MONTANA SPRUIT UPGRADE, GAUTENG

ECOLOGICAL MANAGEMENT PLAN: VOLUME 1

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LIST OF ABBREVIATIONS

DWAF	-	**D**epartment of **W**ater **A**ffairs and **F**orestry
ECA	-	**E**nvironment **C**onservation **A**ct, 1989 (Act No. 73 of 1989)
ECO	-	**E**nvironmental **C**ontrol **O**fficer
EcoMP		**E**cological **M**anagement **P**lan
EIA	-	**E**nvironmental **I**mpact **A**ssessment
EMP	-	**E**nvironmental **M**anagement **P**lan
ESO	-	**E**nvironmental **S**ite **O**fficer
GDARD	-	**G**auteng **D**epartment of **A**griculture and **R**ural **D**evelopment
NEMA	-	**N**ational **E**nvironmental **M**anagement **A**ct, 1998 (Act No. 107 of 1998)
RMP		**R**iparian **M**anagement **P**lan
SEF	-	**S**trategic **E**nvironmental **F**ocus (Pty) Ltd

1. INTRODUCTION

The City of Tshwane Roads and Stormwater department wishes to implement measures to alleviate flooding of properties along the Montana Spruit in Montana Spruit, northern Tshwane in the Gauteng province.

Environmental authorisation is required as the proposed activity triggers a number of listed activities in terms of the regulations of the National Environmental Management Act, Act, 1998 (Act 107 of 1998), as amended (NEMA), and the Environmental Impact Assessment Regulations.

A Basic Assessment process was initiated in 2008 and after following the legislated process a Basic Assessment Report was submitted to the Gauteng Department of Agriculture and Rural Development (GDARD) in December 2009. Following a review the application, GDARD requested additional information including the activity of an Ecological Management Plan that caters for the management of the riparian zones and water quality levels both during and after construction.

Strategic Environmental Focus (Pty) Ltd (SEF) was therefore appointed by TGM Environmental Services cc. to collate the relevant project information and compile a response to the GDARD request with regards to the activity of an Ecological Management Plan.

1.1 Interpretation

The implementation of the EcoMP is an “add on” requirement and should be read in conjunction with the EMP. The EcoMP forms part of the EMP and once approved by GDARD becomes is legally binding through National Environmental Management Act (NEMA) (Act No. 107 of 1998). The proponent is to ensure that through the project tender process the EcoMP is included with the EMP and forms part of the Project Construction Contract. The EcoMP like the EMP is a dynamic document and should be revised to conditions on site.

1.2 Principles

An EMP is compiled using concepts and implementation requirements so that the higher principles of sustainable activity are realised. The EMP, and thus the EcoMP, is governed by a set of principles as set out in the EMP document.

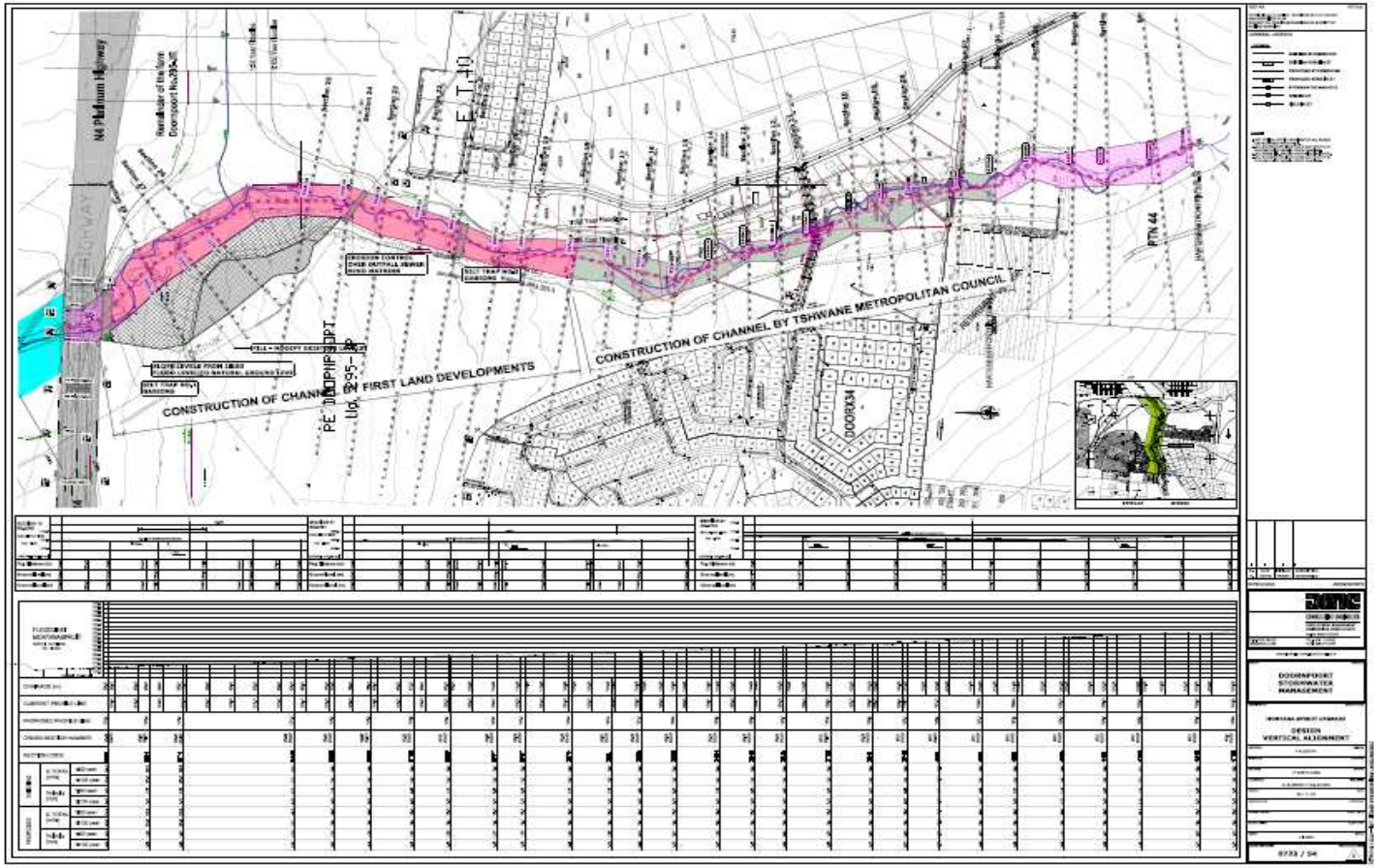

Figure 1: Proposed layout

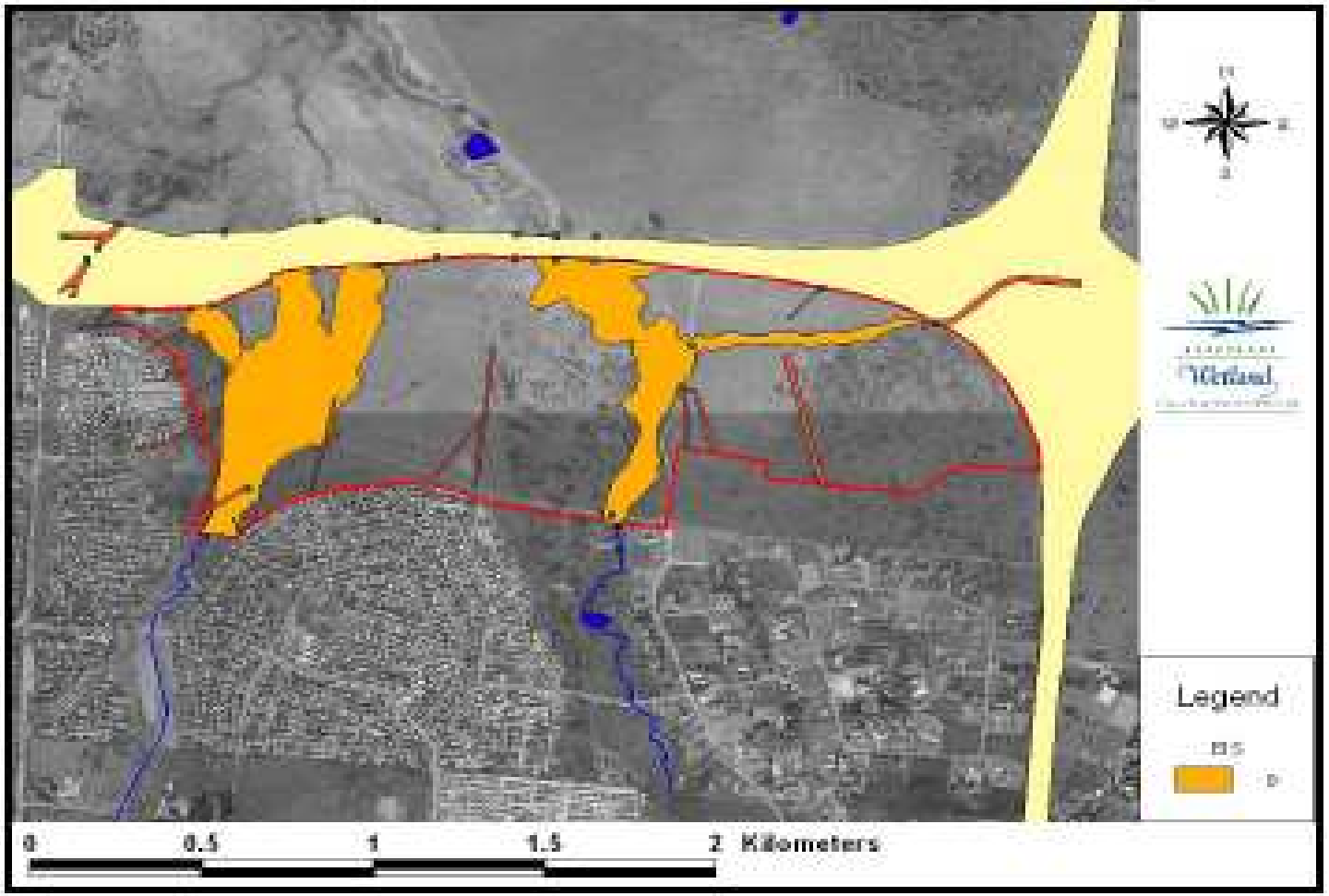

Figure 2: Sensitivity Map (Prepared by Wetland Consulting Services (Pty) Ltd)

1.3 Layout of the EcoMP

The EcoMP involves activities that should be implemented across the life-span of the project. The phases include:

1.5.1 The Planning Phase

Pro-active environmental measures minimise the chance of impacts taking place. Stabilisation and prevention of further degradation of the floodplain, riparian wetland and open space areas through erosion, disturbance and pollution is the primary objective of the EcoMP during this phase of the activity. However, accidental impacts may still take place. Through the incorporation of contingency plans (e.g. this EcoMP) during the planning phase, the necessary corrective action can be taken to further limit potential impacts.

1.5.2 The Construction and Rehabilitation Phase

The bulk of the impacts during this phase will have an immediate effect (e.g. decreased wetland functionality and sedimentation). If the site is monitored on a continual basis during the construction phase, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the contingency plans identified in the planning phase, together with a commitment to sound environmental management from the developer.

1.5.3 The Operational Phase

By taking pro-active measures during the planning and construction phases, potential impacts to the floodplain area emanating from the operational phase will be minimised. However, certain facets will entail ongoing processes, including amongst others, maintenance of stormwater and sewage infrastructure, as well as control of alien invasive vegetation.

The operational phase largely entails monitoring of the outcomes of the EcoMP and guarantees the persistence of open spaces and sensitive ecological features within the floodplain.

2. THE ECOLOGICAL MANAGEMENT PLAN

The EcoMP was designed to mitigate potential impacts of to the Montana Spruit floopdplain channelisation by:

- Identifying the legislative requirements applicable to the ecological aspects of the project;
- Complying with specific requirements and obligations relating to ecologically sensitive habitats;
- Monitoring construction works within or adjacent to wetland areas as well as open space areas of ecological significance; and
- Specifying a program for ecological management actions during the construction as well as the operational phases of the Project.

In order to satisfy the requirements of NEMA, the EcoMP is partitioned into chapters, each chapter focussing on a specific requirement and/or ecological aspect within the open space system. Some requirements are concerned with similar ecological aspects and are incorporated within one chapter. Supporting resources can be found within Volume 2 of this document.

This EcoMP includes:

Chapter 1 Riparian Management and Rehabilitation Plan;

Chapter 2 Guideline: Ecologically Sound Storm Water Monitoring plan;

Chapter 3 Red and Orange List species: Rescue, Persistence and Monitoring Plan;

Chapter 4 Natural Open Space: Fire Management Plan;

Chapter 5 Alien Plant Monitoring and Eradication Plan;

Chapter 6 Ecological Processes Management Plan; and

Chapter 7 Recommendations: Formalisation of Open Space aimed at conservation

In order to prevent unnecessary repetition, the following sections are not discussed in the current document as they are adequately detailed in the EMP:

- Role players and responsibility matrix;
- Enforcement, monitoring and auditing;
- Tolerances;
- Measurement and payment;
- General guidelines;
- Awareness training;
- Contractor environmental Method Statements;
- Site documentation;
- Pro forma documentation prior to the commencement of construction activities; and
- Pro forma documentation during construction activities.

CHAPTER 1: FLOODPLAIN MANAGEMENT AND REHABILITATION PLAN

1 Introduction

The Montana Spruit floodplain and its associated riparian vegetation perform various important ecological functions. A severe increase in run-off due to urbanisation within the catchment is causing accelerated erosion in various sections (especially within the stream channel) which could threaten the floodplain system's integrity and functionality. The project propose channelisation of the Montana Spruit by changing the existing channel through excavating, shaping and widening in order to meet flood conveyance targets.

The potential impacts and key issues identified for the floodplain and riparian areas associated with the Montana Spruit:

- Changes in the hydrology of catchment processes and hydrological systems (including wetlands, streams, and associated aquatic systems);
- Increased volume and intensity of stormwater leading to altered hydrology and erosion;
- Sedimentation of surface water;
- Ecological functioning, including the loss of specialised habitats and species, biodiversity and migration corridors; and
- Invasive alien vegetation encroachment.

Objectives:

- To rehabilitate areas affected by the proposed channelisation project and areas that has been in-filled within the flood plain;
- To meet flood conveyance targets;
- To stabilise the riverbanks;
- To remove alien invasive plant species growing in the floodplain; and
- To re-vegetate the rehabilitated areas with indigenous plants that would naturally occur there.

A detailed rehabilitation plan must be prepared that addresses the above ojectives

2. Legislation

The list of legislative references contained herein is by no means exhaustive but is applicable to the general principals of this document. Legislation, which is relevant to wetlands and riparian areas includes:

- Conservation of Agriculture Resources Act, 1983 (Act 43 of 1983);
- Environment Conservation Act, 1989 (Act 73 of 1989);
- National Water Act, 1998 (Act 36 of 1998);
- National Environmental Management Act, 1998 (Act No. 107 of 1998); and

- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).

The following uses listed in Chapter 4 (Part 1, section 21) of the National Water Act (NWA) (Act no 36 of 1998), are particularly pertinent to the potential impact of the activity on the riparian area associated with the study site. These uses that may occur during the construction and operational phases are subject to the issue of a water use licence from the DWAF:

- Taking water from a water resource;
- Storing water;
- Impeding or diverting the flow of water in a watercourse;
- Engaging in a stream flow reduction activity contemplated in Section 36;
- Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit; and
- Altering the bed, banks, course, or characteristics of a watercourse.

In a South African legal context, the term watercourse is often used rather than the terms wetland, or river. The National Water Act, 1998 (Act No. 36 of 1998) includes wetlands and rivers in the definition of the term watercourse in the definition below.

Watercourse means:

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows, and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The following table addresses potential impacts, management objectives, measurable targets and frequency of action required in relation to the rehabilitation and management of the floodplain.

Riparian Management and Rehabilitation Plan

Table 2: Planning Phase (A)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
A.1 Adhere to applicable legislation i.The person responsible for supervising any construction activity taking place within the floodplain and riparian zone must be familiar with the applicable laws as set out in this chapter; and ii. The developer must apply for Water Use Licences prior to commencement.	• Legal compliance	• Water use licenses for each listed activity.	Prior to any construction that triggers a listed water use that necessitates a water use license
A.2 Designing for new floodplain channel and riparian areas i.Rehabilitation of sensitive habitats and incorporation of attenuation and retention features (e.g. pools both within the active channel and within the floodplain) so as to allow for the presence of standing water which can be utilised by various faunal species (e.g. frogs); ii.Attenuation and flow-dissipating features at stormwater channels leading into the floodplain must be developed; iii.Rehabilitation of the floodplain and terrestrial areas must use indigenous plants that occur naturally in the riparian area (*see Volume 2; Chapter 1*); iv.Implement stormwater management strategies in the design phase (see Chapter 2: Stormwater Management Guideline Plan) v.Design several silt traps at intervals along the length of the stream. Silt traps should span the width of the floodplain and be protected with Reno mattresses and vegetation on the extremities to prevent scouring on the edges of the silt traps	• Proactive minimising of potential riparian degradation resulting from the construction as well as operational phases of the activity; • Enhancing the natural ecological processes of the floodplain; and • Identify and procure the required vegetation needed for rehabilitation.	• Design documents; and • Design of 'best practice' stormwater treatment measures to maximise onsite pollutant retention and removal, as well as infiltration and sub- surface discharge of stormwater	Prior to the commencement of construction

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
A.3 Project contract and programme i. A copy of this EcoMP must be available on site. The Contractor shall ensure that all the personnel on site, sub-contractors and their team, suppliers, etc. are familiar with and understand the specifications contained in the EcoMP.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase • Ensure environmental awareness and formalise environmental responsibilities and implementation	• Contract records • Signed declaration pro forma's	-
A.4 Site demarcation and activity ii. The construction footprint must be kept to a minimum. A detailed construction plan must be developed which clearly indicate accessible areas and no-go areas for construction vehicles and workers. These different zones must be clearly demarcated through erection of fences prior to the initiation of the construction phase and; and iii. "NO ENTRY" signs must be strategically placed along the riparian area and its associated buffer zone which is in close proximity to access routes. Refer to the sensitivity map (Figure 2) for the location of the riparian area and its associated buffer zone.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase	• Demarcated areas	Prior to commencement
A.5 Loss of Migration Corridors and Landscape Connectivity ii. Clusters of existing *Acacia* trees should be left as islands within the new floodplain design to facilitate faunal migration iii. Several species of trees should be planted within the new channel profile to simulate previous arboreal connectivity (*see Volume 2; Chapter 1*); iiii. Trees should also be planted outside of the new channel profile to compensate for loss within the original riparian zone(*see Volume 2; Chapter 1*) ivi. Palisade fencing should be used to allow for the continued natural	• Minimise loss of biodiversity • Minimise the loss of ecological dispersal corridors; • Prioritise the rehabilitation of degraded areas within the riparian habitat; • Prevent subsequent damage to the riparian habitat during construction; and • Monitor the success of the rehabilitation and take corrective action where needed	• Rehabilitation plan explaining the engineering actions and mitigations; • Continuous movement of species using the river as an ecological corridor; • No litigation concerning applicable animal protection acts;	Prioritise stormwater measures and the rehabilitation of the riparian area; Monitor rehabilitation continuously, especially after rainfall events.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
movement of fauna, also applicable to landowners adjacent to the floodplain; vi. Strictly use indigenous vegetation in the landscaping; and vii. Disturbed riparian and floodplain zones should be rehabilitated as a matter of priority and align with the following principles: • Protect the further loss of riparian habitat through stabilisation of the system; • Ensure the continued persistence of a movement corridor for animal and bird species by: o Supporting connections between remaining natural habitat on the periphery of the study area; o Supporting connections between large, intact areas of natural vegetation and adjacent open space systems to facilitate unrestricted dispersal and movement of biota; o Ensuring that landscaping is done with indigenous plant species; o Ensuring that all barriers are permeable to wildlife e.g. Builder's fence (Mesh fence) fencing; • Road crossings over the floodplain must be planned with the utmost care. Provision should be made for the continued undisrupted dispersal of fauna along the floodplain, see GDACE Biodiversity Guidelines.		• No measurable or visible signs of protected - habitat destruction	
A.6 Non-compliance and communication i. The contractor understands that failure to adhere to the requirements of the EcoMP will result in fines as stipulated in the EMP, over and above the costs incurred for any remediation required as a result of the specific non-compliance.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase	• Method statements	Prior to commencement

Riparian Management and Rehabilitation Plan

Table 3: Construction Phase (B)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.1. Site preparation i. Ensure that all red and orange listed plants of conservation concern as well as plants that will be used in rehabilitation are appropriately located, replanted and stored as required ii. Ensure site is adequately demarcated as per planning	• Chronological approach to construction activities	• Plants replanted and stored as required • Areas fenced off and demarcated	At start of construction phase
B.2 Earthworks i. Although the construction and rehabilitation phases are separated within this document, both phases should occur concurrently in sections. This would prevent erosion on a large scale if unexpected rainfall events occur. ii. The top 30cm of vertic soils together with grass sods should be stripped and stockpiled or used immediately on adjacent completed sections for rehabilitation. iii. Topsoil stockpiles should not exceed 2m in height iv. If a G-horizon is excavated in lower areas within the new channel profile, these soils must be kept separate form the vertic soils. v. If there is excess soil on site (as a result of the new channel profile and lack of areas to be filled), subsoils (G-horizon) should be removed from site prior to vertic soils.	• Effective soil management	• Minimised soil erosion	Monitored daily

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.3 Oil and chemicals i. All oils and chemicals must be prevented from affecting the terrestrial areas and floodplain through the specifications contained in the EMP. ii. In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately. In the event of pollution caused as a result of construction activities, the contractor, according to section 20 of the National Water Act, 1998 (Act No. 36 of 1998) shall be responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas. The following procedure should be followed: • The ECO must identify areas where the soil has been disturbed and must record the type and degree of the oil spills. • Determine the extent of the pollution and where it originated form. • Employ a specialist in the field of soil contaminated by oil spills and implement appropriate rehabilitation method/s. • Use off-site Bioremediation methods to rehabilitate polluted soil and place the rehabilitated soil at the original site after treatment. • Use in-situ Bioremediation methods. • The ECO needs to provide a drawing that identifies the areas that have to be rehabilitated, also stating the appropriate rehabilitation method.	• Minimise pollution of the watercourse, soil and groundwater	• No pollution of the watercourse • No litigation due to transgression of pollution control acts • No complaints from I&APs	Monitored daily
B.4 Concrete i. Cement batching areas must be located in consultation with the ECO to ensure residues are contained and that the proposed location does not lead to the contamination of riparian zone or storm water channels, etc. A suitable site should have the following	• Minimise pollution of the watercourse, soil and groundwater	• No evidence of contaminated soil on the construction site • No evidence of contaminated water resources	Monitored daily

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
characteristics: • Easily accessible for large trucks; • Large enough for delivery, sorting and collection; • Secure; and • Is not located within or in close proximity to a natural environmental feature, such as a drainage line or 1:100yr flood line. ii. In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately. In the event of pollution caused as a result of construction activities, the contractor, according to section 20 of the National Water Act, 1998 (Act No. 36 of 1998) shall be responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas. The procedure, as set out in point B1ii) above, must subsequently be followed.			
B.5 Stockpiles, loss of topsoil from erosion, siltation of the watercourse through erosion iii. All stockpiled material must be prevented from being washed down the floodplain channel affecting the aquatic ecology.	• Minimise pollution of the watercourse, soil and groundwater • Minimise sedimentation of the watercourse • Minimise impeding the natural flow of water of surface water bodies on site	• Implementation of an ecologically sensitive stormwater management plan	Monitor daily

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.6 Toilets and ablution facilities i. No ablution facilities are to be located within the floodplain.	• Prevent potential to pollute soils, water resources and natural habitats	• Workforce use toilets provided • No complaints received from I & AP's as well as members of the workforce • No visible or measurable signs pollution of the environment (soils, ground and surface water)	As and when required
B.7 Waste management i. Strictly, no waste shall be disposed of, or stored in the floodplain.	• Prevent potential to pollute soils, water resources and natural habitats • Sustainable management of waste by recycling • Prevent degradation of ecological habitat provided by the riparian zone • No litigation and complaints by I&AP's	• Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site • Site is neat and tidy • No complaints from surrounding residents and businesses • Sufficient containers available on site • No visible or measurable signs of pollution of the environment (soils, ground and surface water)	Daily
B.8 Workshop equipment, maintenance and storage i. No maintenance or washing of vehicles may take place within the floodplain; ii. No wastewater may be discharged into the floodplain. Runoff containing high sediment loads must not be released into riparian area or floodplain channel. If this becomes a problem, it is recommended that an attenuation pond be constructed to allow solids to settle out of runoff prior to leaving the site. It is important to	• Prevent potential to pollute soils, water resources and natural habitats • Minimise chance of transgression of the acts controlling pollution • Disposal of hazardous substances in an appropriate manner	• No pollution of the environment; • No litigation due to transgression of pollution control acts; • Applicable water use license.	Monitor daily

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
note that such attenuation features should not be placed within the floodplain; and iii. Approval must be obtained from DWAF for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998).			
B.9 Crew camps i. The crew camps must be located outside of the floodplain. "NO ENTRY" signs must be strategically placed along the sections of the fenced-off riparian area and buffer zone which is in close proximity to access routes; ii. No uncontrolled discharges from the construction crew camps into the riparian area and buffer zone shall be permitted. Any discharge points need to be approved by the relevant authority; and iii. In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately.	• Prevent potential to pollute soils, water resources and natural habitats • Prevent loss of biodiversity	• No pollution of the environment • No complaints received from I & AP's as well as members of the workforce	Monitor daily
B.10 Access route/haul roads i. Roads and pathways created during the construction phase have the potential to become preferred drainage lines, resulting in gully erosion. It is important to note that riparian areas immediately outside the study site are also susceptible to erosion caused by activities on the site, as well as access to the site; and ii. Any erosion formed during the construction phase shall be backfilled and compacted, and the areas restored to an acceptable condition (80% vegetation cover using indigenous species). Regular	• Minimise loss of topsoil and prevent erosion; • Minimise soil compaction and sedimentation of the riparian zone and associated buffer; and • Prevent loss of biodiversity on the site as well as adjacent sites used for access.	• No erosion on access roads after completion of construction; and • No loss of topsoil due to runoff water on access roads.	As required, monitor daily

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
monitoring should identify areas where erosion is occurring. Disturbed surfaces must be rehabilitated following the principles set out in the rehabilitation section of the current document.			
B.11 Flora i. Once construction is complete, rehabilitation of affected areas must be undertaken in order to restore the ecological functionality of the floodplain. Re-vegetation should preferably take place in a phased approach per section, as soon as possible after completion of a specific section in order not to leave the soils exposed unnecessarily. Active re-vegetation must take place with locally indigenous vegetation and include plants that were rescued from construction areas on the site. (*see Volume 2; Chapter 1*);	• Minimise scarring of the soil surface and land features and prevent the soil to become vulnerable to erosion; • Rehabilitation with plants indigenous to the area; • No construction activities should take place within the "no-go" areas; • Wetland areas outside the study area that are affected by access to the site by machinery and the labour force should also be fenced off and protected.	• No complaints from Nature Conservation; • No measurable or visible signs of destruction of sensitive habitats; • Successful rehabilitation of the riparian vegetation.	As and when required, monitor daily
B.12 Fauna i. All activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962) Workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society; ii. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed; and iii. Employees must be trained on how to deal with fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake, a specialist must be called in to safely relocate the animal.	• Minimise disturbance to animals; and • Minimise interruption of breeding patterns of birds, small mammals and invertebrates.	• No complaints from Nature Conservation; • No litigation concerning applicable animal protection acts; and • No measurable or visible signs of protected - habitat destruction. • No snares or traps on property	As and when required, monitor daily

Riparian Management and Rehabilitation Plan

Table 4: Rehabilitation Phase (C)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
C1 Rehabilitation i. Large sections of the floodplain will be affected by construction, therefore the following principles must be incorporated into a rehabilitation plan: • Eradicate alien invasive weeds form the floodplain and adjacent terrestrial areas and monitor the emergence of their seeds in disturbed and rehabilitated soil (Chapter 5: Alien Eradication and Monitoring Plan); • Make use of soft engineering rather than hard engineering by using natural landscape features and vegetation to direct water flow where possible; • Earthworks should provide open swales and allow for shallow ponds in areas to accumulate sediment and establish reed beds. These pools will assist in improving water quality through trapping and assimilating nutrients; • Cut-off berms / dissipaters can be provided at regular intervals parallel with the contours across the entire width of the disturbed area to prevent soil from being pushed into the stream. These low berms could be spaced 5 to 10m apart and should be 250-500 mm high; • Focus on storm water management in terms of flow attenuation and reduced velocity (Chapter 2: Stormwater Management Guideline Plan); and	• Contingencies for minimising negative impacts anticipated to occur during construction activities; • Eradicate alien invasive plants from the riparian area and prevent new infestation; • Re-vegetate with plants rescued from the construction areas and supplement with plants grown on site, which will naturally occur within the riparian habitat of the Jukskei River; and • Successful rehabilitation.	• Water use licenses; • Functionality of the rehabilitated areas; • Survival rate of plants in re-vegetated areas; • Specialist assessment of the rehabilitated riparian area	During rehabilitation; Monitor monthly after rehabilitation is completed; After completion of rehabilitation, annual specialist assessment, focussing on the functionality, species composition and faunal species present; Report back to Directorate of Nature Conservation on an annual basis

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
• Re-vegetate to stabilize soil and/or protect topsoil against soil erosion in areas where topsoil is still intact and where topsoil has been amended or imported. ii. The banks and surrounding soils of the channel must be stabilized by re-vegetating channel banks by using seed containing pre-stripped topsoil in combination with hydro-seeding. Reno mattresses and geomats can be used to stabilise attenuation and detention features within the floodplain iii. Re-vegetate permanent and seasonal zones of floodplain channel and attenuation features according to prescribed species (*see Volume 2; Chapter 1*); iv. One or more follow-ups are essential in ensuring the success of any rehabilitation action. Where alien vegetation has been removed, it is essential that cleared areas are monitored at regular intervals to ensure that alien elimination is complete. It is further essential that the re-vegetated areas are monitored to ensure that the seedlings, seeds, plugs or any other means of vegetation was successful. Regular manual removal of alien vegetation should form part of a management plan for the rehabilitated flood line area.			

Riparian Management and Rehabilitation Plan

Table 5: Operational Phase (D)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
D.1 Waste management i. No wastewater may be discharged into the floodplain. ii. Runoff containing high sediment loads must not be released into natural or municipal drainage systems or nearby watercourses.; iii. Excessive quantities of sand silt and silt-laden water should not enter the storm water system. Design of the storm water drainage system so as not to contaminate the natural drainage system is important. Appropriate measures, e.g. drainage retention areas to prevent silt and sand entering drainage or watercourses must be (Chapter 2: Stormwater Management Guideline Plan).	• Sustainable management of waste by recycling; • Provide recycle bins and install litter traps to prevent litter from reaching the river via stormwater; • Minimise litigation and complaints by I&AP's • Minimise potential to pollute soils, water resources and natural habitats • Prevent sedimentation of the watercourse	• Disposal of refuse in an appropriate manner with no refuse polluting the activity • Activity is neat and tidy • No complaints from surrounding residents and businesses • Sufficient containers available on site and a recycling station; • No visible or measurable signs of pollution of the environment (soils, ground and surface water).	Daily
D 2 Stormwater Management i. Engineering interventions must enhance rather than further deteriorate the functions of the riparian area; and ii. Adhere to Chapter 2: Stormwater Management Guideline Plan (B5).	• Minimise pollution of soil, surface and ground water resources; • Minimise the potential loss of topsoil; • Minimise the potential of flooding of the activity, or its neighbouring properties; and • Ensure the survival of plants necessary for stormwater management.	• No pollution at discharge points; • No silt build-up at the discharge points; and • No complaints from I & AP's or authorities.	As and when required Monitor seasonally

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
D.3 Biodiversity i. The cumulative loss of habitat by increased urbanisation enhances the value of remaining areas of natural vegetation as refuges to many species. The specialised habitat created by riparian conditions forms breeding and foraging habitat for several species. Destruction of riparian zones and wetlands on and adjacent to the study site must be minimised by closely following, and regularly monitoring compliance to the mitigation measures listed. • Lighting must be positioned in such a way so as not to disturb species of nocturnal habit • As part of rehabilitation, create habitats that are suitable for foraging and breeding for small mammals, herpetofauna and birds through the re-establishment of indigenous vegetation species and landscaping; and ii. A monitoring program must identify and remove exotic vegetation and maintain open space areas free from invasive species.	• Minimise loss of biodiversity; • Monitor fauna and flora species (Chapter 3: Red and Orange List Species: Rescue, Persistence and Monitoring Plan) ; and • Specialist assessment of the vegetation in dedicated open spaces	• No complaints from Nature Conservation; • No litigation concerning applicable animal protection acts; • No measurable or visible signs of protected - habitat destruction; • Persistence of species.	Monitor visitor access to the riparian area on a weekly basis Monitor seasonally
D.4 Infrastructure maintenance i. The newly constructed and shaped channel must be inspected after each major rainfall event (> 50mm precipitation) for sign of erosion. The main channel which will be reinforced must be inspected to ensure that it is not being undercut. Appropriate remediation action should be initiated as soon as possible if necessary; ii. Silt traps must be inspected and cleaned out when appropriate, soils recovered could potentially be used to rehab erosion that has developed in other areas; iii. The sewage systems which transect the site must be inspected for leakages on a regular basis and any leakages must be attended to immediately. In case of emergency sewage leaks, effluent must not	• Minimise pollution of soil, surface and ground water resources; and • Ensure the functionality of attenuation/detention ponds.	• No complaints from surrounding residents and businesses; • No pollution of the environment; and • Maintenance schedule and records.	Monitor as part of a monthly maintenance inspection schedule

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
be discharged into any water course, wetland, naturally vegetated areas or water bodies; and			
D. 7 General health of the Montana Spruit i. It is recommended that a Montana Spruit Forum be established where landowners along the length of the river could all become involved in rehabilitation of the flood plains and riparian vegetation in order to improve the health along the whole of the river. This forum should review this restoration plan and update the document according to the larger scope of the initiative.	• Plan meetings with adjacent activities and owners of vacant land in order to encourage the linkages of open spaces and mitigation measures to benefit the ecological processes taking place within the area.	• Montana Spruit Forum or similar organisation.	

CHAPTER 2: STORM WATER MANAGEMENT GUIDELINE PLAN.

1. Future Storm Water Regime on Site

The following would influence the future storm water regime on the site:

- Land-use;
- Rainfall volume;
- Runoff volume;
- Permeability of the surface;
- Slope; and
- Soil types.

2. Impact of Proposed Activity on Local Storm Water

The proposed activity could have the following impacts on the existing local storm water:

- Increased storm water runoff volume as a result of increased hard surfaces;
- Increase in on-site and off-site erosion;
- Increased sedimentation of surrounding surface water resources; and
- Potential decrease in surface water quality of the surrounding rivers and streams as a result of litter, fertilizer, herbicides, heavy metals, solvents, sewage etc. in the storm water run-off from the site.

A more detailed identification of the storm water related risk sources are summarised in the tables below.

Table 6: Risks during construction phase

Possible Risks	Source of the risk
Increased storm water runoff velocity	• Removal and destruction of vegetation
Erosion of stream banks, riparian zone and floodplains.	• Movement of vehicles. • Movement of workforce. • Construction method.
Sedimentation of the stream.	• Movement of vehicles. • Movement of workforce. • Construction method.
Floral disturbance (riparian zone, floodplains).	• Movement of vehicles. • Workforce activities.

	• Construction activities.
Surface water pollution	• Oil and fuel spills from construction vehicles. • Construction material (i.e. concrete, solvents, paints etc.). • Workforce activities.
Change in hydrological regime on a micro scale.	• Presence of roads/ bridge in close proximity of the stream.

Table 7: Risks during operation phase

Possible Risks	Source of the risk
Increased stormwater runoff velocity	• More concentrated flows due to new stream channel profile
Erosion of stream banks and floodplains. (risk minimal)	• Movement of maintenance vehicles. • Movement of maintenance personnel. • Maintenance activities.
Sedimentation of stream. (risk minimal)	• Movement of maintenance vehicles. • Movement of maintenance personnel. • Maintenance activities.
Faunal disturbance. (risk minimal)	• Movement of maintenance vehicles. • Movement of maintenance personnel. • Maintenance activities. • Presence of transmission lines.
Floral disturbance (riparian zone, floodplains). (risk minimal)	• Movement of vehicles. • Movement of maintenance personnel. • Maintenance activities. • Presence of services, i.e. powerlines, sewage lines etc.
Disturbance of hydrological regime (micro scale) in floodplains and riparian zone.	• Presence of roads and buildings in close proximity of the stream.
Surface water pollution	• Application of herbicides
Eutrophication	• Application of fertilizers

The following Storm Water Management Guideline Plan must inform an engineering storm water plan and should be used on site to mitigate impacts to the environment.

Storm Water Management Guideline Plan

Table 8: Planning Phase (A)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
A.1 Site demarcation and activity (also see Chapter 1) i.The riparian zone and its associated buffer zone must be clearly demarcated and fenced before the contractors set up their crew camps or begin construction. Builder's fence (Mesh fence) is considered preferable. The methodology statement for the fence construction should be submitted to an approved by the ECO; and ii."NO ENTRY" signs must be strategically placed along the riparian area and its associated buffer zone which is in close proximity to access routes. Refer to the sensitivity map (Figure 1) for the location of the riparian area and its associated buffer zone.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase	• Demarcated areas	Prior to commencement
A.2 Designing for storm water management i. Provide permeable surfaces and address increased runoff volumes at source, which is a proactive, and efficient way of dealing with runoff; ii. Attenuate flows within the drainage system, to reduce runoff velocity and provide permeable surfaces. This can take the form of constructed retention / stilling basins, grassed swales, wetlands and weirs within a drainage system. Attenuation features should be included into present stormwater systems to deal with the problem closer to the source rather than after it gets into the river channel.	• Limit storm water runoff volume as a result of increased hard surfaces; • Prevent on-site and off-site erosion; • Prevent sedimentation of surrounding surface water resources; • Prevent uncontrolled river crossings, provide crossings (bridge) that span the riparian area, and • Mitigate the potential decrease in surface water quality of the	• Engineering Storm Water Management Plan; and • Landscape design indicating attenuation the planned ponds, swales and other mitigation measures	Prior to the commencement of construction activities

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
	surrounding rivers and streams as a result of litter, fertilizer, herbicides, heavy metals, solvents, sewage etc. in the storm water run-off from the site.		
A.3 Non-compliance and communication i. The contractor understands that failure to adhere to the requirements of the EcoMp and EMP will result in fines as stipulated in the EMP, over and above the costs incurred for any remediation required as a result of the specific non-compliance.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase	• Method statements	Prior to commencement

Storm Water Management Guideline Plan

Table 9: Construction Phase (B)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.1 Mitigate Increased Storm water runoff volume and velocity i. Provide permeable surfaces and address increased runoff volumes at source; ii. Increase the volumetric capacity of drainage systems, to handle increased runoff volumes; and iii. Attenuate flows within the drainage system, to reduce runoff velocity	• Limit storm water runoff volume as a result of increased hard surfaces; • Prevent on-site and off-site erosion; • Prevent sedimentation of surrounding surface water resources; and • Mitigate the potential decrease in surface water quality of the surrounding rivers and streams (including the Crocodile River) as a result of litter, fertilizer, herbicides, heavy metals, solvents, sewage etc. in the storm water run-off from the site.	• Permeable surfaces; • Attenuation ponds and drainage systems in place and functional; • Monitor functionality of artificial wetlands/ detention and attenuation ponds; and • Vegetated drainage systems and litter traps	During construction
B.2 Prevent erosion of footpaths, tracks and gravel roads i. Appropriate flow diversion and erosion control structures i.e. earth embankments must be put in place where soil may be exposed to high levels of erosion due to steep slopes, soil structure etc.; ii. Should a freak storm displace the temporary earth embankments or other erosion control structures, a visual inspection of the site must be made and any damage be recorded. Any damage and loss of soil resulting from a storm is to be remedied immediately. Should the temporary walls collapse due to construction error, the contractor is to fund the remediation process; iii. Storm water at the construction crew camps must be managed so as to reduce the silt loads in the stream channel. Measures must be implemented to distribute storm water as evenly as possible to avoid	• Prevent erosion; • Remediate unforeseen erosion (e.g. rain storms); and • Re-vegetate open areas as soon as possible.	• No erosion; • Preventative measures in place; • Immediate remediation in the event of erosion; and • Evidence of monitoring and reporting.	Daily monitoring in rainy season; Regular monitoring of the functionality and preparedness of preventative measures

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
point sources of erosion; iv. Construction on the slopes and in soft or erodable material will require erosion control measures and correct grassing methods; and v. All construction areas should be suitably top soiled and vegetated as soon as is possible after construction.			
B.3 Sedimentation of streams and rivers i. To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area; ii. All soil must be removed and stockpiled on the site; iii. The temporary storage of soil, inert spoil, fill etc. should be above the 20 year floodline or at least 20 m from the top of the bank of any drainage lines; iv. Stockpiles should not be higher than 2m to avoid compaction, and single handling is recommended; and v. Dust suppression is necessary for stockpiles older than a month – with either water or a biodegradable chemical binding agent.	• Rehabilitate riparian areas, • Prevent run-off and erosion into the river; and • Dust suppression.	• Functional artificial hydrology features (e.g. ponds); • Topsoil storage limited to short periods; and • Evidence of regular monitoring, reporting and corrective actions where needed.	During construction and on completion of construction; Monitoring of artificial hydrology features to continue in operational phase
B.4 Surface water pollution i. A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas; ii. Storage of potentially hazardous materials should be above any 100-year flood line, or as agreed with the ECO. These materials include fuel, oil, cement, bitumen etc.; iii. Surface water draining off contaminated areas containing oil and	• Prevent surface water pollution; • Immediately mitigate accidental pollution in the correct manner.	• Number of pollution occurrences; and • Evidence of monitoring and reporting.	Monitor continuously throughout construction; Monitor immediately after rain event.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
petrol would need to be channelled towards a sump which will separate these chemicals and oils; iv. Oil residue shall be treated with oil absorbent such as Drizit or similar and this material removed to an approved waste site; v. Concrete is to be mixed on mixing trays only, not on exposed soil. vi. Concrete and tar shall be mixed only in areas, which have been specially demarcated for this purpose; vii. Storm water shall not be allowed to flow through the batching area. Cement sediment shall be removed from time to time and disposed of in a manner as instructed by the Consulting Engineer; viii. All construction materials liable to spillage are to be stored in appropriate structures with impermeable flooring; ix. Portable septic toilets are to be provided and maintained for construction crews. Maintenance must include their removal without sewage spillage; x. Under no circumstances may ablutions occur outside of the provided facilities; xi. At all times care should be taken not to contaminate surface water resources; xii. No uncontrolled discharges from the construction crew camps to any surface water resources shall be permitted. Any discharge points need to be approved by the relevant authority; xiii. In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately; xiv. Where construction in close proximity to sewer lines is unavoidable then excavations must be done by hand while at all times ensuring			

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
that the soil beneath the sewer lines is not destabilised; and xv. Backfill must be compacted to form a stabilised and durable blanket; and the current load above the sewer lines must at no time be exceeded.			
B.5 Stormwater Management i. All surface runoff generated as a result of the activity must be managed (e.g. artificial wetlands / stormwater and flood retention ponds) prior to entering the riparian zone and should be retained outside of the demarcated buffer zone and subsequently released to simulate natural hydrological conditions. Refer to the sensitivity map (Figure 1) for the location of the riparian/wetland area and its associated buffer zone; ii. Stormwater, wherever possible, must be allowed to soak into the land in the area on which the water has been discharged. The stormwater system, especially the discharge points, must be inspected and eroded areas must be repaired if required; iii. Discharge points must be inspected for blockages of any kind; these must be removed timeously to ensure the efficient operation of the stormwater management system. No waste or refuse must be allowed to access the stormwater infrastructure; iv. Excessive quantities of silt laden runoff water must not be allowed to access the stormwater system. In the event that silt runoff occurs off the activity site, the cause of this must be investigated and suitable mitigation measures employed. This may include the vegetation of bare areas, installing flow diversion channels in consultation with an engineer, installing velocity reducing structures etc.; v. Where vegetation has been utilised as part of the stormwater	• Minimise pollution of soil, surface and ground water resources; • Minimise the potential loss of soil; and • Minimise the potential of flooding of the activity, or its neighbouring properties.	• No evidence of pollution at the discharge points; • No evidence of silt build-up at the discharge points; and • No complaints from I & AP's	As and when required; Monitor seasonally

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
management system, it is important to ensure that the vegetation is maintained and does not die, as this is essential for effective infiltration; and vi. For all maintenance undertaken, reference must be made to recommendations in the engineer's reports and or the approved stormwater management plan. All maintenance activities must be monitored to ensure that no environmental damage occurs. All damage must be mitigated immediately. Engineering interventions must enhance rather than further deteriorate the functions of the riparian and wetland area.			
B.6 Non-compliance and communication i. The contractor understands that failure to adhere to the requirements of the EcoMP will result in fines as stipulated in the EMP, over and above the costs incurred for any remediation required as a result of the specific non-compliance.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase	• Method statements	Prior to commencement
B.7 Project contract and programme ii. A copy of the storm water management plan must be available on site. The Contractor shall ensure that all the personnel on site, sub-contractors and their team, suppliers, etc. are familiar with and understand the specifications contained in the storm water management plan	• Contingencies for minimising negative impacts anticipated to occur during the construction phase • Ensure environmental awareness and formalise environmental responsibilities and implementation	• Contract records • Signed declaration pro forma's	-

Storm Water Management Guideline Plan

Table 10: Operational Phase (C)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
C.1 Mitigate increased storm water runoff volume and velocity i. Address increased runoff volumes at source; and ii Maintain the capacity of drainage systems and monitor its functionality on a regular basis.	Management organisation or home owners association to: • Monitor functionality of artificial wetlands/ detention and attenuation ponds; • Where maintenance are carried out e.g. work on pipelines, prevent on-site and off-site erosion; • Prevent sedimentation of surrounding surface water resources; and • Prevent litter and fertilisers from reaching the rivers.	• Permeable surfaces; • Evidence of monitoring and reporting on the functionality of drainage systems and artificial hydrology features; • Monitor the survival of vegetation essential to the functionality of drainage systems; and • Regular (monthly) clearing of llitter traps.	Continuous monitoring followed by remediation or corrective action where needed.
C. 2 Prevent erosion of footpaths, tracks and gravel roads i. Footpaths, tracks and gravel roads should be monitored for the onset of erosion; ii. Erosion preventative measures should be implemented upon the onset of erosion; and iii.Storm water management measures as discussed in this report should be incorporated into the final design.	• Prevent erosion; • Remediate unforeseen erosion (e.g. rain storms); • Re-vegetate open areas as soon as possible; • Prevent uncontrolled river crossings, encourage the use of crossings (bridge) that span the riparian area, • Control recreational activities along the riparian habitat and provide for limited recreational use (e.g. hiking trails,	• No erosion; • Preventative measures in place; • Immediate remediation in the event of erosion; • Evidence of monitoring and reporting; and • Control (e.g. signs and patroller) activities in riparian habitat.	Daily monitoring in rainy season; Regular monitoring of the functionality and preparedness of preventative measures

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
	mountain bike track)		
C.3 Sedimentation of streams and rivers i. To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area; ii. All topsoil must be removed and stockpiled on the site; iii. The temporary storage of topsoil, inert spoil, fill etc. should be above the 20 year floodline or at least 20 m from the top of the bank of any drainage lines; iv. Stockpiles should not be higher than 2m to avoid compaction, and single handling is recommended; and v. Dust suppression is necessary for stockpiles older than a month – with either water or a biodegradable chemical binding agent.	• Rehabilitate riparian areas, • Prevent run-off and erosion into the river; • Dust suppression	• Functional artificial hydrology features (e.g. ponds); • Topsoil storage limited to short periods; and • Evidence of regular monitoring, reporting and corrective actions where needed.	During construction and on completion of construction; Monitoring of artificial hydrology features to continue in operational phase.
C.4 Surface water pollution <u>General:</u> i. At all times care should be taken not to contaminate surface water resources; ii. Storage of potentially hazardous materials should be above the 100-year flood line, or as agreed with the ECO. These materials include fuel, oil, pesticides etc.;	• Prevent surface water pollution; and • Immediately mitigate accidental pollution in the correct manner	• Number of pollution occurrences; • Evidence of monitoring and reporting; and • River health assessment by aquatic specialist (every 4 years).	Monitor continuously; Monitor immediately after rain event.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
iii.Sufficient care must be taken when handling these materials for maintenance work, to prevent pollution of surface water resources; iv. In the case of pollution of any surface or groundwater, the Regional Representative of the Department of Water Affairs must be informed immediately; and v. Storm water management measures as artificial wetlands should be incorporated into the final design. <u>Contaminants related to fuel and oil spills</u> i. Maintenance vehicles are to be maintained in good working order, to reduce the probability of leakage of fuels and lubricants; ii. A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate maintenance chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas. It should be outside the 1: 100 year floodline; iii.Surface water draining off contaminated areas containing oil and petrol would need to be channelled towards a sump which will separate these chemicals and oils; and iv. Oil residue shall be treated with oil absorbent such as Drizit or similar and this material removed to an approved waste site. <u>Contamination related to pesticide use and fertilizer use</u> i. Apply pesticides / fertilizer at minimal levels in accordance with the label and targeted to specific problem; ii. Implement cultural controls such as proper plant selection, planting time and planting method to reduce susceptibility to insects, pests and diseases, thereby reducing the pesticide or fertiliser usage; iii.Implement mechanical and physical controls, where practical as an			

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
alternative to chemical application; iv. Do not apply pesticides during high temperatures, windy conditions or immediately prior to heavy rainfall or irrigation; v. Use, if possible, pesticides with a low half-life time and a low solubility; vi. Create buffer zones along drainage lines to prevent entering pesticides via spray drift or runoff.			

CHAPTER 3: SPECIES FOR REHABILITATION, RED AND ORANGE LIST SPECIES: RESCUE, PERSISTENCE AND MONITORING PLAN

1. Introduction

Although there were only two species of conservation concern confirmed on site (*Crinum bulbispernum* and *Hypoxis hemerocallidea),* the possibility of encountering other species of conservation concern during the construction phase do exist. Therefore the following section does include a large number of species purely from a cautionary approach. There are also several plant species that currently persist on site which are to be utilised for rehabilitation purposes.

Species of Conservation Concern: Rescue, Persistence and Monitoring Plan

Table 11: Planning Phase (A)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
A.3. Search and rescue plants of conservation concern i.Where construction will take place, rescue all species of conservation concern (*see Volume 2: Chapter 3*), as well as any other bulbous plant. Several water loving species e.g. *Typha capensis*, should be moved down or upstream from the section being worked on to appropriate holding facilities. Holding facilities should be created by excavating shallow holding ponds close to the current channel (but not in the channel itself), or, an onsite nursery should be established ii. Use local or relevant nursery to ensure survival of rescued plants in interim. iii.These plants should be replanted and seeded in affected areas to recreate habitat for pollinators and perform other vital functions; iv.Collect grass seed of relevant species; and v.Sequential construction strategy i.e. phasing the construction of the site and rehabilitating with the rescued plants immediately after each phase.	• Apply for the relevant permits for the removal of protected plants; • To recreate the natural environment with rescued plants; and • Collect and replant as many species as possible, to recreate habitat for pollinators in open spaces.	• Applicable permits; • Survival rate of rescued plants; • Open Space landscaping plan; and • Report back to Directorate of Nature Conservation on an annual basis.	Prior to the commencement of any construction activities; Report back to Directorate of Nature Conservation on an annual basis on the number of surviving plants and replanting success annually.
A.2 Limit faunal and floral disturbance on the site and provide for the habitat and life history needs of important pollinators i. Plan areas where construction will take place simultaneously in such a way, as to constantly have natural areas or already re-vegetated areas in between construction sites – this will allow flight paths for faunal species to scurry away from construction and towards no go areas; ii. Education of the construction staff about the value of wildlife and environmental sensitivity should occur; iii. The detention and attenuation ponds must incorporate areas of different depths	• Safeguard the sensitive faunal habitats; • Mitigate any disturbances to faunal species; • Plans to re-allocate faunal species encountered during construction; and • Appoint responsible person(s), with	• Planning of activities to exclude any movement and construction related activities within the dedicated Open spaces; • Permeable fencing around **all** sensitive	Prior to the commencement of construction

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
and levels as part of the landscape activity in order to create suitable breeding habitats for various species; iv. Construction activities should be carried out during the dry season (winter) when disturbance to faunal species will be minimal and the potential for erosion to occur as a result of rainfall events will be minimised;	applicable backgrounds, to implement and maintain the monitoring programme and subsequent reporting.	habitats, even where rehabilitation will take place. • Planned dates for surveys and reporting; • Report back to Directorate of Nature Conservation on an annual basis.	
A.4 Protect sensitive flora *in situ* i. The areas earmarked for exclusion from activity must be protected from disturbance; ii. Retain as large an area of contiguous open space in a natural state as possible; iii. All listed or proposed threatened or endangered plant species shall be protected and preserved in accordance with the Gauteng Nature Conservation Ordinance No 12 of 1983, Environmental Conservation Act, 1989 (Act No. 73 of 1989) and the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as well as any other applicable legislation;	• Minimise damage to indigenous flora; • Relocate plant species displaced by the construction, to suitable habitat within the dedicated open spaces; and • Remove as little natural vegetation as possible.	• Open space layout; and • Areas containing natural, undisturbed vegetation.	Report back to Directorate of Nature Conservation on an annual basis.

Species of Conservation Concern: Rescue, Persistence and Monitoring Plan

Table 12: Construction Phase (B)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.1 General: Fauna i. The areas earmarked for exclusion from activity must be fenced off (using permeable fencing) prior to construction phase to ensure that the developer and his contractors do not disturb the natural vegetation in these areas. Dumping of building rubble and other waste, storage of equipment or crew camps in these areas must be prevented; ii. Education of new construction staff about the value of wildlife and environmental sensitivity should occur as the need arises; iii. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed; iv. All listed or proposed threatened or endangered animal species shall be protected and preserved in accordance with the Gauteng Nature Conservation Ordinance No 12 of 1983, Environmental Conservation Act, 1989 (Act No. 73 of 1989) and the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as well as any other applicable legislation; v. If any fauna species are encountered / observed on site, they should not be disturbed in any way until the relevant specialist has been consulted. If a Red Data species is encountered the Environmental Control Officer should be informed immediately. Should the wildlife, Red Data or other, need to be caught and removed, the animals should be relocated to a conservation area in the vicinity; vi. A list of fauna specialists should be available should any wildlife be encountered on site and their possible removal implemented during construction and/or	• Limit faunal disturbance on the site and provide for the habitat and life history needs of important pollinators; • Relocation of sensitive and other encountered species; • No harm done to faunal species on the site; • Construction of wall and fencing must be permeable and sufficient to allow specie movement; and • Regular specialist assessment.	• No harm done to faunal species on the site; • Relocation records; • Specialist assessments; and • Report back to Directorate of Nature Conservation on an annual basis.	Monitor daily where construction is taking place; Weekly monitoring of the fencing safeguarding the dedicated open space and for he occurrence of any disturbances; and Report back annually.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
operation. Capture and removal of all fauna species must be done under the supervision of a relevant specialist (*see Volume 2: Chapter 3*); vii. The remaining wildlife on site should not be trapped or hunted by construction crew or inhabitants of the activity; viii. Construction activities should be carried out during the dry season (winter) when disturbance to faunal species will be minimal and the potential for erosion to occur as a result of rainfall events will be minimised; ix. Solid barriers such as walls should not be built on the periphery (or inside) of the study area. Barriers should incorporate into their design, fauna movement structures such as culverts or openings to encourage movement between the activity and adjacent areas. Please refer to the document "Guideline Document for the Design of a Boundary Wall that will allow Free Movement to Identified Fauna Species" (*see Volume 2: Appendix B*); x. During the construction phase noise should be kept to a minimum to reduce the impact of the activity on the site and the activity should be done in phases to allow faunal species to temporarily migrate into the conservation areas in the vicinity; xi. Lighting must be positioned in such a way so as not to disturb species of nocturnal herpetofauna currently dependant on the wetland habitat; xii. Faunal assessments in conjunction with the plant rescue operation must be conducted in the vegetation growing period from the first rains in October to the end of April and should be done by a qualified specialist as indicated by the "Guidelines for Biodiversity" supplied by the GDARD.			

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B. 2 Potential faunal species (*see Volume 2: Chapter 3*) i.**African Grass Owl (*Tyto capensis*) Vulnerable** • Maintain a buffer zone of at least 500m from identified roosting and nesting locations, with buffer zones increased to 1000m where possible • Do not allow annual burning of the wetlands associated with Grass Owls; • Ensure relevant land owners, managers and all others involved in the management of sites which support this species are aware of its presence and rarity, and appropriate methods of habitat management for its conservation; and • Rehabilitation and appropriate management practices such as no grazing areas in wetlands could increase Grass Owl habitat significantly.	• Annual surveys are to be conducted within the study area by a Grass Owl specialist to determine the continued presence of breeding pairs. Success to be measured if species continues with breeding; and • Lead Partners: Endangered Wildlife Trust, BirdLife South Africa, Avian Demographic Unit (Department of Statistical Science, University of Cape Town), South African National Biodiversity Institute.	• Survey data; • Success to be measured if species continues with breeding; and • Report back to Directorate of Nature Conservation on an annual basis.	Annually
ii **Half collared Kingfisher (*Alcedo semitorquata*) Near Threatened** • Maintain a buffer zone of 50m from the edge of the riparian zone; • Do not remove any large and or overhanging trees or indigenous vegetation from the river banks; and • Ensure relevant land owners, managers and all others involved in the management of the river and riverine areas which may support this species are aware of its presence and rarity, and appropriate methods of habitat management for its conservation.	• Annual surveys are to be conducted within the study area by a qualified zoologist who can assess avifauna to determine the continued presence of this species; and • Lead Partners: Endangered Wildlife Trust, BirdLife South Africa, Avian Demographic Unit (Department of Statistical Science, University of Cape Town), South African National Biodiversity Institute.	• Survey data; and • Success to be measured if species continue to persist along the river.	Annually

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
iv **Whitebellied Korhaan (*Eupodotis cafra*) Vulnerable** • It is unlikely for the Whitebellied Korhaan to be present in the study area; • However, precautionary mitigation measures should be considered in case a stray population has adapted to the environment; • Dense, tall grassland with bush clumps should be maintained within the open space areas to provide breeding, roosting and foraging habitat; • Burning of the grassland should not occur on a yearly basis and should burning be used it should not occur between October and January, the breeding season for the Whitebellied Korhaan; • Ensure relevant land owners, managers and all others involved in the management of sites which support this species are aware of its presence and rarity, and appropriate methods of habitat management for its conservation; and • Rehabilitation and appropriate management practices such as no grazing and / or landscaping (mowing and cutting) of the natural grassland areas should be used.	• Lead Partners: Endangered Wildlife Trust, BirdLife South Africa, Avian Demographic Unit (Department of Statistical Science, University of Cape Town), South African National Biodiversity Institute.	• Survey data	Annually
vi Bull frogs (*Pyxicephalus adspersus*) Vulnerable • The associated grassland should remain undisturbed and incorporated into an open space system which links the open areas to larger conservation areas; • Appropriate attenuation and detention facilities must be recreated which simulate typical floodplain features with large shallow, temporary, inundated areas. • During construction, the possibility exists for bull frogs (*Pyxicephalus adspersus)* to be dug up. Should this occur, the animal should be collected by the appropriate specialist and relocated to the nearest nature reserve or area within the activity with suitable habitat;	• Annual surveys are to be conducted within the study area by a qualified zoologist who is knowledgeable in bull frogs. The survey must asses which life stages are still utilising the site; and • Lead Partners: Endangered Wildlife Trust, South African National Biodiversity Institute.	• Survey data; and • Success to be measured if species continue to use the site for some life stages; with breeding.	lly.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
• If a bullfrog is dug up all similar features within the floodplain which will be affected by the channel reshaping process must be carefully dug up (up to 80cm) and the soil placed within new attenuation and detention facilities; • Stormwater attenuation features can also be used for the reintroduction of indigenous wildlife species such as amphibians; • Ensure relevant land owners, managers and all others involved in the management of sites which support this species are aware of its presence and rarity, and appropriate methods of habitat management for its conservation; • Rehabilitation and appropriate management practices for the wetland and attenuation pond areas, such as no grazing areas in wetlands could increase the likelihood of the persistence of the species within the area ;and • When Giant Bullfrogs habitat will be retained in an open space system of a activity situated within the urban edge, Giant Bullfrogs should be prevented from leaving the site at dangerous areas (busy road) and entering unsuitable habitat through the erection of an impermeable wall or appropriately designed fence prior to construction commencing. The wall/fence should be solid (i.e. without openings) below ground to the level of the foundations and for at least 20 cm above ground.			
vii Bush Baby (*Ceropithecus albogularis*), Least Concern (Possible Decline) • An open space system which includes ecological corridors between sensitive areas should be incorporated into the activity. This would also require that enough *Acacia karoo* trees are planted in close proximity within the floodplain in order to ensure arboreal connectivity; • If any bush babies are encountered / observed on site, they should not be disturbed in any way until the relevant specialist has been consulted. Should the wildlife need to be caught and removed, the animals should be relocated to a	• Annual surveys could be conducted within the study area by a qualified zoologist who can assess mammal species to determine the continued presence of this species; and • Lead Partners: Endangered Wildlife Trust, BirdLife South Africa, South African National Biodiversity Institute; Gauteng Department of	• Survey data; and • Success to be measured if species return and continue to persist within the open space system and possibly the landscaped areas.	Annually.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
conservation area in the vicinity and / or the open space system. • The remaining wildlife on site should not be trapped or hunted by construction crew or inhabitants of the activity. • Do not remove any large, indigenous trees within the open spaces system as these provide habitat for the bush baby; • The construction of the activity should be staggered to allow the species to relocate to undisturbed areas; • Landscaping should incorporate indigenous trees to provide new habitat for the bush babies which may return to the site. Inhabitants of the activity are encouraged to allow the bush babies to occupy their gardens but are not encouraged to feed them; and • Ensure relevant land owners, managers and all others involved in the management of the open space system which may support this species are aware of its presence and appropriate methods of habitat management for its conservation.	Agriculture and Rural Development (GDARD).		
viii **The South African Hedgehog *(Atelerix frontalis)* Least Concern -** • The likelihood for this species to be present on site is low • An open space system which includes ecological corridors between sensitive areas should be incorporated into the activity; • If any hedgehogs are encountered / observed on site, they should not be disturbed in any way until the relevant specialist has been consulted. It would be recommended for the hedgehogs to be incorporated into the tolerances of the inhabitants of the activity however should the wildlife need to be caught and removed, the animals should be relocated to a conservation area in the vicinity and / or the open space system;	• Lead Partners: Endangered Wildlife Trust, BirdLife South Africa, South African National Biodiversity Institute; Gauteng Department of Agriculture and Rural Development (GDARD).	• Survey data; and • Success to be measured if species return and continue to persist within the landscaped and open space areas.	

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
• Inhabitants of the activity are not encouraged to feed the hedgehogs; • The remaining wildlife on site should not be trapped or hunted by construction crew or inhabitants of the activity; • The construction of the activity should be staggered to allow the species to relocate to undisturbed areas; • Landscaping should incorporate indigenous trees to provide new habitat for the bush babies which may return to the site; and • Ensure relevant land owners, managers and all others involved in the management of the open space system which may support this species are aware of its presence and appropriate methods of habitat management for its conservation.			

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B 3 General: Flora i. The areas earmarked for exclusion from activity must be fenced off during the construction as per B1 above; ii. Plants of conservation concern must be removed prior to construction within an area; iii. Removed plants should be held in the on-site nursery for safe keeping until such time as it can be replanted in the natural landscaping; iv. When conservation important species are relocated to the dedicated open spaces, only replant in areas where disturbance took place; v. A list of plant species should be kept on site as a checklist for plants to be dug out during construction; vi. Education of new construction staff about the value of the natural environment; vii. Landscaping associated with the activity should include forage and host plants required by pollinators and other fauna. These would include various grasses and forbs and *Acacia* trees which occur naturally in the area. viii. Annual assessment of the vegetation and persistence of the conservation concern plant species within dedicated open spaces, by a suitably qualified specialist	• Protect the dedicated open spaces; • Environmental awareness training to staff, specifically new staff; • Relocate plants of conservation concern successfully, without causing damage to the area that the plant is being relocated to; • Monitor survival rates; and • Specialist assessment of the vegetation in dedicated open spaces.	• Applicable permits; • Survival rate of rescued plants in nursery and in rehabilitated and replanted areas; • Plant check list; • Records of plants collected and relocated, including new locality; • Specialist assessments; and • Report back to Directorate of Nature Conservation on an annual basis.	Daily monitoring of plants where construction is taken place; Weekly monitoring of plant survival rates; Weekly monitoring of the fencing safeguarding the dedicated open space and for he occurrence of any disturbances; Annual specialist assessments; and Report back to Directorate of Nature Conservation on an annual basis.
B.4 Specific floral species i. **Gifbol (*Hypoxis hemerocallidea)* Declining** ii. **Poison Bulb *(Boophane disticha)*** iii. ***Gladiulus* spp.**	• No removals of these plant, except to protect from construction; • Replanting to suitable habitats; and • Flag the existence of conservation concern species (Red Data) on the	• Applicable permits; • Replanted locality; • Reporting on new localities to the directorate of Nature	Weekly monitoring of plants in nursery and persistence in the natural open spaces; Annual monitoring of species persistence

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
iv. ***Aloe transvaalensis*** v. **Graslelie (*Crinum bulbispernum / graminicola)*** vi. **Pineapple flower *(Eucomis autumnalis subsp. clavata)*** vii. **Red paintbrush *(Scadoxus punices)*** •Remove the above plants prior to construction; and •Replant in areas dedicated as open spaces.	site and notify GDARD.	Conservation; • Specialist assessments during flowering period of plants on the Gauteng Red Data plant list; and • Survival rate.	by a specialist

Species of Conservation Concern: Rescue, Persistence and Monitoring Plan

Table 13: Operational Phase (C)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
C.1 Maintain the natural open spaces i. Depending on the protection status of the open spaces (e.g. conservancy / protected environment) a management entity must be appointed to manage, safeguard and monitor the conservation open spaces; ii. The open space should be clearly demarcated and prevent any edge effect; iii. If grazing is allowed, ensure that overgrazing does not take place through applying appropriate stocking rates according to the areas carrying capacity; iv. Access must be controlled and detrimental activities such as quad bikes prohibited; v. During the operational phase, the use of natural open spaces should be regulated to prevent degradation to the system. This may involve fencing off the area and using it as a nature conservation area. No pollution or dumping should be allowed; vi. An environmental notice board or centre could be incorporated into the design of the open space system. It should ideally be located before people gain entrance into the open space system and should inform them of the value of wildlife and environmental sensitivity; vii. Domestic animals (cats and dogs) must be kept on leashes when walked within open spaces. They may not harass faunal species or destroy vegetation. viii. A suitably qualified floral specialist should assess the success of species relocated annually for the first three years	• Appoint responsible person(s), with applicable backgrounds, to implement and maintain the monitoring programme and subsequent reporting; • Continuous monitoring of the various habitats within the open spaces; • Corrective action taken where needed; • If grazing will be allowed, monitor the grassland for signs of overgrazing. Grazing should only be allowed as per specialist recommendations. • Regular assessment of the aquatic health by a suitably qualified specialist; • Prevent edge effects that impact negatively on the open spaces from happening on adjacent land; • Report environmental crimes on adjacent land.	• Monitor perimeter fences and litter traps within storm water systems; • Specialist assessments on the functionality of the habitats and rehabilitation success; and • Weekly checklists; • Rules and regulations regarding the recreational use of the open space known or accessible to inhabitants and visitors; and • Media attention with regards to the contribution to conservation.	Weekly monitoring of fences and the litter trap; Annual specialist report; and Annual report to the Directorate of Nature Conservation.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
	• Assessment of species relocation; • Monitor species of conservation concern; • Encourage return of faunal species by maintaining habitats; • No fauna mortalities e.g. road kills; and • Inform the GDARD of the occurrence of species of conservation concern and monitor their continuous use of the site.	• Regular monitoring and reporting of relocated species' survival rate; • Specialist assessments on the functionality of the habitats and species occurrences; • Number of residents that partake in the "fauna and flora watch".	Annual specialist report; and Annual report to the Directorate of Nature Conservation

CHAPTER 4: CONSERVATION OPEN SPACE: FIRE MANAGEMENT PLAN;

1. Introduction

Fire plays an important role in the maintenance of grassland, particularly with the control of certain woody invader species. In fact, most of the more desirable sourveld grasses (such as red grass or *Themeda triandra*) are fire climax grasses that tend to decline in the absence of fire. In the drier sweetveld grassland areas of South Africa, the absence of periodic intense fires for many years is thought to be at least partially responsible for the bush encroachment problems experienced in many of these areas. Burning of veld has often been condemned as being a major cause of veld degradation and consequent soil erosion. However, it seems that judicial use of fire, plays an important role in the maintenance of veld.

Fire management also entails the protection of people and property against wildfires. In particular, the controlled burning of the conservation open space could impose risks to adjacent properties and should be addressed within the fire management plan.

2. Rationale of burning conservation open space

Fire has long been used in the management of vegetation and has been accepted in rangeland management during the early 1950's (Bond 2003). Fire is, in general, regarded as an integral ecological component in the maintenance and management of grasslands and savanna regions of the world. Many plants actually need fires to reproduce and ensure their long-term survival. The challenge today is to use fire in a fragmented and highly modified modern landscape to ensure the survival of all plant and animal species. Under natural conditions, lightning is considered the primary source of fire in these regions, especially the highveld grasslands of South Africa.

The most important use of fire for conservation management is to maintain viable populations of all plant and animal species present. Other objectives may include: reduction of fuel load to prevent unmanageable wildfires; control of invasive alien plants; promotion of desirable plants; or safeguarding property and infrastructure.

The aim of such a fire management plan is to simulate natural fires to maintain the grassland within the conservation open space

However, fire should be prohibited from young or recent growth outside of the main growing season, for example during the late summer, autumn or winter when the available biomass appears to be low. In addition, fire is seldom successful in removing woody encroachment, such as with many of the indigenous *Acacia* species, although it will control the height of these species.

It is generally determined that burns should follow a four year cycle. However, it could vary between annual burns to every four years depending on outcomes of a monitoring programme or regular assessments. The burning regime (e.g. frequency, timing or intensity of a fire) will depend on the plant biomass and will dictate whether

burning is necessary or not. The ideal situation is for natural fires to originate at random through ignition caused by lightning strikes. Fires caused by lightning strikes create natural mosaics within grassland resulting in patches of grassland that differs both in height and composition. However, human activity, fences to control livestock and infrastructure have fragmented the regional landscape, inhibiting effective natural mosaic burns. A fire management plan is thus important for sustainable ecosystem service provision.

3. Limitations

This fire management plan is not a concrete document and should be adopted as a guideline management tool. It is based on principles underpinned to improve or facilitate proper veld management practice. It is thus dynamic and could change depending on environmental conditions (e.g. drought) and the management practices applied. Any fire management plan is in general a science, based on current and past trajectories of a number of parameters such as successional patterns and species composition. This fire management plan can thus not dictate the frequency of controlled burning, as for example, consecutive dry years will delay burning, whereas good growing years will probably accelerate the next burning. The timing of fire will thus have to be assessed continuously by a qualified specialist. This assessment should be done every 4-5 years.

Supporting information on legislation and fire management techniques are listed in Volume 2: Chapter 4.

4. References:

Bothma, J.P. (1996). Game ranch management. Van Schaik. Pretoria

National Veld and Forest Fire Act (No. 101 of 1998)

Trollope, W.S.W., Trollope, L. & Bosch, O.J.H. (1990). Veld and pasture terminology in South Africa. Journal Grassland Society South Africa 7(1): 52 – 61

Fire Management Plan

Table 14: Pre-construction / Planning (A)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
A.1 Implement fire management plan i. Plan firebreaks and tracer lines; and ii. Plan mowing and trimming areas around the proposed areas of construction (*see Volume 2; Chapter 4*).	• Commitment of management to appoint and train fire fighting teams; • Delineation of conservation open space where controlled burns will be undertaken in future; and • Provide means of mass communication (e.g. alarm) as well as with authorities and emergency services (e.g. cell phones).	• Appointment of fire management team; • Layout plan, indicating conservation open space; and • List of contact details for emergency services made available and accessible throughout the activity site.	To commence prior to construction.
A.2 Prevent wildfires i. Prevent wildfires that may originate in adjacent areas.	• Establish and train a fire management team; • Provide necessary equipment; • Restrict access to the site; and • Record / map fires that do occur.	• Trained staff; • Record of occurred fires; and • Access control to the site.	To commence as soon as possible and continue until construction is finalised.
A.3 Safeguarding of trees ii. No wood (of indigenous trees) is to be collected, chopped or felled for fires from the site, specially sensitive areas within the site and any surrounding natural vegetation.	• Restrict access to the site.	• Access control.	To commence as soon as possible and continue until construction is finalised.

Fire Management Plan

Table 15: Construction & Rehabilitation Phase (B)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.1 Burning of Conservation Open Space i. As a general rule, all lightning-induced fires should be regarded as natural and must not be extinguished unless it endangers human lives, livestock, and infrastructure or if the conservation management plan dictates otherwise; and ii. No accidental / unplanned fires must be allowed to burn the conservation open space or wetlands	• Fire breaks to prevent unplanned and unnatural fires from entering the conservation open space; • Mowing and trimming around construction; • Restrict access to the site; and • Record / map fires that do occur.	• Trained and available staff and necessary equipment; • Record of occurred fires; • Firebreaks; and • Access control to the site.	Continuous until construction is complete.
B.2 Control wild fires that originate within natural vegetation i. Prevent accidental and lightning induced fires to reach construction areas and complete structures.	• Trained staff with the necessary resources.	• Firebreaks, and • Mowing and trimming.	Monitor every day.
B.3 Prevent wildfires i. No wood (of indigenous trees) is to be collected, chopped or felled from the site, specially sensitive areas within the site and any surrounding natural vegetation; ii. No open fires shall be allowed on site under any circumstances, fires will only be permitted in an adequate facility within the crew camp, Forest Act, 1984 (Act No. 122 of 1984). Fires within the designated areas must be small in scale so as to prevent excessive smoke being released into the air; and iii. Contractors must provide and maintain a method statement for fires; clearly indicating where and for what fires will be utilised plus details of the fuel to be used.	• Restrict access to the site; • Provide adequate cooking facilities within the construction camps; • Minimise risk of wildfires.	• Access control; • No accidental fires originating from construction camps or workforce; • No claims from landowners for damages due to fires • Records of occurred fires.	To commence as soon as possible and continue until construction is finalised.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.4 Non-compliance and communication i. The contractor understands that failure to adhere to the requirements of the EcoMp and EMP will result in fines as stipulated in the EMP, over and above the costs incurred for any remediation required as a result of the specific non-compliance.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase.	• Method statements.	Prior to commencement

Fire Management Plan

Table 16: Operational Phase (C)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
C.1 Implement fire management plan for the Conservation Open Space i. Suitable qualified specialist to assess veld condition and advise on time of burning (every 4 years); ii. Fire management including tracer lines, fire breaks and mowing and trimming; and iii. Allow fires in open spaces ignited by lightning, but prevent from spreading into residential areas.	• Landowners to include an Environmental portfolio on the owners association, with amongst others, the fire management of the conservation open space assigned to the portfolio; • Manage fire to maintain grassland open spaces; • Prevent fire from spreading to residential areas; • Fire response team; and • A 12 month fire implementation strategy and sequence of fire events (*see Volume 2; Chapter 4 Table 11*).	• Appointment of fire management team that comprise of estate staff as well as residents; • Layout plan, indicating conservation open space; • Fire response team; • Emergency service number available at management offices and public areas; and • Specialist assessment of grass biomass to inform burning frequency.	Continuous Monitor daily, especially during dry months; Specialist report, at least once in 4 years (could be coupled with an assessment of the persistence of the ecological value of the open space).
C. 2 Prevent wildfires i. Prevent wildfires that may originate in the open spaces from spreading to residential areas; and	• Establish and train a fire management team; • Minimise risk of veld fires; • Minimise destruction of natural fauna and flora; and • Record / map fires that do occur.	• No veld fires allowed to damage private property; • No claims from landowners for damages due to fire; and • Record of occurred fires.	Continuous monitoring.

CHAPTER 5: ALIEN PLANT MONITORING AND ERADICATION PLAN

1. Introduction

Alien plants cover close to 10 million hectares of South African land, approximately 8% of the country (Agricultural Research Commission, 2001). Alien tree species in particular utilize increased amounts of water compared to indigenous trees. Alien plant species invade riparian and seep zones in particular, with disastrous impacts on water resources, especially within catchments regions. Invader and weed species must be controlled to prevent further infestation and it is recommended that all individuals of the invader species be removed and eradicated (Henderson, 2001). Combating alien infestation is a dynamic process and needs to be reviewed periodically. This document serves to aid in the identification and eradication of the most common invasive species along the Montana Spruit. The approaches for integrated control depend on the species under-consideration, as the efficiency of methods is species specific.

2. Legal Framework

The amended Regulations (Regulation 15) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) identifies three categories of problem plants:

1. Category 1 plants may not occur on any land other than a biological control reserve and must be controlled or eradicated. Therefore, no person shall establish, plant, maintain, propagate or sell/import any category 1 plant species;
2. Category 2 plants are plants with commercial application and may only be cultivated in demarcated areas (such as biological control reserves) otherwise they must be controlled; and
3. Category 3 plants are ornamentally used plants and may no longer be planted, except those species already in existence at the time of the commencement of the regulations (30 March 2001), unless they occur within 30 m of a 1:50 year flood line and must be prevented from spreading.

3. Control Phases

An alien control program should include three phases as listed in Table 17. Each stage is equally important in removing and controlling the spread of alien plants. The aim of control is to reach a point where, ideally, the plants concerned do no longer occur in that particular area or, at least, where the plants can no longer grow, produce viable seeds or spores, coppice, sprout or produce root suckers, reproduce vegetatively, propagate themselves in any other way, or spread into other areas. If this is not possible, the plants have to be contained and their multiplication limited as far as possible. In general, the situation should be monitored during spring, mid summer and autumn each year to avoid alien plant re-infestation, spread and densification and to thereby avoid increased control costs.

Table 17: Control phases

Phase	Actions
1. Initial Control	Drastic reduction of the existing populations
2. Follow-up Control	Control of seedlings, root suckers and coppice re-growth
3. Maintenance Control	Sustain low alien plant numbers/density with low annual control costs. At this phase, alien plants are no longer considered a problem. However, regular monitoring to ensure that no new infestation take place is essential.

In general, the situation should be monitored during spring, mid summer and autumn each year to avoid alien plant re-infestation, spread and densification and to thereby avoid increased control costs.

4. Current Infestation

There are numerous invasive species colonizing the floodplain and adjacent terrestrial areas along the Montana Spruit system. The problematic species that occur on the site, a short identification guide, as well as the areas where they need to be controlled is listed in Volume 2, Chapter 5. The majority of the images are sourced from Henderson (2000) and supplemented by various SEF photographic records.

5. Alien Plant Eradication and Monitoring Plan

The Alien Plant Eradication and Monitoring Plan focus on the current infestation within in the riparian areas, planned conservation open space, areas earmarked for rehabilitation (riparian area and floodplain).

It is recommended that any alien plants that occur where construction is set to take place, be removed as part of the construction activities. The invasive plants that occur within the riparian areas should be removed as part of the rehabilitation and re-vegetation of these areas. Planning should include measures for these as well as continuous monitoring of possible re-emergence during construction and operation.

9. References

Agricultural Research Commission, (2001): Plant Protection Research Institute.

Bromilow, C, (2001): Problem Plants of Southern Africa. Briza Publications, Pretoria.

Calder, I & Dye, P. (2001): Hydrological Impacts of Invasive Alien Plants. Land Use and Water Resources Research, United Kingdom.

Henderson, L. (2001): Alien Invasive Plants. Plant Protection research Institute, Agricultural Research Council, South Africa.

Macdonald, I & Jarman, M. (1985): Invasive Alien Plants in the Terrestrial Ecosystems of Natal, South Africa. South African National Scientific Programmes Report No.118.

Working for Water Programme, (2007): Management Options. Department of Water Affairs and Forestry (DWAF). [http://www.dwaf.gov.za/wfw/Control/]. 2007.08.29

Alien Plant Eradication and Monitoring Plan

Table 18: Pre-Construction / Planning (A)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
A.1 Eradicate alien plants and monitor-emergence i. Plan sequence of alien plant removal; ii. Establish alien working group responsible for removal and continuous monitoring; iii. Eradicate alien invasive plants from the site and ensure that new infestations are removed as soon as they become apparent.	• Clear the activity site of alien invasive plant;.	• Appointment of alien plant working group / assign this duty to specific staff; • Ensure that contractors can identify the relevant plants and are aware of the removal procedures; • Acquire the necessary equipment for removal and control; and • Sequence of areas to be cleared of invasive plants as construction progresses.	To commence prior to construction
A.2 Eradicate alien invasive plants as part of the rehabilitation of the riverbanks i. Remove alien vegetation and rehabilitate the riparian area (see riparian management plan and rehabilitation guidelines) and re-vegetate.	• Clear the riparian area of alien invasive plants via initial control, while not causing damage to the indigenous plants; • Monitor re-emergence of unwanted species; • Apply follow-up treatment; and • Re-vegetate with indigenous species, naturally occurring within the riparian area	• No alien invasive plants within the riparian area; • No new infestations in rehabilitated areas; • No damage to indigenous plant species occurring within the riparian zone (e.g. accidental application of herbicide caused by wind); • Evidence of monthly monitoring and reporting; and	Initial control as part of rehabilitation; Monthly monitoring and follow-up control where needed for the duration of construction.

		• Monitoring leads to follow-up control.	

Alien Plant Eradication and Monitoring Plan

Table 19: Construction (B)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.2 Eradicate alien invasive plants i. Only trained staff should apply herbicides to alien invasive plants only. Take care not to apply foliar spray to any other vegetation than the targeted invasive plant specie; and ii. No earth moving or soil disturbances are allowed in areas which does not form part of the construction footprint . Any disturbances could lead to the area being colonised by alien invasive plants which will lead to the degradation of ecological processes.	• Monitor re-emergence of unwanted species; • Apply follow-up treatment; and • Do not disturb the natural vegetation composition.	• No alien invasive plants within the natural / conservation open spaces; • No new infestations; • No damage to the natural vegetation composition; • Evidence of monthly monitoring and reporting; and • Monitoring leads to follow-up control where needed.	Initial control as part of demarcation of the natural / conservation open spaces; and Monthly monitoring and follow-up control where needed for the duration of construction

Alien Plant Eradication and Monitoring Plan

Table 20: Operational Phase (C)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
C.1 Continuous monitoring of open spaces for re-emergence or new infestations i. New infestations or re-emergence must be controlled immediately;	• Stop re-infestation of aliens within or adjacent to Montana Spruit Floodplain area	• Role of alien work group is handed over to the home owners association and entity responsible for the conservation open spaces; • No alien invasive plants within the natural open spaces; • No new infestations in rehabilitated areas; • Evidence of monthly monitoring and reporting; and • Monitoring leads to follow-up control where needed.	Monthly monitoring and follow-up control where needed on a continuous basis.

CHAPTER 6: ECOLOGICAL PROCESSES MANAGEMENT PLAN

The main aims of this chapter are to:

- Facilitate natural ecological processes;
- Provide for the habitat and life history needs and important pollinators; and
- Minimise artificial edge effects.

The above forms an integral part of the various management plans within this EcoMP. However, to ensure these issues are addressed, an Ecological Processes Management Plan was developed. This Ecological Processes Management Plan is a pivotal part of the EcoMP. It helps to signal potential problems that may result from management actions or ecological processes outside the control of management. As a result of regular monitoring, it will further allow for prompt implementation of effective corrective measures. The main objectives of ecological monitoring are:

i. To assess the changes in environmental conditions;
ii. To monitor the effective implementation of the ecological management plans and mitigation measures; and
iii. Warn of significant deteriorations in environmental quality for further preventative action.

Based on the results of various ecological assessments, it was determined that the wetlands, drainage lines, riparian habitat and grasslands represent the habitat units warranting conservation efforts. Therefore, conservation management objectives should primarily be focused on these habitats. Major conservation initiatives which should be implemented in order to enhance ecological processes include amongst others:

- Removal of alien vegetation (see Chapter 5: Alien Plant Eradication and Monitoring Plan);
- Monitor the persistence fauna and flora species;
- Eliminate detrimental activities and edge effects;
- Manage fires;
- Controlled access; and
- Rehabilitate degraded sensitive areas to regain its functionality, thereby encouraging the return of faunal species to these habitats.

Ecological Processes Management Plan

Table 24: Planning Phase (A)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
A.1 Site demarcation and activity i. The riparian zone and its associated buffer zone must be clearly demarcated and fenced before the contractors set up their crew camps or begin construction. Builder's fence (Mesh fence) is considered preferable. The methodology statement for the fence construction should be submitted to an approved by the ECO; ii. "NO ENTRY" signs must be strategically placed along the riparian area and its associated buffer zone which is in close proximity to access routes. Refer to the sensitivity map (Figure 1) for the location of the riparian area and its associated buffer zone; and iii. Plan stockpile areas, equipment storage and other related activities well away from the natural open spaces, to avoid any edge effects.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase; and • Minimise artificial edge effects.	• Demarcated areas and buffer zones around them.	Prior to commencement
A.2 Planning for biodiversity i. Design and implement boundary walls or fences to allow for the continuous movement of species on the site as well as to and thro adjacent land (*see Volume 2: Appendix B);* ii. Plan construction activities to ideally be carried out during the dry season (winter) when disturbance to faunal species will be minimal, relocation of plants are more successful and the potential for erosion to occur as a result of rainfall events will be minimised; iii. Landscaping associated with the activity should include forage and host plants required by pollinators and other fauna. These would include various grasses, plants and *Acacia* trees which occur naturally in the area. The landscaping plan must include the plant species rescued prior to construction; iv. Land neighbouring the activity, should it also be developed, should be encouraged to make use of the same fauna sensitive walling as used for this	• Facilitate natural ecological processes; • Provide for the habitat and life history needs and important pollinators; • Minimise artificial edge effects; • Plan meetings with adjacent activities and owners of vacant land in order to encourage the linkages of open spaces and mitigation measures to benefit the ecological processes taking place within the area; and • Ensure the persistence of	• Landscaping plan; • Site Layout; • Meetings with adjacent landowners; and • Ecologically sound activity and sequential construction strategy.	Prior to construction

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
activity; and v. Neighbouring developments must incorporate open space systems which link to the current open spaces systems within the area. Any sensitive areas such as wetlands and rivers must be rehabilitated if necessary and buffered by a 32m and 50m buffer zone respectively.	biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats		
A.3 Non-compliance and communication i. The contractor understands that failure to adhere to the requirements of the EcoMp and EMP will result in fines as stipulated in the EMP, over and above the costs incurred for any remediation required as a result of the specific non-compliance.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase	• Method statements	Prior to commencement

Ecological Processes Management Plan

Table 25: Construction Phase B

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.1 Site demarcation and activity i.The riparian zone and its associated buffer zone, as well as the dedicated natural open space areas, must be clearly demarcated and fenced before the contractors set up their crew camps or begin construction (as per A1 above).	• Contingencies for minimising negative impacts anticipated to occur during the construction phase	• Demarcated areas; and • Monitor the perimeter and open spaces for any trespassing or edge effects.	Prior to commencement
B.2 Fire management () i.Preparations for fire breaks and block burns as per Chapter 4: Fire Management Plan; ii.Accumulated information inform the burning regime and fire management of the following fire cycle and provides for a detailed history of fire-driven events Climate data (e.g. rainfall) should be noted and incorporated to the fire report. The burning regime (frequency, timing or intensity) should be changed/altered if veld deterioration or marked differences in species composition was noted. Thus monitoring of the compositional status (Decreaser vs. Increaser) and succession of the grassland will dictate current fire management practices. Also, the occurrence or decline of sensitive plant taxa provides information regarding the ecological health of a system; and iii.Monitor adjacent land for the occurrence of veld fires and prevent from entering the Montana Spruit area	• Preparations for fire breaks and block burns; • Facilitate natural ecological processes; • Provide for the habitat and life history needs and important pollinators; • Minimise artificial edge effects; • Monitor veld condition to assess the success of burning programme; and • Ensure the persistence of biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats	• Fire breaks and block burns; • Mowing ad trimming as needed; • Record all fire sequence events; • Monitor the occurrence or decline of sensitive plant as it provides information regarding the ecological health of a system.	Assessment of veld condition to inform burning every 4 years; Annual assessment of the ecological processes and species as per Chapter 3: Rescue Persistence and Monitoring Plan

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B.3 Alien plant eradication i. Eradicate alien invasive plants from the activity site as per(Chapter 5: Alien Plant Eradication and Monitoring Plan) ii. Where quarries are rehabilitated into attenuation ponds, ensure that no alien infestations occur and re-vegetate with indigenous plant species suited to wetlands; iii. Take care not to apply foliar spray to any other vegetation than the targeted invasive plant specie Re-vegetate as soon as possible to ensure that the spread and germination of alien invasive plant seeds are suppressed; and iv. Re-vegetate as soon as possible to ensure that the spread and germination of alien invasive plant seeds are suppressed.	• Eradicate alien invasive plants from the site; • Continuously monitor for re-infestations and take corrective action; • Facilitate natural ecological processes; • Provide for the habitat and life history needs and important pollinators; • Minimise artificial edge effects; and • Ensure the persistence of biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats	• Monitoring sheet; • No new alien infestations.	Annual monitoring in sensitive habitats.
B.4 Conservation monitoring of key species i.Ensure the persistence of biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats; ii.Continuous rescue and relocation of species displaced by the construction (Chapter 3: Rescue Persistence and Monitoring Plan); and iii.Assess the changes in environmental conditions.	• Assess the occurrence or decline of sensitive plant taxa, this provides information regarding the ecological health of a system;	• Annual specialist assessment ; • Report back to Directorate of Nature Conservation on an annual basis	Annual

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
B. 5 Conservation of sensitive habitats i. Wetlands • Demarcate as sensitive areas and prevent any activity from encroaching on sensitive areas. The methodology statement for the fence construction should be submitted to an approved by the ECO. Refer to the sensitivity map (Figure 1) for the location of the riparian area and its associated buffer zone; • Prevent littering, dumping, the unauthorized removal of plants and animals; • Monitor the Ecological State of wetlands within the study area every year; • All weed species should be removed from the vlei grassland areas. Grassland areas should be inspected annually in order to remove any newly established specimens of weeds (Chapter 5: Alien Plant Eradication and Monitoring Plan); • No grazing by domesticated stock should be allowed within the vlei grasslands; and ii. Riparian habitat • Demarcate as sensitive areas and prevent any activity from encroaching on the riparian area, except necessary rehabilitation. The methodology statement for the fence construction should be submitted to an approved by the ECO; • Riparian areas should be inspected annually for alien vegetation in order to remove any newly established specimens of weeds(Chapter 5: Alien Plant Eradication and Monitoring Plan); • Comply with the Riparian Management and Rehabilitation Plan (Chapter 1: Riparian Management and Rehabilitation Plan). • Prevent littering, dumping and the removal of plants and animals (Chapter 3: Rescue Persistence and Monitoring Plan); • Prevent wildfires, manage fire as a result of lightning strike and assess veld condition regularly to inform burning programme in order to maintain grassland (Chapter 4: Fire Management Plan);	• Ensure the persistence of biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats; • Facilitate natural ecological processes; • Provide for the habitat and life history needs and important pollinators; • Minimise artificial edge effects from construction; • The open space system as well as the corridors linking these areas and other natural areas must be assessed for fauna and flora on a yearly basis to determine the persistence of Red Data species and ensure the vegetation is maintaining its functionality as an ecological system with regard to fauna species; • Assessments must be conducted in the vegetation growing period from the first rains in October to the end of April and should be done by a qualified specialist as indicated by the Guidelines for Biodiversity (2009) supplied by the GDARD; and	• Report back to Directorate of Nature Conservation on an annual basis	Daily monitoring on site; Annual assessment by wetland specialist; Annual reporting to Directorate of Nature Conservation.

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
• Grassland areas should be inspected annually for alien vegetation in order to remove any newly established weeds (Chapter 5: Alien Plant Eradication and Monitoring Plan); •	• All specialist reports must be provided to the GDARD (Nature Conservation) on a yearly basis.		

Ecological Processes Management Plan

Table 26: Operation Phase (C)

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
i. During the operational phase, the use of natural open spaces should be regulated to prevent degradation to the system. This may involve fencing off the area and using it as a nature conservation area. No pollution or dumping should be allowed; ii. An environmental notice board or centre could be incorporated into the design of the open space system. It should ideally be located before people gain entrance into the open space system and should inform them of the value of wildlife and environmental sensitivity; iii. The activity could incorporate a "Fauna and Flora Watching" scheme into the operational phase. A check list of species which could be present on site should be produced and made available to residents. Residents, who wish to partake, can obtain a list and mark off identified species. These lists can be collected and compiled into the ecological assessment on a yearly basis; iv. The developer should not cause damage or disturbances on neighbouring land; and	• Establish a management entity for the dedicated open spaces and endeavour to involve the inhabitants of the local ; • Embark on environmental awareness training; and • Plan meetings with adjacent activities and owners of vacant land in order to encourage the linkages of open spaces and mitigation measures to benefit the ecological processes taking place within the area.	• Demarcated areas; • Monitor the perimeter and the open spaces for trespassing and unauthorised activities; • Increased environmental awareness of residents and participation in environmental matters concerning the area	Continuous monitoring and annual reporting
C.2 Fire management i. Comply with Chapter 4: Fire Management Plan ii. Accumulated information inform the burning regime and fire management of the following fire cycle and provides for a detailed history of fire-driven events Climate data (e.g. rainfall) should be noted and incorporated to the fire report The burning regime (frequency, timing or intensity) should be changed/altered if veld deterioration or marked differences in species composition was noted Thus monitoring of the compositional status (Decreaser vs. Increaser) and succession of the grassland will dictate current fire management practices Also,	• Facilitate natural ecological processes; • Provide for the habitat and life history needs and important pollinators; • Minimise artificial edge effects; • Monitor veld condition to assess the success of burning programme; and	• Record all fire sequence events; and • Monitor the occurrence or decline of sensitive plant as it provides information regarding the ecological health of	Assessment of veld condition to inform burning every 4 years; Annual assessment of the ecological processes and species as per Chapter 3: Rescue Persistence and

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
the occurrence or decline of sensitive plant taxa provides information regarding the ecological health of a system; and iii. Monitor adjacent land for the occurrence of veld fires and prevent from entering the Montana Spruit.	• Ensure the persistence of biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats.	a system.	Monitoring Plan
C.3 Alien plant eradication i. Comply with Chapter 5: Alien Plant Eradication and Monitoring Plan ii. Where rehabilitation took place, ensure that no alien infestations occur; and iii. Where operational maintenance took place, monitor or the emergence of alien plants in disturbed soil.	• Prohibit alien invasive plants from the site; and • Monitor the re-emergence of infestations.	• No alien invasive species present on the site; and • Contractual obligation to not plant alien invasive species.	Annual monitoring in, especially in sensitive habitats.
C.4 Conservation monitoring of key species i.Comply with Chapter 3: Rescue Persistence and Monitoring Plan ii.The activity could incorporate a "Fauna and Flora Watching" scheme into the operational phase. A check list of species which could be present on site should be produced and made available to residents. Residents, who wish to partake, can obtain a list and mark off identified species. These lists can be collected and compiled into the fauna assessment on a yearly basis; iii.Ensure the persistence of biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats; and iv.Assess the changes in environmental conditions.	• Assess the occurrence or decline of sensitive plant taxa, this provides information regarding the ecological health of a system.	• Persistence of species; • Annual specialist assessment ; and • Report back to Directorate of Nature Conservation on an annual basis.	Annual
C. 5 Conservation of sensitive habitats i. Wetlands • As per B5i) above; • Protect vlei grasslands from fire by instituting annual fire breaks;	• Ensure the persistence of biodiversity on the site and encourage the use of the site by additional species through maintaining suitable habitats; • Facilitate natural ecological	• Persistence of species in habitats; • Report back to Directorate of Nature Conservation on an annual basis	Daily monitoring on site; Assessment by wetland specialist every two years;

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	FREQUENCY OF ACTION
• Controlled burning of vlei grasslands should only occur after consultation with a wetland specialist and only after the first spring rains (Maximum every four years). • Wetland areas should be inspected annually in order to remove any newly established specimens of weeds (Chapter 5: Alien Plant Eradication and Monitoring Plan); • No grazing by domesticated stock should be allowed within the vlei grasslands; and ii. Riparian habitat • As per B5ii) above; • Riparian areas should be inspected annually for alien vegetation in order to remove any newly established invasive weeds (Chapter 5: Alien Plant Eradication and Monitoring Plan); • Maintain recreational pathways and control access and activities; • Domestic animals must be leashed when using the pathways; and • Comply with the Riparian Management and Rehabilitation Plan (Chapter 2: Riparian Management Plan).	processes; • Provide for the habitat and life history needs and important pollinators; • Minimise artificial edge effects from recreational activities; • The open space system as well as the corridors linking these areas and other natural areas must be assessed for fauna and flora on a yearly basis to determine the persistence of Red Data species and ensure the vegetation is maintaining its functionality as an ecological system with regard to fauna species. • Assessments must be conducted in the vegetation growing period from the first rains in October to the end of April and should be done by a qualified specialist as indicated by the Guidelines for Biodiversity (2009) supplied by the GDARD; and • All specialist reports must be provided to the GDARD (Nature Conservation) on a yearly basis.		Assessment of veld condition by specialist every 1 to 4 years, depending on the management plan; and Annual reporting to Directorate of Nature Conservation.

CHAPTER 8: RECOMMENDATIONS: FORMALISATION CONSERVATION OF OPEN SPACE

1. Introduction

The Montana Spruit Floodplain and associated terrestrial areas should be utilised by local residents in order to help maintain ecological processes and increase the value of the area. In order to increase the sustainability of the open space area, several avenues of formalisation exist.

2. Legal Framework

The recommendations within this document draws on the following main legislation:

National Environmental Management Act, 1998

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), the environment is held in public trust for the people. The beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.

National Environmental Management: Protected Areas Act, 2003

In order to safeguard the future biodiversity of South Africa, we need to formally protect at least 10% of all ecosystem types to maintain nature and natural landscapes. However, it is unlikely that these targets can be met without the cooperation of private land owners. The Protected Areas Act makes provision for this cooperation. The Act provides for any land, including private or communal land, to be declared a formal protected area, and allows for co -management of that land by the landowner(s) or any suitable person or organisation.

The National Environmental Management: Protected Areas Act 2003 (Act No. 57 of 2003 (NEMPA) provides the framework of a protected area system that will accommodate private conservation. NEMPA allows for the establishment of protected areas on private land and encourages conservation practices to protect biodiversity and restrict invasive practices like unregulated mining, forestry and activity.

In terms of the NEMPA, all protected areas shall have management authorities who are responsible for compilation of management plans. These management plans must include:

- The terms and conditions of any applicable biodiversity management plan
- A co-ordinated policy framework
- Planning measures, controls and performance criteria
- A programme for the implementation of the plan and its costing
- Procedures for public participation, including participation by the owner (if applicable), any local community or other interested party

- Where appropriate, the implementation of community-based natural resource management
- A zoning of the area indicating what activities may take place in different sections of the area and the conservation objectives of those sections

NEMPA further provides for:

- The establishment of a representative system of protected areas as part of the national strategy to protect South Africa's biodiversity and to ensure that the sustained biodiversity benefits future generations; and
- The participation by communities in conservation and its associated benefits, and for cooperative governance in the management of protected areas.

Revenue Laws Amendment Bill 2008, Section 46

(Currently available on National Treasury's website: http://www.treasury.gov.za. The Revenue Laws Amendment Act 60 of 2008 should be available on same website soon)

Landowners may enter into partnership agreements to conserve their land for biodiversity in the form of either:

- A Biodiversity Management Agreement (under NEMBA);
- A Protected Environment (under NEMPA); or
- A Nature Reserve or National Park (under NEMPA).

In response to the commitments of landowners to secure biodiversity on their land, Treasury has recognised that (Cummings & Botha, 2008):

1. Landowners have forgone use rights to their land, which have inherent value, and
2. Landowners often incur substantial costs in managing their land under these agreements.

As a result, a number of fiscal mechanisms have been developed to support what is essentially a cost carried by an individual for the public good. Three different scenarios are to be addressed by tax mechanisms, each providing a more secure conservation agreement, and demanding a higher level of commitment and cost from the landowner.

For more information on these tax incentives please contact:

Tracey Cumming
Coordinator: Biodiversity & Fiscal Reform
Botanical Society Conservation Unit
Tel: 021 799 8826 Fax: 021 761 5983

3. Rationale for protected environments

Landowners play a pivotal role in conservation. With 80% of the priority habitats in private hands, conservation strategies must involve private landholders. In addition, the existing network of formal reserves cannot adequately protect the many threatened species and ecosystems in South Africa. This means that landowners can make a significant contribution towards the conservation of the unrivalled biodiversity of our country (http://www.stewardship.co.za)

4. Options to formalise the Montana Spruit open space area

These options are an extract from Botha (date unknown). The full document is available at http://www.botanicalsociety.org.za/cu/downloads/pamphlets/Pilot%20Proj-low.pdf

Option 1- Voluntary schemes

1. *Conservancies*
   These are dedicated forums for farmers, private landowners, and formal conservation bodies to interact and manage issues and common resources.
2. *Private Nature Reserves (PNR)*
   These are currently voluntary, but should ideally fall under the auspices of Management Agreement or Contractual Reserves. Individuals with conservation-worthy land can register a PNR with the provincial Nature Conservation authorities. A site inspection and certain conditions are usually sufficient to satisfy the provincial agencies after which it is accepted and published by the Premier.

Option 2- Management Agreements

The next level of landowner commitment usually involves the sacrificing of certain rights or the assumption of some responsibilities. Management agreements are not readily found in South African legislation, although many aspects of contractual parks would qualify. They are usually employed in areas where classical reserve scenarios would not be effective and are often accompanied by fencing and land management subsidies.

Option 3- Contractual Parks/Reserves

1. *Protected Natural Environment (PNE)*
   This is an effective and potentially underused category that prescribes closely what activity is not permitted. Land is registered by property and zoned Open Space III, thereby limiting subdivision and subsequent activity. The premier can promulgate regulations governing a PNE. It can include urban and rural land and individuals can be co-opted into PNEs. There is usually a requirement of the site having" outstanding natural beauty, or important ecological processes".
2. Provincial and Municipal Contractual protected areas
   These are under-utilised in SA and should become common practice with all provincial, municipal and private conservation agencies.

A conservancy is the voluntary co-operative environmental management of an area, by its community and user groups, and in respect of which registration has been granted by the relevant provincial nature conservation authorities (www.conservancies.co.za). The Gauteng Conservancy Association (GCA) promotes conservation on private property in Gauteng in an effort to protect Gauteng's fast-disappearing greenbelt areas. It is an independent body, prepared to co-operate with all those who are passionate about conservation and willing to work for it. The GCA represents rural and urban conservancies in Gauteng. These conservancies range in size from tens of thousands of hectares to tiny areas, measuring a few hectares. Aims

- To conserve Gauteng's environmental and agricultural resources.
- To join forces with other conservation bodies to seek solutions to environmental problems.
- To actively involve all communities within our conservancies in conservation issues.
- To develop a strong, united voice for conservation in Gauteng.
- To encourage the formation of rural, urban, industrial and informal settlement conservancies in Gauteng.
- To give support to and network with conservancies in Gauteng and throughout South Africa, by sharing information and resources.
- To raise awareness among all residents of conservancies and the public, of the need to conserve our environmental and agricultural resources.
- To gain recognition and support for our aims from the public, business and the government.

3. The management authority of the Montana Spruit open space area may enter into a written agreement with a local community inside or adjacent to the open space to allow members of the community to use biological resources in the reserve or site in a sustainable manner. A material transfer agreement or benefit-sharing agreement may be compiled to formalise the agreement.

4. Develop perimeter fences for open spaces that:

    - Allow wildlife movement;
    - Protect wetlands and riparian areas; and
    - Prohibit access into open space by vehicles other than maintenance vehicles.

5. In open space areas, designated public access points shall be provided that connect to internal trails/pathway systems and destinations designated for public use.

6. Controlled access is permitted.

7. Raise visitor awareness though erecting information boards on aspects of the river ecosystem and grasslands.

8. According to the public open space by-laws, no swimming or bathing is permitted in public open spaces.

9. Plastic (recycled as per www.Timberplatic.co.za) animal proof rubbish bins and 2m recycled plastic benches shall constitute the approved standard for site furnishings.

10. Place and enforce restrictions to keep dogs on-leash along any trail that passes near the natural open space area. Strictly enforce prohibitions against dogs and cats off-leash within any natural open space.

11. Access shall be restricted to maintenance and emergency vehicles, in consultation with Eskom.

12. All other users desiring vehicular access to open space areas (for example, to transport construction equipment to private property where no other access is feasible) must obtain a special Access Permit. The Access Permit may be obtained from the management authority. The Permittee (holder of the permit) shall be required to restore any damage to the open space.

13. Signs and fencing shall be installed where appropriate.

14. Encroachment of private landowners on public open space is strictly prohibited. Private landowners shall not construct gardens, patios or other amenities on public lands, nor should they plant, remove or mow vegetation, or trap or release wildlife.

15. Temporary access through the open space may be granted for transportation of supplies or equipment to private property, providing that no feasible alternative route exists. Applicant shall obtain the appropriate Special Access permit and restore any disturbance as detailed above.

16. Uniform signage types shall be provided where appropriate and should conform to the required national standards

6. References

Botha, M. (unknown): So You Want to Conserve Your Land. Conservation options for protected areas on private, communal and municipal land. Correspondence: Cape Conservation Unit, Botanical Society http://www.botanicalsociety.org.za/cu/downloads/pamphlets/Pilot%20Proj-low.pdf

Cumming, T. & Botha M. (2008): A brief summary of the tax incentives in support of Protected Areas Expansion and Securing Threatened Ecosystems as provided for in the Revenue Laws Amendment Act 60 of 2008. Botanical Society of South Africa (BOTSOC)

Stewardship: http://www.stewardship.co.za

Strategic Environmental Focus, (2005): Porcupine Park Open Space Management Plan. Prepared for Golden Creek Investments.

Strategic Environmental Focus, (2009): River Glen Estate Guideline Document for the Design of a Boundary Wall That Will Allow Free Movement to Identified Animal Species. Prepared for GIP Builders (Pty) Ltd

GLOSSARY OF TERMS

Alien species: A plant or animal species introduced from elsewhere: neither endemic nor indigenous.

Anthropogenic: change induced by humans intervention.

Applicant: Any person who applies for an authorisation to undertake an activity or to cause such activity to be undertaken as contemplated in Section 22(1) of the Environment Conservation Act, 1989 (Act No. 73 of 1989).

Biodiversity: The rich variety of plants and animals that live in their own environment.

Built environment: Physical surroundings created by human activity, e.g. buildings, houses, roads, bridges and harbours.

Buffer zone: a collar of land that filters edge effects;

Critically Endangered: A taxon is facing an extremely high risk of extinction in the wild, as indicated by the best available evidence

Conservation: Protecting, using and saving resources wisely, especially the biodiversity found in an area.

Contamination: Polluting or making something impure.

Corrective (or remedial) action: Response required in order to address an environmental problem that is in conflict with the requirements of the EMP. The need for corrective action may be determined through monitoring, audits or management review.

Degradation: The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.

Ecology: The study of the inter relationships between organisms and their environments.

Ecosystem: The relationship and interaction between plants, animals and the non-living environment.

Endemic: The taxon has its habitat in a specified district or area;

Edge effects: inappropriate influences from surrounding activities, which physically degrade habitat, endanger resident biota and reduce the functional size of remnant fragments including, for example, the effects of invasive plant and animal species, physical damage and soil compaction caused through trampling and harvesting, abiotic habitat alterations and pollution;

Endangered: a taxon is facing a very high risk of extinction in the wild, as indicated by the best available evidence;

ex situ conservation: means conservation outside a taxon's wild/natural habitat, usually involving propagation or seed banking

Environment: All physical, chemical and biological factors and conditions that influence an object and/or organism.

Environmental Impact Assessment: Assessment of the effects of a activity on the environment.

Environmental Management Plan (EMP): A legally binding working document, which stipulates environmental and socio-economic mitigation measures that must be implemented by several responsible parties throughout the duration of the proposed project.

Environmental Management System (EMS): Environmental Management Systems (EMS) provide guidance on how to manage the environmental impacts of activities, products and services. They detail the organisational structure, responsibilities, practices, procedures, processes and resources for environmental management. The ISO14001 EMS standard has been developed by the International Standards Organisation.

Environmental policy: Statement of intent and principles in relation to overall environmental performance, providing a framework for the setting of objectives and targets.

Habitat: The physical environment that is home to plants and animals in an area, and where they live, feed and reproduce.

Hazardous waste: Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.

Impact: A description of the potential effect or consequence of an aspect of the activity on a specified component of the biophysical, social or economic environment within a defined time and space.

Indigenous species: Plants and animals that are naturally found in an area.

Infrastructure: The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage.

In situ conservation: Conservation within a taxon's wild habitat where the populations occur naturally.

Integrated: Mixing or combining all useful information and factors into a joint or unified whole. See Integrated Environmental Management.

Integrated Environmental Management (IEM): A way of managing the environment by including environmental factors in all stages of activity. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed activities. Also called "IEM".

Invasive and weedy species: Plants which are declared to be weeds and invader plants in terms of the amended regulations of the Conservation of Agricultural Resources Act No. 43 of 1983.

Land use: The use of land for human activities, e.g. residential, commercial, industrial use.

Mitigation: Measures designed to avoid, reduce or remedy adverse impacts

Natural environment: Our physical surroundings, including plants and animals, when they are unspoiled by human activities.

Near Threatened: A taxon that is not Critically Endangered, Endangered or Vulnerable currently, but is close to qualifying for, or is likely to qualify for, one of these categories in the near future;

Policy: A set of aims, guidelines and procedures to help you make decisions and manage an organisation or structure. Policies are based on people's values and goals. See Integrated Metropolitan Environmental Policy.

Process: Activity usually happens through a process - a number of planned steps or stages.

Red List Plant Species: A plant taxon considered to be threatened, or close to becoming threatened with extinction and therefore classified as Critically Endangered, Endangered, Vulnerable or Near Threatened;

Recycling: Collecting, cleaning and re-using materials.

Resources: Parts of our natural environment that we use and protect, e.g. land, forests, water, wildlife, and minerals.

Storm water management: Strategies implemented to control the surface flow of storm water such that erosion, sedimentation and pollution of surface and ground water resources in the immediate and surrounding environments are mitigated. This is specifically important during the construction and decommissioning phases of a project.

Study area: Refers to the entire study area encompassing the total area of the six (6) contiguous farms as indicated on the study area map.

Sustainable activity: Activity that is planned to meet the needs of present and future generations, e.g. the need for basic environmental, social and economic services. Sustainable activity includes using and maintaining resources responsibly.

Sustainability: Being able to meet the needs of present and future resources.

Threatened A taxon that is Critically Endangered, Endangered or Vulnerable.

Vulnerable: A taxon is facing a high risk of extinction in the wild, as indicated by the best available evidence.

Waste Management: Classifying, recycling, treatment and disposal of waste generated during construction and decommissioning activities.

Wetlands: An area of land with water mostly at or near the surface, resulting in a waterlogged habitat containing characteristic vegetation species and soil types e.g. vleis, swamps.

Zoning: The control of land use by only allowing specific type activity in fixed areas or zone