Appendix C:
Environmental Management Programme (EMPr)

Boitekong Ext 15 Remedial Works: Environmental Management Plan

Report Prepared for

Department of Water Affairs

Report Number 438209/003

Report Prepared by

srk consulting

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Boitekong Ext 15 Remedial Works: Environmental Management Plan

Impala Platinum for
Department of Water Affairs

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Table of Contents

List of Tables

List of Figures

Disclaimer

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1 INTRODUCTION AND SCOPE OF REPORT

1.1 INTRODUCTION

SRK Consulting was requested by the Impala Platinum to assist the Rustenburg Local Municipality under their guidance to compile an Environmental Management Plan (EMP) for the proposed river rehabilitation measures to alleviate flooding of the Boitekong X 15 residential area, in North West Province. The report has been compiled as per the principles of National Environmental Management Act (NEMA) The purpose of this study is to describe mitigatory measures that can be made binding on all contractors during the upgrading.

Boitekong X15 located within the Rustenburg Local Municipality was developed within the flood line of the Dorpspruit And during the previous rainy season a number of houses were inundated by flood waters and the residents had to be evacuated to safer places and has still not been able to return to their homes since there is a safety risk.

Remedial measures have been identified and the construction of these need to commence prior to the next rainy season to reduce the risk of again flooding and damage to property and potential loss of life. Please refer to **Fig.1** which indicate the location of the site with the proposed remedial measures,

Remedial measures identified include;

- Existing Prison dam upgrade
- Phala Road crossing upgrade
- Flood protection berms along the houses that are within a 1:100 Year Floodplain

It is the opinion of the consultant that Environmental Authorisation will not be required for the Phala Road upgrade and the construction of the flood protection berms since these activities do not fall within the listings for a Basic Assessment or a full Environmental Impact Assessment. The upgrade of the Prison Dam will however require an environmental authorisation at Basic assessment level. A meeting was held with Environmental Affairs in Mafikeng and they confirmed that no authorization was necessary for the road and the proposed flood protection berm; they will be forwarding a formal letter stating this, within the next 4 to 6 weeks. The more onerous environmental requirements for the rehabilitation of the dam necessitate the need to implement the project in phases. It is therefore proposed that it is phased as follows to allow for the process to obtain an environmental authorisation:

Phase 1: Construction of the berm and upgrading of the culverts

Phase 2: Repair and upgrade of Prison Dam to act as attenuation facility

Water Use Authorisation would be required since the Crocodile West WMA is exempt from General Authorisations. Water Use authorisation in terms of Section 21 c) and i) would therefore be required.

The Prison Dam has already been reclassified by the Dam Safety office at DWA head office and the process to apply for a dam construction licence has been initiated with the appointment of Mr Johann Enslin (BKS Consulting as the designer/consultant responsible for upgrading of the dam

A wetland study has been completed and a separate wetland's report is attached hereto. Relevant legislation applicable to this project and location of wetlands are shown in Fig 1;

Rustenburg Municipality, and its contractors and agents, is required to comply with all national, provincial and local legislation and regulations, not limited to

- Constitution of South Africa (Act 108 of 1996);
- National Environmental Management Act (Act 107 of 1998);
- Environment Conservation Act (Act 73 of 1989);
- National Water Act (Act 36 of 1998);
- Atmospheric Pollution Prevention Act (Act 45 of 1965);
- National Environmental Management Act: Air Quality Act (Act 39 of 2004);
- Occupational Health and Safety Act (Act 85 of 1993);
- Amended Asbestos Regulations, 2002;
- Municipal By-Laws.
- The National Environmental Management Waste Act (NEMWA), 2008 (Act 59 of 2008),
- Regulations In Terms Of Section 9c(6) of the Water Act, Act of 1956, Relating to dams with a Safety Risk
- R. 890 National Water Act (36/1998): Draft regulations regarding the safety of dams:

Table 1-1: Environmental and Water Use Authorisations

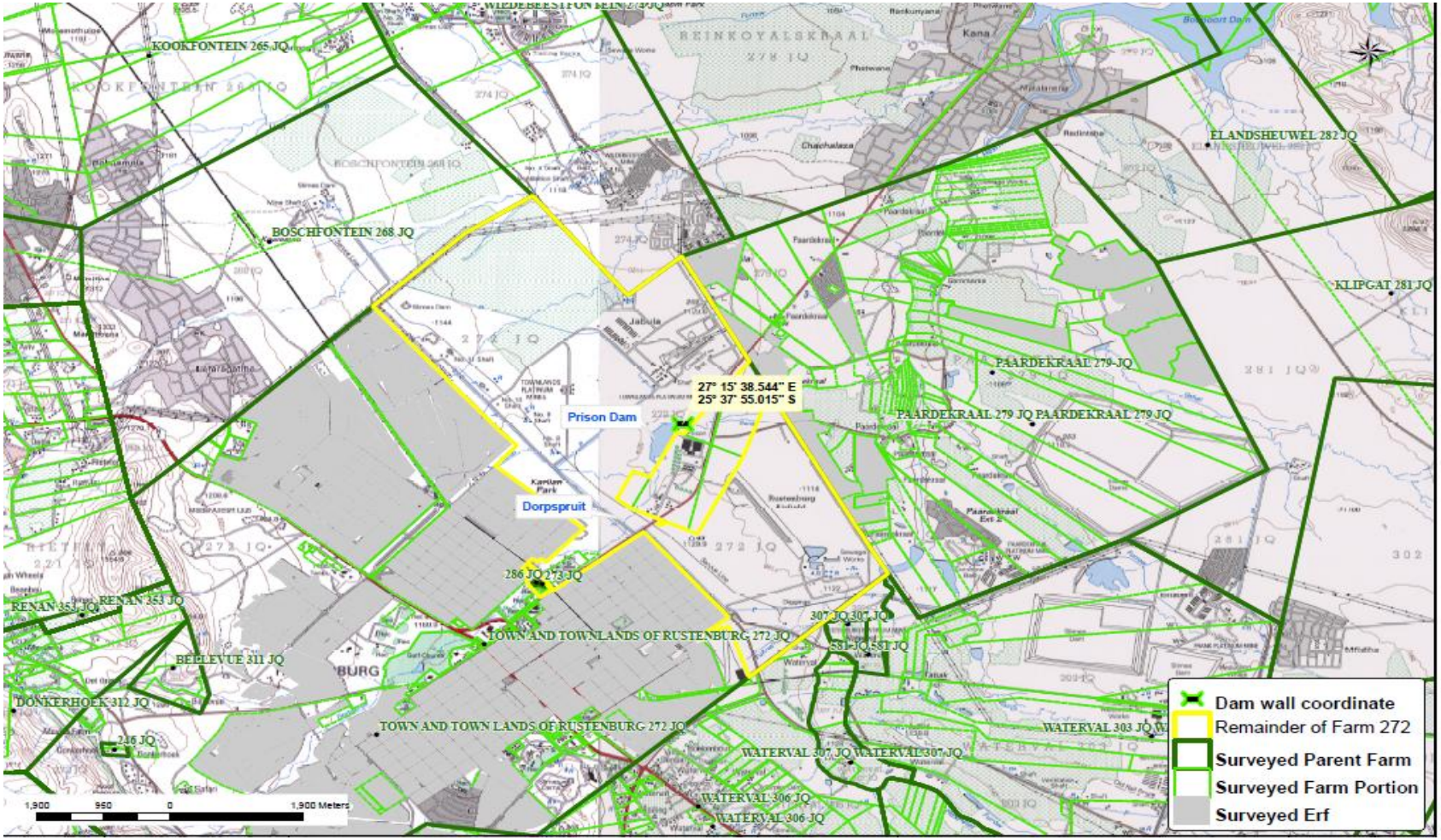
ACTIVITY	Water Use Authorisation	Environmental Authorisation	Comments
Upgrading of Prison Dam to act as flood attenuation dam	A Water Use Authorisation would be required including the reclassification of the dam in terms of the dam safety regulations and a dam construction permit	An environmental impact assessment will be required on a basic assessment level	The dam is currently authorized under an existing lawful use in terms of the National Water Act. DWA may require that an application is now made for a water use licence for Section 21 (c) and (i) The process in obtaining environmental authorization for the upgrading of this dam has commenced and no construction activities of the dam will take place prior to obtaining the required approvals
Upgrading of Phala Road	A Water Use Authorisation would be required. A	Not required	

	section 21 (c) and (i)		
Construction of flood protection berms	A Water Use Authorisation would be required. A section 21 (c) and (i)	Not required	

2 GENERAL PROJECT DESCRIPTION

2.1 Location

Boitekong falls within the Rustenburg Local Municipality in the North West Province and is located on the outskirts and approximately 8,5km north east of the centre of the town. The inhabitants of Boitekong are mainly employees of Impala Platinum which explains their involvement in finding a solution to the flooding problem. The residents are title holders of their dwellings. The location of the project is indicated on the 1:50000 map in Fig:1and the location of Wetlands in relation to the project in Fig 2



srk consulting	**Boitekong Loaclity Map**	Project No. 438209

Figure 1: Boitekong Locality Map

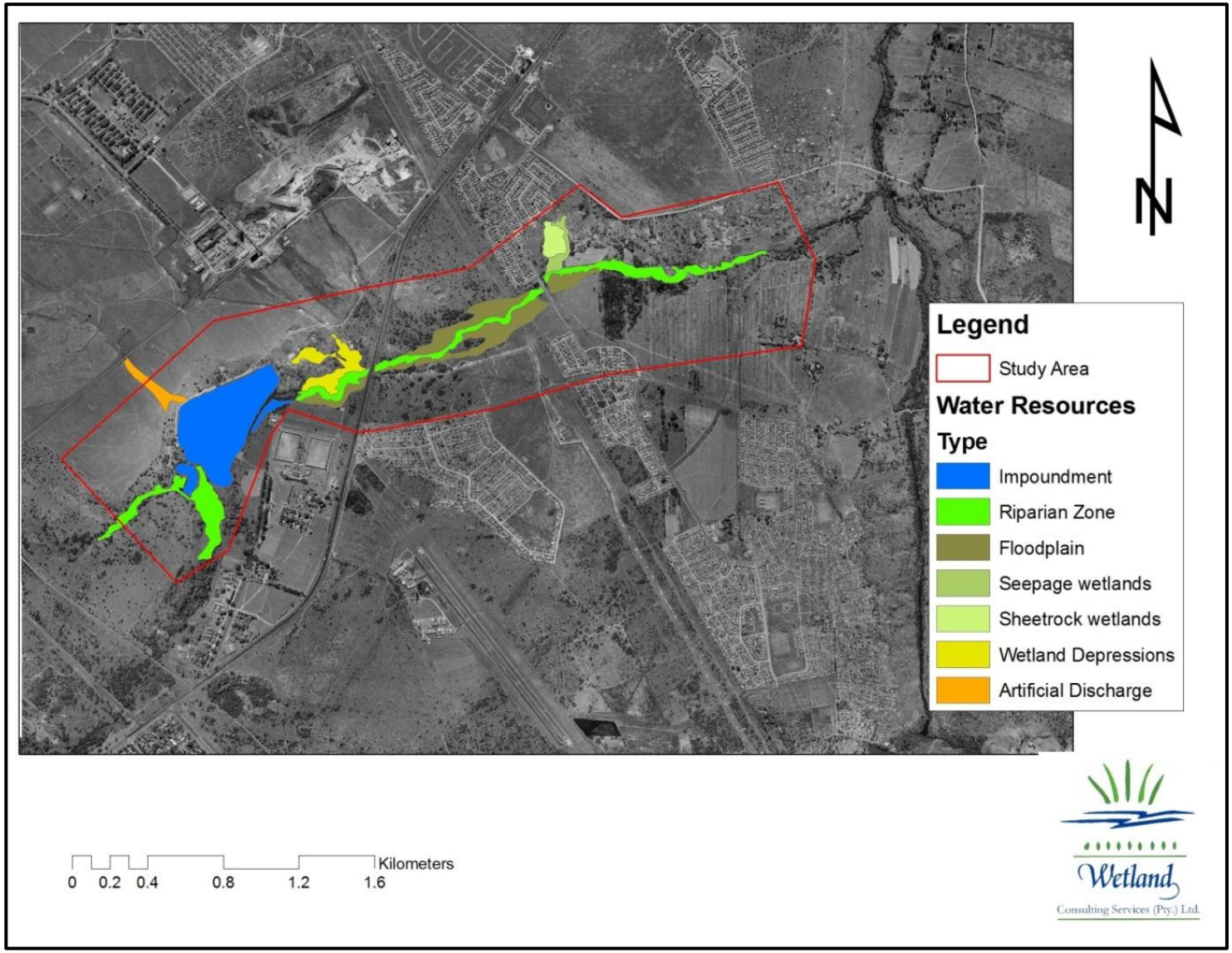


Figure 2: Indication of Wetland Areas (Wetland Delineation, Classification & Assessment: Dorpspruit near Rustenburg Report by Allan Batchelor 2011)

2.2 Project Description

The urgency to have mitigation measures in place before the rainy season to protect people and property have necessitated that the project be undertaken in a phased approach to allow for time to obtain the required authorisations. It is envisaged that the project will be implemented in phases with the first phase consisting of the construction of the berm and the upgrading of the road culverts and the second phase will be the upgrading of the dam.

2.2.1 Remediation proposal

Various options were investigated but only the most viable option involving the upgrading of the existing dam to act as an flood attenuation dam, improvement of the culverts in Phala Road and construction of an earth embankment to protect the houses within the floodplain was recommended for implementation is discussed here. The remediation options are indicated in **Fig 3**

2.3 Implementation Phase 1

2.3.1 Phala Road crossing upgrading

The upgrading will be undertaken by:

- excavating a portion of the watercourse upstream and downstream of the river (approx. 30 meters) at the existing road crossing in order to increase the flow width,
- place additional storm water culverts below the existing road crossing to accommodate the required design attenuated flow (1:25 year event); and
- construct inlet and outlet erosion control structures downstream and upstream of the upgraded road crossing to protect the river and storm water culverts from erosion, width of road to remain the same.

The proposed remedial measures was discussed at a meeting with the Rusternburg Local Municipality who agreed with the proposed upgrading measures of Phala road crossing. A supporting letter is attached in Appendix B.

2.3.2 Flood protection berms

The flood protection berms will be constructed by:

- removing existing vegetation along the path of the planned berms to a width not exceeding about 6 meters outside the 32 m environmental buffer zone,
- constructing a compacted earth berm made up of compacted earth layers to a maximum height of about 1.0 m and line the berm with stone pitching/ Reno mattresses to protect against erosion, berm slopes will be not steeper than 1:3 (1 vertical: 3 horizontal). Top width of berm will be about 1.5 meters

2.4 Implementation Phase 2

2.4.1 Existing dam upgrading

This storage dam is located on Rustenburg LM property and is currently registered to be used for recreation. It is proposed to:

- increase existing dam embankment height and length with a compacted earth embankment; and

- redesign and modify existing spillway without altering the permanent storage capacity of the dam

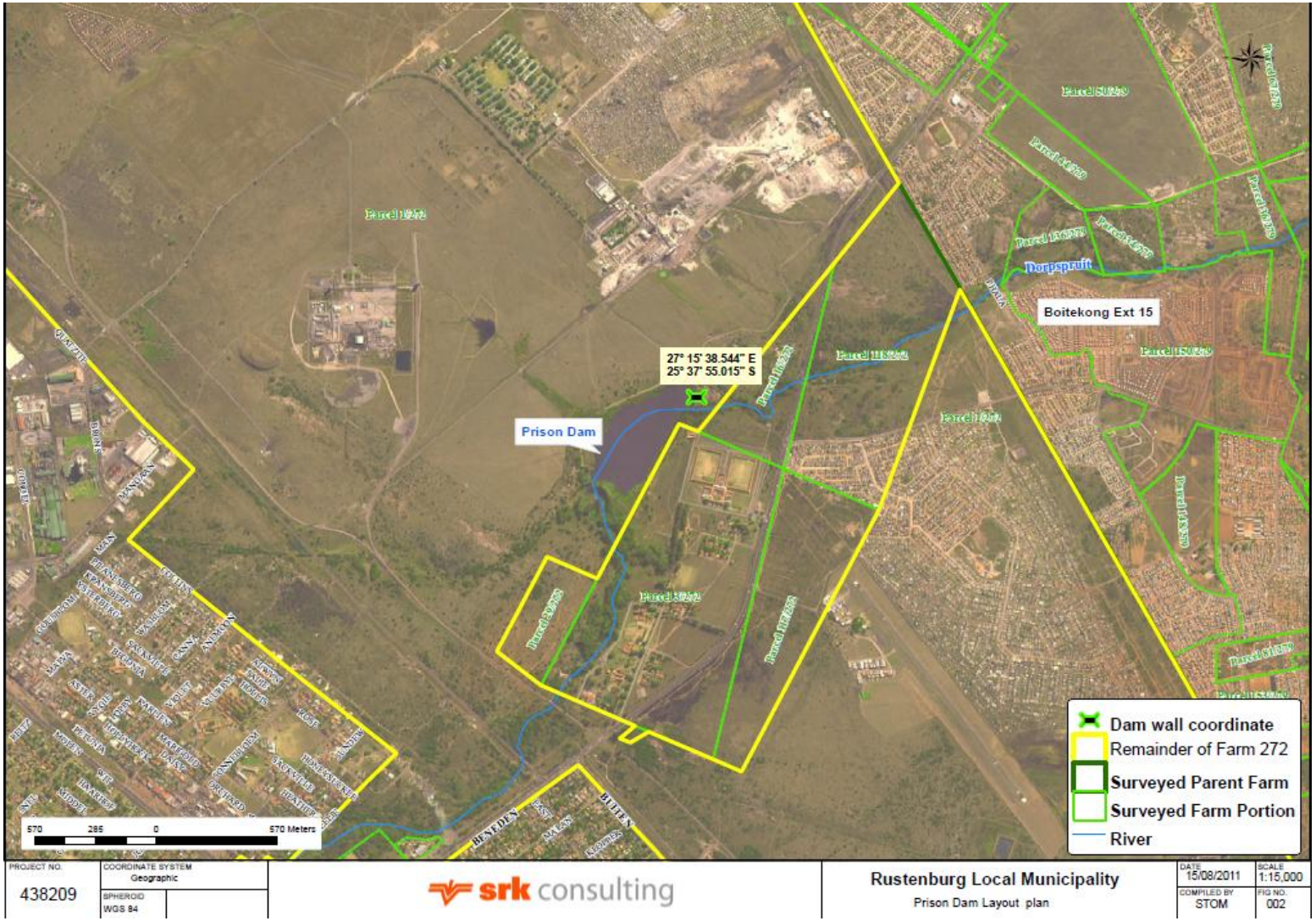


Figure 3: Aerial view of Prison Dam, the Dorpspruit and Boitekong x15

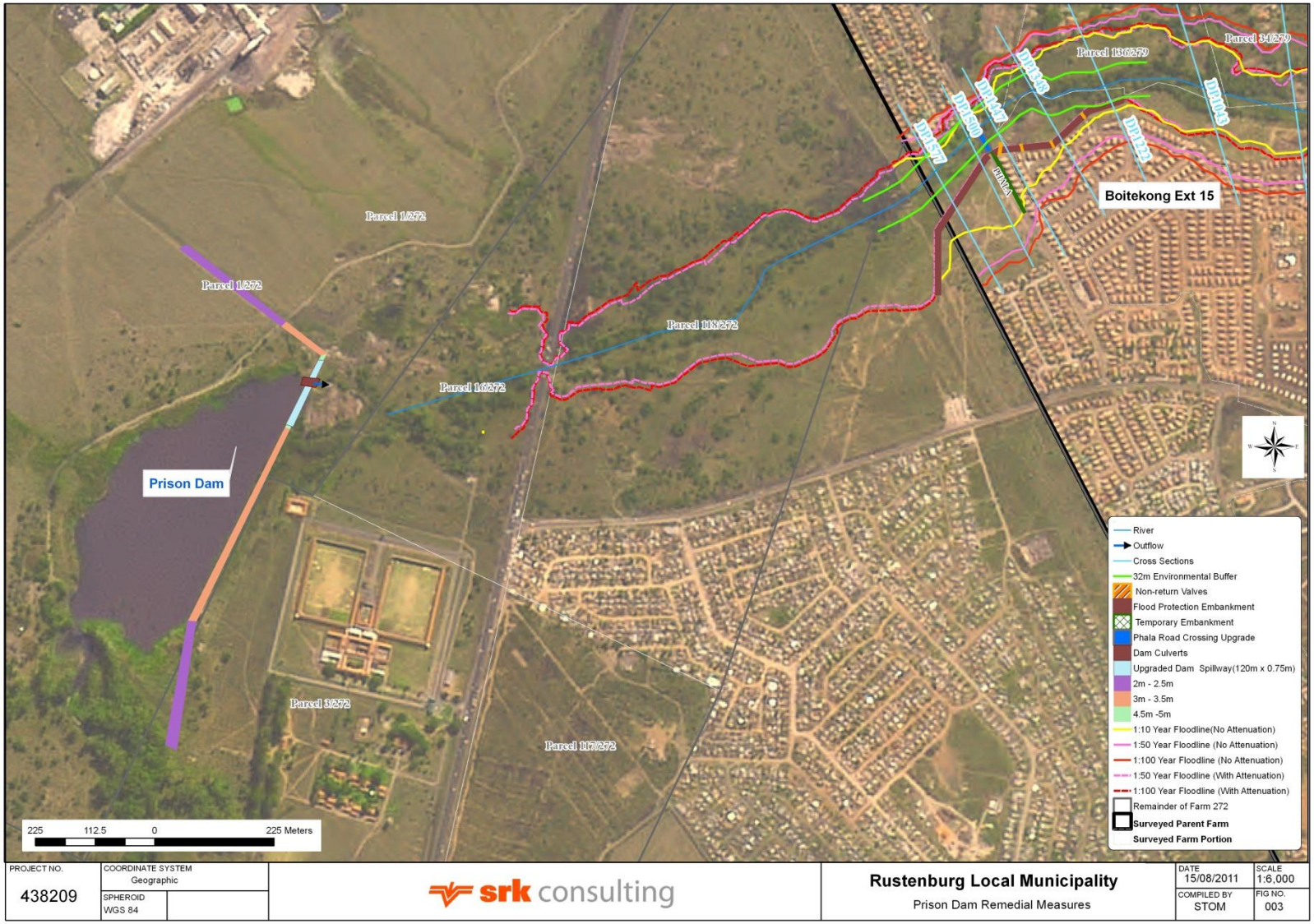


Figure 4: Proposed Remediation Measures

3 RISK AND KEY ISSUES

Risks and key issues were identified through an internal process based on similar developments and environmental assessment. The risks and key issues identified include:

- Contamination of ground and surface water;
- Impacts on air quality;
- Increased surface water runoff;
- Increased erosion;
- Floral destruction;
- Faunal displacement and destruction;
- Visual intrusion;
- Traffic impacts;
- Increased ambient noise levels; and
- Long-term maintenance.

4 ENVIRONMENTAL ASPECTS ADDRESSED

In the event that a negative environmental impact is identified, it can be avoided, mitigated or off-set. This EMP attempts to identify and mitigate potential environmental impacts at the planning phase of the project. The mitigating measures that are proposed, take cognizance of the final design and impacts that may ensue from this development. The point of departure for this EMP is to take a pro-active route by addressing potential problems before they occur. This will limit corrective action needed during the upgrading and operational phases of the development. Additional mitigation will be included throughout the project phases, as necessary. This EMP addresses the following phases of the development:

4.1 The Planning Phase

Pro-active environmental management measures with the goal of attaining sustainable development have continually been incorporated into the design and layout of the proposed upgrading of the stormwater drainage system. Pro-active environmental measures minimize the chance of impacts taking place. There is still the risk of accidental impacts taking place, however by incorporating contingency plans such as this EMP; the necessary corrective action can be taken to further limit potential impacts.

4.2 The Upgrading Phase

The bulk of the impacts during this phase will have an immediate effect (e.g. noise, dust and water pollution). The site will be monitored on a continual basis during the upgrading phase. These impacts will then be mitigated through the contingency plans as identified in the planning phase, together with a commitment to sound environmental management from the client and contractor.

4.3 The Operational Phase

Impacts during the operational phase of a development of this nature will be limited in number and low in intensity. By taking pro-active measures during the planning and upgrading phase, potential environmental impacts emanating during the operational phase will be minimised. This in turn will minimise the risk and reduce monitoring effort.

5 THE ENVIRONMENTAL CONTROL OFFICER

It is planned that an independent Environmental Control Officer (ECO) be appointed by the Impala Platinum to oversee all the environmental aspects relating to this development. The ECO should be appointed during the planning phase and form part of the project management team. He/she should attend monthly project meetings, conducting audits to assess compliance with the EMP and be responsible for providing feedback on potential environmental problems associated with the development. In addition the ECO would be responsible for:

- Liaison with relevant authorities,
- Liaison with contractors regarding environmental management, and
- Undertaking routine monitoring and appointing a competent person/institution responsible for specialist monitoring, if necessary.

5.1 Liaison with authorities

The ECO would be responsible for liaising with North West Department of Agriculture, Conservation, Environment and Rural Development (DACERD) and the Department of Water Affairs (DWA) During the upgrading phase the ECO would be responsible for submitting monthly Environmental Audits Reports to DACERD. These audit reports will be based on the mitigating measures recommended and include a description of the general state of the site and areas of non-compliance. In order to keep a record of any impacts, an environmental log (Refer to Appendix A) should be kept on a continual basis.

5.2 Liaison with contractors

The ECO will also be responsible for informing the contractors of any decisions that are taken concerning the natural and social environment during the upgrading phase of the project. This would also include informing the contractors of the necessary corrective actions to be taken against employees transgressing the management contained in this EMP.

5.3 Environmental Liaison Officer (ELO)

The Environmental Liaison Officer (ELO) will be appointed by the Contractor to assist with the more regular monitoring of the construction activities. The ELO shall be permanently on site to ensure daily environmental compliance with the EMP including the Rehabilitation Plan and would ideally also be a senior and respected member of the upgrading crew. Past experience has revealed that ELO's that can relate to the work force are the most effective or information transfer and ensuring compliance with the EMP.

5.4 Routine monitoring

A Monitoring Programme will be submitted to DWA for approval on what will be monitored, where and when prior to the construction activities taking place

Routine monitoring would be necessary during the upgrading of the stormwater drainage system. The ECO would be responsible for this monitoring which will entail auditing environmental performance against the mitigatory actions recommended in this report which include the rehabilitation phase. Continued monitoring on the efficiency and status of the erosion measure would be required in the operational phase.

6 ENVIRONMENTAL MANAGEMENT PLAN

Table 6-1 below forms the core of this EMP for the planning, upgrading and operational phases of this development. This table should be used as a checklist on site during the different phases. Compliance with this EMP must be audited monthly during the upgrading phase and once immediately following completion of the upgrading.

Table 6-1: General Environmental Management

Element	Management Plan
Objective	• All persons involved in the construction, operation and maintenance of the upgrading of the stormwater sysstem need to be aware of the objectives of the management plan; • All persons involved in the operation and maintenance of Rustenburg Municipality will be made aware of the environmental consequences of their individual actions, and in a position to minimise the environmental impact of their activities, particularly with respect to potential land, surface water and groundwater contamination, air emissions, human accidents and waste management of materials removed from site; • Roles and responsibilities need to be defined to effectively implement the environmental management procedures.
Sources	• Materials handling and processing leading to the generation of wastes or emissions and discharges to air, land or water; • Environmental accidents and incidents.
Action/Controls	• The ultimate responsibility for environmental management and costs associated with such management and possible environmental remediation is Rustenburg Municipality in association with Impala Platinum • Rustenburg Municipality is responsible to enforce the implementation of the EMP by its employees; • All contractors, are responsible for the implementation of the EMP as applies to their specific activities, under the direction and control of Impala Platinum; • Rustenburg Municipality workforce and any contractor are to undergo an environmental induction to be provided by Rustenburg Municipality covering the EMP and roles and responsibilities with respect to environmental management. All workers that have completed the induction should sign that they have understood and will implement the measures required; • Where necessary, translations are to be provided by Rustenburg Municipality to ensure that all site personnel and workers will implement the measures discussed; • A senior staff member who is directly involved in the operation and emergency activities shall be nominated as an Environmental Control Officer (ECO).
ECO Responsibility	• The ECO shall be responsible for: • on site implementation of the EMP which includes the Rehabilitation Plan; • ensuring environmental awareness among members of the workforce, contractors and site visitors as necessary.
Monitoring	• The ECO shall be responsible for adequate monitoring of activities to ensure compliance with the EMP which includes the Rehabilitation Plan;

Element	Management Plan
Corrective Actions/Reporting	• All incidents (Safety, Health and Environmental related) that occurred on site are to be recorded in an Incident Register, which is to be made available to the authorities should they request it; • Rustenburg Municipality shall implement preventative and corrective actions if necessary, in accordance with the requirements of the EMP, outcomes of environmental audits and changes to environmental legislation as may occur from time to time; and report on environmental incidents that may occur on site in accordance with the requirements of the EMP and environmental legislation to Rustenburg Municipality management responsible for the site.

Table 6-2: Environmental Monitoring

Element	Management Plan
Objective	• To monitor the compliance with the EMP which includes the Rehabilitation Plan; • To monitor the effectiveness of management measures stipulated in the EMP.
Sources	• Work performed on site that affects environmental complaints.
Action/Controls	• Appropriate frequency checks during normal operation of the site, to ensure no environmental risks are present as a result of the operations activities/tasks; • Appropriate frequency records during normal operation of the site of activities/tasks undertaken; • Monthly record by Rustenburg Municipality of wastes removed from the site, or placed in storage for removal, during operational and maintenance activities, and appropriate frequency records during normal operation of the facility; • Monthly records to be made in terms of prevention, minimisation, recovery, recycling, hazard rating, treatment, storage, transportation and disposal.
Monitoring	• Internal audits by the Rustenburg Municipality to be undertaken on a monthly basis to monitor compliance with the EMP during the operation and maintenance of the site; • Internal audits by the Rustenburg Municipality to be undertaken on a monthly basis to identify any potential risks that may be arising and to provide preventative maintenance and risk reduction as may be required.
Corrective Actions/Reporting	• Should non-compliance with the EMP be identified, corrective measures should be taken to ensure compliance.

Table 6-3: General Environmental Management Plan for proposed river rehabilitation of the Dorpspruit to alleviate flooding of Boitekong X 15. Details are given in the following section

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
Planning Phase	General	❖ This EMP must be made binding to the construction contract ❖ The special conditions of contract must include for the stripping and stockpiling of topsoil from the site for later re-use. (where applicable)	Client	Once off
Planning Phase	General	❖ The client must appoint an Environmental Control Officer (ECO) and an Environmental Liaison Officer (ELO) to oversee the environmental aspects of the development	Client	Once off
Planning Phase	General	❖ The ECO should form part of the project management team and should attend all project meetings	ECO, Engineer, Client	Continuous
Planning Phase	Emergency Preparedness	❖ If chemicals in sufficient quantity and toxicity have the potential to be released on the construction sites, emergency contingency plans should be prepared as safety measures. These safety measures should be communicated with the relevant personnel on the construction site.	Engineer, Client, ECO	Once off
Planning Phase	Pollution of natural water courses	❖ Silt traps (interceptors) should be incorporated into the drainage system, and stream channel, where the pollution risk is high.	Engineer, ECO	Once Off
		❖ Community use of the area needs to be assessed and accommodated in the design phase. However where this	Engineer, ECO, Client	Once off

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		usage threatens the functioning of the system or the safety of individuals, education programs, notices, and legislative methods should be used to promote a change in attitude and behavior. ❖ Large waste containers could be provided for the dumping of larger refuse items. These must be cleared once a month.	Rustenburg LM	Continuous
Planning Phase	Environmental impacts of site establishment	❖ Prior to establishment of the site camp(s), the Contractor shall produce a plan showing the positions of all buildings, letdown yards, vehicle wash areas, fuel storage areas, and other infrastructure for approval by the ECO. ❖ Site establishment should not be allowed below the 100-year flood line. Any material stored and camp site must be above the extent of the water course, any existing road to be upgraded or temporary access road to be constructed within the extent of the water course requires a water use authorisation	Contractor, ECO	Once off
Planning Construction Phase	General –	❖ stockpiling must be outside the extent of the water course (1:100 year flood line or delineated riparian habitat, whichever the greatest)	Contractor. ECO	Continuous
Construction Phase	General	Work near the watercourse should be carried out so as to minimize disturbance to the watercourse and habitat. Spoil and construction materials must not be stored in or next to a watercourse such that river flow is impeded, or where there is a risk of pollution. Any temporary storm water diversion must not stop the flow of the water course ❖ No uncontrolled discharges from the site/working area to the watercourse shall be permitted. All discharge points will	Contractor, ELO	Monitor daily

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		require approval. Discharges including concrete mixing, vehicle washing etc ❖ Should water downstream of a spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input shall be agreed with the engineer. The costs of containment and rehabilitation shall be for the contractor's account, including the costs of specialist input. ❖ The Contractor shall not use the land forming the Site of, or connected with, the Works for any purpose whatsoever other than for the proper carrying out of the Works under the Contract and shall place any camps that may be required for himself and his employees and animals only on sites approved by the ECO and consulting engineer, no trees or bushes shall be damaged or cut down by the Contractor or by any of his employees whether for use on the Works or otherwise without the written consent of the Consulting Engineer or the Environmental Control Officer and then only where and in the manner as they may direct. ❖ Construction equipment may not move outside the area defined as the site		
		❖ Construction should take place during the dry season if possible. Failing this, additional measures should be taken to ensure that possible environmental damage is minimised. Measures may include, silt retention areas, erosion control	Contractor, ECO	Once Off

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		mats, raised stream crossings to prevent mud being washed into streams from construction vehicles. A temporary storm water diversion would also be required so as to bypass stream flow during the construction phase		
Construction Phase	Erosion and Landscaping	❖ Building levels should plan adequately for surface run-off, to minimize erosion during construction. ❖ In the event of runnels or erosion occurring, the contractor must affect repairs timeously. Restorative repairs should include the backfilling and consolidation of eroded areas. ❖ Surface water from upslope shall be contained and dispersed in erosion proof channels and allowed to discharge slowly and naturally, unless it is part of a planned diversion of the stream, for which permission has been granted. ❖ Steep cut and fill slopes in soft or erodible material will require erosion control measures and correct grassing methods.	Contractor	As necessary
Construction Phase	Work Area	❖ The working area of the construction site shall be agreed on between the Supervisory Engineer, ECO and the contractor	Contractor, Engineer, ECO	Once Off
		❖ Existing roads shall be used as far as possible. New temporary access loads shall be approved by the Supervisory Engineer in consultation with the ECO. No Deviation from approved access roads shall be allowed. ❖ All temporary access roads no longer required, shall be decommissioned, ripped and land rehabilitated to the	Contractor, Engineer, ECO	As necessary

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		original land use. ❖ All storm water channels or berms shall be constructed so as to allow for easy vehicular crossing		
Construction Phase	Site Establishment	❖ Site establishment should take place above the 100-year flood line, or as agreed with the ECO. ❖ Location of the site camp should take cognizance of the collapsible nature of the sides of the watercourse. ❖ Adequate ablutions should be supplied for workers. ❖ The watercourse may not be used for any waste disposal of any kind. ❖ Potable water should be supplied. ❖ Care should be taken that water points do not turn into mud baths. ❖ To eliminate vegetation destruction, the main construction camp must be placed in an area that is already disturbed and not sensitive. ❖ The camp will require rehabilitation at the end of the contract.	Contractor	Monitor Weekly
Construction Phase	Vegetation	❖ The use of indigenous trees and shrubs should be optimized during the layout of any buffer areas, landscaped areas and communal open spaces	Developer, Landscape Contractor	Once off
		❖ Any wetland and buffer areas should be rehabilitated.	Contractor ELO	Once off and monitoring weekly

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
Construction Phase	Vegetation adjacent to the site	The following provisions shall apply with respect to the protection of areas of vegetation adjacent to the site: ❖No tree or shrub adjacent to the site shall be felled, lopped, cut or pruned without the prior written approval of the Supervisory Engineer or Environmental Control Officer. ❖No tree or shrub adjacent to the site shall be felled, lopped, cut or pruned until it has been clearly marked for this purpose by the Supervisory Engineer or the Environmental Control Officer. The method of marking will be specified by the Supervisory Engineer or the Environmental Control Officer, and the Contractor will be informed in writing. ❖No tree adjacent to the site shall be pruned for any reason. ❖No basal cover or grass shall be disturbed outside the site. ❖ No tree or vegetation adjacent to the site shall be burned for any reason	Contractor	Continuous
Construction Phase	Fauna management and protection	❖ minimises the impact on the local fauna and shall apply the following specifications with respect to fauna management and protection: ❖ Under no circumstances shall any animals (wildlife and domestic animals) be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees. ❖ The Contractor and his employees shall not bring any domestic animals onto the site. ❖ The Contractor shall ensure that the work site is kept clean	Contractor	Continuous

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		and tidy and free from rubbish that would attract animal pest species. ❖ Construction supervisors and / or section foremen shall inspect the Works area for injured or stunned animals. If injured or stunned animals are found, the Supervisory Engineer should be notified as soon as possible. ❖ Upon receipt of such notification, the Supervisory Engineer will arrange for the animals to be examined and / or collected as soon as practicable. The Supervisory Engineer will take all necessary actions to ensure that delays are minimised. ❖ There shall be no feeding of indigenous animals. ❖ The Contractor shall ensure that domestic and native animals are safe from injury that may arise from unprotected Works. ❖ If, in the opinion of the Contractor, a particular animal species becomes a pest by virtue of its nature, population numbers or other factors, the Contract or may apply to the Supervisory Engineer for a control programme to be initiated. Such application shall be in writing and contain justification as to why a control programme is needed. The Contractor shall be responsible for obtaining necessary approvals and undertaking the control programme. ❖ The Contractor shall advise his workers of the penalties associated with the needless destruction of wildlife, as set out in the Animals Protection Act (Act71 of 1962) sec. 2 (fine R2 000 and/or 12 months imprisonment		

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
Construction Phase	Litter Control	❖ Large rubbish bins are to be placed at strategic points in the construction area. General refuse and rubbish must be removed from site on a weekly basis.	Contractor	Once off, Monitor weekly
		❖ Rubble and upgrading refuse should be collected and removed weekly.	Contractor and Local Council	Weekly inspection to ensure rubble is contained within one area
		❖ A weekly litter patrol of the entire site is to be conducted by the ELO. The necessary remedial action is to take place within 24 hours of the inspection by the upgrading crew.	ELO, construction crew	Weekly
Construction Phase	Concrete and Chemicals	❖ Concrete shall be mixed only in areas that have been specially demarcated for this purpose. ❖ All concrete shall be mixed on concrete trays, and berms should be constructed to contain water run-off, on sloping areas. ❖ All concrete that is spilled outside these areas shall be promptly removed by the Contractor and taken to an approved dumpsite. ❖ After all concrete mixing is complete; all waste concrete shall be removed from the batching area and disposed of at an approved dumpsite. ❖ Stormwater shall not be allowed to flow through the batching area. ❖ Cement sediment shall be removed from time to time and	Contractor, ELO	Continuous, Monitor daily for high volumes of batching

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		disposed of in manner as instructed by the Supervisory Engineer.		
		❖ Storage of potentially hazardous materials must be above the 100-yearflood line, or as agreed with the ECO. These materials include fuel, oil, cement, bitumen etc. ❖ A walled concrete or other impermeable platform, dedicated store with adequate flooring or beamed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas. ❖ Sufficient care must be taken when handling these materials to prevent pollution.	Contractor, ELO	Continuous, monitor weekly
		❖ Surface water draining off contaminated areas containing oil and petrol would need to be channeled towards a sump which will separate these chemicals and oils. ❖ Oil residue shall be treated with oil absorbent such as Drizit or similar and this material removed to an approved waste site. ❖ In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately.	Contractor, ELO	As necessary
Construction Phase	Noise Pollution	❖ Where possible upgrading work should be undertaken during normal working hours (08H00 –17H00). ❖ v The construction must abide by the National Noise laws	Contractor, ELO	Continuous

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		and the local bylaws regarding noise		
		❖ Should an extension of the construction hours be required, the adjacent property owners are to be informed in writing two days in advance of any overtime activities	Contractor	As necessary
Construction Phase	Damage to existing structure	❖ The contractor will be fully liable for any damage or removal of structures not demarcated for demolition. ❖ No burning of the vegetation is allowed. Campfires should be made in a designated area	Contractor	Once off, monitor daily as necessary
Construction Phase	Damage to water course	❖ Under no circumstances may ablutions occur outside of the provided facilities. ❖ At all times care should be taken not to contaminate the watercourse. ❖ No uncontrolled discharges from the site to the watercourse shall be permitted. Any discharge points need to be approved by the relevant authority.	Contractor, ELO,ECO	Monitor daily
Construction Phase	Air pollution	❖ Water is to be used to dampen surfaces and curb dust production should he need arise. ❖ Vehicles to be used during the construction phase are to be kept in good working condition and should not be the source of excessive fumes	Spot checks daily weekly as necessary	Monitor daily
		❖ All materials transported to site must be transported in such a manner that they do not fly off the vehicle. This may necessitate covering friable materials.	Contractor	Spot checks daily weekly as necessary

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
Construction Phase	Safety and Health	❖ The site crew are to be managed in strict accordance with the Occupational Health and must also adhere to guidelines of the Road Traffic Act/Road Traffic Signs Manual Safety Act (Act 85 of 1993)	Contractor	Daily
Construction Phase	Security	❖ The contractor must supply his own security arrangements for the construction crew camp	Contractor	Monitor daily
Construction Phase	Traffic	❖ Existing access routes should not be blocked or impeded by construction. If this is unavoidable, adequate prior planning should be implemented to ensure that safety and access to routes is maintained.	Contractor	As necessary
		❖ Overnight parking of vehicles should be above the 100-year flood line. ❖ Roads should be kept free of construction debris. Debris, created as a result of construction, should be cleared timeously	Contractor	Monitor daily
Construction Phase	Destruction to heritage resources	❖ Any suspicious paleontological sites exposed during construction activities may not be disturbed prior to authorisation by the South African Heritage Resources Agency. ❖ Construction personnel must be alert and must inform the local authority should they come across potentially valuable findings.	Contractor	As necessary
Construction	Flow of	❖ Site inspections are to be conducted by the developer and contractor on an ad hoc basis during the course of the	Client, Contractor	Ad Hoc basis

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
Phase	information	works or as agreed by the parties involved. Operation inspections should occur annually. ❖ A two-week notice is to be issued prior to these inspections. ❖ A 48-hour notice period is required for any impromptu inspections.		
Construction Phase	Information flow	❖ The inspections should refer to the implementation of the above-mentioned actions as well as any other matters of concern. ❖ Monthly audits, during the construction phase, should be undertaken to ensure that the EMP is implemented and sound environmental management occurs in the operational phase. This should be done by the ECO	ELO, ECO Representative Developer Any relevant party	Monthly
		❖ Business should be informed one week in advance of construction activities commencing in vicinity of their properties	Contractor	As necessary
Operational Phase	Maintenance	❖ A programme of monitoring and maintenance should be drawn up. ❖ Typically, normal stormwater and pollution control facilities should be inspected annually. ❖ All drainage structures must be regularly cleared of organic and inorganic debris and silts. ❖ All constructed elements of the development should be checked and maintained, to ensure they are in working	Rustenburg LM	Twice yearly, prior and subsequent to the rainy season, or as necessary

ACTIVITY POSSIBLE	IMPACTS	ACTION	RESPONSIBILITY	FREQUENCY OF ACTION
		order.		
		❖ All rehabilitation programmes must be regularly checked and monitored.	Rustenburg LM	Weekly
Operational Phase	Community	❖ Education and information should be disseminated via clinics, schools, community centres, and places of worship and public notices about need for stormwater management.	Rustenburg LM, Impala Platinum	Continuous

7 CONSTRUCTION MANAGEMENT PLAN

The construction management plan to be implemented by the Contractor shall include the following key measures:

7.1 Management of construction campsites

1. The Contractor shall comply with all relevant laws and regulations concerning water provision, sanitation, wastewater discharge and solid waste disposal. The Contractor is referred, in particular, to the requirements of the National Environmental Management Act (Act 107 of 1998) and the National Water Act (Act 36 of 1998) and related regulations.
2. The Contractor shall not locate campsites in any area in which vegetation is pristine, nor within the area covered within the 1 in 100 year flood line area or deliniated riparian habitatzone,, whichever is the greatest., nor in any area that could cause nuisance or safety hazards to surrounding landowners, inhabitants or the general public. The location of a construction campsite requires prior landowner agreement.
3. Prior to the commencement of construction, the Contractor shall also prepare documentation for each proposed campsite which contains, but is not limited to, details of: (a) site layout; (b) topsoil management; (c) cuts and fills; (d) sewage treatment; (e) solid waste disposal; (f) erosion control (g) fencing; (h) litter management; (i) provision for vehicle and plant servicing; (j) management of hazardous materials, (k) water supply, (l) management of veld fire risk (m) rehabilitation; and (n)security. The documentation shall be submitted to Rustenburg Municipality as a part of the Contractor's project specific Environmental Plan prior to establishment on site.
4. The Contractor shall keep construction campsites clean and tidy at all times. The Contractor shall not leave domestic waste uncontained, and temporary storage shall be fenced to keep out people and animals. No permanent domestic waste disposal shall be permitted at the campsites. All domestic refuse is to be removed weekly to an existing licensed domestic landfill.
5. The Contractor shall take specific measures to prevent the spread of veld fires, caused by activities at the campsites. These measures may include appropriate instruction of employees about fire risks and the construction of firebreaks around the site perimeter.
6. The Contractor shall prevent accelerated erosion from construction campsites and shall not discharge polluted runoff into drainage lines (*See* soil conservation and water management programmes).

7.1.1 Management of fuels and other hazardous materials

7. The Contractor shall comply with all applicable laws, regulations, permit and approval conditions and requirements relevant to the storage, use, and proper disposal of hazardous materials.
8. The Contractor shall manage all hazardous materials and wastes in a safe and responsible manner, and shall prevent contamination of soils, pollution of water and/or harm to people or animals as a result of the use of these materials.
9. The Contractor shall prepare a hazardous materials and waste management plan for inclusion in the site specific Environmental Plan to be submitted to Rustenburg Municipality prior to establishment on site. This plan shall include, but shall not be limited to, measures to prevent: (a) contamination of soils; (b). pollution of water; (c) safe siting and storage; (d) containment of lubricants and waste oil during maintenance of vehicles; and (e) tampering with tanks.

10. The Contractor shall classify all hazardous materials to be used on site according to recognized Codes of Practice such as SABS Code 0228 for the Identification and Classification of Dangerous Substances and Goods and the DWAF Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste, and shall ensure that the handling, storage, transport and disposal of these materials meets the requirements of these Codes.
11. The Contractor shall not locate fixed fuel storage tanks in any location other than at approved plant yards or campsites. Any fuel storage facilities with a capacity greater than 1000 litres shall be located on flat or gently sloping ground and shall be bermed from the surrounding area to contain at least 125% of the total capacity of the storage containers. The berms and the floor of the bermed area shall be of impermeable material or be lined to ensure that petroleum products cannot escape.
12. The Contractor shall not construct fixed fuel storage or service or refuel any vehicle or equipment within the area covered within the 1 in 100 year flood line event area or deliniated riparian habitatzone, whichever is the greatest, or where there is the potential for spilled fuel to enter a watercourse or groundwater. Should it not be possible to establish such a facility outside of the 100 m zone, the Contractor shall ensure that the necessary precautions are taken to prevent and clean up spillages, including spill kits on the bowsers.
13. The Contractor shall enclose all fixed storage by a security fence with a lockable gate.
14. When crossing watercourses, the Contractor shall place on-site tools and equipment, such as pumps, compressors and generators on bermed impermeable sheeting (e.g. polyethylene or other similar material) to prevent hydraulic fluid or fuel leaks from contaminating soil or groundwater or entering any watercourse or wetland.
15. The Contractor shall take all reasonable precautions to prevent fuel and lubricant spills during the course of construction. To this end, the Contractor shall ensure that: (a) there is no overfilling of diesel bowsers and equipment tanks; (b) regular audits are performed to verify that no leaking or defective equipment is brought onto site; and (c) any oils or lubricants discharged during routine vehicle servicing on site are captured using drip trays, containers or other appropriate containment measures.
16. The Contractor shall ensure that all equipment which is required to work in fish-bearing waters is cleaned of oil, grease and other contaminants damaging to aquatic life.
17. The Contractor shall ensure that fuelling and repairs are carried out or supervised by personnel familiar with spill containment and cleanup procedures.
18. The Contractor shall ensure that there is sufficient spill containment and absorbent material available on site to manage accidental spills. The Contractor shall immediately clean up accidental spillages of fuels and oils, or other hazardous substances, and shall report the incident to Rustenburg Municipality and the measures taken to remediate the spill problem.

7.1.2 Management of the construction right-of-way

19. The Contractor shall prevent littering and the random discard of solid waste on the site.
20. The Contractor shall manage hazardous waste as described in provisions 8 to 18.
21. The Contractor shall minimise the risk of bush fires (refer to provision 5 and 28-33).
22. The Contractor shall prevent trespassing on the site. Public entry to the site shall be prohibited and signs to this effect shall be erected at points of potential public entry.

23. The Contractor shall prohibit and actively monitor and prevent poaching or harassment of wild animals by contract employees. Any employee found poaching shall be dismissed.
24. At the start of every working day the Contractor shall patrol the open trench and rescue any animals that are trapped in it either by catching and releasing (e.g. frogs and toads) or by driving out (e.g. dangerous snakes).
25. The Contractor shall ensure that no animals or fish will be captured in the construction area for food purposes
26. The Contractor shall prohibit and actively monitor and prevent the harvesting of medicinal or any other plants by contract employees.
27. The Contractor shall ensure that contract employees remain within the construction right-of-way or on approved roads providing access to the construction right-of-way.

7.1.3 Fire prevention and management

28. The Contractor shall take all necessary precautions to prevent the ignition of veld fires caused either deliberately or accidentally as a result of the work being performed.
29. The Contractor shall prepare a fire prevention and fire emergency management plan as a part of the Environmental Plan to be submitted to Rustenburg Municipality prior to establishment on site. The plan shall include, but not be limited to, the following: (a) sources of fire risk; (b) measures to comply with any requirements of local authority fire departments; (c) measures to meet requirements agreed between Rustenburg Municipality and the landowner; (e) measures to minimize the risk of accidental veld fires caused by any activity related to the work; and (f) measures to control an accidental veld fire.
30. The Contractor shall provide adequate fire fighting equipment at specified localities on the work site to meet any emergency resulting from ignition of a veld fire. This equipment should include, but not be limited to, (a) fire extinguishers; (b) fire resistant clothing for fire fighters; and (c) fire fighting flails.
31. The Contractor may expect that hot work will be prohibited under specified meteorological conditions and that appropriate and adequate fire fighting equipment would be required to be on standby at all times where hot work is being carried out.
32. Wherever practicable, bush shall not be cleared using burning. In instances where this is possible, controlled burning can only take place upon request of and approval from the landowner, and when there is no wind and appropriate fire fighting equipment is in attendance.

7.1.4 Management of dust and noise nuisance

33. The Contractor shall control dust along the construction right-of-way so as to ensure that no detrimental effects to landowners, occupants or the general public are caused. Control measures to be considered include the use of water bowsers to wet down surfaces that have been denuded and which have the potential to generate dust (*See* air quality programme).
34. The Contractor shall comply with the legal requirements for the management of noise impact specified in the Noise Regulations under the Environment Conservation Act (Act 79 of 1989). If instructed to do so by Rustenburg Municipality, the Contractor shall demonstrate compliance with the noise regulations by means of measurement of residual noise levels at receiver points specified by Rustenburg Municipality. Measurement shall be in accordance with the requirements of the noise regulations.

35. The Contractor shall notify all landowners and inhabitants within 200m of a blast zone of the dates and times at which blasting is scheduled to occur. Blasting shall not be undertaken between the hours of 18h00 and 07h00 without the agreement of the affected landowners and occupiers

36. The Contractor's employees shall not make recreational use of all-terrain vehicles or motorcycles on the site.

7.1.5 Land owner and occupier relations

37. The Contractor shall respect the property and rights of landowners and occupiers at all times and shall treat all such persons with deliberate courtesy.

38. The Contractor shall comply with all special agreements between Rustenburg Municipality and affected landowners provided in the Servitude Agreements and/or the Property List and/or required in terms of relevant national legislation.

39. Access over land, the integrity of fences, the closure of gates, control of veld and forest fires, littering, dust control, noise abatement, harassment of domestic and wild animals, sedimentation and contamination of ground and surface waters, damage to landscape and vegetation, and all such environmental matters, shall be controlled, as far as practicable, by the Contractor in the best interests of the land owner or occupier.

7.1.6 Complaints register

40. The Contractor shall establish and maintain a register for periodic review by Rustenburg Municipality that logs all complaints raised by landowners, occupiers or the general public about construction activities. The register shall be regularly updated and maintain records, including the name of the complainant, his or her domicile and contact details, the nature of the complaint and if any action that was taken to rectify the problem.

7.1.7 Health management

41. The Contractor shall comply with all relevant legislative requirements governing worker health and safety (e.g. OHS Act (Act 85 of 1993) and related amendments and regulations).

8 CONSTRUCTION CONTROL PLAN

The construction management plan to be implemented by the Contractor shall include the following key measures:

8.1 Control of access to the construction right-of-way

1. The Contractor shall obtain access to the site (a) on a public road (b) on an existing private road or track with the consent of the relevant owner or occupier of land and Access to, and along the construction right-of-way explicitly excludes access to land other than the access routes referred to above.

2. The category of 'specially approved route' is for cases where there is no existing access. A specially approved route is one for which the relevant owner or occupier of land has given consent, and for which approval has been applied for in writing, and granted in writing by Rustenburg Municipality, subject to any conditions that the landowner or Rustenburg Municipality consider to be warranted (e.g. regarding erosion control, rehabilitation). No specially approved routes will be granted if areas of pristine habitat are to be impacted.

3. The utility and safety of any existing access shall not be lowered by use for the construction work or construction-related activities, nor shall spillage, littering, accelerated erosion, or other environmental impact, occur. The Contractor shall: (a) ensure compliance with these requirements; (b) exercise all relevant health, safety and environmental controls (including dust control, noise abatement and litter prevention); and (c) remedy immediately any non-compliance and the effects thereof.

4. In all areas where construction requires gravelling or other methods of improving vehicle access, the Contractor shall completely remove these materials after construction and prior to rehabilitation of the area.

5. The Contractor shall restrict the number of entry and exit points for security reasons. The Contractor shall ensure that his activities do not compromise the landowners or occupiers security, nor result in the loss, injury or death of any farm animals or game.

6. The dismantling of gates and fences shall be subject to any special conditions reached in the servitude agreements between Rustenburg Municipality and landowners.

Control of construction activities in sensitive areas

7. Prior to the commencement of construction activities, the Contractor shall (together with the ECO) survey the limits of the construction right-of-way and of any additional workspace areas required for construction and shall mark the limits using 1.5 m long stakes at 200 m maximum intervals. These stakes shall be preserved throughout the work under contract. In the areas where pristine habitat is affected, the stake interval shall be reduced to 50 m spacing and the stakes shall be painted a conspicuous colour.

8. In these areas, the Contractor shall take the following additional precautions: (a) staff and, in particular, machine operators shall be specifically instructed about the sensitivity of the areas; (b) vegetation clearance shall be restricted to the absolute minimum necessary to provide access along the construction right-of-way; and (c) site staff responsible for environmental management shall increase the frequency of monitoring in the areas to verify continuing compliance with the environmental standard and the restriction of vehicle traffic to within the construction right-of-way.

9. Damage or harm to threatened plant species is illegal Threatened species are defined in terms of the most recent Red Data list of Southern African Plants. While every effort has been made to ensure that the proposed construction does not impact on threatened species, the Contractor shall be solely responsible for any action necessary to ensure the prevention of harm to such species found during construction. In the event that the Contractor, Rustenburg Municipality or any other party in any area that could be damaged by the works finds a threatened plant, this shall immediately be reported to Rustenburg Municipality and the Provincial Parks Board. The Contractor shall call upon a suitably qualified botanical expert to oversee: (a) rescue of the plant(s) and transplantation in a suitable local habitat in a conserved area or in a recognised botanical garden; or, where this is not possible; and (b) the collection of seeds and cuttings for use at botanical gardens and for storage in seed banks.

10. The Contractor shall take note of the possible occurrence of threatened animals near the construction area. In addition to the general prohibitions specified in provision 4, the Contractor shall be particularly vigilant in these areas in order to ensure that none of these animals are deliberately or accidentally harmed.

8.2 Control of vegetation clearing

11. The Contractor shall not clear any vegetation along the construction right-of-way outside of the areas defined by the stake markers referred to in provision 7 above.

12. The Contractor shall clear vegetation along the construction right-of-way, and the access routes defined in provisions 1 and 2, to the minimum degree necessary for construction. Cleared vegetation shall be windrowed along the perimeter of the construction right-of-way.

13. The large indigenous trees occurring in the riparian, which have been individually categorised, named and marked in the field shall not be damaged by the Contractor. The trees shall be plotted on the survey drawings. The Contractor shall prevent damage to these trees in all cases where the trunk of the tree is situated outside of the permanent right-of-way (6 m wide).

14. Where the Contractor has to dispose of vegetation cleared from the construction right-of-way, he/she may do so with the permission of the landowner provided there is no impairment to the health and wellbeing of any person, to water quality, land use and capability or ecological stability of the area in which it is disposed. Various options, such as chipping and use by local communities, should be explored when disposing of cleared vegetation.

15. The burning of vegetation should be avoided as far as possible. The Contractor shall only be permitted to undertake the controlled burning of brush and other vegetation cleared from the construction right-of-way, upon consent from the landowner and subject to compliance with any burning regulations of the district. A method statement shall be prepared for each controlled burn, and submitted to Rustenburg Municipality.

8.3 Control of construction of watercourse crossings

16. The Contractor is responsible for controlling riparian and stream damage to the river systems where construction activities are to take place.

17. The Contractor shall comply with any conditions of approval set by the DWA, over and above the requirements of this EMP.

18. The Contractor shall prepare for each river crossing a detailed method statement for review by Rustenburg Municipality and for approval by the DWA. The method statement shall include but not be limited to:

    a) A biophysical description of the site (profile, depth and width of channel(s), geo-technical drawings, large trees, reed beds, etc);

    b) The proposed timing and duration of watercourse crossing construction;

    c) An itemised list of the equipment that will be used for the construction activities

    d) Measures that will be used to control suspended sediment and turbidity (e.g. berms, hay bales, bidem curtains, river / stream diversions, settling ponds), damage to riparian vegetation, spillage of fuels and oils, cement and other foreign materials and a monitoring programme to provide rapid feedback on the effectiveness of controls.

    e) Measures that will be used to ensure that identified and surveyed trees in the riparian fringe scheduled for protection within the construction right-of-way, shall not be damaged during construction.

    f) Measures that will be used to stabilize river embankments after construction and to return the channel to its pre-construction profile or to a more stable profile.

g) Measures that will be used to minimize the impact of blasting on aquatic species in the event that construction under submerged conditions is necessary.

19. During construction, the Contractor shall make provision to maintain the natural flow of any drainage line affected by construction.

20. In excavating the bed of the water body for the upgrading of Phala Rd, the Contractor shall comply with the following: (a) the excavated areas must be backfilled with material that is of the same quality

21. Where isolating the location of a works, the following measures, among others, may be considered by the Contractor in order to minimize the risk of increased suspended sediment in the water column downstream of the works:

    a) Elimination of surface flow through the construction site;

    b) The use of non-erodible materials for the construction of any berms, coffer dams or other isolation structures used in a works within a flowing watercourse. The use of non-earthen dam structures, such as aqua dams, are possible options;

    c) In cases where the entire flow of water of a water body is diverted around the water crossing site, it must be returned to the water body immediately downstream of the crossing site;

    d) The use of silt fences or hay bales to isolate the construction area from the water body in situations where the flow velocities and volumes are low;

    e) The removal and temporary storage of any material excavated from the bed or banks of the water body to a location out of the water body until the materials are permanently removed from the location or backfilled into the water body. Where sufficient space exists, and where the storage will not cause any environmental damage, this may be within the macro-channel banks of the river; and

    f) The treatment of any water removed from the isolation area, prior to discharge back into the downstream river course, to remove suspended sediment.

22. Rustenburg Municipality shall undertake periodic independent audits of sediment generation caused by the construction works in the rivers in order to verify the results of the sediment monitoring maintained by the contractor.

23. The Contractor shall adhere to the requirements of the Water Use License authorisation by DWA with respect to watercourse crossings

24. During the carrying out of the works, the Contractor shall remove any fish that are found within the isolated portion of the watercourse crossing site, without harming the fish, to an area of the water body immediately adjacent to the watercourse crossing, outside the isolated portion of the watercourse crossing site.

25. Where construction through river channels involves excavation of submerged rock, the Contractor shall give preference to methods that do not involve underwater blasting. In the event that the Contractor adjudges underwater blasting methods to be the only practical method this shall be fully motivated and all necessary plans shall be prepared to demonstrate that the work can be conducted without significant risk to aquatic organisms. Such plans shall be submitted to Rustenburg Municipality and shall be approved by the DWA as a part of the method statements for each major river crossing prior to implementation of the works.

26. The method statements shall include all information required by the DWA.

27. The Contractor shall apply measures to reduce impact on spawning fish, such as: (a) limiting the season of explosive use from March to September (non-spawning season); and (b) use of non-explosive scare techniques to move fish from the immediate blast zone (small repelling explosive charges are not considered to be an effective means of driving fish from a blast area. Acoustic repellent devices and/or bubble curtains may need to be considered).
28. The Contractor shall notify DWA in advance of any underwater blasting scheduled for the major river crossings. The Contractor shall monitor the effect of underwater blasts upstream and downstream of the blast zone. If any fish mortality results from a blast, the Contractor shall record the species and size and shall immediately notify Rustenburg Municipality and the DWA.
29. Where rehabilitating the river crossing works, the Contractor shall comply with the following: (a) the river channel embankments shall be returned to the pre-existing (or a more stable) profile than that which existed prior to construction. The Contractor may make use of the fixed point photography taken by Rustenburg Municipality in order to ensure compliance with this requirement; (b) river embankments shall be stabilised, using any necessary protection measures, including re-vegetation, rip rap, reno mattresses and other measures, to ensure that the banks are protected against erosion; (c) measures using indigenous grasses to permanently stabilise disturbed areas shall be fully effective by the end of one growing season; and (d) debris disposal and clean up shall be carried out to return the river course to its pre-existing condition prior to the works.
30. In rehabilitating the river crossings, the Contractor shall, in addition to the requirements specified in the re-vegetation specification, include the re-planting of indigenous trees in the riparian fringe. At least 70% of the trees at each river crossing shall be alive and healthy at the end of the maintenance period. The precise location of the trees in the riparian zone shall be provided to the Contractor by Rustenburg Municipality. All trees are to be purchased from a reputable commercial supplier and are to be supplied with a phyto-sanitary certificate which certifies that the soil in which they were propagated is weed free

8.4 Control of wetland crossings

(No construction activities are planned in or around the wetlands, however this section is added to the do

8.5 Control of topsoil and subsoil

31. The Contractor shall store topsoil (defined as the soil above 150 mm) excavated from the trench in a wind row or stockpile which shall be discernibly separate from wind rows or stockpiles of any other excavated materials.
32. The Contractor shall remove topsoil from a corridor up to 6 m wide over the right of construction way. Topsoil shall not be disturbed, more than is absolutely necessary, on the remaining construction right-of-way.
33. Topsoil shall not be contaminated with anything that might impair its plant-support capacity (e.g. aggregate, cement, concrete, fuels, litter, oils, domestic and industrial waste).
34. The Contractor shall temporarily stockpile topsoil in a location that will minimize any loss due to erosion or mixing with other material.
35. The Contractor shall ensure that topsoil is stockpiled in a manner and for a period of time that does not result in deterioration in its plant support capacity.

36. After the completion of the backfilling, re-contouring and erosion control works, the Contractor shall spread the topsoil evenly at uniform depth over the areas from which it was removed.

37. The stockpiling of topsoil for the purposes of reinstatement is regarded as a vital component of successful rehabilitation, and compliance with the stripping requirements specified in measures 7 and 8 will be strictly enforced. In areas where topsoil of less than 150 mm is stripped, the Contractor will be required to demonstrate that substantial constraints prevailed which made this requirement unattainable.

38. The Contractor may distribute waste soil (soft material) evenly around the construction right-of-way as long as it does not impact negatively on natural vegetation or land capability.

8.6 Control of the impact of construction activities on archaeological sites and graves and palaeontological remains

39. In terms of the Natural Heritage Resources Act (Act 25 of 1999), no graves or archaeological sites, including man-made structures more than 60 years old, may be disturbed, damaged or destroyed by any person without requisite arrangements or permits from SAHRA. .

40. The Contractor shall be responsible for the following: (a) land survey of the position of all known archaeological sites and graves identified above and verification of which of these is affected by the construction right-of-way. If any of the sites earmarked as warranting protection cannot be adequately protected during construction, then the Contractor shall immediately draw this to Rustenburg Municipality's attention.

41. The Contractor shall make provision for accidental discovery of archaeological sites and graves along the construction right-of-way. Prior to construction, the Contractor shall, with the assistance of a professional archaeologist, verify that no further sites exist along the construction right-of-way over and above those described in this EMP. In the event that any sites found are significant enough to warrant conservation, the Contractor shall determine whether this is feasible and, if not, immediately notify Rustenburg Municipality of the project adjustment necessary to avoid the site.

42. In fulfilment of SAHRA requirements, the Contractor shall prepare the necessary documentation and obtain the permits from the SAHRA to construct through those sites which are directly affected by the construction works but are considered to be of low significance. It should be noted that buildings 60 years and older must be assessed and a permit obtained from SAHRA before demolition is considered.

9 REHABILITATION PLAN

9.1 Objectives

The objectives of the specification were as follows:

- To designate graphically on an aerial photograph relevant planting zones;
- To provide a listing of applicable plant species for each planting zone; and
- To detail the methodology to be used for the planting of plants within planting zones.

9.2 Strategies

9.2.1 Specification aim

The aim of this specification is to provide a user-friendly practical document that can be used by the appointed Landscape Contractor/s or approved Wetland Specialist to re-vegetate the upgraded stormwater drainage system at Boitekong Ext 15

9.2.2 Specification objectives

9.2.3 Scope of work

a) Planting zones were designated based on expected hydrogeomorphic conditions;
b) Plant species applicable to the planting zones have been selected based on the following:
    i. From personal communication with Top Crop Nursery, suppliers of Indigenous Bunching Grasses, for plug-planting;
    ii. From personal communication with Agricol (Pty) Ltd., Camperdown Branch, suppliers of grass seed;
    iii. From personal communication with the South African National Biodiversity Institute (SANBI), Working for Wetlands Initiative;
    iv. From perusal of a series of draft manuals for wetland rehabilitation, (Russel, 2008);
    v. From examination of Mucina & Rutherford (2006); and
    vi. From the author's personal knowledge of plant species suitable for the project and site location;
c) The methodology provided for the planting of plants within planting zones was based on the following:
    i. Reference to the South African Landscaper's Institute (SALI) Specification Document

9.3 Planting Zones and Plant Species

Planting zones have been designated based on the anticipated wetness zones within the existing Dorpspruit watercourse (i.e. permanent, seasonal, temporary wet and peripheral dry areas surrounding these).

9.3.1 Permanently Wet - PW

Permanently wet areas are those areas where the soil is saturated for the entire year.

9.3.2 Seasonally Wet -SW

Seasonally wet areas are those areas where the soil is saturated for almost all of the year mainly during the wet season.

9.3.3 Temporarily Wet - TW

Temporarily wet areas are those areas where the soil is saturated for a few months or even weeks of the year mainly during the wet season.

9.3.4 Peripheral Dry Areas - PD

These areas surround the wet areas.

A list of Rehabilitation Type Detail plant species to be planted within these zones has been provided in **Table 9.1- Table 9-3**. below. The prescribed planting methodology for each species has also been listed in the table and each methodology has been described in detail in Section 6 below.

Table 9-1: Type 1 Specialist list for Plant species to be planted on Earth Embankments, in designated planting zones and according to prescribed planting methodology

Botanical Name	Common Name	Planting Zone	Planting Methodology
Grasses			
Cynodon dactylon (Required species for erosion protection	Couch Grass	SW/TW/PD	Hydroseeding 2kg/ha
Cynodon dactylon (Required species for erosion protection	Couch Grass	SW/TW/PD	Plugs 10 / m²

Note: Source – "company name" and "file name".

Table 9-2: Type 2 Specialist list for Plant species to be planted on Reno Mattress areas, in designated planting zones and according to prescribed planting methodology

Botanical Name	Common Name	Planting Zone	Planting Methodology
Grasses			
Aristida junciformis	Ngongoni Three-awn	PD	Plugs 5/m^2
Cymbogon plurinodes	Narrow-leaved Turpentine Grass	PD	Plugs 5/m^2
Cymbopogon excavatus	Broad-leaved Turpentine Grass	PD	Plugs 5/m^2
Hyparrhenia hirta	Common Thatching Grass	PD	Plugs 5/m^2
Melinis minutiflora	Molasses Grass	PD	Plugs 5/m^2
Melinis nerviglumis	Bristle-leaved Red Top	PD	Plugs 5/m^2
Melinis repens	Natal Red Top	PD	Plugs 5/m^2
Miscanthus capensis	Daba Grass	PD	Plugs 5/m^2
Oplismenus hirtellus	Basket Grass	PD	Plugs 5/m^2

Note: Source – "company name" and "file name".

Table 9-3: Type 3 Specialist list for Plant species to be planted in Disturbed River areas, in designated planting zones and according to prescribed planting methodology

Botanical Name	Common Name	Planting Zone	Planting Methodology
Grasses			
Setaria sphacelata var. sericea	Golden Bristle Grass	TW/SW	Plugs 5/m^2
Setaria megaphylla	Broad-leaved Bristle Grass	TW/SW	Plugs 5/m^2
Themeda triandra	Red Grass	PD	Plugs 5/m^2
Imperata cylindrica	Cottonwool Grass	SW/TW	Plugs 5/m^2
Juncus effusus	Incema Grass	TW	Plugs 5/m^2

Monocymbium ceresiiforme	Boat Grass	TW	Plugs 5/m^2
Herbaceous plants	(Optional)		
Cyperus papyrus	Papyrus	PW	Plants/out-of-ground
Cyperus esculentus		PW/SW	Plants/out-of-ground
Plantago longissima		PW	Plants/out-of-ground
Typha capensis	Bulrush	PW	Plants/out-of-ground
Phragmites australis	Common Reed	PW/SW	Plants/out-of-ground
Echinochloa colona *Echinochloa crus-galli*	Jungle Rice Watergras	PW/SW/TW	Plants/out-of-ground
Cyperus latifolius *Cyperus immensus*	iKhwane Grass	PW	Plants/out-of-ground
Leersia hexandra	Wild Ricegrass	PW/SW	Plants/out-of-ground
Juncus kraussii	Juncus iNcema	SW	Plants/out-of-ground
Hemarthria altissima	Red Swamp Grass	SW/TW	Plants/out-of-ground
Acroceras macrum	Nile Grass	SW/TW	Plants/out-of-ground

Note: Source – “company name” and “file name”.

9.4 Planting Methodology

All plants as listed above are to be planted according to the SALI Specifications. The appointed Landscape Contractor as a minimum requirement must adhere to this document when re-vegetating the attenuation pond and planting plants.

Where additional specifications have been required to supplement the SALI specification, these have been provided below. These pertain specifically to the type of planting methodology listed, namely: hydroseeding; planting of plugs and planting of out-of-ground plants.

The following plant suppliers and Landscape Contractor’s/Wetland Specialists are recommended:

9.4.1 Hydroseeding and Grass Plugs

Hydroseeding is to be used for mat and clump-forming grass seed and mostly for the Peripheral Dry and Temporary Wet areas. Hydroseeding has been stipulated as opposed to simple grass seeding as it has a better success rate with an improved rate of establishment, a sort-after quality, particularly as vegetation is to be re-established with the minimum of delay, after its removal during the earthworks phase. The hydroseeded Peripheral Dry and Temporary Wet areas are also to be inter-planted with grass ‘plugs’. Grass ‘plugs’ are also to be planted in Seasonally Wet areas. It is hoped that the mat-forming grasses will provide initial cover and that over time the clump-forming grasses will establish and provide a richer grassland species composition.

Seed is to be of the same season, with a guaranteed germination percentage and is to be free from weeds and foreign materials. All seed supplied shall be labelled in accordance with the Government Seed Act No. 20 of 1961 and the Contractor shall produce such certification and seed samples as may be required to verify compliance with the Act and test the seed.

The hydroseedmix should be hydroseeded as follows:

- The area to be hydroseeded should be fertilized with 3:2:1 (25) + Zn at a rate of 500kg/ha;
- Compost consisting of either chicken litter, kraal manure or sugar-cane filter cake shall be incorporated at a rate of 5m^3/ha;

- Cellulose pulp consisting of either wood shavings, shredded straw, shredded paper or cotton waste, shall be added to the mix and applied at a rate of 250kg/ha;
- SG 100, an anti-erosion compound or similar approved shall be incorporated into the mix. The application rate should be in accordance with Manufacturer's instructions;
- The surface of the soil is to be prepared by cultivation/raking or harrowing as appropriate until ground is broken down to an approved fine tilth 75mm deep and uniformly firmed to finish at the correct levels;
- Any stones exceeding 50mm in any direction shall be removed from the surface to tip. The prepared surface is to be lightly moistened prior to seeding;
- Grass seed shall be applied evenly over the entire working area,. The seed mix shall be applied mixed with water via a tanker or other suitable approved seeding/broadcasting equipment;
- The Contractor shall ensure that seed after being sown is kept continually moist, until germination and establishment, after which normal irrigation methods are to be applied; and
- Acceptable cover will be deemed to have been attained only once 85% of the total hydroseeded area is covered with most of the specified grass species, six months after hydroseeding occurred, and there are no bare patches greater than 0.25m^2 in area.

The 'plugs' shall be mature, a minimum of 70mm in height and shall be supplied in polystyrene trays in quantities of 200/tray. They shall have sufficient fibrous roots to hold together when handled. They shall be green, healthy and true to type. Plugs shall be packed to avoid drying out in transit and must be planted within two days of delivery.

The 'plugs' should be planted as follows:

- Ground preparation and fertilization would have been previously undertaken when the area was hydroseeded. As the plugs are to be inter-planted into the hydroseeded area, no additional fertilization/ground preparation is necessary;
- The Contractor shall allow for watering once a week until established;

Acceptable cover will be deemed to have been attained if after three months even tufts have been established.

9.4.2 Out-of-ground Plants

Out-of-ground plants have been specified as a planting option as opposed to plants in bags. Out-of-ground plants should have been carefully lifted with a substantial root ball and these should be transported to the site under ideal conditions, i.e. kept moist and protected from sun and wind. Plants should be planted on the same day as lifted. Plants should be attained from legal sources and should be attained shortly before or at the beginning of the growing season. The leaves of out-of-ground plants should be trimmed back to 10 to 15cm in length, so as to reduce water loss through transpiration. Should it be required course mesh may be used to secure plants until they establish.

Out-of-ground plants have been specified for herbaceous plants that may be planted in the Permanently Wet, Seasonally Wet and Temporary Wet Areas.

9.4.3 Plants in Bags

Plants in bags have been specified for herbaceous plants and trees that may be planted in all wetness planting zones. Planting is to occur as per the SALI specification document **(Appendix 1)**.

9.5 Alien Vegetation, Maintenance & Monitoring

It is recommended that a 12 month maintenance period be stipulated, which will aid in the establishment of the newly planted vegetation. The maintenance should also focus on ongoing alien vegetation control. Of particular concern is the prevention of the infiltration of Kikuyu grass, which is a problem in the area. Planting should be carried out as soon as possible after construction in order to prevent soil erosion and the invasion of alien vegetation onto the site.

The Landscape Contractor should note these payment details and should ensure that they price the Contract adequately so as to allow for any replacement planting, including the supply of all materials and labour until final completion, to ensure that full cover is attained.

9.6 Measures

43. The rehabilitation of the construction and related sites shall be done in parallel to the construction works and not only commence after all construction activities are concluded
44. The Contractor shall restore the construction right-of-way to the natural contours of the ground and shall allow normal surface drainage.
45. The Contractor shall remove all temporary works along the construction right-of-way and fences and private roads disturbed by construction shall be restored to their original condition.
46. The Contractor shall loosen compacted soils along the construction right-of-way by means of a plough or scarifier. Scarifying areas where topsoil has been removed shall be carried out prior to the replacement of topsoil. Care shall be taken to avoid topsoil inversion if scarifying is carried out in areas where topsoil has not been removed. Any ripping or scarifying operation shall not exceed a depth of 100 mm.
47. The Contractor shall prevent concentrated run-off along, or next to, the construction right-of-way, and shall do so by shaping the land, establishing vegetation, and taking other appropriate measures to absorb and disperse runoff.
48. In places where erosion control is required, including the top of bank of all gullies, watercourses, large depressions and steep slopes, the Contractor shall construct diversion banks across the construction right-of-way to divert the flow of water away from the backfilled trench and into the natural drainage courses.
49. On arable land, the Contractor shall ensure that stone and rock within the soil profile and at the surface do not constrain use any more than on adjacent land.
50. Where the land is naturally armoured with surface rock or stone, the Contractor shall, after construction, replace the armouring over the construction right-of-way to protect against erosion.
51. On slopes steeper than 5%, the Contractor shall use special protection methods to arrest soil erosion during the vulnerable period before vegetation re-establishment occurs.
52. Where brush and tree limbs cannot be chipped or used by local communities, this vegetation shall be spread evenly over the construction right-of-way to preserve and assist the regeneration of natural vegetation, erosion control and providing animal habitation. Tree trunks and large limbs are to be laid in a random fashion across the natural slope of the ground, and should not obstructing access by construction vehicles. No tree trucks and large limbs shall be placed in gullies or erosion ditches.
53. The Contractor shall establish vegetation cover (using species appropriate to the local area) in all areas disturbed by the works in the first growing season after construction, and shall maintain

this cover for the duration of the maintenance period. The Contractor shall notify Rustenburg Municipality in writing, prior to re-vegetation, of the method of preparation (scarifying/ ripping/ discing), soil amelioration (addition of lime or gypsum), fertilizing, and seeding (source, mixture and quantity) to be used in rehabilitating each area of the works and the post-establishment maintenance regime to be implemented.

54. The Contractor shall maintain and submit to Rustenburg Municipality detailed records of the method used to re-establish grass in each area of the contract.

55. Re-vegetation shall be done on the routine including, but not limited to, all borrow areas, temporary access roads, spoil sites, camp sites and the like.

56. Once the grass has been established, the maintenance period shall commence. This period shall extend for a minimum period of one calendar year.

10 CONCLUSIONS AND RECOMMENDATIONS

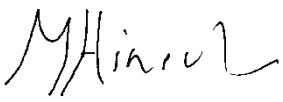
The proposed upgrading and flood control project should have a positive effect on the physical environment in the vicinity of the existing Phala road and development currently being flooded . It is unlikely that the proposed project should have a negative influence on the environment or be detrimental to the existing aesthetics.

This Environmental Management Plan should be used as an on-site reference document during all phases of this Project. Auditing should take place in order to determine compliance with this EMP. Parties responsible for transgression of this EMP should be held responsible for any rehabilitation that may need to be undertaken. Parties responsible for environmental degradation through irresponsible behavior / negligence should receive penalties.

Key points:

- The proposed project is surrounded by an existing residential area and care should be taken during upgrading to reduce noise, dust pollution and to secure the building site.
- The system to be installed will require some maintenance. The responsible authority is to make the necessary budget and capacity allowances in this regard. It is believed that minimal or no maintenance will be required for the proposed dam upgrading, whereas a degree of maintenance of the flood protection berms will be required. Routine maintenance of the road will be the same as before upgrade.

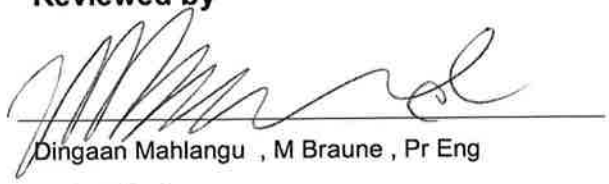
Prepared by



Manda Hinsch Pr.sci. Nat

Principal Scientist

Reviewed by



Dingaan Mahlangu , M Braune , Pr Eng

Project Reviewers

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

Appendices

Appendix A: Incident Report (Example)

Incident Log (example)

DATE	ENVIRONMENTAL CONDITION	COMMENTS (Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)	CORRECTIVE ACTION TAKEN (Give details and attach documentation as far as possible)	SIGNATURE

Appendix B: Letter of Support from Rustenburg Town Council