMAs are made up of quaternary catchments, which relate to the drainage regions of South Africa. Each of the quaternary catchments have associated hydrological parameters including area, Mean Annual Precipitation (MAP), Mean Annual Evaporation (MAE) , and Mean Annual Runoff (MAR).

9.4.1.6.1 Regional Hydrology

The WRTRP is situated in the Upper Vaal Water Management Area (WMA) 8 within the quaternary catchments C23E, C23J, C23D, C22J and A21D (Plan 17), with the Kloof Mining Right area falling within quaternary catchments C23J, C22J and C23D.

The surface water attributes of the affected catchments namely the MAR in million cubic meters (Mm^3), MAP (mm) and MAE (mm) are summarised in Table 9-18 (WRC, 2005).

Table 9-18: Summary of the Surface Water Attributes for Quaternary Catchments

Quaternary Catchment	Total Area (km^2)	MAP (mm)	MAR (Mm^3)	MAE (mm)
A21D	761	714	17.78	1700
C22J	669	633	11.81	1650
C23D	510	664	9.12	1650
C23E	850	631	13.41	1675
C23J	890	620	18.49	1670

Runoff emanating from quaternary catchment C23D drains in a south westerly direction into the Mooirivierloop River, which is the largest river in the quaternary catchment. Runoff emanating from quaternary catchment C23D drains in a south westerly direction via the Mooirivierloop River. The C23D quaternary catchment is a contributing catchment to C23E and consequently all runoff from C23D eventually drains to the outlet of C23E. The C23E quaternary catchment is also made up of urban areas which are greater than 5 km^2.

The C22J quaternary catchment area is 669 km^2 and has an MAR of 11.81 Mm^3. Runoff emanating from quaternary catchment C22J drains in a southerly direction, also via the Leeuspruit River. The C23J quaternary catchment area is 890 km^2 and has an MAR of 18.49 Mm^3. Runoff emanating from quaternary catchment C23J drains in a south westerly direction via the Loopspruit River.

Runoff from the A21D quaternary catchment drains in a north easterly direction away from the WRTRP area via the Rietspruit River. The Rietspruit River is the largest river within the quaternary catchment.

Plan 17: Catchment Area

9.4.1.6.2 Water Quality

Where data from SGL's current monitoring networks were not sufficient to characterise the baseline of the WRTRP, additional samples were taken. Surface water quality samples were collected from the rivers and dams within and around the project area to determine the baseline water quality for the project area. The sampled rivers include the Leeuspruit, Loopspruit and other unnamed rivers around the project area.

Samples were submitted to Aquatico Laboratory (Pty) Ltd, a SANAS accredited laboratory in Pretoria for analysis of their physical and chemical quality status, as well as additional water quality data sets (January 2013 to March 2015) also provided to Digby Wells and used to describe the current water quality status for those monitoring points.

Water quality results have been benchmarked against the SANS 241-1: 2011 drinking water standards. This part of SANS 241 specifies the quality of acceptable drinking water, defined in terms of microbiological, physical, aesthetic and chemical determinants, at the point of delivery. Water that complies with this part of SANS 241 is deemed to present an acceptable health risk for lifetime consumption (this implies an average consumption of 2 L of water per day for 70 years by a person that weighs 60 kg).

The results were also benchmarked with the In-stream Water Quality Guidelines for the Vaal Dam Catchment. This is due to the fact that the project area lies within the Vaal Dam drainage region/catchment.

The Resource Water Quality Objectives (RWQOs) are defined by the NWA as "clear goals relating to the quality of the relevant water resources" (DWAF, 2006a). In South Africa, the South African Water Quality Guidelines (SAWQG) has been developed as discrete values that set out the change from one category of fitness for use to another (DWAF, 1996).

The water quality guidelines describe the "fitness for use" of a water resource, while the Water Quality Objectives defines "what management action is required" for a water resource. The fitness for use of water defines how suitable the quality of water is for its intended use. The following fitness for use categories are linked to the SAWQGs:

- **Ideal** – the use of water is not affected in any way; 100% fit for use by all users at all times; desirable water quality (TWQR);
- **Acceptable** – slight to moderate problems encountered on a few occasions or for short periods of time;
- **Tolerable** – moderate to severe problems are encountered; usually for a limited period only; and
- **Unacceptable** – water cannot be used for its intended use under normal circumstances at any time (DWAF, 2006c).

The water quality results are set out in Table 9-19 (benchmark against drinking standards) and Table 9-20 (benchmark for in-stream quality).

Table 9-19: Water quality results benchmarked against the SANS 241-1:2011 drinking water quality standards

Sample ID			pH-Value at 25° C	Conductivity at 25° C in mS/m	Total Dissolved Solids	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Chlorides as Cl	Sulphate as SO_4	Nitrate NO_3 as N	Fluoride as F	Aluminium as Al	Iron as Fe	Manganese as Mn	Free and Saline Ammonia as N
SANS241-1:2011	(Aesthetic quality Recommended)		5-9.5	<170	<1200	<150	<70	<200	<50	<300	<250	<10	<1	<0.3	<0.3	<0.1	<1.5
	(Drinking water quality Max. Allowable)		4-5 or 9.5-10	370	2400	300	100	400	100	600	500	11	1.5	0.5	2	0.5	2
	Exposure Duration (years)		70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs
		Date	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cl mg/l	SO4 mg/l	NO3-N mg/l	F mg/l	Al mg/l	Fe mg/l	Mn mg/l	N_Amonia mg/l
LP002		03/03/2015	6.9	8	34	7	5	5	0	5	7	0	0.2	0.1	0.0	0.0	0.00
LP004		03/03/2015	7.2	92	688	95	31	75	0	31	95	1	0.4	0.0	0.0	0.0	0.00
LP005		03/03/2015	7.5	93	708	96	31	75	0	31	96	1	0.4	0.0	0.0	0.0	0.00
LP006		03/03/2015	8.0	101	754	106	36	78	0	36	106	1	0.4	0.0	0.0	0.0	0.00
LU014		02/03/2015	7.5	113	970	124	50	65	0	50	124	0	0.4	0.0	0.0	0.0	0.00
DSW9	50th Percentile	2013 to 2015	8.3	90	662	183	212	52	0	42	278	1	0.3	0.1	0.0	0.0	0.0
	95th Percentile		8.8	101	1009	224	225	61	0	49	304	2	0.6	0.1	0.1	0.1	0.1
DSW42	50th Percentile	2013 to 2015	8.3	74	520	158	192	26	0	35	143	1	0.1	0.1	0.0	0.0	0.0
	95th Percentile		8.5	80	579	175	207	29	0	38	149	1	0.2	0.1	0.1	0.0	0.1
L1	50th Percentile	Jan 2013-March 2015	7.7	90	743	96	41	32	0	19	428	2	0.5	0.0	0.0	0.1	2.9
	95th Percentile		8.2	100	933	125	55	53	0	29	502	5	0.7	0.1	0.0	0.4	6.1
L2	50th Percentile	Jan 2013-March 2015	7.5	88	696	84	48	37	0	17	387	1	0.6	0.0	0.0	0.1	0.2
	95th Percentile		8.0	94	889	155	62	44	0	24	410	1	1.1	0.0	0.0	0.3	0.4
L3	50th Percentile	Jan 2013-March 2015	7.6	114	877.0	119	38	76	0	70	415	2	0.4	0.0	0.0	1.2	2.1
	95th Percentile		8.0	173	1480.0	186	54	144	0	97	719	5	0.7	0.1	0.0	9.7	4.6
W12	50th Percentile	Jan 2013-March 2015	7.8	75	460.0	59	18	57	0	36	415	75	0.4	0.0	0.1	1.4	4.0
	95th Percentile		8.1	82	538.2	116	22	85	0	50	719	215	0.7	0.1	0.1	3.7	18.4
W13	50th Percentile	Jan 2013-March 2015	7.8	75	474.0	55	19	57	0	40	82	8	0.4	0.0	0.0	1.3	4.8
	95th Percentile		8.1	82	606.0	119	25	92	0	52	236	14	0.5	0.1	0.0	3.0	19.8

Sample ID			pH-Value at 25° C	Conductivity at 25° C in mS/m	Total Dissolved Solids	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Chlorides as Cl	Sulphate as SO_4	Nitrate NO_3 as N	Fluoride as F	Aluminium as Al	Iron as Fe	Manganese as Mn	Free and Saline Ammonia as N
SANS241-1:2011	(Aesthetic quality Recommended)		5-9.5	<170	<1200	<150	<70	<200	<50	<300	<250	<10	<1	<0.3	<0.3	<0.1	<1.5
	(Drinking water quality Max. Allowable)		4-5 or 9.5-10	370	2400	300	100	400	100	600	500	11	1.5	0.5	2	0.5	2
	Exposure Duration (years)		70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs	70yrs
		Date	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cl mg/l	SO4 mg/l	NO3-N mg/l	F mg/l	Al mg/l	Fe mg/l	Mn mg/l	N_Amonia mg/l
W15	50th Percentile	Jan 2013-March 2015	8.0	94	692.0	86	28	73	0	50	267	5	0.3	0.0	0.1	0.0	3.6
	95th Percentile		8.3	107	853.6	128	48	105	0	64	310	9	0.6	0.0	0.2	0.6	6.7
DP006		02/03/2015	7.7	11	82	27	11	6	0	4	6	0	0.0	6.6	0.0	0.2	0.2
DP003		02/03/2015	7.0	36	306	95	33	14	0	65	14	0	0.0	23.1	0.0	0.2	0.2
LU009		02/03/2015	7.6	114	896	0	226	63	0	112	386	1	0.0	133.0	55.0	0.0	0.1
GOL2376-SW1		25/03/2015	7.0	5	32	3	3	3	1	5	1	0	0.3	-0.003	0.115	-0.001	0.1
GOL2376-SW2		25/03/2015	7.7	57	358	49	28	36	5	42	78	0	0.3	-0.003	-0.003	0.003	0.2
GOL2376-SW3		25/03/2015	7.9	120	764	149	50	72	11	98	417	1	0.4	-0.003	-0.003	-0.001	0.2
GOL2376-SW4		25/03/2015	8.3	119	826	156	50	67	10	90	454	2	0.3	-0.003	-0.003	-0.001	0.1
GOL2376-SW5		25/03/2015	7.8	123	862	157	46	70	13	83	494	3	0.3	-0.003	-0.003	-0.001	0.1
GOL2376-SW6		25/03/2015	8.1	101	654	102	41	81	8	90	315	1	0.4	-0.003	-0.003	-0.001	0.2
GOL2376-SW7		25/03/2015	7.6	7	48	4	4	3	1	6	1	0	0.2	-0.003	-0.003	-0.001	0.1
GOL2376-SW8		10/07/2015	8.4	110	777	107	43	81	5	88	362	1	0.3	-0.002	-0.004	-0.002	0.1
GOL2376-SW9		10/07/2015	8.3	111	790	109	44	84	6	90	372	1	0.3	-0.002	-0.004	0.196	0.1
GOL2376-SW13		10/07/2015	8.2	91	616	82	28	77	6	70	283	4	0.5	-0.002	-0.004	-0.002	0.1
GOL2376-SW21		10/07/2015	8.8	89	628	70	42	66	2	55	343	2	0.6	-0.002	-0.004	-0.002	0.0
GOL2376-SW23		10/07/2015	7.8	131	985	142	58	77	6	95	490	10	0.4	-0.002	-0.004	0.060	0.0
GOL2376-SW26		10/07/2015	8.3	117	810	126	48	73	7	109	358	1	0.4	-0.002	-0.004	-0.002	0.0

Table 9-20: Water quality results benchmarked against the in-stream water quality guidelines for the Vaal Dam Catchment

Sample ID			Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Conductivity at 25° C in mS/m	pH-Value at 25° C	Free and Saline Ammonia as N	Fluoride as F	Phosphate as PO_4
In-stream Water Quality Guidelines for the Vaal Dam Catchment		Ideal	<0.1	<25	<40	<20	<10	6.5-8.5	<0.2	<0.05	<0.05
		Acceptable	0.1-0.2	25-50	40-75	20-45	11232	-	0.2-0.5	0.05-0.20	0.05-0.25
		Tolerable	0.2-0.3	50-75	75-120	45-70	30-45	-	0.5-1.0	0.2-0.4	0.25-0.50
		Unacceptable	>0.3	>75	>120	>70	>45	<6.5;>8.5	>1	>0.4	>0.5
		Dates									
LP002		03/03/2015	18.0	4.9	0	7.2	8.3	6.9	0.0	20.0	0.2
LP004		03/03/2015	237.0	31.0	0	94.8	91.7	7.2	0.0	127.1	0.4
LP005		03/03/2015	240.0	30.8	0	96.0	93.3	7.5	0.0	126.3	0.4
LP006		03/03/2015	265.0	35.8	0	106.0	101.0	8.0	0.0	147.8	0.4
LU014		02/03/2015	310.0	49.8	0	124.0	113.0	7.5	0.0	204.2	0.4
DSW9	50th Percentile	2013 to 2015	1.5	42.5	0	278.0	89.8	8.3	0.0	0.3	0.1
	95th Percentile		2.0	49.1	0	303.8	100.9	8.8	0.1	0.6	0.1
DSW42	50th Percentile	2013 to 2015	1.2	35.0	0	143.0	74.1	8.3	0.0	0.1	0.3
	95th Percentile		1.3	38.3	0	148.8	80.2	8.5	0.1	0.2	0.3
L1	50th Percentile	Jan 2013-March 2015	2.3	19		428	90	7.7	2.9	0.45	
	95th Percentile		5.3	29.2		502	99.8	8.24	6.1	0.74	
L2	50th Percentile	Jan 2013-March 2015	0.6	16.5		387	87.5	7.5	0.2	0.6	
	95th Percentile		0.775	24		410	93.75	7.975	0.37	1.05	
L3	50th Percentile	Jan 2013-March 2015	1.9	70		415	114	7.6	2.1	0.43	
	95th Percentile		5.45	97.4		718.8	172.8	8.04	4.6	0.745	
W12	50th Percentile	Jan 2013-March 2015	74.5	36		415	75	7.8	4	0.4	
	95th Percentile		215.25	50.2		718.8	82.4	8.1	18.4	0.725	

Sample ID			Nitrate NO_3 as N	Chlorides as Cl	Total Alkalinity as $CaCO_3$	Sulphate as SO_4	Conductivity at 25° C in mS/m	pH-Value at 25° C	Free and Saline Ammonia as N	Fluoride as F	Phosphate as PO_4
W13	**50th Percentile**	**Jan 2013-March 2015**	7.8	40		82	75	7.8	4.8	0.4	
	95th Percentile		14.2	52.2		235.8	82.2	8.12	19.8	0.525	
W15	**50th Percentile**	**Jan 2013-March 2015**	5.2	50		267	94	8	3.6	0.3	
	95th Percentile		8.74	64		310	107	8.3	6.74	0.56	
DP006		**02/03/2015**	0.3	3.56		5.72	10.8	7.67	0.15	0	
DP003		**02/03/2015**	0.3	64.7		13.5	36	7.02	0.22	0	
LU009		**02/03/2015**	1.4	112		386	114	7.63	0.08	0	
GOL2376-SW1		**25/03/2015**	0.24	5.48	19.2	0.53	5.25	6.97	0.11	0.25	0.08
GOL2376-SW2		**25/03/2015**	0.21	41.5	205	78	56.5	7.72	0.22	0.34	0.06
GOL2376-SW3		**25/03/2015**	0.84	97.7	149	417	120	7.89	0.22	0.39	0.06
GOL2376-SW4		**25/03/2015**	1.52	89.9	139	454	119	8.28	0.13	0.32	0.06
GOL2376-SW5		**25/03/2015**	2.53	82.8	133	494	123	7.76	0.1	0.3	0.08
GOL2376-SW6		**25/03/2015**	1.16	90.1	131	315	101	8.14	0.15	0.41	0.44
GOL2376-SW7		**25/03/2015**	0.17	5.83	24.5	0.9	6.5	7.55	0.11	0.22	0.07
GOL2376-SW8		**10/07/2015**	0.833	88.2		362	110	8.35	0.079	0.319	0.017
GOL2376-SW9		**10/07/2015**	0.554	90.1		372	111	8.29	0.083	0.337	-0.002
GOL2376-SW13		**10/07/2015**	4	70		283	91	8.17	0.068	0.457	0.509
GOL2376-SW21		**10/07/2015**	1.55	54.6		343	89.4	8.8	0.006	0.633	-0.002
GOL2376-SW23		**10/07/2015**	9.86	95.1		490	131	7.82	0.009	0.353	-0.002
GOL2376-SW26		**10/07/2015**	1.19	109		358	117	8.34	0.031	0.372	-0.002

9.4.1.7 Fauna & Flora

The project area falls within four vegetation types according to Mucina and Rutherford (2006) as described below and shown in Plan 18. The sections below also discuss the fauna and flora of the area.

9.4.1.7.1 Carletonville Dolomite Grassland

This vegetation unit mainly occurs in the North-West Province but also in Gauteng and marginally into the Free State Province. It is distributed in the region of Potchefstroom, Ventersdorp and Carletonville, extending westwards to the vicinity of Ottoshoop, but also occurring as far east as Centurion and Bapsfontein in Gauteng Province.

This vegetation occurs on slightly undulating plains dissected by prominent rocky chert ridges. It forms a complex mosaic pattern dominated by many species. Grasses such as: *Loudetia simplex* (Common Russet Grass), *Hyparrhenia hirta* (Common Thatching Grass), *Brachiaria serrata* (Velvet Signal Grass) and *Heteropogon contortus* (Spear Grass) are prominent while shrubs such as: *Euclea undulata* (Common Guarri), *Searsia magalismontana* (Berg Taaibos), *Zanthoxylon capense* (Small Knobwood) and *Diospyros lycioides* (Bluebush) are scattered in protected places (e.g. among rocks and boulders). The geology of this vegetation unit consists of dolomites and cherts of the Malmani subgroup from the Transvaal super group.

Conservation status is currently considered vulnerable, with only a small extent conserved in statutory reserves (Sterkfontein Caves— part of the Cradle of Humankind World Heritage Site, Oog Van Malmani, Abe Bailey, Boskop Dam, Schoonspruit, Krugersdorp, Olifantsvlei, Groenkloof) and in at least six private conservation areas. Almost a quarter of the vegetation type has already been transformed by cultivation, urban sprawl or by mining activity as well as the building of the Boskop and Klerkskraal Dams. Erosion is considered to be very low (84%) and low (15%).

9.4.1.7.2 Gauteng Shale Mountain Bushveld

This vegetation unit occurs in Gauteng and North-West Provinces, mainly on the ridge of the Gatsrand south of Carletonville–Westonaria–Lenasia. It occurs on low broken ridges varying in steepness and generally with a high surface rock cover. The vegetation is a short, semi-open thicket, dominated by a variety of woody species such as: *Acacia caffra*, *Searsia leptodictya*, *Cussonia spicata* and *Englerophytum magalismontanum*. The understory is dominated by grasses such as: *Cymbopogon pospischilii* and *Digitaria eriantha*. Some of the ridges form plateaus that carry scrubby grassland. The geology consists of shale and andesite from the Pretoria group (Transvaal supergroup).

Conservation status is currently considered to be Vulnerable, statutorily conserved in Skanskop and Hartebeesthoek Nature Reserves, Magaliesburg Nature Area and Groenkloof National Park.

9.4.1.7.3 Rand Highveld Grassland

Rand Highveld Grassland is found in the highly variable landscape with extensive sloping plains and ridges in the Gauteng, North-West, Free State and Mpumalanga Provinces. The vegetation type is found in areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as in the vicinity of Derby and Potchefstroom, extending southwards and north-eastwards from there. The vegetation is characterised by species rich, sour grassland alternating with low shrubland on rocky outcrops. The most common grasses on the plains belong to the genera *Themeda, Eragrostis, Heteropogon* and *Elionurus*. High numbers of herbs belonging to the Asteraceae family are also found. In rocky areas, shrubs and trees also prevail and are mostly *Protea caffra, Acacia caffra, Celtis africana* and *Searsia* spp.

Due to the low conservation status, this vegetation type is classified as Endangered. Almost half of the vegetation type has been transformed by cultivation, plantations, urbanisation or dam-building. Scattered aliens (most prominently *Acacia mearnsii*) are present in the unit.

9.4.1.7.4 Soweto Highveld Grassland

This vegetation unit occurs in Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces. It lies in a broad band roughly delimited by the N17 road between Ermelo and Johannesburg in the north, Perdekop in the southeast and the Vaal River (border with the Free State) in the south. It extends further westwards along the southern edge of the Johannesburg Dome (including part of Soweto) as far as the vicinity of Randfontein. In southern Gauteng it includes the surrounds of Vanderbijlpark and Vereeniging as well as Sasolburg in the northern Free State.

The vegetation occurs on gently to moderately undulating landscape on the Highveld plateau supporting short to medium high, dense, tufted grassland dominated almost entirely by *Themeda triandra* (Rooi grass) and accompanied by a variety of other grasses such as *Elionurus muticus* (Wire grass), *Eragrostis racemosa* (Small heart grass), *Heteropogon contortus* (Spear grass) and *Tristachya leucothrix* (Trident grass).

Only small scattered wetlands, narrow streams and occasional ridges or rocky outcrops interrupt the continuous grassland cover. The geology of the Soweto Integration consists mainly of shale, sandstone or mudstone of the Madzarinwe formation (Karoo supergroup).

The conservation status is currently considered to be Endangered, only small areas are statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, and Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site). Almost half of the area already transformed by cultivation, urban sprawl, mining and building of road infrastructure. Some areas have been flooded by dams (Grootdraai, Leeukuil, Trichardtsfontein, Vaal and Willem Brummer dams). Erosion is generally very low (93%).

Plan 18: Vegetation Types

9.4.1.7.5 Possible Floral Species of Special Concern

The project area lies within three Quarter Degree Square (QDS) grids, namely 2627AD and 2627BC and 2627DA. According to the PRECIS, no Red Data species are expected to occur for the QDS for each of the sites.

The Plants of South Africa (http://posa.sanbi.org) website list was obtained from the South African National Biodiversity Institute (SANBI) website; it lists all the Red Data plant species officially recorded by SANBI for Quarter degree square grid. In order for a plant species to be included in this list, a specimen collected in this grid must be supplied to SANBI. This list is therefore not a comprehensive list representing only those species that may occur in these grids, but rather a guideline as to what is likely to occur here. The sites sampled are also only a very small portion of the whole grid and habitats suitable for certain species in these Plants of South Africa (POSA) lists may not be present at the sites sampled. It is therefore not unusual for species in the POSA list to be absent from the sampling sites.

Certain species included in the list below was confirmed by scrutinising previous specialist studies that were undertaken in the past. The IUCN category descriptions are provided in Table 9-21, with the Species of Special Concern (SSC) likely to occur on site are listed in Table 9-22.

Table 9-21: Red Data Categories (SANBI, 2012)

Category		Description
Extinct	(EX)	No known individuals remaining.
Extinct in the Wild	(EW)	Known only to survive in captivity.
Critically Endangered	(CR)	Extremely high risk of extinction in the wild.
Endangered	(EN)	High risk of extinction in the wild
Vulnerable	(VU)	High risk of endangerment in the wild.
Near Threatened	(NT)	Likely to become endangered in the near future.
Least Concern	(LC)	Lowest risk. Does not qualify for a more at risk category.
Data Deficient	(DD)	Not enough data to make an assessment of its risk of extinction.
Not Evaluated	(NE)	Has not yet been evaluated against the criteria.
	Extinct	**Threatened species** are species that are facing a high risk of extinction. Any species classified in the IUCN categories **CR, EN** or **VU** is a threatened species. **Species of conservation concern** are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories**, NT, LC** and **DD**
	Threatened	
	Other categories of conservation concern	
	Other categories	

Table 9-22: Plant SSC likely to occur on site

Plant species	Status
Kniphofia typhoides	NT (confirmed)
Trachyandra erythrorrhiza	NT (confirmed)
Hypoxis hemerocallidea	Declining (confirmed)
Eucomis autumnalis subsp. clavata	Not Evaluated (confirmed)
Boophone disticha	*Declining*
Adromischus umbraticola subsp. umbraticola	NT
Drimia sanguinea	NT
Khadia beswickii	VU

Fauna expected to occur on site include assemblages within terrestrial and wetland ecosystems: mammals, birds, reptiles, amphibians and invertebrates. Each of these assemblages occurs within unique habitats and the ecological state of these habitats directly relates to the number of species found within them. The main habitats occurring in the project area are grassland plains and pans, with little altitudinal variation.

9.4.1.7.6 Amphibians

Amphibians are viewed as good indicators of changes to the whole ecosystem because they are sensitive to changes in the aquatic and terrestrial environments (Waddle, 2006). Most species of amphibians are dependent on the aquatic environment for reproduction (Duellman and Trueb 1986). Additionally, amphibians are sensitive to water quality and ultra violet radiation because of their permeable skin (Gerlanc and Kaufman 2005). Activities such as feeding and dispersal are spent in terrestrial environments (Waddle, 2006). According to Carruthers (2001), a number of factors influence the distribution of amphibians, but because amphibians have porous skin they generally prosper in warm and damp habitats. The presence of suitable habitat within the study area should provide a number of different species of amphibians.

According to Carruthers (2001), frogs occur throughout southern Africa. A number of factors influence their distribution, and they are generally restricted to the habitat type they prefer, especially in their choice of breeding site. The choices available of these habitats coincide with different biomes, these biomes in turn, are distinguished by means of biotic and abiotic features prevalent within them. Therefore a collection of amphibians associated with the Grassland biome will all choose to breed under the prevailing biotic and abiotic features present. Further niche differentiation is encountered by means of geographic location within the biome, this differentiation includes, banks of pans, open water, inundated grasses, reed beds, trees, rivers and open ground, all of which are present within the area of interest. No previous records of amphibians that occur on site were found on the South African Reptile

Conservation Assessment (SARCA) website (http://sarca.adu.org.za/). The Near threatened Giant Bullfrog (*Pyxicephalus adspersus)* is expected on site due to available habitat.

9.4.1.7.7 Avifauna

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological condition are linked to land cover. As the land cover of an area changes, so do the types of birds in that area (The Bird Community Index, 2007). Land cover is directly linked to habitats within the study area. The diversity of these habitats should give rise to many different species. According to the South African Bird Atlas Project (SABAP2), 324 species of birds have been identified in the area; the majority of these birds are comprised of Grassland species. All birds that could be present within QDS 2627 AD, 2627 BC and 2627 DA. Of these species, 10 have been assigned an international Red Data status with one Endangered, six Near Threatened, and three Vulnerable species recorded. These species are listed in the Table 9-23 below. The presence of these species will be confirmed as part of the EIA phase.

Table 9-23: Red data bird species

Common Name	Scientific Name	Red Data Status
Maccoa duck	*Oxyura maccoa*	Near threatened
Lesser flamingo	*Phoenicopterus minor*	Near threatened
Grass owl	*Tyto capensis*	Vulnerable
Black winged pratincole	*Glareola nordmanni*	Near threatened
Blue Korhaan	*Eupodotis caerulescens*	Near threatened
European Roller	*Coracias garrulus*	Near threatened
Pallid Harrier	*Circus macrourus*	Near threatened
White Backed Vulture	*Gyps africanus*	Endangered
Cape Vulture	*Gyps coprotheres*	Vulnerable
Secretarybird	*Sagittarius serpentarius*	Vulnerable

9.4.1.7.8 Invertebrates

Butterflies are a good indication of the habitats available in a specific area (Woodhall 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope (specific habitat requirements with populations concentrated in a small area) species which may be very specialised (Woodhall 2005). Butterflies are useful indicators as they are relatively easy to locate and catch, and to identify. Red Data species expected to occur on site are the Marsh sylph (*Metisella meninx*), Roodepoort Copper (*Aloeides dentatis dentatis VU*) and Highveld Blue

(*Lepidochrysops praeterita EN*). The presence of these species will be confirmed as part of the EIA phase.

9.4.1.7.9 Mammals

A database search for mammal species that have been recorded in the three QDS grids (2627 AD, 2627 BC and 2627 DA) on the virtual museum of the Animal Demography Unit (ADU) (http://www.adu.org.za). This database forms part of the Department of Biological Science at the University of Cape Town. No recent records of mammals have been recorded in the study area. Mammal species that have been recorded in the Gauteng Province, and could possibly occur in the area of interest are discussed below.

Mammal species expected to occur in the area of interest include 5 species Table 9-24 as per ADU database searches. The variety of vegetation types occurring in the area of interest ensures an ecologically diverse assemblage of plant species which in turn could support a variety of mammal species, therefore the current expected species list could be more extensive than is currently thought.

Table 9-24: Expected Mammal Species

Family	Genus	Common name	Red list category
Sciuridae	*Xerus (Geosciurus) inauris*	South African Ground Squirrel	LC
Bovidae	*Taurotragus oryx*	Eland	LC
Bovidae	*Hippotragus niger*	Sable	LC
Bovidae	*Antidorcas marsupialis*	Springbuck	LC
Bovidae	*Kobus ellipsiprymnus*	Water Buck	LC

9.4.1.7.10 Reptiles

Reptiles are ectothermic (cold-blooded) meaning they are organisms that control body temperature through external means. As a result reptiles are dependent on environmental heat sources. Due to this many reptiles regulate their body temperature by basking in the sun, or in warmer areas. Substrate is an important factor determining which habitats are suitable for which species of reptile. The presence of few rocky out crops within the study area is could mean few reptile species are present.

According the Animal demography unit's virtual museum a total of 40 species have been recorded in this QDS in the past (http://sarca.adu.org.za/). These species are listed in Table 9-25. Four species in this list are designated as endemic.

Table 9-25: Expected Reptiles

Genus	Species	Common name	Status	Endemic
Agama	*Aculeate, distanti*	Distant's Ground Agama	NE	Yes
Agama	*atra*	Southern Rock Agama	NE	0
Aparallactus	*capensis*	Black-headed Centipede-eater	NE	0
Rhinotyphlops	*lalandei*	Delalande's Beaked Blind Snake	NE	Yes
Crotaphopeltis	*hotamboeia*	Red-lipped Snake	NE	0
Boaedon	*capensis*	Brown House Snake	NE	0
Dasypeltis	*scabra*	Rhombic Egg-eater	NE	0
Lamprophis	*aurora*	Aurora House Snake	NE	Yes
Pachydactylus	*affinis*	Transvaal Gecko	NE	Yes
Pachydactylus	*capensis*	Cape Gecko	NE	0
Gerrhosaurus	*flavigularis*	Yellow-throated Plated Lizard	NE	0

9.4.1.8 Aquatics

Within the quaternary catchments (as identified in the surface water baseline section), a total of nine river systems will be affected by the proposed project and a total of 13 Sub Quaternary Reaches (SQRs).

Based on the findings of the specific baseline information for each SQR potentially affected by this project, the majority of river systems are largely modified with the Present Ecological State (PES) of these systems ranging from Class D to Class E. The modification of these systems is largely attributed to the location of the sources of the associated river systems. The sources of the river systems are located within urban and industrial areas and as such, associated impacts to instream and riparian conditions have resulted in the large modification of the systems. Consequently, aquatic biota is considered to be of low importance with low sensitivities within these systems.

Dominant existing instream impacts within the project area include impoundments, water quality modification (industrial runoff), sewage effluent and solid waste disposal. Riparian impacts in the included vegetation removal, channel and bed modification and urban/industrial encroachment. Overall, only moderately important and sensitive aquatic ecosystems were found (based on desktop information) with no red data aquatic taxa excepted to be present.

9.4.1.9 Wetlands

The WRTRP area spans over several quaternary catchments and therefore is characterised by several different watercourses as summarised in the surface water section above. There are several information layers that have fed into the desktop analysis of the wetlands for the WRTRP. The area is found to have many valley bottom systems which mostly correlate to the rivers and their tributaries. These systems are both channelled and unchannelled. There are also multiple pan systems occurring at multiple parts in the landscape.

The majority of river systems associated with the project area are largely modified. The modification of these systems is largely attributed to the location of the sources of the associated river systems, which are located within urban and industrial areas and associated impacts to instream and riparian conditions have resulted in the large modification of the systems. The project area is characterised by the valley bottom systems associated with the Wonderfonteinspruit, Leeuspruit, Loopspruit and other tributaries. In addition, in the midslopes and valley heads of the catchments, there are pan and seep systems associated with the landscapes. The NFEPA wetlands within the project area are shown in Plan 19 and the wetlands in and around the RTSF site are shown in Plan 20.

Plan 19: NFEPA Wetlands

Plan 20: RTSF Wetlands

9.4.1.10 Heritage

Geologically, the project area is largely underlain by dolomitic rock that has the potential for karst topography. Karst topography refers to landscapes formed from the dissolution of soluble rocks, including dolomite and limestone. Karst topography is characterised by underground drainage systems with sinkholes, dolines and caves. This geological phenomenon creates karst caves that can be filled with fine to coarse-grained alluvium during periodic flooding. The alluvium may be represented by bodies of breccia, sandstone and siltstone which have an increased potential to contain archaeological material. This geological feature is one of the motivating factors in implementing the proposed project. Many of the historical TSFs are at risk as the potential for sinkholes is high in some areas.

Archaeologically, Stone Age and Late Farming Community sites have been recorded within the larger area under consideration here. Stone Age lithics recorded have been found as surface scatters outside of any discernible context thereby limiting the information potential and overall significance of these resources. Late Farming Community sites within the region have primarily been identified as stone walled settlements classified as Type N and Klipriviersberg. Only one potential stonewalled site has been identified in the routing option for the powerlines on the farm Doornpoort 347 IQ Portion 73. No other archaeological sites have been identified within the development footprint of the proposed infrastructure associated with the WRTRP.

Within regional, local and site specific contexts the project is located in historically significant mining-industrial and agricultural-rural cultural landscapes (Plan 21). In terms of the mining landscape, there are several features and markers such as many of the historical TSFs created by the original mines established during the first half of the 20th century. The agricultural landscape is represented in turn by several structures and werwe that were recorded during the scoping survey completed on 16 February 2015. The potential impacts to these will be assessed during the Impact Assessment phase of the project.

9.4.1.11 Socio – Economic

The West Rand DM encompasses 2 442 km^2 of the province's land mass and is predominantly rural. The main economic hubs in the DM are Krugersdorp, Randfontein, and Westonaria; the dominant land uses in the region include mining, residential, and agriculture. Developments of residential settlements are concentrated towards the east of the district, and are reflective of current developmental dynamics and historical patterns and trends. As a result of the mining activities, and due to the dolomitic nature of the land in the district, land use patterns are often dispersed. This has meant that major economic centres in the district take on a fragmented form. In addition to the significant impact mining has had on the district, tourism and conservation opportunities exist to the north and north-east of the district, while agricultural holdings in the western side of the district represent possibility for development of the agricultural sector in the region.

The dispersed main economic centres are linked by various roads and rail routes, which also provide links to areas beyond the DM. The N14 and N12 form a strong south-east and north-west linkage, while the R500 provides road connection to the north via the linkage with the N14. The R512 is the access road to Lanseria airport, and the R559 links Soweto and Randfontein.

Plan 21: Heritage Sensitivity

9.4.1.11.1 Towns, Resources and Land Capabilities

The Westonaria LM is bordered by the Randfontein LM, Johannesburg Metropolitan Municipality, Merafong City LM, Sedibeng DM, and Emfuleni LM. The LM's residential development is generally dispersed with the dominant townships including (Plan 22):

- Westonaria;
- Bekkersdal;
- Hillshaven;
- Glenharvie;
- Venterspost;
- Simunye; and
- Mining towns such as Libanon and Waterpan.

The only significant business node occurs within Westonaria town's Central Business District (CBD); the rest of the Westonaria LM is characterised by scattered residential areas and various mining developments. The main reason for the perceived low population density in the LM is due to the dolomitic conditions in the region. Westonaria town is linked to Johannesburg via the N12; the prominent entrance point into Johannesburg from Gauteng, various developments are planned for along this route to take advantage of its strategic positioning.

The only notable agricultural holdings areas in the LM are located to the north-eastern and central parts of the district. The local government, based on the vision of a global city, or the Unicity, supports future development to the west of the LM. Development on this side of the LM would mean that the area's development follows the natural market forces, ensuring that commercial and industrial developments remain close to the current and future workforces.

The Westonaria LM's Spatial Development Framework makes mention of the fact that apart from the development potential to the west of the LM, as discussed above, the south of the LM has been demarcated for mining and conservation. The dolomitic nature of the areas located to the north of the LM make the land primarily suitable for the agricultural and mining activities. In addition to mining, the northern regions of the LM have potential for the development of small-scale or subsistence farming opportunities.

Land uses in the Merafong City LM can be categorised in three main divisions, i.e. agriculture, mining, and residential. Agriculture is the dominant land use in the LM, followed by mining and residential land uses, with the latter accounting for approximately 8% of the total land area of the LM.

Plan 22: Local Municipalities

The municipality's human settlements are relatively scattered due to the mining activities taking place, the prominent settlements are:

- Fochville;
- Carletonville;
- Welverdiend;
- Greenspark;
- Wedela;
- Blyblank;
- Khutsong; and
- Kokosi.

Carletonville is located to the north of the LM, which is also were the majority of the municipality's high value agricultural land is located. The Carletonville-Khutsong-Welverdiend area is also the LM's most populous region. The townships of Kokosi and Greenspark and the relatively wealthier Fochville is located to the South of the LM, with the central part of the LM being characterised by mining activities and the associated scattered housing developments. As with the rest of the West Rand mining belt, the LM's infrastructure development is hindered by the high occurrence of dolomite.

The economy of Merafong is dominated by the mining activities, which has led to the development of dispersed human settlements leading to a loss of purchasing power across the region as central town functions are not well developed in the LM.

9.4.1.11.2 Demographic Profile and Income Levels

Based on a combined population of 333 444, the Westonaria and Merafong City LMs comprise just about 40.1% of the West Rand DM's total population, which was estimated at 831 241 individuals in 2013. The average household size in the DM is 2.8. Based on Census 2011 (Stats SA, 2015), approximately 65% of households in the district are living in formal residential properties; the remaining 35% reside in informal or traditional dwellings. In South Africa, approximately 71% of households reside in formal residences (Stats SA, 2015). Traditionally, smaller household sizes are indicative of an increase in development, however, based on the relatively high number of households living in informal dwellings and considering the fact that the region is classed as a mining region it can be assumed that in this case the smaller household size is rather a result of migrant workers working or searching for opportunities, with the aim of sending money home to their families.

The male population of the West Rand DM exceeds the female population at 52% versus the 48% females residing in the region (Stats SA, 2015). The fact that 71% of the DM's population is of working age (Stats SA, 2015), i.e. between the ages of 15 and 65, could be seen as an additional indicator of the fact that the area attracts migrant workers. Moreover, in the two local municipalities within which Phase 2 of the project will be located an even

higher number of individuals are of working age with 73.3% in the Westonaria LM, and 72.6% in the Merafong City LM (Stats SA, 2015).

Within the Westonaria and Merafong City LM's, the proportion of the population aged 20 and older with no education is greater than in the district, with 6.2% and 6% versus the 5.0% observed in the DM (Stats SA, 2015). Furthermore, the percentages of individuals who have obtained a matric qualification in these local municipalities are also below that of the district, province, and even South Africa.

The average income within the Westonaria and Merafong City LMs were significantly lower than that of the other study areas at R5 597 and R6 625 per month (in 2011 in current prices), respectively (based on Stats SA, 2015).

9.4.1.11.3 Economy and Sectoral Structure

In 2013, the economies of the Westonaria and Merafong City LM's represented 35.8% of the total GDP of the West Rand DM, which was valued at R61 466 million (2013 current prices). Between 2003 and 2013, the West Rand DM economy has been growing at a Compounded Annual Growth Rate (CAGR) of 1.1% per year.

The West Rand economy is primarily based on the tertiary services with 66.7% of its GDP being generated by industries in this sector. Finance and personal services, as well as government services are the major contributors to the Western Rand economy. Its dependency on mining though is also quite substantial as the mining sector contributed 11.2% of GDP in the district. It should be noted that manufacturing is also quite prominent in the West Rand economy with 15.7% contribution to its GDP.

The Westonaria and Merafong City economies though are far more dependent on the mining industry than the district in general.

9.4.1.11.4 Labour Force and Employment Structure

In South Africa, the unemployment rate is defined as comprising of those individuals aged between 16 and 65 years old, actively looking for employment that are unable to find gainful opportunities; it therefore does not take into consideration discouraged job seekers. Based on Stats SA's Census 2011 data, the West Rand DM had 590 206 individuals of working age in 2011 with 3.3% of these individuals being discouraged job seekers. The situation was slightly worse in the Westonaria and Merafong City LMs, where 4.1% and 3.6% respectively of the working age population groups were discouraged job seekers; however, it was still better than at the national level where the figure was 5.5% (Stats SA, 2015).

The labour force participation rate in the West Rand DM was estimated at 56.9% in 2013. The unemployment rate in the West Rand DM was 24.4% in 2013. In the Westonaria LM, unemployment was recorded at 42.0%, while the Merafong City LM recorded an unemployment rate of 21.1%.

Between 2003 and 2013, the economy of Westonaria, due to the share decline in its mining sector's production output lost over 24 thousand employment opportunities. At the same time, the Merafong City economy managed to increase its employment by over five thousand people during the same period, despite experiencing negative economic growth rate. This means that the losses in the mining sector's employment due to the contraction of that industry in the Merafong City LM were possible to offset by the increased employment in other industries.

In the West Rand DM, 75.3% of jobs are formal employment opportunities, while in the LMs formal employment opportunities comprise even a greater percentage, i.e. 81.5% and 80.5% in the Westonaria and Merafong City LMs, respectively (Quantec Research, 2015). At the same time, it is estimated that 2.4% of those employed in the West Rand DM are working in private households.

It is estimated that just about two thirds of all employment opportunities within the DM are created by the tertiary sector. Mining provides 15.0% of employment opportunities in the West Rand DM.

Within the Westonaria LM the importance of the mining sector for job security is significantly greater than in the district, as it provides 36.7% of opportunities in the LM's economy. It again shows the economy's reliance on the mining sector. In 2003, though, the mining sector contributes 74.2% of all jobs created in Westonaria; at the same time, though, the total employment in the local area was 51 409.

In the Merafong City LM, the employment structure was largely skewed towards the tertiary and mining industries. The mining sector created 42.7% of all employment opportunities in this economy in 2013 with the tertiary industries accounting for 48.8%. Unlike the situation observed in the Westonaria LM, employment in mining has increased between 2003 and 2013 despite the sector experiencing decline post 2008 period. Losses in employment in agriculture, manufacturing and finance and business service, though offset some of the employment gained during that period in mining and other industries.

9.4.2 Description of the Current Land Uses

9.4.2.1 Land Use

The present land use in the region is categorized as follows (refer Plan 15):

- Cultivated;
- Natural/Grazing;
- Mined; and
- Urban built-up.

These land uses will be verified in the field survey for the EIA phase of the study.

9.4.2.2 Land Capability

Land capability (refer Plan 16) is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long term use of land under rain-fed conditions. An indication is also provided about the permanent limitations associated with the different land use class definitions

The land capability of the pipeline routes and RTSF and CPP sites are as follows:

- Class II (Intensive cultivation);
- Class III (Moderate cultivation); and
- Class VI (Moderate grazing).

9.4.3 Description of Specific Environmental Features and Infrastructure on the Site

A summary of specific environmental features and infrastructure within the project area is set out below.

- Stone Age walls were found at the proposed CPP site;
- The proposed RTSF site is adjacent to wetlands (including some isolated pans within the footprint) and there are graves within the proposed footprint;
- The Wonderfonteinspruit has been significantly modified and flows within a pipeline for a portion of the river's length. It is colloquially known as the 1 m pipeline; ;
- According to SARCA, the Giant Bullfrog is expected to reside within the project area;
- Sensitive aquatic species are expected within some of the sub quaternary reaches; and
- According to the Gauteng Conservation Plan, there is an area on the western boundary of the proposed RTSF site that is considered as being an "Important Area".

9.4.4 Environmental and Current Land Use Map

Refer to the environmental and current land use maps; Plan 12 and Plan 13. Current land use is described in Section 9.4.2.

9.5 Item 2(h)(v): Impacts Identified

The proposed WRTRP relevant to the Kloof Mining area may have potential impacts on the social and biophysical environments. These impacts may result from the construction and operational activities planned for the proposed project.

The aspects and potential impacts for each of the activities are considered below.

9.5.1 Air Quality

The potential impacts associated with the various environmental aspects to be assessed in terms of the ambient air quality are set out in Table 9-26.

Table 9-26: Potential Impacts on Ambient Air Quality

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ No impact.
▪ Construction and operation of the CPP	▪ Increase in dust generation and particulate matter during construction through earth moving. ▪ During operation the emissions form the plant will potentially impact on the quality of the air.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Increase in dust generation and particulate matter during construction. ▪ Impacts during operation will be caused by windblown dust and PM 10 and 2.5 generation from the RTSF. ▪ Limited impact to the receiving environment during the construction phase of AWTF due to dust generation.
▪ Construction and operation of pipelines	▪ Limited impact to the receiving environment during the construction phase of the pipelines due to dust generation. ▪ The use of gravel roads during pipeline inspections may generate dust.

9.5.2 Noise

The potential impacts associated with the various environmental aspects to be assessed in terms of the ambient noise levels set out in Table 9-27.

Table 9-27: Potential Impacts on Ambient Noise Levels

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ None.
▪ Construction and operation of the CPP	▪ Noise may be created during the construction of the CPP. It will be short term and local in nature. ▪ The operation of the CPP will generate noise.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ The construction will generate noise through earth moving activities. ▪ Noise during operation may be caused by the pumps associated with the RTSF.

Project Activity	Potential Impact
▪ Construction and operation of pipelines	▪ The construction phase may cause noise to be generated from vehicles and machinery.

9.5.3 Groundwater

The potential impacts associated with the various environmental aspects to be assessed in terms of the groundwater are set out in Table 9-28.

Table 9-28: Potential Impacts on Groundwater

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ The abstraction from the shaft has been taking place under the current mining operations at Kloof. It is not expected to have any additional impacts.
▪ Construction and operation of the CPP	▪ Seepage/ spillage of untreated water or chemicals onto surface which may seep into groundwater environment with water quality impacts.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Seepage from the TSF can potentially influence the groundwater quality in the underlying aquifers. ▪ Seepage from the RTSF and RWD can also impact the quality of the streams in the proximity via groundwater baseflow.
▪ Construction and operation of pipelines	▪ No impact unless spills occur.

9.5.4 Radiation

The potential impacts associated with the various environmental aspects to be assessed in terms of radiation are set out in Table 9-29.

Table 9-29: Potential Impacts in terms of Radiation

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ None.
▪ Construction and operation of the CPP	▪ Possible radioactive contamination of the water and soil resources within the plant, which if spilled or leaked may have an impact. ▪ The extraction of uranium will remove pollutants from the tailings that could impact on the environment. This is a positive activity.

Project Activity	Potential Impact
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Should the tailings be radioactive and the physical properties are such that it can be distributed by wind there is a possibility of health impacts to nearby communities as well as possible groundwater contamination. ▪ Possible radioactive contamination of the discharged water into the Leeuspruit, which in turn may have health impacts to humans.
▪ Construction and operation of pipelines	▪ Contamination of soil and surface water should the pipelines spill.

9.5.5 Soils

The potential impacts associated with the various environmental aspects to be assessed in terms of soils are set out in Table 9-30.

Table 9-30: Potential Impacts on Soils

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ None.
▪ Construction and operation of the CPP	▪ Potential loss of top soil through erosion during the construction phase. ▪ Loss of land capability and land use.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ The construction phase may have erosion impacts. ▪ Decreasing in land capability during the operational phase as areas previously available for agriculture will be occupied by the RTSF.
▪ Construction and operation of pipelines	▪ None unless spillages occur contaminating the soil.

9.5.6 Surface Water

The potential impacts associated with the various environmental aspects to be assessed in terms of surface water are set out in Table 9-31.

Table 9-31: Potential Impacts on Surface Water

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ Abstraction of water will result in a reduction in water quantity for downstream water users of the Wonderfonteinspruit. ▪ Abstraction of water will reduce the quantity of contaminated water reporting to the Wonderfonteinspruit. This is a positive impact.
▪ Construction and operation of the CPP	▪ An increase in turbidity of surface water, due to runoff during construction emanating from the cleared and stripped areas. ▪ Operational phase will result in decreased run-off as water on site will report to PCDs.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Water quality could be compromised due to contaminated runoff/seepage emanating from the RTSF reporting into the nearby rivers. ▪ Sediments in the runoff may also cause siltation of the water in the rivers. ▪ The increase in water volumes from the discharge of treated water in the Leeuspruit may cause the inundation of riparian areas due to treated water discharge. ▪ Potential changes in aquatic habitat due to treated water discharge in the Leeuspruit. Changes in base flow will change velocity and depth conditions in the receiving streams, with the possibility of changes in habitat conditions. ▪ General impacts on surface water resources, both positive (due to treated water discharge) and negative. The magnitude of change in monthly and annual catchment yield will be assessed within the study area.

Project Activity	Potential Impact
▪ Construction and operation of pipelines	▪ The disturbance or alterations of any drainage lines during pipeline construction at the river crossings mat result in potential flow changes in the downstream river regime. ▪ No effect on surface water other than short-term local risk of pipe rupture.

9.5.7 Aquatics

The potential impacts associated with the various environmental aspects to be assessed in terms of the aquatic environment are set out in Table 9-32.

Table 9-32: Potential Impacts on the Aquatic Environment

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ The reduction of water in the Wonderfonteinspruit may impact on aquatic habitats.
▪ Construction and operation of the CPP	▪ None.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Uncontrolled runoff/seepage from the RTSF may pollute nearby water causes and destroy aquatic habitats. ▪ Potential changes in aquatic habitat in the Leeuspruit. Changes in base flow will change velocity and depth conditions in the receiving streams, with the possibility of changes in habitat conditions. ▪ Treated water will be discharged into the Leeuspruit, potentially improving the water quality of the receiving water resources. This is a positive impact.
▪ Construction and operation of pipelines	▪ The aquatic health of the river systems may be compromised should pipelines spill near or over river crossings.

9.5.8 Fauna and Flora

The potential impacts associated with the various environmental aspects to be assessed in terms of fauna and flora is set out in Table 9-33.

Table 9-33: Potential Impacts on Fauna and Flora

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ The reduction of water quantity in the Wonderfonteinspruit may impact on downstream habitats.
▪ Construction and operation of the CPP	▪ The construction phase and the clearing of the site will cause the loss of floral species/vegetation types and biodiversity
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Construction of the RTSF and ancillary infrastructure may cause alteration and damage to habitats ▪ Particulate matter emanating from RTSF my impact floral species. ▪ Discharge of treated water into the Leeuspruit may have a positive impact on downstream habitats.
▪ Construction and operation of pipelines	▪ Construction of pipelines may disturb or destroy natural habitats ▪ Spillages of pipelines will impact on natural vegetation and animals.

9.5.9 Wetlands

The potential impacts associated with the various environmental aspects to be assessed in terms of the wetlands are set out in Table 9-34.

Table 9-34: Potential impacts on wetlands

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ None.
▪ Construction and operation of the CPP	▪ Wetlands may be impacted upon due to the construction of the CPP adjacent to and within limited wetland areas. ▪ Loss of wetland habitat.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Runoff from RTSF may impact surrounding wetlands. ▪ Loss of wetland habitat.
▪ Construction and operation of pipelines	▪ Impacts on wetlands at pipeline crossing points.

9.5.10 Heritage

The potential impacts associated with the various environmental aspects to be assessed in terms of heritage resources are set out in Table 9-35.

Table 9-35: Potential impacts on heritage resources

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ None.
▪ Construction and operation of the CPP	▪ Damage and/or destruction of heritage resources during the site clearance.
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Construction of RTSF may cause alteration, damage to or destruction of historical buildings and structures older than 60 years. ▪ Construction may impact on graves and cause the relocation of these to be done.
▪ Construction and operation of pipelines	▪ Construction of pipelines may disturb or destroy heritage resources on route.

9.5.11 Socio-Economic

The potential impacts associated with the various environmental aspects to be assessed in terms of socio-economics are set out in Table 9-36.

Table 9-36: Potential impacts on socio-economics

Project Activity	Potential Impact
▪ Abstraction of water from the K10 Shaft	▪ None.
▪ Construction and operation of the CPP	▪ Temporary job creation during the construction phase. ▪ Temporary economic benefits related to project spending during construction. ▪ Increased spending and job creation during the operation of the CPP.

Project Activity	Potential Impact
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Limited job creation during operation but positive during construction. ▪ Possible impact on people living close to the TSF sites through dust emissions and contamination of groundwater. ▪ Increased availability of potable water quality. This is a positive impact. ▪ The construction and operation of the AWTF will result in limited job creation. This is a positive impact. ▪ The establishment of the RTSF will impact on agricultural areas, as well as potential impacts to downstream water users due to water runoff contamination.
▪ Construction and operation of pipelines	▪ Construction may have limited social impacts on route.

9.5.12 Visual

The potential visual impacts associated with the various environmental aspects to be assessed are set out in Table 9-37.

Table 9-37: Potential visual impacts

Project Activity	Potential Impact
1. Abstraction of water from the K10 Shaft	▪ None
2. Construction and operation of the CPP	▪ Loss of sense of place, although the landscape is already predominantly mining.
3. Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Visual impact of RTSF in region.
4. Construction and operation of pipelines	▪ The construction activities may have a visual impact.

9.5.13 Cumulative Impacts

Cumulative impacts are defined as impacts arising from the combined effects of two or more projects or actions. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts – implying that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation. Cumulative impacts usually relate to large-scale rather than site-specific impacts and have a tendency to increase the intensity of impacts already predicted for the proposed project.

9.5.13.1 Air Quality

Cumulative impacts usually occur when the individual effects of many actions combine over time and/or space. To assess cumulative impacts, background level of different pollutants will be evaluated to which predicted concentrations will be added to establish impacts. Operation of the RTSF and the CPP will have a cumulative effect on particulate PM_{10} and $PM_{2.5}$ and the gaseous pollutants present in the ambient atmosphere prior and during operation of the project.

The cumulative impacts on air quality will take into account the existing activities in the region that contribute to air quality impacts, such as the TSF north of the proposed RTSF, the TSFs near South Deep, agricultural activities and coal burning in informal developments.

9.5.13.2 Heritage

A neutralising cumulative impact may occur with the establishment of a modern mining landscape through the construction of the RTSF and the reclamation and complete removal of the existing historical TSFs

9.5.13.3 Socio-Economic

It should be noted that several of the aforementioned impacts (e.g. influx related impact) will not occur in isolation, but will combine with the current and expected impacts of other operations that are planned/operating within the greater study area. This scenario may result in several cumulative impacts.

More in-depth investigations would, however, need to be conducted during the impact assessment phase to determine if any project induced impacts will be enhanced or exacerbated by existing or planned projects.

9.6 Item 2(h)(vi): Methodology to be used in Determining the Significance of the Environmental Impacts

Based on South African legislation and guidelines, the following criteria will be taken into account when examining potentially significant impacts:

- Nature of impacts (induced/direct/indirect, positive/negative);
- Duration (short/medium/long-term, permanent(irreversible) / temporary (reversible), frequent/seldom);
- Extent (geographical area, size of affected population/habitat/species);
- Intensity (minimal, severe, replaceable/irreplaceable);
- Probability (high/medium/low probability); and
- Mitigation (as per mitigation hierarchy: avoid, mitigate or offset significant adverse impacts).

The significance rating process follows the established impact/risk assessment formula:

SIGNIFICANCE = CONSEQUENCE[6] x PROBABILITY[7] x NATURE[8]

The matrix (Table 9-39) calculates the rating out of 147 points, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 9-38. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation, and again after consideration of the mitigation has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of seven categories (The descriptions of the significance ratings are presented in Table 9-40).

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

[6] Consequence = Intensity + Extent + Duration

[7] Probability = Likelihood of and impact occurring

[8] Nature = Positive (+1) or Negative (-1) impact

Table 9-38: Impact Assessment Parameter Ratings

Rating	Intensity		Extent	Duration/reversibility	Probability
	Negative impacts	**Positive impacts**			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to highly sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity		Extent	Duration/reversibility	Probability
	Negative impacts	**Positive impacts**			
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity		Extent	Duration/reversibility	Probability
	Negative impacts	**Positive impacts**			
3	Moderate loss and/or damage to biological or physical resources of low to moderately sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity		Extent	Duration/reversibility	Probability
	Negative impacts	Positive impacts			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 9-39: Probability/Consequence Matrix

Significance

Probability																																						
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

Table 9-40: Significance Rating Description[9]

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Low (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Medium-low (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Medium-high (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	High (negative) (-)

[9] It is generally sufficient only to monitor impacts that are rated as negligible or minor

9.7 Item 2(h)(vii): The Positive and Negative Impacts that the Proposed Activity (in terms of the initial site layout) and Alternatives will have on the Environment and the Community that may be Affected

Table 9-41 summarises the anticipated positive and negative impacts of the project, relevant to the Kloof Mining Right EMP. Refer to more detail on the anticipated impact in Section 9.5 above.

Table 9-41: Summary of Positive and Negative Impacts

Aspect	Positive Impacts	Negative Impacts
Air quality	Removal of poorly designed and unrehabilitated TSFs form the region. These TSFs currently contain varying amounts of uranium that is dispersed through adsorption.	Potential increase in dust generation in the vicinity of the TSF that is being reclaimed. Increased dust generation around the RTSF. Emissions from the CPP will impact on air quality.
Groundwater	Removal of historical TSFs that are currently polluting the sensitive dolomitic aquifers. Reduced AMD potential through the reclamation of sulfur from the these TSFs.	Potential for increased seepage from the historical TSFs to the dolomitic aquifers during the hydraulic reclamation process. Pollution of the weathered aquifer beneath, and in proximity of to, the RTSF.
Soils	Rehabilitation of soils beneath the historical TSFs will improve land capability for these areas.	Loss of land capability and land use in the RTSF footprint.
Surface water	Treatment of currently impacted mine water to potable standards. There is likely to be a positive impact on the Wonderfonteinspruit as this water will no longer be released into it. There will be a positive impact from the AWTF's treated water being released into the Leeuspruit. After rehabilitation of the historical TSFs the clean runoff in the catchment will be increased.	Prior to final rehabilitation of the RTSF there will be a Loss of surface water runoff to the catchment.
Aquatics and wetlands	The increase of clean water in the Leeuspruit (and the probable reduction of salt load in the Wonderfonteinspruit), will have a positive impact on aquatic ecology and wetland health.	Potential negative impacts localised around construction activities near, or within, watercourses.

Aspect	Positive Impacts	Negative Impacts
Socio-economic	Economic injection into the District through employment creation. This will have a multiplier effect on the region. Through SGL's SLPs the project will also improve other aspects of community quality of life and wellbeing.	When the project is announced there will invariably be an influx of people looking for work. Often associated with this is an increase in health and safety risks and community tension.
Noise	None identified.	Increase in noise levels around the reclamation and pumping activities.
Fauna and flora	Reduction of contaminated natural areas.	Disturbance of nationally protected vegetation types.
Heritage	None identified.	It is likely that there are graves within the footprints of the larger infrastructure. These will need to be relocated prior to construction commencing.

9.8 Item 2(h)(viii): The Possible Mitigation Measures that could be Applied and the Level of Risk

As the project is still in the scoping phase, this section only provides mitigation measures at a high level based on the anticipated impacts. Once fieldwork has been finalised, public participation fully conducted and impacts thoroughly assessed, more detailed and aspect specific mitigation measures can be developed and will be presented in the EIA/EMP Report.

Preliminary mitigation measures for the potential impacts anticipated in terms of the ambient air quality are set out in Table 9-42.

9.8.1 Air Quality

Preliminary mitigation measures for the potential impacts anticipated in terms of the air quality are set out in Table 9-42.

Table 9-42: Potential Impacts on Ambient Air Quality

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ No impact.	▪ Application of wetting agents or dust suppressant on the dirt road and exposed areas. ▪ The area of disturbance must be kept to a minimum and no unnecessary clearing of vegetation must occur. ▪ Drop heights when loaders and offloading should be minimised. ▪ Vehicle travel speed and distances should be minimised. ▪ Stack emissions controlled. ▪ Concurrent rehabilitation of side slopes of RTSF. ▪ Reagent handling optimisation.
▪ Construction and operation of the CPP	▪ Increase in dust generation and particulate matter during construction through earth moving. ▪ During operation the emissions form the plant will potentially impact on the quality of the air.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Increase in dust generation and particulate matter during construction. ▪ Impacts during operation will be caused by windblown dust and PM_{10} and $PM_{2.5}$ generation from the RTSF. ▪ Limited impact to the receiving environment during the construction phase of AWTF due to dust generation.	
▪ Construction and operation of pipelines	▪ Limited impact to the receiving environment during the construction phase of the pipelines due to dust generation. ▪ The use of gravel roads during pipeline inspections may generate dust.	

9.8.2 Noise

Preliminary mitigation measures for the potential impacts anticipated in terms of the ambient noise levels set out in Table 9-43.

Table 9-43: Potential Impacts on Ambient Noise Levels

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ None.	▪ Restricting construction/site clearance activities to daylight hours. ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. ▪ Switching off equipment when not in use. ▪ Sound damping on relevant machinery ▪ Pump stations to be housed in noise attenuating enclosures; ▪ Regular service maintenance on the pipelines to mitigate water hammer noise; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Switching off equipment when not in use.
▪ Construction and operation of the CPP	▪ Noise may be created during the construction of the CPP. It will be short term and local in nature. ▪ The operation of the CPP will generate noise but will be restricted to the site.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ The construction will generate noise through earth moving activities. ▪ Noise during operation may be caused by the pumps associated with the RTSF.	
▪ Construction and operation of pipelines	▪ The construction phase may cause noise to be generated.	

9.8.3 Groundwater

Preliminary mitigation measures for the potential impacts anticipated in terms of the groundwater are set out in Table 9-44.

Table 9-44: Potential Impacts on Groundwater

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ The abstraction form the shaft has been taking place under the current mining operations at Kloof. It is not expected to have any impacts.	▪ Install effective pollution prevention measures such as runoff trenches and containment infrastructure or barrier systems. ▪ Separate clean and dirty water streams. ▪ Monitor boreholes to detect and analyse contamination. ▪ Suitably sized pollution control dams ▪ Provide suitable containment or barrier systems for seepage control from the RTSF ▪ Provide pipeline monitoring and inspection patrol protocols
▪ Construction and operation of the CPP	▪ Seepage/ spillage of untreated water or chemicals onto surface which may seep into groundwater environment with water quality impacts.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Seepage from the TSF can potentially influence the groundwater quality in the underlying aquifers (dolomites). ▪ Seepage from the RTSF can also impact the quality of the streams in the proximity via groundwater baseflow.	
▪ Construction and operation of the AWTF	▪ None.	
▪ Construction and operation of pipelines	▪ No impact unless spills occur.	

9.8.4 Radiation

Preliminary mitigation measures for the potential impacts anticipated in terms of radiation are set out in Table 9-45.

Table 9-45: Potential Impacts in terms of Radiation

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ None.	▪ Application of wetting agents or dust suppressant on the RTSF to limit particulate dispersion. ▪ Install effective pollution prevention measures such as runoff trenches and containment infrastructure or barrier systems. ▪ Separate clean and dirty water streams. ▪ Monitor boreholes and surface water points to detect and analyse contamination. ▪ Monitor worker exposures and public exposures
▪ Construction and operation of the CPP	▪ Possible radioactive contamination of the water and soil resources within the plant, which if spilled or leaked may have an impact. ▪ The extraction of uranium will remove pollutants from the tailings that could impact on the environment. This is a positive activity.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Should the tailings be radioactive and the physical properties are such that it can be distributed by wind there is a possibility of health impacts to nearby communities as well as possible groundwater contamination. ▪ Possible radioactive contamination of the discharged water into the Leeuspruit, which in turn may have health impacts to humans.	
▪ Construction and operation of pipelines	▪ Contamination of soil and surface water should the pipelines spill.	

9.8.5 Soils

Preliminary mitigation measures for the anticipated impacts terms of soils are set out in Table 9-46.

Table 9-46: Potential Impacts on Soils

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ None.	▪ Installation of storm water management structures. ▪ Effective stripping and stockpiling of topsoil. ▪ All stockpiles should be protected by a bund wall and vegetation to prevent erosion of stockpiled material and deflect surface water runoff. ▪ Topsoil stockpiles are to be kept to a maximum height of 4 m (the practical tipping height of dump trucks). ▪ Topsoil is to be stripped when the soil is dry, as to reduce compaction.
▪ Construction and operation of the CPP	▪ Potential loss of top soil through erosion during the construction phase. ▪ Loss of land capability and land use.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ The construction phase may have erosion impacts. ▪ Decreasing in land capability during the operational phase as areas previously available for agriculture will be occupied by the RTSF.	
▪ Construction and operation of pipelines	▪ None unless spillages occur contaminating the soil.	

9.8.6 Surface Water

Preliminary mitigation measures for the potential impacts anticipated in terms of surface water are set out in Table 9-47.

Table 9-47: Potential Impacts on Surface Water

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ Abstraction of water will result in a reduction in water quantity for downstream water users of the Wonderfonteinspruit. ▪ Abstraction of water will reduce the quantity of contaminated water reporting to the Wonderfonteinspruit. This is a positive impact.	▪ Intercepting fast flow pathways by placing a bund across the overland flow route prevents the runoff from quickly reaching the watercourse. This has the benefit of slowing the natural runoff and therefore reducing flood risk, while trapping sediment being washed from the fields. ▪ The pumps located at each of the sumps should be installed within closed off areas to contain material spillages. In times of power failure, manual monitoring of the sump associated with the pump station should be carried out. ▪ Provision of pollution control dams at the CPP. ▪ Provision of RWD at the RTSF. ▪ Concurrent rehabilitation of RTSF side walls ▪ Vegetation of stockpiles ▪ Leak detection and inspection protocols for pipelines
▪ Construction and operation of the CPP	▪ An increase in turbidity of surface water, due to runoff during construction emanating from the cleared and stripped areas. ▪ Operational phase will result in decreased run-off as water on site will report to PCDs.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Water quality could be compromised due to contaminated runoff/seepage emanating from the RTSF reporting into the nearby rivers. ▪ Sediments in the runoff may also cause siltation of the water in the rivers. ▪ The increase in water volumes from the discharge of treated water in the Leeuspruit may cause the inundation of riparian areas due to treated water discharge.	

Project Activity	Potential Impact	Mitigation Measures
	▪ Potential changes in aquatic habitat due to treated water discharge in the Leeuspruit. Changes in base flow will change velocity and depth conditions in the receiving streams, with the possibility of changes in habitat conditions. ▪ General impacts on surface water resources, both positive (due to treated water discharge) and negative. The magnitude of change in monthly and annual catchment yield will be assessed within the study area.	
▪ Construction and operation of pipelines	▪ The disturbance or alterations of any drainage lines during pipeline construction at the river crossings mat result in potential flow changes in the downstream river regime. ▪ No effect on surface water other than short-term local risk of pipe rupture.	

9.8.7 Aquatics

Preliminary mitigation measures for the potential impacts anticipated in terms of the aquatic environment are set out in Table 9-48.

Table 9-48: Potential Impacts on the Aquatic Environment

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ The reduction of water in the Wonderfonteinspruit may impact on aquatic habitats.	▪ Construction activities near aquatic environments must be limited with impacted footprints kept as small as possible. ▪ Aquatic resources should be demarcated (sign posted) to keep machinery away from water bodies. ▪ Liners/barriers/containment including synthetic, clay and geological, compacted or cement liners/paving to minimise seepage from entering aquatic systems.
▪ Construction and operation of the CPP	▪ None.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Uncontrolled runoff/seepage from the RTSF may pollute nearby water causes and destroy aquatic habitats. ▪ Potential changes in aquatic habitat in the Leeuspruit. Changes in base flow will change velocity and depth conditions in the receiving streams, with the possibility of changes in habitat conditions. ▪ Treated water will be discharged into the Leeuspruit, potentially improving the water quality of the receiving water resources. This is a positive impact.	
▪ Construction and operation of pipelines	▪ The aquatic health of the river systems may be compromised should pipelines spill near or over river crossings.	

9.8.8 Fauna & Flora

Preliminary mitigation measures for the potential impacts anticipated in terms of fauna and flora is set out in Table 9-49.

Table 9-49: Potential Impacts on Fauna and Flora

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ The reduction of water quantity in the Wonderfonteinspruit may impact on downstream habitats.	▪ The planting of indigenous trees around the treatment facility should be done. Trees are useful for erosion and nutrient control. ▪ Re-vegetation of construction footprint and unpaved roads as soon as possible. ▪ Minimise vegetation removal to infrastructure footprint. Clearing and grading should only occur where absolutely necessary. ▪ Construction sequencing is proposed. ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the disturbed areas to the minimum and within designated areas only. Re-vegetate open areas to limit erosion, which will also aid in water infiltration and flood attenuation. ▪ Avoid known areas of faunal and floral SSC. ▪ Avoid sensitive landscapes such as riparian and ridge areas that were encountered on site. ▪ Manage nationally restricted alien invasive plant species by ensuring the removal of
▪ Construction and operation of the CPP	▪ The construction phase and the clearing of the site will cause the loss of floral species/vegetation types and biodiversity.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Construction of the RTSF and ancillary infrastructure may cause alteration and damage to habitats ▪ Particulate matter emanating from RTSF my impact floral species. ▪ Discharge of treated water into the Leeuspruit may have a positive impact on downstream habitats.	
▪ Construction and operation of pipelines	▪ Construction of pipelines may disturb or destroy natural habitats. ▪ Spillages of pipelines will impact on natural vegetation and animals.	

Project Activity	Potential Impact	Mitigation Measures
		vegetation during construction and operation are controlled so that no open areas occur. ▪ Applications for permits for removal of certain plants, where required. If plant SSC are to be removed, they should be either translocated to a similar habitat to the donor site or relocated to a nursery.

9.8.9 Wetlands

Preliminary mitigation measures for the potential impacts anticipated in terms of the wetlands are set out in Table 9-50.

Table 9-50: Potential Impacts on Wetlands

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ None.	▪ There is limited mitigation for the loss of wetland habitat. An offset strategy should be compiled to compensate for the wetlands that are lost to the proposed project prior to any development on site. ▪ Site selection and alternatives to minimise impact or loss
▪ Construction and operation of the CPP	▪ None.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Runoff from RTSF may impact surrounding wetlands. ▪ Loss of wetland habitat.	
▪ Construction and operation of pipelines	▪ Impacts on wetlands at pipeline crossing points.	

9.8.10 Heritage

Preliminary mitigation measures for the potential impacts anticipated in terms of heritage resources are set out in Table 9-51.

Table 9-51: Potential Impacts on Heritage Resources

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ None.	▪ Modify through amendment to the design of the RTSF as far as is feasible to preserve burial grounds and graves in situ. ▪ Where project alternatives are not feasible, the potential impact to burial grounds and graves must be remedied through the implementation of a grave relocation process. ▪ Structures older than 60 years are protected under section 34 of the NHRA, and a Section 34 Permit Application with PHRA-G regulated by Chapter III of the Regulations to the Act (GNR 548) is required prior to any alterations or demolition if such structures. ▪ Any unseen sites discovered during construction to be secured
▪ Construction and operation of the CPP	▪ Damage and/or destruction of heritage resources during the site clearance.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Construction of RTSF may cause alteration, damage to or destruction of historical buildings and structures older than 60 years. ▪ Construction may impact on graves and cause the relocation of these to be done.	
▪ Construction and operation of pipelines	▪ Construction of pipelines may disturb or destroy heritage resources on route.	

9.8.11 Socio-economic

Preliminary mitigation measures for the potential impacts anticipated in terms of socio-economics are set out in Table 9-52.

Table 9-52: Potential Impacts on Socio-Economics

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ None.	▪ Procurement of goods and services from local small business. ▪ Recruit local labour as far as possible and within the constraints of the skills pool. ▪ Sub-contract to local construction companies as far as practicable. ▪ Establishment of appropriate training and skills development at an early stage to allow affected farm workers to benefit from the mine employment opportunities.
▪ Construction and operation of the CPP	▪ Temporary job creation during the construction phase. ▪ Temporary economic benefits related to project spending during construction. ▪ Increased spending and job creation during the operation of the CPP.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Relatively limited job creation. ▪ Possible impact on people living close to the TSF sites through dust emissions and contamination of groundwater.	
▪ Construction and operation of pipelines	▪ Construction may have limited social impacts on route.	

9.8.12 Visual

Preliminary mitigation measures for the potential visual impacts are set out in Table 9-53.

Table 9-53: Potential Visual Impacts

Project Activity	Potential Impact	Mitigation Measures
▪ Abstraction of water from the K10 Shaft	▪ None	▪ Concurrent rehabilitation of RTSF ▪ Colour selection of plant exterior ▪ Consider screen walls as appropriate ▪ Vegetate soil stockpiles.
▪ Construction and operation of the CPP	▪ Loss of sense of place, although the landscape is already predominantly mining.	
▪ Construction and operation of the RTSF Complex (including RWD and AWTF)	▪ Visual impact of RTSF in region.	
▪ Construction and operation of pipelines	▪ The construction activities may have a visual impact.	

9.9 Item 2(h)(ix): The Outcome of the Site Selection Matrix and Final Layout Plan

9.9.1 RTSF

Two independent, parallel TSF site selection processes were completed by Golder Associates (Golder, 2010) for Rand Uranium's CUP/Geluksdal TSF and Metago (Metago, 2009) for Gold Fields' WWP. These processes entailed the selection of a suitable site for a TSF required for the respective proposed projects. The WRTRP now brings together the collective requirements of the two previous projects in the same wider area but at larger deposition tonnages and ultimate storage capacities required. Both processes used environmental, economic and social screening criteria to aid in the selection process, as detailed in Section 9.1.1.

The site that is chosen for the RTSF must be able to accommodate the total 1.3 Bt of final tailings material from the region. In addition it needs to accommodate a rate of rise commensurate with a retreatment rate of 4 Mt/month. If these conditions are not met it is likely that a second facility will be required which does not align with the Department and I&APs requirements for a single deposition facility for the region.

For this reason the CTSF and Geluksdal sites were discounted and not selected for the final layout of the WRTRP. Table 9-54 provides the motivation for the selection of the final layout site.

Table 9-54: Final layout selection criteria

Criteria	CTSF		Geluksdal TSF		RTSF (Selected site)	
	Design	**Suitable**	**Design**	**Suitable**	**Design**	**Suitable**
Total volume	750 Mt	No	350 Mt	No	1.3 Bt	Yes
Rate of Rise to accommodate production of:	2.4 Mt/m	No	900 kt/m	No	4 Mt/m	Yes
Footprint	1 000 ha	No	1 000 ha	No	1 350 ha	Yes
Other risks/issues	Geology and topography is not as favourable.		Site overlies a significant area of wetlands		Footprint constrained by watercourses	
	Authorities and I&APs want a single deposition facility which this option does not support.		Authorities and I&APs want a single deposition facility which this option does not support.		This site will support the Authorities' and I&APs requirement for a single deposition facility.	

Based on the above the final layout with the RTSF position is chosen for detailed investigation during the EIA phase.

9.9.2 CPP

A site selection process (premised on its location being central to the resources base of the many historical TSFs and being closest to the proposed RTSF), was undertaken by Golder Associates (Golder, 2013) for the CPP (previously referred to as the CTP in the site selection study). A total of 100 candidate site areas were identified, of which 25 candidate sites were in compliance with the site selection criteria and taken forward for further analysis.

After screening the 25 top listed candidate sites, 15 candidate sites remained and were taken forward for assessment by the specialists through a high-level desktop analysis to investigate the social, environmental, and regulatory, economic and engineering viability of the sites. The inputs from the specialists collectively resulted in 9 of the 15 candidate sites being fatally flawed. After assessing each site collaboratively including a risk assessment, 4 sites remained as the options for final assessment. The Top Two sites were then identified as the preferred and alternative site respectively. The sites were called Site T2 (Preferred Option) and Site T9 (Alternative). The preferred option Site T2 has been assessed as part of this environmental impact assessment as indicated on Plan 4 and will be taken into the impact assessment phase.

9.9.3 AWTF

Due to operational constraints, such as the source of the water, the AWTF is to be placed close to the return water pump station (adjacent to the RWD of the RTSF) to allow for minimum cost and impacts associated with the discharge of the treated water, into the Leeuspruit.

9.9.4 Pipelines

Premised on the primary requirement of the pipe routes being selected being the shortest distance between the mining site resources pump stations, the thickener/booster stations, the CPP and the RTSF, alternative routes were considered which capitalised on the following:

- Following existing routes where possible;
- Avoiding identified environmental sensitive areas;
- Crossing existing impacted land;
- Maximising mine owned land; and
- Assessing the operating costs pertaining to topographical considerations on pumping costs.

These alternatives are indicated on Plan 9.

9.10 Item 2(h)(x): Motivation where no Alternatives Sites were Considered

9.10.1 RTSF

Alternatives were considered for the RTSF in terms of locality and layout.

9.10.2 CPP

Alternatives were considered for the CPP in terms of locality and layout.

9.10.3 AWTF

Alternatives were considered for the AWTF in terms of locality and layout.

9.10.4 Pipelines

Alternatives in terms of pipeline routes were considered. Considerations such as topography, pumping requirements and auxiliary infrastructure determined the most suitable route.

9.11 Item 2(h)(xi): Statement Motivating the Preferred Sites

9.11.1 RTSF

A parallel and independent site selection process was undertaken in 2009 and 2010 by Metago and Golder Associates, respectively, which considered the social, environmental and economic aspects of potential sites. The preferred areas identified by Metago (sites B2/B3) overlaid preferred areas identified by Golder Associates (sites 33/34) during their selection process, confirming the suitability of the area now referred to as the RTSF. Subsequent intrusive investigations have confirmed the suitability of the site in relation to its size with respect to the proposed deposition rate (4Mt/m), and rate of rise and ultimate tonnage capacity (1.3Bt) to accommodate the region's collective TSF resources. It is relevant to note that neither of the two sites ultimately adopted by RU (Site 35) and Gold Fields (CTSF) are capable of meeting the required deposition rates and tonnage required by the WRTRP.

Therefore the RTSF preferred site will be taken forward for investigation during the EIA phase.

9.11.2 CPP

A site selection process was undertaken by Golder Associates (Golder, 2013) for the CPP. A total of 100 candidate site areas were identified, of which 25 candidate sites were in compliance with the site selection criteria and taken forward for further analysis. The Top Two sites were then identified as the preferred and alternative sites respectively. The sites were called Site T2 (Preferred Option) and Site T9 (Alternative). The preferred option, Site T2, will be assessed as part of this study.

9.11.3 AWTF

The position of the AWTF has been selected as the closest to the source of impacted water to be treated, adjacent to the RWD of the RTSF, as well as close to the proposed point of discharge.

9.11.4 Pipe routes

As outlined in section 9.9.4, the interconnecting pipeline routes shown on Plan 9 have been well considered and are the preferred pipeline routes for the project.

10 Item 2(i): Plan of Study for the Environmental Impact Assessment Process

10.1 Item 2(i)(i): Description of Alternatives to be Considered Including the Option of Not Going ahead with the Activity

The project as a whole addresses the legacy issue of historical placement of TSFs on dolomitic ground on the West Rand and its associate ongoing challenges with respect to AMD generation and management of water and air quality issues into perpetuity. The alternative to this project as a whole is that the TSFs will remain where they are and have to be managed in perpetuity with regard to water and air quality challenges.

10.1.1 RTSF

10.1.1.1 Site Alternative

Site alternatives were considered as described in Section 9.1.1.

10.1.1.2 Deposition Alternative

An alternative to the above ground deposition of reprocessed tailings was “in-pit” or underground backfill deposition. Due to the bulking of the material from an original in-situ density of 2.75 t/cubm to 1.45 t/cubm, void volumes available either in open pits or underground and the placement challenges in flooded conditions to match deposition rates of up to 4 Mt/m are not practical or predictable.

10.1.1.3 Seepage attenuation Alternative

The RTSF will be constructed on top of very low permeability bedrock. Based on the outcome of the geohydrological and geochemical studies, suitable mitigation methods will be considered as part of the EIA phase of the project.

10.1.2 CPP

10.1.2.1 Site Alternative

Site alternatives were considered as described in Section 9.1.2.

10.1.2.2 Technology Alternative

The CPP is proposed to comprise modern technologies with respect to optimised, economically viable recovery of uranium, gold and sulfur. The proposed processes have been selected and equipment has been sized optimally for the anticipated tonnages and anticipated metal and sulphur recoveries based on extensive metallurgical test work at Mintek. Due to the nature of the mineralogy of the tailings, a roaster and acid plant was selected as the preferred option for the improved recovery of gold and sulfur in the form of sulfuric acid. In addition, some of the acid recovered can be re used in the recovery of uranium in the uranium section, thus optimising the beneficiation processes. These recovery processes, in turn, reduce the environmentally harmful residual levels of uranium and sulfur in the final tailings to be deposited on the RTSF, reducing its susceptibility to AMD. .

10.1.3 AWTF

10.1.3.1 Process and Technology Alternative

In terms of the AWTF, a desktop trade-off study was conducted by pumping experts, Paterson & Cooke to compare the capital costs, operational costs and total cost of ownership of two options namely:

- Re-using the return water for re-mining; and
- Treating the return water to discharge compliance standards, using the AWTF located at the RWD and putting the treated water to beneficial use at point of discharge.

The outcome of the trade-off showed that AWTF option will have a lower life cycle cost in comparison with the return water pumping system for a range of flow rates.

Technology alternatives were considered purely from a “best fit” and cost effective perspective. In terms of the AWTF itself, there is a wide range of technologies available for the treatment of high salt and heavy metal load mine affected water. Based on a comprehensive water and salt balance for the specific return water dam product by the RTSF, various options regarding the appropriate technology and the business case were

considered. The list below shows a summary of the applicable technologies available for treatment of this water:

- Biological Reduction of heavy metals and sulfates;
- Electrodialysis Reversal Technology;
- Ion Exchange Technology;
- Reverse Osmosis Membrane Technology;
- Electrocoagulation; and
- Freeze Desalination.

Each of the mentioned technologies have their own niche applications, and the respective advantages and disadvantages have been taken into account. The well-established RO process combined with a patented Crystalactor enhancement has been selected to be carried forward to the impact phase. Pilot plant studies will be conducted as an ongoing optimisation initiative..

10.1.4 Pipelines

10.1.4.1 Route Alternative

The pipeline routes and supporting infrastructure need to be located where the feed sources, current infrastructure, services and proposed infrastructure including the WBT, CPP and RTSF are located. Alternative pipeline routes between the WBT and the CPP and between the CPP and the RTSF have been identified. Refer to Section 9.9.4

10.1.5 No-go alternative

In terms of the “No-go” option, the primary land uses for the region are mining, agriculture, and in some areas, residential. The proposed location of the RTSF is currently used for agriculture. If not used for mining (the no-go option), possible alternative land uses for the proposed RTSF and associated infrastructure site include commercial agriculture, grazing, or low-cost housing. If not used for mining, the potential contamination from historical TSFs severely limits the options of viable alternative land uses.

Existing / historical TSFs will remain *in situ* and continues to impact on the environmental and social landscapes, as per the status quo. None of the envisioned benefits (described in Section 7) will come to fruition, i.e. environmental clean-up, job opportunities, investment into the economy, treatment of currently impacted water and a reduction in the health impacts posed by the historical TSFs.

The existing impacts include:

- Leaching contaminants e.g. uranium and sulfur, into the sensitive dolomitic aquifers;
- Risk to community health and an increased potential for AMD in the West Rand
- Further weakening of the West Rand's economy as mining declines;
- The AWTF cannot be funded resulting in mine affected water not being treated to potable standards (SANS 241:2011);
- The Kloof Mining Right area houses the primary infrastructure required for the implementation of the WRTRP. If any component of it is not approved the entire project will be abandoned.

10.2 Item 2(i)(ii): Description of the Aspects to be Assessed as part of the Environmental Impact Assessment Process

In order to investigate and assess the impacts of the proposed WRTRP the following specialist studies have been proposed for the EIA phase:

- Surface water assessment, including:
  - Surface water quality; and
  - Surface water quantity
- Characterisation of the social environment;
- Radiation study;
- Ecological assessment, including:
  - Wetland investigation;
  - Fauna & flora assessment; and
  - Aquatic assessment.
- Geohydrological assessment;
- Archaeology and heritage assessment;
- Economic analysis;
- Soil and land capability assessment; and
- Air quality assessment.

10.3 Item 2(i)(iii): Description of Aspects to be Assessed by Specialists

The environmental aspects to be assessed in terms of the Plan of Study (PoS) by the various specialists are detailed below.

10.3.1 Screening or Ultimate scope Assessment

The screening assessment will provide the authorities with a clear picture of the ultimate WRTRP. It also serves to eliminate perception that SGL is applying for the WRTRP incrementally. The screening assessment will be a desktop review of the ultimate project to identify potential fatal flaws for components that are not a part of the initial implementation. This will be done from an environmental and social perspective. All specialist studies will provide input into the screening assessment.

10.3.2 Air Quality Study

The air quality study will consider the following aspects:

- Baseline Assessment;
- Dust Fallout Monitoring;
- Emissions Inventory;
- Dispersion Modelling; and
- Air Impact Assessment.

10.3.3 Noise Study

The noise study will determine the significance of noise impacts on nearby receptors of the various developments.

10.3.4 Groundwater Study

The groundwater study will assess the following:

- Hydrocensus;
- Geophysical surveying;
- Borehole drilling; and
- Aquifer testing.

10.3.5 Radiation

The radiological impact to workers will be assessed, with the purpose to define appropriate radiation protection measures during the reclamation processes. A qualitative assessment of the potential impact to the public is included. The baseline will be established through radon gas measurements, prior to the project commencing.

The information gathered will be used to determine the potential risk to workers and the public. A radon dispersion model will be developed to quantify the radon inhalation pathway. This is in addition to the air quality dispersion modelling that will be done as part of the environmental authorisation studies. For this purpose the potential radon exhalation rate will also be quantified.

10.3.6 Soils Study

The soil study will assess the impacts on soils, land capability and land use.

10.3.7 Surface Water Study

The surface water study will assess the following aspects:

- Impact on surface water receptors; and
- Floodline determination.

10.3.8 Aquatics Study

Following methods outlined by the River Health Programme, the aquatics study will consider the following aspects:

- Abiotic drivers (biophysical attributes of the system); and
- Biotic or biological responses.

10.3.9 Fauna & Flora Study

The floral assessment will include the following aspects:

- Vegetation classification, mapping of plant communities identified and the description thereof;
- Identification of any important and sensitive plant communities, floral species and biodiversity important species, communities and or ecosystems;
- Species list of each plant community;
- Dominant species of each plant community;
- Declared invaders and alien / exotic species (if present) for each plant community;
- Rare or endangered species, as well as all protected plants (if present) for each plant community;

- Ecological status;
- Biodiversity, biodiversity rich areas and sensitive areas; and
- Recommended species composition / mixture of species, included grasses, herbs, shrubs and trees to be used during rehabilitation as part of re-seeding and re-vegetation of rehabilitated and backfilled areas.

The faunal assessment will include the following aspects:

- Species list of mammals, birds, reptiles, amphibians and invertebrates;
- Dominant species;
- Exotic species (if present);
- Red data species, as well as any protected species; and
- Biodiversity, biodiversity rich areas and sensitive areas.

10.3.10 Wetlands Study

Aspects to be assessed as part of the wetlands study include:

- Delineation of wetlands;
- Wetland integrity; and
- Wetland functionality.

10.3.11 Heritage Study

Aspects to be considered as part of the heritage study includes:

- Archaeological resources protected under Section 35 of the NHRA;
- Built Structures protected under Section 34 of the NHRA;
- Burial Grounds and Graves protected under Section 36 of the NHRA.

10.3.12 Socio – Economic Study

Aspects to be considered as part of this study will include:

- Employment creation;
- Local economic and community development;
- Physical and economic displacement;
- Damage or disturbance to archaeological and cultural heritage; and
- Decrease quality of life due to nuisance effects.

10.4 Item 2(i)(iv): Proposed Method of Assessing the Environmental Aspects including the Proposed Method of Assessing Alternatives

10.4.1 Air Quality Study

10.4.1.1 Baseline Assessment

A baseline assessment will be carried out to determine the regional climate and to assess the local (site-specific) prevailing weather conditions, and its influence on the climatic and atmospheric dispersion and dilution potential of pollutants released into the atmosphere (if available).

Site-specific meteorological data will be obtained from the nearest South African Weather Service Automatic Weather Station and evaluated to determine local prevailing weather conditions.

Modelled MM5 meteorological data will be extracted for the point near the future operations. This dataset consists of surface data, as well as upper air meteorological data that is required to run the dispersion model. It is required if site specific surface and upper air meteorological data is not available.

10.4.1.2 Dust Fallout Monitoring

To determine the background dust fallout for the project area, prior to development, the dust monitoring network, comprising eight single dust fallout buckets, will be established. It is proposed that an additional 6 Samplers be erected for the CPP and RTSF sites.

The use of the dust fallout results will make it possible to interpret the baseline dust levels at the relevant sensitive receptors around the reclamation, RTSF and plant areas. The results could also be used at a later stage to ascertain whether the activities at the mine and processing plant have an effect on the air quality of the area.

The results of dust fallout monitoring will be analysed and compared with the proposed acceptable rates as per the draft national dust control regulations, together with the analysis of available meteorological data.

10.4.1.3 Emissions Inventory

This phase of the study will require the establishment of an emissions inventory based on the CPP and ancillary activities. The sources of air emissions will need to be determined and the amount of emissions quantified to determine the contributions to PM_{10} and $PM_{2.5}$ that the CPP will make. This quantification will be done by completing dispersion modelling.

This information will also be used in the application for the Air Emissions License (AEL).

10.4.1.4 Air Quality Dispersion Modelling

Dispersion models compute ambient concentrations as a function of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions of various sources. All emission scenarios would be simulated using the USA Environmental Protection Agency's Preferred/Recommended Models: AERMOD modelling system (as of December 9, 2006, AERMOD is fully promulgated as a replacement to ISC3 model). The dispersion modelling will be completed for all components of the Stage 2a process i.e. the reclamation sites, the CPP and the RTSF.

10.4.1.5 Impact Assessment - Analysis and Interpretation

The Report containing the impact assessment will be compiled and will contain:

- Identification of existing sources of emissions and characterisation of ambient air quality within the airshed using available monitoring data (Client to provide any existing ambient monitoring data if available);
- Review of the current South African legislative and regulatory requirements;
- Detailed literature review of emissions from all activities on site. Where information is not available on emission rates, US EPA AP42 emission factors or Australian NPI emission factors will be used. Other emission sources in the area will also be included in the emission inventory (client to assist in the provision of this information);
- Define the potential sensitive receptors areas, such as local communities, as well as environmental constraints relative to air quality;
- Dispersion simulations of ground level concentrations (GLC) of particulate matter (PM10, and PM2.5), emissions and dust deposition will be carried out. The baseline and anticipated cumulative impacts of the activities on the ambient air quality of the operations will also be identified and discussed.

Analysis of the dispersion modelling will highlight:

- Predicted zones of maximum ground level impacts (PM_{10}, $PM_{2.5}$ and nuisance dust);
- Frequency with which guidelines (standards) for criteria pollutants will be exceeded; and
- Recommendations of buffer zones and impact management zones.

Recommendations will be provided regarding the mitigation and management of the identified potential impacts on air quality. These will include preparation of a mitigation and management plan that mitigates or manages all potential environmental, health and social risks, and includes a management plan for the on-going monitoring of relevant air quality aspects.

10.4.2 Noise Study

The comprehensive noise assessments will look at what the significance of the noise impacts are for each application and will quantify the main noise sources from the construction and operation of the CPP as well as the construction of the RTSF, including the construction and operation of the associated pump station and pipelines between the CPP and RTSF.

10.4.2.1 Methodology – Detailed Assessment

The noise assessment will be carried out in accordance with the Gauteng Noise Control Regulations GN 5479 of 1999 (PG 75 of 20 August 1999) in terms of section 25 of the Environmental Conservation Act of 1989 (Act 73 of 1989).

Baseline measurements will take for a 24 hour period per location. A Cirrus, Optimus Green, precision integrating sound level meter will be used for the measurements. The instrument will be field calibrated with a Cirrus, sound level calibrator.

The noise level propagation from the proposed reclamation activities will be calculated by means of the dispersion modelling software 'Soundplan'. This model will depict in detail, what the expected noise levels are to be at sensitive receptors, and can predict, per receptor, the intensity of the noise impact.

The noise assessment report will include the analyses of the baseline information as well as the quantification of the proposed noise sources depicted as isopleth plots, indicating the expected propagation of sound pressure from the proposed reclamation activities.

The noise assessment report will also include recommended practical mitigation measures as well as recommended a noise management programme to minimise the impact of noise on the surrounding environment.

Both the desktop assessments and comprehensive noise assessment will be presented in one noise assessment report and will comprise of baseline noise measurements as well as assess, via predictive noise dispersion modelling, the potential impact of the noise emissions from the new CPP plant and RTSF.

The primary deliverable will be a Noise Assessment Report which will describe the following:

- Baseline noise measurements;
- Noise dispersion modelling in support of the application for the CPP and RTSF;
- Significance of impacts; and
- Noise management programme.

10.4.3 Groundwater Study

This geohydrological study will focus on the assessment of the potential impact of the proposed RTSF on the groundwater environment. The influence of the RTSF will be investigated fully to comply with the Department of Water and Sanitation (DWS) regulatory requirements under the NWA as well as the NEMA. During the geohydrological study, the following tasks will be completed:

- Determination and description of the baseline (existing) groundwater quality, level, gradient and flow direction for the RTSF site;
- Environmental significance rating of the baseline water quality by comparing the water chemistry with the South African water quality guidelines;
- All borehole construction details, hydrogeological logging and aquifer test results;
- Quantification of contamination plumes originating from the RTSF during operation and after mine closure;
- Determination of the migration patterns and flow pathways of the contamination plume and the connectivity between the contamination sources and the groundwater receptors;
- A list of boreholes and farms that will be affected by the contamination plume will be compiled;
- Environmental significance rating of each of the activities that could potentially impact the groundwater environment will be determined;
- Coordinates of preferred monitoring boreholes (existing and new) that are located up-gradient, as well as down-gradient of the RTSF and associated infrastructures. This will assist with accurately quantifying any contaminants released from the CTSF by comparing the inflowing quality with that of the outflowing;
- The completion of a numerical model of the RTSF site;
- Comments on the design of the mine activities, such as the blast-curtain, so as to prevent and abate groundwater contamination; and
- Ultimately the above tasks will be integrated into a final report conforming to EIA and EMP standards and made available to the client for review. The report will include all data, information and findings, recommendations and a full risk assessment derived from the transient simulations for life of project and post closure, as well as a groundwater monitoring protocol.

10.4.4 Soils Study

Baseline soil information was obtained using published South African Land Type Data. Land Type Data for the site was obtained from the Institute for Soil Climate and Water (ISCW) of the Agricultural Research Council (ARC) (Land Type Survey Staff 1972 - 2006). The land type data is presented at a scale of 1:250 000 and comprises of the division of land into land types.

A more detailed study of the soils present within the project area will be conducted. The site will be traversed by vehicle and on foot. A soil auger will be used to characterise and classify the soil form and depth. The soil will be hand augured to the first restricting layer or a depth of 1.2 m. Soil survey positions will be recorded as waypoints using a handheld GPS. Soil forms (types of soil) found in the landscape will be identified using the Taxonomic Soil Classification, a System developed for South African. Landscape features such as existing open trenches will also be used in mapping the soil profile and classifying the soil form and depth.

Land capability will be determined by a combination of soil, terrain and climate information/features (geomorphology). Capability is defined by the most intensive long term sustainable use of land under rain-fed conditions.

10.4.5 Surface Water Study

To complete the surface water assessment, there are a number of tasks which need to be completed. These tasks are set out below.

10.4.5.1 Desktop Assessments

The desktop assessment will constitute:

- Assessment and update of Baseline hydrological characteristics of the area ; and
- Assessments of the adequacy of existing surface water sampling points up and downstream of infrastructure upgrades and extensions. If existing sites are inadequate new sites should be located up and downstream.

10.4.5.2 Site visit and Sampling

A site visit will be undertaken to confirm the site characteristics, confirm catchment characteristics and the existing water resources (pans, dams and streams) and also to collect independent water quality samples for submission to a South African National Accreditation Systems (SANAS) accredited laboratory for analysis of the variables of concerns.

10.4.5.3 Water Balance Update

The current water balance will need to be updated to reflect the new activities and water uses. This update will take place in conjunction with the Sibanye Water Department, however, Digby Wells will take the lead on this aspect.

To update the water and salt balance, Digby Wells will undertake the following:

- review the available information to gain an understanding of the entire project water system, and explaining the drivers of water within the system and management thereof, for example:
  - The mass balance processes;
  - Waste storage facilities;
  - Water inflows required to be pumped to storage dams for use within the system;
  - Pollution control dams and runoff from the polluted areas.
- Undertake a site verification:
  - Perform interviews with the appropriate site personal to confirm process flows and estimates.
- Update water and salt balance;
- A technical report will be compiled for the overall integrated water management providing the following:
  - All modelling methodologies and assumptions for the water balance; and
  - Data analysis in the spread sheets and a presentation illustrating the results.

10.4.5.4 Floodline Determination

The determination of the flood lines associated with the Leeuspruit will be required for the RTSF. This will entail the following:

- Conducting a hydrological assessment to determine flood peak analysis for the different recurrence interval flood peaks for the watercourse within the proposed development area for the 1:50 and 1:100 year recurrence interval flood-line;
- Performing a hydraulic analysis in Hec-Ras Programme to determine the surface water elevations for the 1:50 and 1:100 year flood peaks; and
- Plot the flood-lines using the Arc GIS programme software.

10.4.5.5 Impact Assessment

The specialist surface water assessment reports will include the following:

- The use of the Digby Wells developed impact assessment methodology to rate the significance of the impacts;
- Update of mitigation measures to reduce the significance respectively;
- Update of a surface water management plan to ensure that the impacts are minimised; and
- An updated monitoring programme to ensure that new potential impacts are monitored.

10.4.6 Aquatics Study

Methods outlined by the River Health programme will be utilised to determine the state of the biophysical attributes of the associated river course. These biophysical attributes refer to the drivers and biological responses of an aquatic ecosystem. The selected drivers and biological responses for this study include:

10.4.6.1 The Abiotic Driver Assessment:

- The assessment of physio-chemical variables of the water; and
- Habitat indices:
  - Invertebrate Habitat Assessment System (IHAS).
  - Intermediate Habitat Integrity Assessment (IHIA)

10.4.6.2 The Biotic Response Indicator Assessment:

- South African Scoring System version 5 (SASS5);
- Macro – Invertebrate Response Assessment Index (MIRAI); and
- Fish Response Assessment Index (FRAI).

10.4.7 Fauna & Flora Study

10.4.7.1 Vegetation Survey

A floristic (plant) survey will be conducted during the growing season of all species that may potentially occur in the project area. Two wet seasons will be undertaken. Visits during other seasons will be determined by the flowering and fruiting times of species that do not occur during the summer, specifically the grasslands and rocky areas. This will give an indication of the actual species present on site and these will be discussed in context of plant communities within the ecosystem of the area. The protected, endemic, exotic, alien invasive and culturally significant species will also be discussed as separate issues and related back to relevant legal requirements. Furthermore the identification of red data and protected

species as listed according to the IUCN List as well as Provincial and National legislation will be completed. Depending on the vegetation and terrain, the Braun-Blanquet sampling, belt or line transect methods could be used during vegetation assessments, however should dominant vegetation types require other methods be used, then these shall be motivated. The Braun-Blanquet method allows for the following to be compiled:

- Vegetation classification regarding plant communities within the area and sub communities and variations of these;
- Species list for each plant community, including diagnostic and dominant species.
- Invasive species (if present) for each plant community;
- Exotic species (if present) for each plant community;
- Protected and/or endemic species for each plant community; and
- Culturally significant plant species within each community.

Additional vegetation assessment such as quantitive assessments will be conducted to determine the tree/shrub structure, height and average tree cover of the natural area as objective for rehabilitation.

10.4.7.2 Faunal Survey

Field surveys will be conducted concurrently with vegetation surveys and all animals observed in the area will be noted. Any ecological indicators, such as calls, tracks and dung will also be noted and regarded as the presence of that particular animal. An invertebrate assessment will include sweep-netting for insects, which will be preserved in alcohol for identification purposes. Detailed fauna lists will be generated and discussed and related back to the floristic component of the area. The probability of occurrence for species not observed during field surveys will be updated if applicable regarding available habitats. Protected and endemic species will be the focus of discussion. Diurnal and nocturnal surveys will be performed. Faunal composition of disturbed sites will be compared to the composition of undisturbed areas. The number of sample plots will vary for each component of the faunal survey. The current status of the faunal environment will be determined and an evaluation of the extent of site-related effects in terms of certain ecological indicators, as well as identification of specific important ecological attributes such as rare and endangered species, protected species, sensitive species and endemic species will be made. The faunal environment and habitat will be characterised in relation to biota and the extent of site related effects. Presence of read data and protected species will be indicated on a map.

The deliverables include:

10.4.7.2.1 Mammals

A list of all potential mammals will be compiled by means of desktop study and all potential red data species will be highlighted with short habitat descriptions.

The presence of mammals will be recorded using tracks, dung, ecological indicators, camera traps, non-fatal traps (Sherman traps) and visual sightings of the animals themselves, sample sites will cover all habitat available for mammals species within the study area, is expected that at least 10 sample sites will be completed. A full survey to determine species richness will be carried out. The following will be recorded during the mammal survey:

- All mammals encountered or noted during the surveys will be recorded;
- Tracks and dung of mammals encountered during the survey will be, where possible, identified and recorded (if possible);
- A list of the most prominent mammal species will be compiled;
- A list of rare and endangered species encountered during the survey, as well as species listed according to the results of a desktop study but which were not recorded during the survey, will be compiled;
- A list of protected species that occur on the potential list but not recorded during the site visits or surveys; and
- A list of exotic or introduced vertebrate species occurring on the property.

10.4.7.2.2 Birds

Visual sightings will be conducted with binoculars and identification will be obtained from recognised field guide text books. A complete list of bird species encountered within the boundaries of the study area will be compiled. Transects, spot counts and fixed point counts will be completed for the bird assessment. Sample sites will be randomly spread across the study area with at least 10 sample sites located across all of the vegetation units identified. Supporting material such as bird sounds, text books etc. must also be used to identify birds on site. The following will be recorded during the bird survey:

- All birds encountered or noted during the surveys will be recorded;
- A list of the most prominent birds encountered and possible species that can be expected to be present;
- A list of rare and endangered species encountered during the survey;
- Possible migration species that are not on site during the survey will be assessed from literature surveys; and
- A species list of all the birds that can possibly be present within the relevant grid in which the farms are situated will be compiled using the Roberts' Multimedia Birds of Southern Africa.

10.4.7.2.3 Amphibians and Reptiles

Reptiles and Amphibians will be sampled using both active and passive sampling techniques. Active searching will be done and as many as possible caught, identified and photographed using the rubber band technique. Sample sites will be concentrated in areas where habitat that could support reptile and amphibian species are found, at least five sample plots will be completed. Passive sampling will include drift fence arrays and pitfall traps where possible. Amphibians will be sampled using active methods such as netting during their hours of activity (night).

Passive sampling methods will include pitfall traps and sound recordings where possible:

- All frogs, snakes, lizards and tortoises encountered or noted during the surveys will be recorded;
- A list of the most prominent amphibian and reptile species will be compiled;
- A list of rare and endangered species encountered during the survey, as well as species listed according to the results of a desktop study but which were not recorded during the survey, will be compiled; and
- A list of protected species that occur on the potential list but not recorded during the site visits or surveys.

10.4.7.2.4 Invertebrates

Indicator invertebrates groups will be sampled using appropriate methodology, such as sweep netting. Approximately ten sample plots are envisaged however this number could change during the site assessment. For each sample plot the insects are identified to at least family level and where possible to genus and species level. Groups including ants, ground living beetles (Tenebrionidae and Carabidae), termites, leafhoppers, spiders and scorpions will be included if present. The methodology of how the field surveys will be conducted (pitfall traps, active search, netting, etc.) will be included.

10.4.7.2.5 Sensitive Areas

All sensitive areas, as described by the provincial and national legislation, will be identified. The locality and extent, as well as species composition of sensitive areas such as the wetlands or pans, streams, rivers and rocky outcrops will be conducted to identify and map all such sensitive areas present.

10.4.8 Wetlands Study

10.4.8.1 Wetland Delineation

The wetland delineation will be completed according to the following features outlined in the DWAF (2005) guidelines:

- Terrain Unit Indicator – helps to identify those parts of the landscape where wetlands are more likely to occur;
- Soil Form Indicator – identifies the soil forms, which are associated with prolonged and frequent saturation;
- Soil Wetness Indicator – identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation, and
- Vegetation Indicator – identifies hydrophilic vegetation associated with frequently saturated soils.

10.4.8.2 Wetland Integrity and Functionality Assessment

The most suitable South African tools for wetland ecological status are used to determine the state of the wetlands identified on site. The following tools are used for the integrity and functionality assessment:

- Wet-Health – a rapid assessment of the Present Ecological State (PES) of the vegetation, hydrology and geomorphology of wetlands on site (Macfarlane *et al.* 2007);
- Wet-Eco-services – an assessment of the services provided by wetlands to society and biodiversity (Macfarlane *et al.,* 2007); and
- EIS – an assessment of the ecological importance of the system for the maintenance of biodiversity (Duthie 1999).

10.4.9 Heritage Study

The following methodology will be carried out as part of the heritage study:

- Collection of qualitative data to described the cultural landscape, including review of credible information sources. This includes a review of historical imagery and cartographic sources.
- Collection of quantitative data through a non-intrusive survey of the proposed development footprint, recording of identified heritage resources through GPS waypoints, photographs and detailed notes.
- An assessment of the cultural significance of identified heritage resources against criteria outlined under Section 3 of the NHRA.
- An assessment of potential direct, indirect and cumulative impacts of the proposed project activities on identified heritage resources.

10.4.10 Socio – Economic Study

Should the scoping phase of the project be successful, the project will proceed to the impact assessment phase, during which a full EIA would be submitted. The EIA will include a SIA that will perform detailed investigations to confirm the anticipated severity and extent of the identified socio-economic impacts. The SIA will quantify impacts according to a recognised rating scale, and formulate appropriate mitigation measures to ameliorate negative socio-economic impacts and enhance positive ones.

The following activities will be undertaken as part of the SIA:

- Qualitative data collection by means of interviews;
- Description of socio-economic baseline conditions;
- Identification, assessment and rating of impacts;
- Designing of measures to mitigate or enhance of identified social impacts; and
- Reporting of study results in the form of a specialist SIA report.

10.5 Item 2(i)(v): The Proposed Method of Assessing Duration Significance

Duration will be assessed using the following qualifications:

- Permanent: No Mitigation. No mitigation measures or natural process will reduce the impact after implementation.
- Permanent: Mitigation. Mitigation measures of natural process will reduce the impact.
- Project Life. The impact will cease after the operational life span of the project.
- Long term. The impact will last for 6-15 years
- Medium term. The impact will last for 1-5 years
- Short term. The impact will last for less than 1 year
- Immediate. The impact will last for less than 1 month

10.6 Item 2(i)(vi): The Stages at which the Competent authority will be Consulted

In addition to the DMR having been consulted during the pre-application phase, the DMR will be consulted at the following stages:

- On submission of application (in the form of a submission meeting);
- During the legislated timeframes associated with the Scoping Report for comment; and
- During the legislated timeframes associated with the EIA Report for comment.

10.7 Item 2(i)(vii): Particulars of the Public Participation Process with regard to the Impact Assessment Process that will be Conducted

This section provides details on the PPP to be conducted as part of the EIA process.

10.7.1 Steps to be taken to Notify Interested and Affected Parties

The PP process for the Impact Assessment phase will be similar to that of the Scoping phase. The premise is to meet various legislative requirements for PP and for a single, integrated process to be followed. This will limit stakeholder fatigue and enable stakeholders with a single view of the full project and EIA information. However, stakeholder comments gathered during the Scoping phase will be used when designing the PP process for the Impact Assessment phase.

The main objective of stakeholder engagement in this phase is to:

- Share results of the specialist impact studies;
- The proposed mitigation measures and recommendations; and
- Demonstrate how I&AP comments and concerns were addressed.

In Table 10-1 a summary of the anticipated PP activities for the Impact Assessment phase is provided.

Table 10-1: Summary of PPP activities during the Impact Assessment Phase

Activity	Details
Impact Assessment Phase	
Update of stakeholder information	The stakeholder database will be updated with new I&APs who formally register, attend stakeholder meetings or submit comments.
Announce availability of the EIA/EMP Reports	Announcement of availability of the EIA/EMP Reports will be distributed via email, post and SMS. Advertisements were also placed in the following newspapers: ▪ Randfontein Herald (Local Newspaper) ▪ Carletonville Herald (Local Newspaper) Roodepoort Record (Local Newspaper)
Placement of EIA/EMP Reports	The EIA/EMP Reports has been made available to stakeholders at the following public places: ▪ City of Johannesburg Metropolitan Library ▪ Randfontein Public Library ▪ Westonaria Public Library ▪ Toekomsrus Public Library ▪ Fochville Public Library ▪ Carletonville Public Library ▪ Bekkersdal Public Library The EIA/EMP Reports will also available on the Digby Wells website www.digbywells.com (under Public Documents) and will also be available at the various stakeholder meetings. *(Public comment period: 15 September to 15 October 2015)*

Activity	Details
Stakeholder Meetings	A series of stakeholder meetings will be held in early October 2015. It is scheduled that focus group meetings be held with authorities, landowners and occupiers, NGOs and communities. An open house meeting is also scheduled and all stakeholders on the database will be invited to attend. All comments received at these meetings will be captured and responded to in the CRR.
Announcement of the updated EIA/EMP Reports	A letter will be emailed and posted to the full database to announce availability of the updated EIA/EMP Reports so that stakeholders can confirm that their comments have been addressed. *An SMS to notify stakeholders that the updated Scoping Reports are available for comment will be sent to the full database.*
Placement of updated EIA/EMP Reports	The updated EIA/EMP Reports will be made available, once complete, at the following public places: ▪ City of Johannesburg Metropolitan Library ▪ Randfontein Public Library ▪ Westonaria Public Library ▪ Toekomsrus Public Library ▪ Fochville Public Library ▪ Carletonville Public Library ▪ Bekkersdal Public Library The updated EIA/EMP Reports will include the amended CRR, which contains new stakeholder comments and responses, and the inclusion of new PP activities undertaken as part of the Impact Assessment phase. The updated EIA/EMP Reports will also be available on the Digby Wells website www.digbywells.com (under Public Documents).

10.8 Item 2(i)(viii): Description of the Tasks that will be Undertaken During the Environmental Impact Assessment Process

The following tasks will be undertaken during the EIA phase:

- Further define the project activities;
- Further assess the project alternatives based on technical, economic, social and environmental criteria;
- Supplement the legal review of the project;
- Undertake detailed specialist investigations;
- Assess potential impacts using the methodology provided herein;
- Provide detailed and feasible mitigation and management measures in an EMP; and
- Public participation activities, including public and key stakeholder meetings.

10.9 Item 2(i)(ix): Measures to Avoid, Reverse, Mitigate, or Manage Identified Impacts and to Determine the Extent of the Residual Risks that need to be Managed and Monitored

Refer to Table 10-2 for a summary of the potential impacts, mitigation measures and residual impacts for the Kloof component of the WRTRP.

Table 10-2: Potential Impacts, Mitigation Measures and Residual Impacts for the Kloof Mining Right area Activities

Project Activity	Potential Impacts	Mitigation Measures	Potential for residual risk
▪ Abstraction of water from the K10 Shaft	▪ The abstraction form the shaft has been taking place under the current mining operations at Kloof. It is not expected to have any impacts. ▪ No significant impacts on the surface water environment.	▪ Application of wetting agents or dust suppressant on the dirt roads and exposed areas. ▪ Limit activity to non-windy days. ▪ The area of disturbance must be kept to a minimum and no unnecessary clearing of vegetation must occur. ▪ Restricting construction/site clearance activities to daylight hours. ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers. ▪ Switching off equipment when not in use. ▪ Pump stations to be housed in noise attenuating enclosures. ▪ Regular service maintenance on the pipelines to mitigate water hammer noise. ▪ Install effective pollution prevention measures such as runoff trenches and containment infrastructure. ▪ Separate clean and dirty water streams. ▪ Monitor boreholes to detect and analyse and contamination. ▪ Application of wetting agents or dust suppressant on the RTSF to limit particulate dispersion. ▪ Install effective pollution prevention measures such as runoff trenches and containment infrastructure. ▪ Separate clean and dirty water streams. ▪ Monitor boreholes and surface water points to detect and analyse and contamination. ▪ Installation of storm water management structures. ▪ Effective stripping and stockpiling of topsoil. ▪ All stockpiles should be protected by a bund wall to prevent erosion of stockpiled material and deflect surface water runoff. ▪ Topsoil stockpiles are to be kept to a maximum height of 4 m (the practical tipping height of dump trucks). ▪ Topsoil is to be stripped when the soil is dry, as to reduce compaction. ▪ Intercepting fast flow pathways by placing a bund across the overland flow route prevents the runoff from quickly reaching the watercourse. This has the benefit of slowing the natural runoff and therefore reducing flood risk, while trapping sediment being washed from the fields. ▪ The pumps located at each of the sumps should be installed within closed off areas to contain material spillages. In times of power failure, manual monitoring of the sump associated with the pump station should be carried out. ▪ Construction activities near aquatic environments must be limited with impacted footprints kept as small as possible. ▪ Aquatic resources should be demarcated (sign posted) to keep machinery away from water bodies. ▪ Liners including synthetic, clay and geological, compacted or cement liners	▪ Although dust suppression techniques will reduce a high percentage of particulate matter from dispersing in the air, some particulate matter may still disperse. ▪ Sound abatement measures will minimise noise levels but not necessary to within existing ambient noise levels. ▪ Surface water runoff from hard areas (paved or solid areas) may spill over containment infrastructure (trenches/containment dams) during extreme rain events. ▪ Contamination plumes from, for instance the RTSF will be minimised through mitigation measures but could still expand outside the operational areas over long periods of time. ▪ Miniscule levels of radioactive particulates may still reside in the RTSF after treatment via the CPP.
▪ Construction and operation of the CPP	▪ Increase in dust generation and particulate matter during construction through earth moving. ▪ During operation the emissions form the plant will potentially impact on the quality of the air. ▪ Noise may be created during the construction of the CPP. It will be short term and local in nature. ▪ The operation of the CPP will generate noise but will be restricted to the site. ▪ Seepage/ spillage of untreated water or chemicals onto surface which may seep into groundwater environment with water quality impacts. ▪ Possible radioactive contamination of the water within the plant, which if discharged may have an impact. ▪ Potential loss of top soil through erosion during the construction phase. ▪ Loss of land capability and land use. ▪ An increase in turbidity of surface water, due to runoff during construction emanating from the cleared and stripped areas. ▪ The construction phase and the clearing of the site will cause the loss of floral species/vegetation types and biodiversity. ▪ Damage and/or destruction of heritage resources during the site clearance. ▪ Temporary job creation during the construction phase. ▪ Temporary economic benefits related to project spending during construction. ▪ Increased spending and job creation during the operation of the CPP. ▪ Loss of sense of place.		
▪ Construction and operation of the RTSF	▪ Increase in dust generation and particulate matter during construction. ▪ Impacts during operation will be caused by windblown dust and PM 10 and 2.5 generation from the RTSF. ▪ The construction will generate noise through earth moving activities. ▪ Noise during operation may be caused by the pumps associated with the RTSF. ▪ Seepage from the TSF can potentially influence the groundwater quality in the underlying aquifers (dolomites). ▪ Seepage from the RTSF can also impact the quality of the streams in the proximity via groundwater baseflow.		

Project Activity	Potential Impacts	Mitigation Measures	Potential for residual risk
	▪ Should the tailings be radioactive and the physical properties are such that it can be distributed by wind there is a possibility of health impacts to nearby communities as well as possible groundwater contamination. ▪ The construction phase may have erosion impacts. ▪ Decreasing in land capability during the operational phase as areas previously available for agriculture will be occupied by the RTSF. ▪ Water quality could be compromised due to contaminated runoff emanating from the RTSF reporting into the nearby rivers. ▪ Sediments in the runoff may also cause siltation of the water in the rivers. ▪ Uncontrolled runoff from the RTSF may pollute nearby water causes and destroy aquatic habitats. ▪ Construction of the RTSF may cause alteration, damage to habitats ▪ Particulate matter emanating from RTSF my impact floral species. ▪ Runoff from RTSF may impact surrounding wetlands. ▪ Loss of wetland habitat. ▪ Construction of RTSF may cause alteration, damage to or destruction of historical buildings and structures older than 60 years. ▪ Construction may impact on graves and cause the relocation of these to be done. ▪ Relatively limited job creation. ▪ Possible impact on people living close to the TSF sites through dust emissions and contamination of groundwater. ▪ Visual impact of RTSF in region.	prevent seepage from entering aquatic systems. ▪ The planting of indigenous trees around the treatment facility should be done. Trees are useful for erosion and nutrient control. ▪ Re-vegetation of construction footprint and unpaved roads as soon as possible. ▪ Minimise vegetation removal to infrastructure footprint. Clearing and grading should only occur where absolutely necessary. ▪ Construction sequencing is proposed. ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the disturbed areas to the minimum and within designated areas only. Re-vegetate open areas to limit erosion, which will also aid in water infiltration and flood attenuation. ▪ Avoid known areas of faunal and floral SSC. ▪ Avoid sensitive landscapes such as riparian and ridge areas that were encountered on site. ▪ Manage nationally restricted alien invasive plant species by ensuring the removal of vegetation during construction and operation are controlled so that no open areas occur. ▪ Applications for permits for removal of certain plants, where required. If plant SSC are to be removed, they should be either translocated to a similar habitat to the donor site or relocated to a nursery. ▪ There is no mitigation for the loss of wetland habitat. An offset strategy should be compiled to compensate for the wetlands that are lost to the proposed project prior to any development on site. ▪ Modify through amendment to the design of the RTSF as far as is feasible to preserve burial grounds and graves in situ. ▪ Where project alternatives are not feasible, the potential impact to burial grounds and graves must be remedied through the implementation of a grave relocation process. ▪ Structures older than 60 years are protected under section 34 of the NHRA, and a Section 34 Permit Application with PHRA-G regulated by Chapter III of the Regulations to the Act (GNR 548) is required prior to any alterations or demolition if such structures. ▪ Procurement of goods and services from local small business. ▪ Recruit local labour. ▪ Sub-contract to local construction companies. ▪ Employ labour-intensive measures in construction. ▪ Resettlement Action Plan could be developed and implemented. ▪ Establishment of appropriate training and skills development at an early stage to allow farm workers to benefit from the mine employment opportunities. ▪ Concurrent rehabilitation.	
▪ Construction and operation of the AWTF	▪ Limited impact to the receiving environment during the construction phase of AWTF. ▪ Possible radioactive contamination of the discharged water, which in turn may have health impacts to humans. ▪ The increase in water volumes may cause the inundation of riparian areas. ▪ Potential changes in aquatic habitat. Changes in base flow will change velocity and depth conditions in the receiving streams, with the possibility of changes in habitat conditions. ▪ General impacts on surface water resources. The magnitude of change in monthly and annual catchment yield will be assessed within the study area. ▪ Potential changes in aquatic habitat. Changes in base flow will change velocity and depth conditions in the receiving streams, with the possibility of changes in habitat conditions.		

Project Activity	Potential Impacts	Mitigation Measures	Potential for residual risk
▪ Construction and operation of pipelines	▪ The construction phase may cause noise to be generated. ▪ No impact unless spills occur. ▪ Contamination of soil and surface water should the pipelines spill. ▪ None unless spillages occur contaminating the soil. ▪ The disturbance or alterations of any drainage lines during pipeline construction at the river crossings mat result in potential flow changes in the downstream river regime. ▪ No effect on surface water other than short-term local risk of pipe rupture. ▪ The aquatic health of the river systems may be compromised should pipelines spill near or over river crossings. ▪ Construction of pipelines may disturb or destroy natural habitats. ▪ Spillages of pipelines will impact on natural vegetation and animals. ▪ Impacts on wetlands at pipeline crossing points. ▪ Construction of pipelines may disturb or destroy heritage resources on route. ▪ Construction may have limited social impacts on route.		

11 Item 2(l): Other Information Required by the Competent Authority

The competent authority has not requested additional information to date.

11.1 Impact on the Socio-Economic Conditions of any Directly Affected Person

A social impact assessment will be undertaken as part of the EIA, anticipated impacts include:

- Temporary job creation during the construction phase;
- Permanent employment opportunities during the operational phase;
- Possible dust fallout within surrounding communities; and
- Potential groundwater contamination which may impact the quality of potable water.

11.2 Impact on any National Estate Referred to in Section 3(2) of the National Heritage Resources Act

A heritage impact assessment will be undertaken as part of the EIA process. Based on the current understanding of the cultural landscape and the identified heritage resources within the project area, Digby Wells will be undertaking the following:

- Exemption from further palaeontological assessments for the proposed infrastructure footprint as the palaeo-sensitivity is insignificant;
- An HIA will be undertaken that includes the following heritage components:
  - An Archaeological Impact Assessment including reconnaissance to identify and record archaeological resources within the impact footprint;
  - An assessment of burial grounds and graves including reconnaissance to identify, record and document all burials that may exist in the impact footprint;

Integration of additional specialist studies to determine any possible living heritage in the project area. Studies that may be considered for integration include Social Impact Assessment, Biophysical Assessment and Visual Assessment.

12 Other Matters Required in terms of Sections 24(4)(a) and (b) of the Act

Section 24(4)(b)(i) of the NEMA (as amended), provides that an investigation must be undertaken of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity. Refer to Sections 9 and 10 for feasible alternatives assessed.

13 Undertaking Regarding Correctness of Information

I Marcelle Radyn herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and I&APs has been correctly recorded in the report.

Signature of the EAP: _____

Date: _____

14 Undertaking Regarding Level of Agreement

I Marcelle Radyn herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

Signature of the EAP: _____

Date: _____

Appendix 1: Proof of Qualifications for EAP

Appendix 2: EAP's CV

Appendix 3: Regional and Local Setting

Appendix 4: Plans

Appendix 5: Public Participation Process