Watercourse Rehabilitation and Management Plan

AS PART OF THE ENVIRONMENTAL AUTHORISATION (EA) AND WATER USE AUTHORISATION (WUA) PROCESSES FOR THE PROPOSED KOSMOSDAL EXTENSION 92 BRIDGE DEVELOPMENT IN CENTURION, GAUTENG PROVINCE.

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GLOSSARY OF TERMS

Alien vegetation/ plant species	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally.
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
Biodiversity	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystem, ecological processes and landscape of which they are integral parts.
Habitat	In relation to a specific species, a place or type of site where such species naturally occurs.
Indigenous vegetation	Vegetation occurring naturally within a defined area. In relation to a specific area, a species that occurs, or has historically occurred, naturally in a free state in nature within that specific area, but excludes a species introduced in that area as a result of human activity.
Red Data Listed Species	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
Species of Conservation Concern	The term SCC in the context of this report refers to all RDL (Red Data) and IUCN (International Union for the Conservation of Nature) listed species as well as protected species of relevance to the project.
Watercourse	As defined by the National Water Act, 1998 (Act 36 of 1998): “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 Government Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.”

LIST OF ABBREVIATIONS

AIP	Alien and Invasive Plants
AIPCP	Alien and Invasive Plants Control Plan
BAS	Best Attainable State
COT	City of Tshwane
CVB	Channelled Valley Bottom
DEA	Department of Environmental Affairs
DWAF	Department of Water and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EC	Electrical Conductivity
ECO	Environmental Control Officer
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
EO	Environmental Officer
Ext	Extension
GDARD	Gauteng Department of Agriculture and Rural Development
GN	Government Notice
GPS	Global Positioning System
HGM	Hydrogeomorphic
LT	Least Threatened
IUCN	International Union for the Conservation of Nature
NEMA	National Environmental Management Act
NEMBA	National Environmental Management Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Area
NWA	National Water Act
PES	Present Ecological State
REC	Recommended Ecological Category
RDL	Red Data Listed
RMO	Recommended Management Objective
SAS	Scientific Aquatic Services (Pty) Ltd
SCC	Species of Conservation Concern
TDS	Total Dissolved Solids
VU	Vulnerable
WRMP	Watercourse Rehabilitation and Management Plan
WUA	Water Use Authorisation

1 INTRODUCTION

1.1 Background and Locality

Scientific Aquatic Services (Pty) Ltd (SAS) was appointed to develop a Watercourse Rehabilitation and Management Plan (WRMP) as part of the Environmental Authorisation (EA) and Water Use Authorisation (WUA) processes for the proposed box culvert bridge development associated with the Rietspruit River, as part of the larger Kosmosdal Extension (Ext) 92 development. The proposed bridge development and associated activities will hereafter be referred to as the 'Kosmosdal Ext 92 bridge'. The proposed Kosmosdal Ext 92 bridge involves the installation of large box culverts, which will significantly increase the through-flow capacity of the crossing, which, in its current state, is prone to flooding due to inappropriate pipe culvert size and insufficient through-flow under the bridge.

The site is located on the remainder of Portion 2 of the farm Olievenhoutbosch 389 JR, along the Rietspruit road in Centurion, within the City of Tshwane (COT) Metropolitan Municipality, Gauteng Province. The Blue Valley Golf and Country Estate is located to the south of the proposed site (refer to Figures 1 and 2). The proposed site is currently vacant and largely earmarked for the authorised Kosmosdal Ext 92 development and associated infrastructure.

To identify all possible freshwater ecosystems, a 500 meter (m) "investigation area" in accordance with Government Notice (GN) 4167 of 2023, as it relates to the National Water Act (NWA) (Act No. 36 of 1998) as amended, was used as a guide to assess possible sensitivities of the receiving environment.

The WRMP fits into the overall planning process of the development activities, with specific mention of the construction phase and should be implemented by the proponent as soon as it has been approved by the relevant authorities and as soon as construction has reached a stage where management actions are required and when rehabilitation activities become viable.

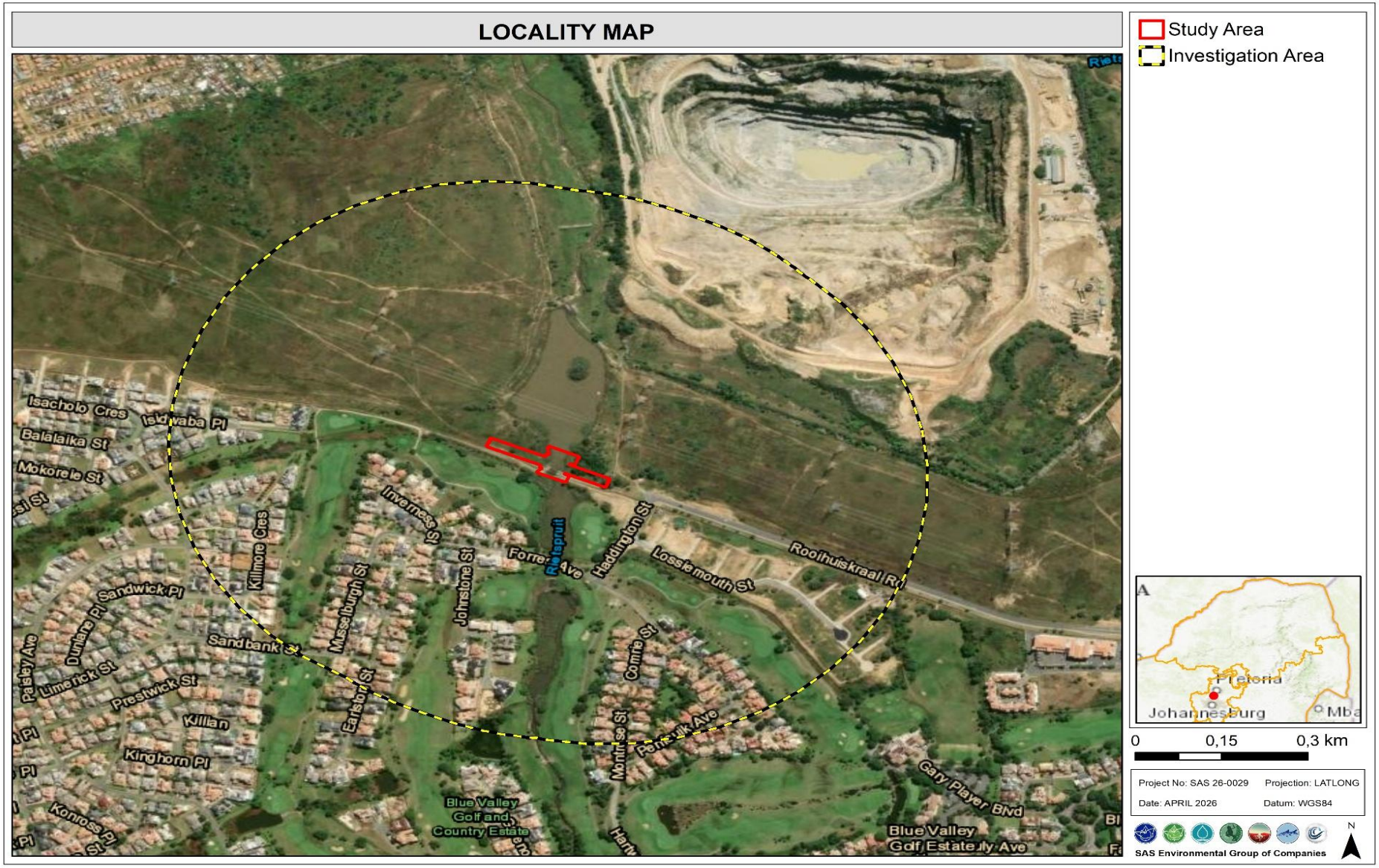

Figure 1: A digital satellite map depicting the location of the study area and associated investigation area in relation to the surrounding area.

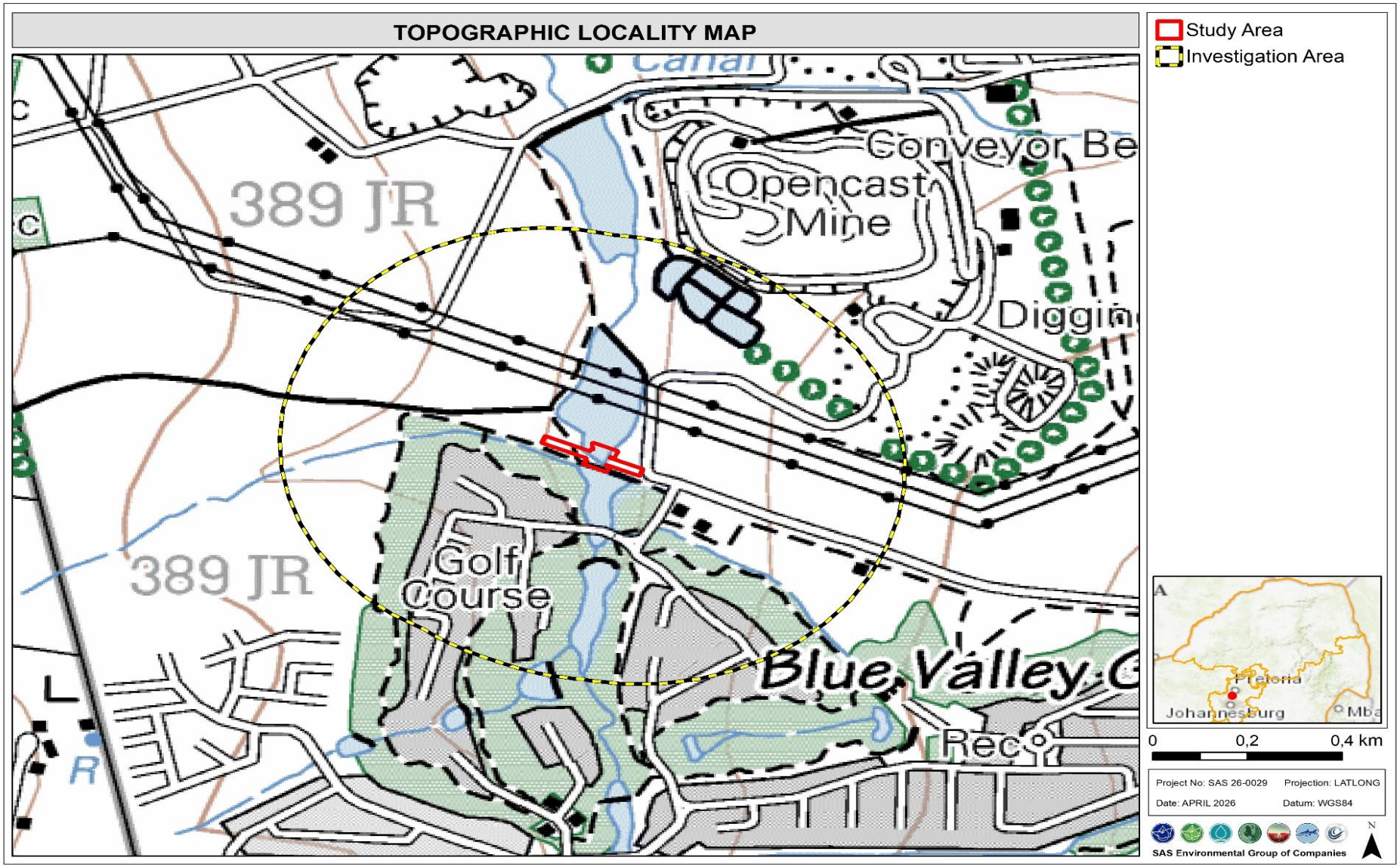

Figure 2: Topographic map depicting the location of the study area and associated investigation area in relation to the surrounding area.

1.2 Key Objectives

The key objective of this WRMP is to ensure that impacts are managed in line with the impact mitigation hierarchy as advocated by the Department of Environmental Affairs (DEA) *et. al* (2013) and that ecological integrity within the receiving environment is maintained at a minimum, or where possible, improved. The management and rehabilitation assessment seeks to achieve a required end state that supports local and regional conservation, as well as the provision of downstream goods and services. It also describes how the negative impacts associated with the proposed Kosmosdal Ext 92 bridge will be controlled and monitored. Finally, the assessment identifies the responsible parties and timeframes tasked with implementing these measures. The key aims of the WRMP include:

- Maintenance of the present state of the freshwater ecology associated with the portions of the freshwater ecosystems potentially impacted by the proposed activities (Section 3);
- The minimising of impacts as a result of the proposed activities on the freshwater ecosystems in the receiving environment including impacts such as erosion and sedimentation, as well as impacts on water quality, all of which have the potential to affect habitat and biota within the freshwater ecosystems;
- The minimising of impacts on goods and services provision by the freshwater ecosystems;
- Provision of a plant species management plan which includes a rescue and relocation plan for indigenous vegetation, control of alien and invasive plant (AIP) species as well as a revegetation plan of the disturbed freshwater area (Section 3.2.2);
- Prudent monitoring to ensure timeous detection of, and response to damage caused by the proposed activities (Section 3.2.3); and
- Provision of recommendations for future rehabilitation activities.

This WRMP advocates the use of several environmental management tools and mitigatory measures appropriate to the overall planning process of the construction, operational and rehabilitation phases of the proposed activities and must be implemented by the proponent as soon as it has been approved by all relevant authorities.

1.3 Assumptions and Limitations

- GN 4167 (2023) requires that upon completion of the construction activities, systematic rehabilitation should restore the watercourse to its ecological condition prior to the commencement of the water use. The Rietspruit River have been considered largely to seriously modified (PES = D/E), and is subject to ongoing impacts from the upstream catchment, outside the control of the proposed development. This WRMP is anticipated to have localised, but limited, enhancement of the watercourse associated with the proposed development;
- SAS (2026) undertook a freshwater ecosystem impact assessment of the reach of the freshwater ecosystem directly associated with the proposed development, which is used as the background to this WRMP (Annexure C). It is expected that the results obtained by SAS (2026) have been accurately assessed and the rehabilitation measures proposed herein for the freshwater ecosystem are considered realistic and implementable. No further assessments were undertaken as part of the WRMP;
- The ground-truthing and delineation of the freshwater ecosystem boundaries and the assessment thereof are confined to the findings by SAS (2026) only. The freshwater ecosystem delineation as presented in this report (Annexure C) was therefore obtained from the findings of SAS (2026). Verification of the freshwater ecosystem boundaries did not form part of the scope of work of this study;
- The reach of the freshwater ecosystem downstream of the crossing has been significantly altered by the presence of an active quarry and has been canalised and diverted. Accordingly, it would not be possible to rehabilitate this reach until such time as the active quarrying terminates. Rehabilitation of the downstream reach is accordingly not considered part of the scope of this WRMP; and
- This WRMP focuses on the activities associated with the proposed Kosmosdal Ext 92 bridge development and within the extent of a 100 m radius to address any potential indirect/edge effects. This plan does not consider the rehabilitation of the watercourses at a larger, catchment level. This should be undertaken by the relevant government/municipal department in conjunction with relevant stakeholders such as residents and the commercial and industrial companies operating in the area, and an integrated implementation plan should be developed for the larger investigation area (i.e. 500 m from the proposed developments).

1.4 Specialist studies informing the WRMP

As part of the freshwater ecological assessment undertaken by SAS, a site visit was undertaken in February 2016 and March 2026 to assess the Present Ecological State (PES) and perceived impacts that the proposed development may have on the receiving environment, with specific mention of any identified freshwater ecosystems where the proposed Kosmosdal Ext 92 bridge is located.

The primary drainage system associated with the proposed bridge is a reach of the Rietspruit River. Although an unchanneled valley bottom wetland and a non-perennial drainage line hydrogeomorphic (HGM) units were identified immediately south of the proposed bridge, these HGM units are located upstream of the proposed activities and are not deemed to be at risk from the proposed activities. Similarly, the non-perennial drainage line flowing into the impounded portion of the Rietspruit River (refer to Figure 3) is not deemed to be at risk due to the direction of flow, and the anticipated buffering effects of the impoundment. Thus, only the affected reach of the Rietspruit River, which is impounded, was assessed.

The freshwater system within the investigation area was classified according to the Classification System (Ollis *et al.*, 2013) as an Inland System. The river falls within the Dry Highveld Grassland Group 3 Wetland Vegetation (WetVeg) Type, indicated as Least Threatened (LT) by Mbona *et al.* (2015). At Levels 3 (Landscape Unit) and 4 (HGM Type) of the Classification System, the system was classified as per the summary in Table 1, below.

Table 1: Characterisation at Levels 3 and 4 of the Classification System (Ollis *et al*., 2013) of the Rietspruit River associated with the project investigation area.

Level 3: Landscape unit	Level 4: HGM Type
Valley floor: The base of a valley, situated between two distinct valley side-slopes.	**River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water.

The assessed reach has been heavily modified by long-term anthropogenic impacts. Historically, the system likely functioned as a channelled valley-bottom wetland; however, both the Terrasoil Science (2015) and SAS (2016 and 2026) assessments indicate that these wetland characteristics have largely been lost. The system now exhibits features of a defined river channel, with vegetation communities more typical of riparian habitat than wetland conditions.

Extensive land use changes within the catchment, including urban and industrial development, road construction, historical agriculture, waste disposal, and upstream quarrying, have

significantly altered the hydraulic and geomorphological functioning of the system. These activities have resulted in increased sediment inputs, leading to channel incision, altered flow dynamics, and reduced overbank flooding. Consequently, system functionality, including downstream recharge, has decreased. Additionally, instream infrastructure such as culverts and bridge crossings further disrupts flow and may negatively affect water quality and aquatic biota. The results of the field assessment for the freshwater ecosystem are summarised in Table 2. Please also refer to Annexure C for detailed information on the receiving freshwater environment.

Table 2: Summary of results of the field assessment (SAS, 2026).

Present Ecological State (PES)	Ecoservice provision	Ecological Importance and Sensitivity (EIS)	Recommended Ecological Category (REC) / Recommended Management Objective (RMO) / Best Attainable State (BAS)
Category: D/E (Largely to Seriously Modified)	Demand: Very High to Low Supply: Moderate to Very Low	Low/Marginal	**REC:** D; **RMO:** Improve; **BAS:** D

In order to meet the REC of the Rietspruit River (i.e. to improve the ecological condition of the system to a PES category D [largely modified] a catchment-wide strategy and cooperation between several stakeholders at both a national and local level would be required, which is not considered feasible and or practical for the proponent. Thus, this WRMP focuses on the specific proposed bridge crossing activities which are considered likely to impact a small reach of the Rietspruit River.

The WRMP acts as a freshwater ecosystem management tool for the proposed activities and has been developed to address and manage all perceived and potential impacts upon the identified freshwater ecosystem (refer to Figure 3), as a result of the proposed Kosmosdal Ext 92 bridge construction and operation.

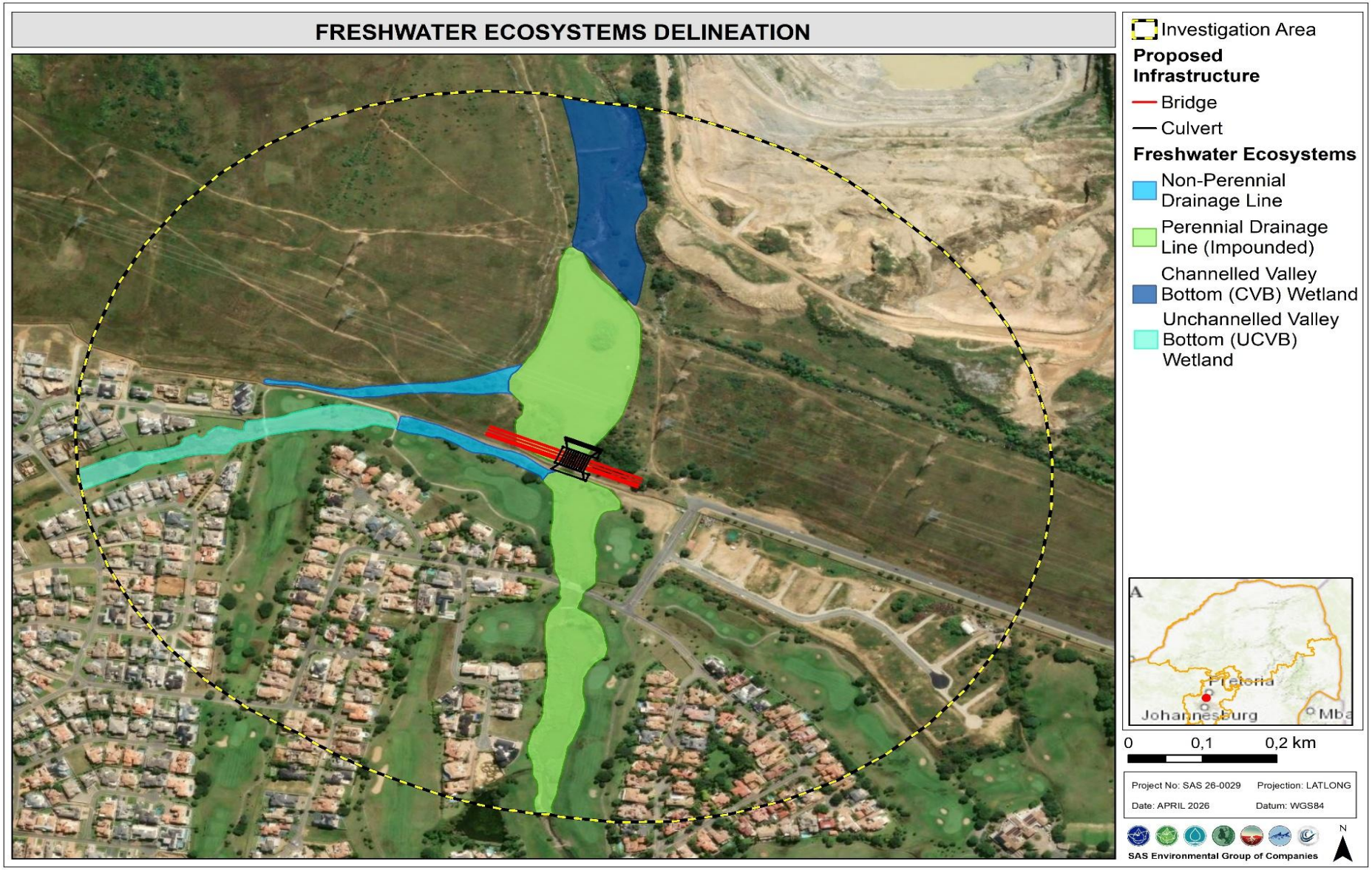

Figure 3: The identified watercourses associated with the proposed activities and the investigation area.

2 LEGISLATIVE FRAMEWORK FOR THE WRMP

The following legislative documents were considered and the aspects which are pertinent to watercourse management, including the rehabilitation of disturbed areas associated with the proposed Kosmosdal Ext 92 bridge development, were utilised. Further details of each are provided in Annexure B.

- The Constitution of the Republic of South Africa, 1996[1];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) (as amended);
- The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA);
- The National Environmental Management: Biodiversity Act, 2014 (Alien and Invasive Species Regulations, 2014), as updated[2];
- The National Water Act (Act no. 36 of 1998) (as amended); and
- GN 4167 as published in the Government Gazette 49833 of 2023, as it relates to the NWA.

Note: Adopting this WRMP does not absolve the proponent from complying with any applicable legislation or the general "duty of care" set out in Section 28 (1) of the NEMA that states: *"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment*".

3 WATERCOURSE REHABILITATION AND MANAGEMENT PLAN

3.1 Roles and Responsibilities

A site-specific WRMP has been developed to provide step-by-step implementation measures to rehabilitate disturbance within the perceived zone of influence of the proposed development (Section 3.2.2). The implementation of these measures is the core of the WRMP, as this entails putting rehabilitation and management activities into visible outputs. The success of the rehabilitation efforts is highly dependent upon cogent conceptual planning undertaken at the early stage of the construction activities associated with the proposed development. The

[1] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 19996". It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it nor the acts amending it are allocated act numbers.

[2] Note these Regulations superseded the Conservation of Agricultural Resources Act (Act No. 43 of 1983) (CARA) Regulations 15 and 16 concerning invasive or problem plants in agricultural lands.

mitigation measures that must be adhered to during the construction and operational phases are listed in the tables that follow as well as the freshwater assessment undertaken by SAS (2026). A list of the roles and responsibilities of the individuals involved in the implementation of this WRMP is provided in Figure 4 and Table 3.

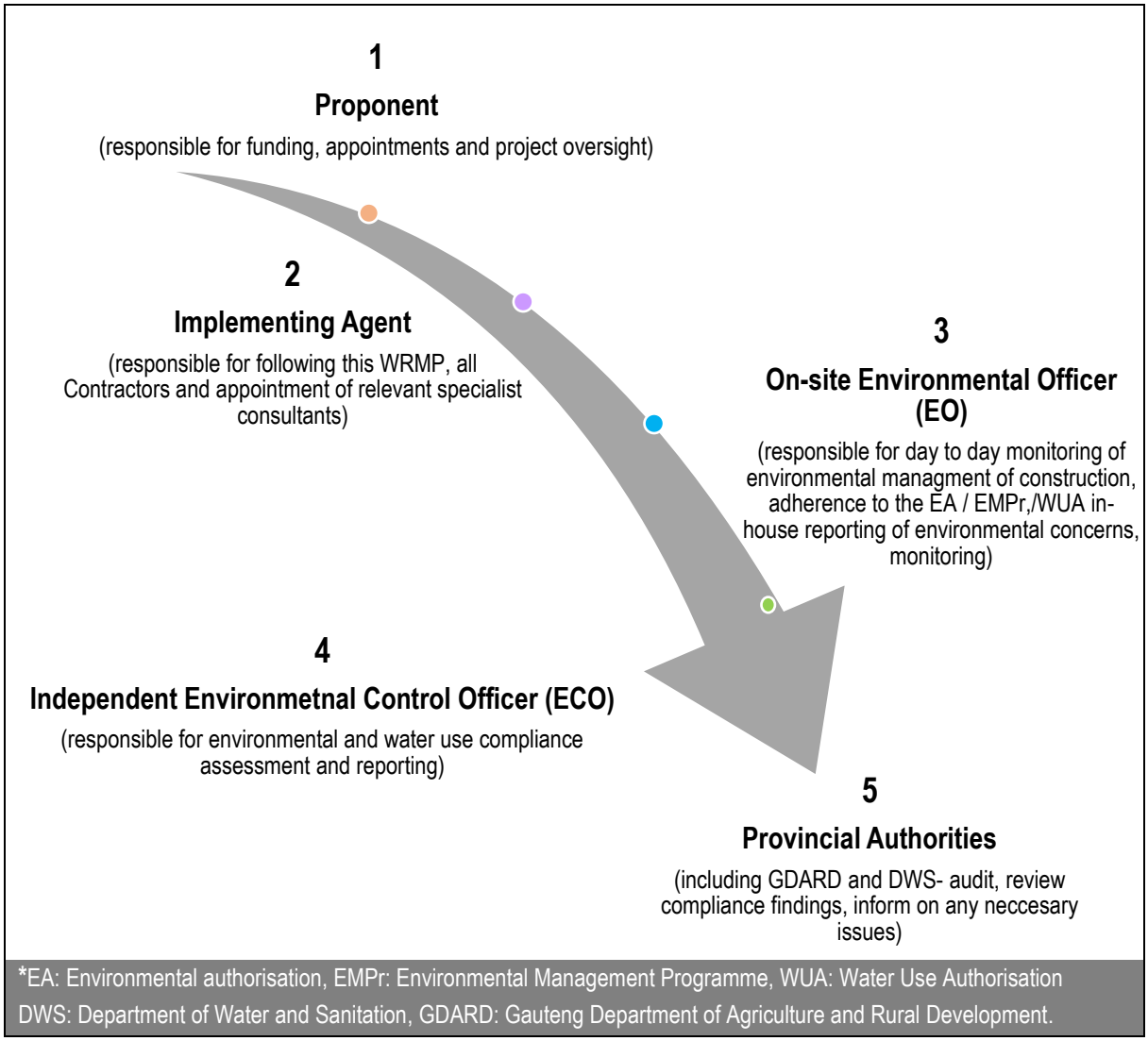

Figure 4: A list of the roles and responsibilities of the individuals involved in the implementation of this WRMP.

Table 3: Summary of various parties involved with the implementation of this WRMP.

Party	Responsibility
Proponent	• The Proponent must ensure sufficient funding for the implementation and long-term maintenance of the mandated rehabilitation requirements as stipulated in this report; • The Proponent will be responsible for the appointment of the Implementing Agent as well as an Independent ECO to monitor and assess compliance with the EMPr and all authorisation conditions, including but not necessarily limited to the EA and WUA; • The Proponent is responsible for the establishment of a Steering Committee comprising appropriate stakeholders that must convene at least biannually to discuss the rehabilitation activities, any challenges encountered and potential remediation actions/additional mitigation measures; • The proponent must ensure that all actions from the Steering Committee are implemented by the Implementing Agent and ensure that funds for implementation are available; • The Proponent will be responsible for ensuring the Implementing Agent receives a copy of this document and understand its contents; • The Proponent must ensure that suitable penalties are in place for non-conformance of the conditions of the WUA as well as this Implementation Plan by the Implementing Agent and any sub-contractors; • The proponent must give the authority to the on-site ECO to stop works on site should he/she feel that there is a serious threat to or impact on the surrounding environment; and • Should ownership of the property change, the role and responsibility for compliance with this Implementation Plan, as well as long-term maintenance must also be transferred.
Implementing Agent	• An appropriately qualified Contractor should be appointed as the Implementing Agent, to manage all sub-contractors and appoint specialists, as required; • The Implementing Agent may appoint an on-site Environmental Officer (EO) to ensure day to management and monitoring of environmental management on the construction site; • The Implementing Agent must ensure that all sub-contractor/s take full responsibility for each of his/her employees and any penalties imposed; • The Implementing Agent must immediately inform the Proponent and ECO if any changes to the project are envisaged and if any aspects of this implementation plan, the EA or WUA cannot be complied with; • It is the responsibility of the Implementing Agent to ensure that the measures stipulated within this WRMP are adhered to; and • Should the Implementing Agent require clarity on any aspect of this WRMP, the Implementing Agent must contact the ECO for advice or alternatively, a suitably qualified specialist. **Training of Rehabilitation Workers** The Implementing Agent (typically through the EO) is to facilitate an initial environmental induction to all sub-contractors and associated workers in environmental awareness, including minimisation of disturbance to areas of increased ecological sensitivity (i.e. freshwater ecosystem), as well as fauna and flora with a no poaching policy, management of waste and prevention of water pollution. Furthermore, the Implementing Agent is to ensure that all operational workers have received basic training on fire management and prevention measures and be aware of any emergency protocols required. **Contractor Performance** The Implementing Agent must ensure that the relevant sub-contractors adhere to the conditions of this Implementation Plan. Should the Contractor require clarity on any aspect of this WRMP, the Contractor must contact the Implementing Agent directly, who, if needed can consult with the specialists involved in the WRMP. Should the ECO feel that the conditions of the WRMP are not being met by the Contractor(s), the ECO has been given the authority by the Proponent to stop works if in his/her opinion there is/may be a serious threat to or impact on the surrounding environment and instruct the contractor(s) on suitable rectification and remediation actions that must be implemented immediately.
On-site Environmental Officer (EO)	The on-site EO is the person responsible for the day-to-day environmental management and control on the construction site and adherence to the EMPr and conditions of authorisations (including but not necessarily limited to the EA and WUA) and is typically appointed by the Implementing Agent (Contractor). The on-site EO should ideally be appointed prior to site clearing for construction and at the latest before the start of rehabilitation works so as to record baseline conditions, both prior to and

Party	Responsibility
	post construction, and will be responsible for ensuring that all rehabilitation activities are implemented. The on-site EO is mandated to do the following: • Ensure that all Implementing Agent's employees are fully aware of their environmental responsibilities and the sensitivities of the site. This should take the form of an initial environmental awareness-training program in which requirements of this document will be explained and ongoing environmental awareness in the form of regular too box talks; • Monitor site activities on a regular basis to ensure that there is minimal unintended environmental impact to the surrounding areas as well as the areas to be rehabilitated; • Monitor the site activities and rehabilitation actions in line with this WRMP as well as any relevant WUAs/EAs; • The on-site EO should have all relevant contact details for the team responsible for implementation of this plan and any rapid response units, as needed should additional clarity be required; • The on-site EO is responsible for maintaining on-site copies of all required documents such as copies of all respective authorisations, relevant legislation, copies of the EMPr and the WRMP, incidents register, compliance monitoring reports produced by the ECO, etc. • The on-site EO is responsible for ensuring that all corrective actions as detailed in the compliance monitoring reports produced by the ECO are implemented; • Ensure that a 'hotline' exists for reporting incidents, specifically unplanned/uncontrolled fires breaking out and resolving any problems rapidly; • Compile a monthly status report, indicating any non-compliances as well as progresses made on the implementation of this WRMP; and • Monitor all proposed developments and ensure efficient remediation/mitigation measures are implemented, as deemed necessary. A monthly monitoring report must be compiled.
Independent Environmental Control Officer (ECO)	The independent ECO must be suitably qualified with relevant experience to undertake external compliance assessments during construction and post construction rehabilitation for compliance with the stipulations of the EMPr and conditions of the EA and other authorisations, including the relevant WUA. The independent ECO will: • Conduct compliance assessments in line with the frequency of reporting as specified in the EA and WUA and produce compliance reports that are to be sent to the relevant authorities; • Undertake monthly (or more frequent if specified by the EMPr/WUA) site visit to discuss the findings with the on-site EO and ensure that the rehabilitation activities are compliant; and • Compile a relevant audit and monitoring report, which is to be submitted to the relevant provincial authorities.

3.2 Site Specific Rehabilitation, Implementation and Management Plan

This implementation of the WRMP is based on three (3) key actions illustrated in Figure 5 and discussed in detail in Sections 3.2.1 to 3.2.3

Figure 5: The three (3) key actions of the WRMP implementation.

3.2.1 Action 1: Planning

The intention of this WRMP is to achieve the rehabilitation objectives in the most economical and feasible manner by restoring the identified watercourse associated with the proposed development, to their respective conditions prior to the commencement of the water use, and where practicably feasible, improving the ecological condition and function of the watercourse. To achieve the rehabilitation objectives and increase the rehabilitation success rate, cogent conceptual planning is essential to provide clear and concise requirements to orient the rehabilitation and management activities to achieve the desired final results. Table 4 provides requirements to be considered during planning and before implementing the WRMP.

Table 4: Planning requirements to be considered prior to the implementation of the WRMP measures.

1.1 Obtaining all relevant authorisations and permits.
Before rehabilitation activities can commence all necessary permits and authorisations will be required, including but not limited to:

- EA (as applicable) from GDARD; and
- WUA from DWS

Note: If any plants or seeds will be harvested from the surrounding area for revegetation purposes, a permit may be required from the relevant authority prior to plant harvesting.

1.2 Appointment of a Contractor and all required specialists
During the planning phase certain aspects need to be considered in order to effectively implement this plan. This includes:

- Appointment of a suitably qualified Contractor(s) to undertake the required work;
- Appointment (by the Contractor) of an EO to monitor the rehabilitation activities as well as to undertake the required post rehabilitation monitoring;
- Appointment (by the Proponent) of an Independent ECO to undertake compliance assessments;
- Appoint any specialist consultants required for guidance, management and monitoring that may need to be retained; and
- The ECO is to compile a monthly environmental compliance report indicating all observations, actions and any remediation measures that were implemented and the reports are to be submitted to the competent authorities.

Note: Should the Contractor or the Contractor's EO not have the appropriate expertise for implementation of this plan then it is the responsibility of the Contractor to retain a suitably qualified freshwater and/or botanical ecologist to oversee the implementation.

1.3 Budgetary Provision
A rehabilitation budget needs to be prepared prior to the commencement of rehabilitation activities. The preparation of a budget is a crucial step in planning of a project, as it allows for the prediction and calculation of all the costs related to implementation of the rehabilitation activities, including, but not limited to labour, material, expertise and post rehabilitation maintenance and management.

1.4 Timing

- The construction must occur during the drier winter months to reduce having to deal with higher flow volumes and spate flows that typically occur after rainfall events in these urban systems.
- Rehabilitation of the freshwater ecosystem, as assessed (SAS, 2026), associated with the proposed development should commence as soon as possible and should optimally be concurrent as work progresses. Rehabilitation should have a fixed deadline for completion.

1.5 Planning for on-site requirements
Establishment and Access

- Access control for the proposed Kosmosdal Ext 92 bridge development must be implemented to ensure that no unauthorised persons are on-site.
- The watercourse boundaries and the required buffer zones during the construction phases must be clearly demarcated in the vicinity of the proposed road crossing with temporary fencing, and no personnel or vehicles are to be permitted to enter the watercourses unless essential.
- Adequate signage (in the appropriate languages commonly spoken in the area) must be placed around the planned development area;
- Dedicated rehabilitation camp, laydown areas and parking areas for vehicles must be located away from all identified sensitive areas; and
- All access roads to the relevant rehabilitation areas must be planned and demarcated. Use of existing roads or roads planned and authorised as part of the proposed Kosmosdal Ext 92 development activities must be favoured.

1.6 Indigenous plant harvesting and propagation.

- As part of the proposed rehabilitation plans, indigenous freshwater ecosystem species must be re-instated following the removal of alien and invasive plants (AIPs).
- As such, plans should be made for where the species are to be sourced and budgetary allowances made for the purchasing of various species, with inputs from a suitably qualified botanist and/or landscape architect.
- Availability of species needs to be secured before rehabilitation activities commence to ensure that plants/seeds are ready and available for re-vegetation (Task 3), so as not to leave areas exposed and vulnerable to erosion and incision.

1.7 Kick-off meeting/ Environmental Induction

Before commencing with the rehabilitation activities, a kick-off session must be undertaken with all the responsible persons involved in the implementation of the WRMP. The key aims of the meeting are:

- Create awareness to all personnel about the rehabilitation areas and that no development related activities may occur within these areas;
- Agreeing on the timeline for rehabilitation activities;
- Identifying the rehabilitation expectations and limitations; and
- Validating the WRMP rehabilitation strategies and the involvement of all the responsible persons in the implementation process.

1.8 Training of Contractors

All contractors involved in the implementation of this WRMP must receive basic training in environmental awareness, including minimisation of disturbance to areas of increased ecological sensitivity, as well as fauna and flora with a no poaching policy, management of waste, prevention of fires and prevention of water pollution.

3.2.2 Action 2: Watercourse Rehabilitation and Management Implementation

Successful rehabilitation depends upon conceptual planning, research and design flexibility. Watercourses are ever-changing systems that have adapted to local conditions over many decades. It is not only important that a rehabilitated watercourse, such as a wetland, looks like a wetland; it must also function as one (Canadian Wildlife Service, 2005).

The key objectives of the watercourse rehabilitation are to:

- Meet the requirements of relevant local and regional authorities;
- Contribute towards meeting local and provincial freshwater ecosystem conservation targets;
- Manage the rehabilitation activities to maintain and/or improve ecological integrity of the identified freshwater ecosystem and associated buffer areas;
- Maximise the service provision of the identified freshwater ecosystem that will be rehabilitated;

- Maximise the ecological functioning of the identified freshwater ecosystem that will be rehabilitated;
- Ensure continued dominance of indigenous floral species within the identified rehabilitated areas;
- Detail specific actions deemed necessary to assist in mitigating the potential environmental impact on the rehabilitated freshwater ecosystem areas;
- Evaluate and monitor the rehabilitated areas throughout the rehabilitation process and thereafter; and
- Minimise further adverse impacts on the identified freshwater ecosystem and associated buffer areas.

To maintain the PES of the affected reach of the Rietspruit River from the assessed Category D/E (SAS, 2026), various activities need to be undertaken. These activities can be broken down into three key actions. This WRMP includes practical rehabilitation and management methods to achieve rehabilitation objectives and a desired end result.

The rehabilitation and management methods of the WRMP were grouped into Three Actions, with Action 2 comprising three (3) tasks (Figure 6) and discussed in Sections 3.2.2.1 – 3.2.2.3 to guide the implementation thereof.

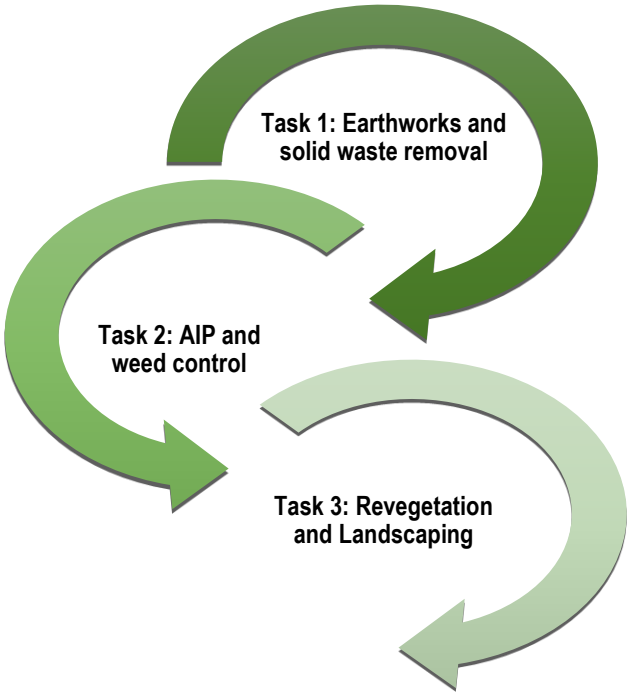

Figure 6: Grouped tasks for the rehabilitation and management method implementation.

The freshwater ecosystems (watercourses) and the associated ecological buffer where these initiatives must be implemented (Tasks 1-3) is represented in Figure 7 below. As noted by

SAS (2026), the rehabilitation of the overall watercourses would require a catchment-wide approach, involving numerous stakeholders and would necessitate ongoing monitoring for a period of several years.

Therefore, the WRMP is to address post-construction impacts associated with the proposed Kosmosdal Ext 92 bridge and as such, it is recommended that the rehabilitation measures provided herein be implemented within a 100 m extent of the proposed bridge crossing over the Rietspruit, encircled in orange.

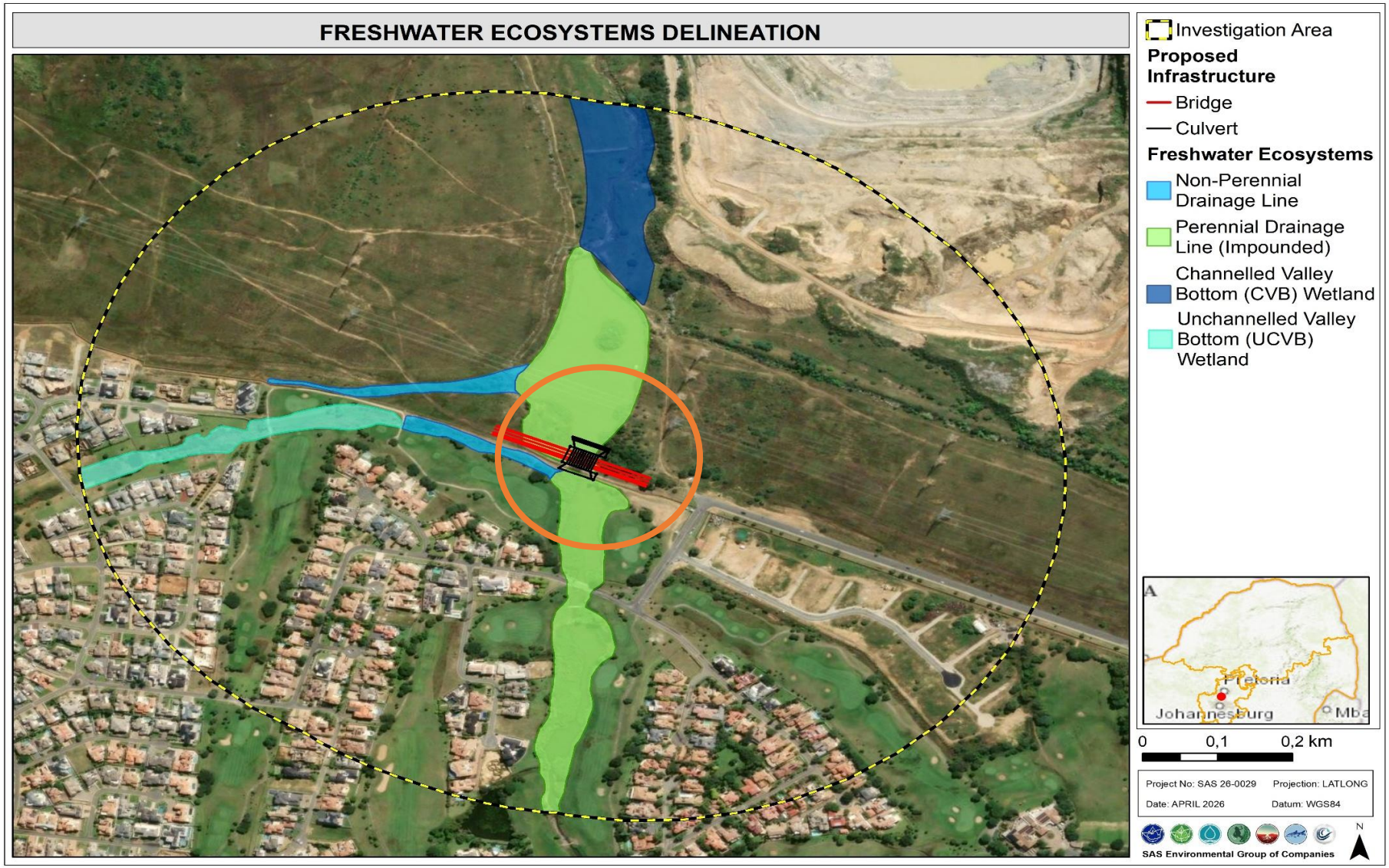

Figure 7: Representation of the freshwater ecosystems targeted for rehabilitation. Rehabilitation activities must be focused within a 100 m extent of the proposed bridge crossing (encircled in orange)

3.2.2.1 Task 1: Earthworks and solid waste removal

This task includes the construction of the proposed Kosmosdal 92 bridge crossing within the Rietspruit River as depicted in Figure 7 above. Table 5 below provides the rehabilitation measures to be implemented as part of this task.

Table 5: Rehabilitation and control measures to be implemented.

Responsible Persons	Proponent Project/Site Manager	Environmental Officer Independent Environmental Control Officer
Objective/ Requirement	**Control measures**	
Indigenous Vegetation removal	➢ Where possible, any indigenous vegetation, specifically any endangered species, must be rescued prior to the commencement of any earthworks (associated with embankment re-shaping) and housed at a dedicated nursery, for re-instatement during the revegetation stage; ➢ Should the Implementing Agent not have the expertise to identify and rescue such species, they will need to appoint a suitably qualified botanist to assist to ensure that plants are harvested correctly for maximum survival; and ➢ Any permits that may be required for the rescue and harvesting of these species must be in place prior to undertaking any earthwork activities.	
All earthwork activities	➢ The laydown areas, vehicle re-fuelling areas and material storage facilities are to remain outside of the delineated freshwater ecosystems and the associated 15 m ecological buffer. ➢ The freshwater ecosystems and the 15 m ecological buffer must be demarcated using a suitable barrier or material (e.g., Figure A) by an ECO and marked as 'no-go' areas except for the proposed bridge crossing area.  **Figure A: Example of a barrier fence used to demarcate the no-go area around the freshwater ecosystems and the 15 m ecological buffer.** ➢ The natural watercourse is a perennial watercourse with a medium flow volume, thus temporary stream diversion may be necessary should any drainage lines support active flow during the time of construction. As indicated in the method statement compiled by Civil Concepts (Pty) Ltd,2026, all work will be done during the dry season to facilitate water management. Therefore, the following is proposed in this regard: ▪ It is considered imperative that bank modification activities for stream diversion take place during the dry winter months when flows are low or absent to prevent the onset of large-scale erosion and bank destabilisation. ▪ The potential risk of sedimentation of the downstream reaches of the freshwater ecosystems is highest during the phase where soil is loosened, excavated and relocated. To prevent loosened soil from entering the active channel and causing sedimentation, it must be ensured that the active flow path of the river is separated from the area of active excavation/infilling by means of a suitable barrier (e.g. sandbags or rip-rap) at all times during the construction and operational phase of the project. ▪ It is suggested that a coffer dam area be created and dewatered using sandbags and cobbles to divert the channel around the construction area. Water must be diverted into	

Responsible Persons	Proponent / Project/Site Manager	Environmental Officer / Independent Environmental Control Officer
Objective/ Requirement	Control measures	

the downstream reaches around the coffer area (Figure B) to allow for recharge of the downstream reaches at all times.

- To prevent loose soil from being carried off and thereby increasing the sedimentation of the downstream river reaches, sediment traps must be installed downgradient of the construction area to ensure that volumes of sediment entering the river are minimised (Figure C). Sediment traps are to be inspected daily during construction and accumulated sediment to be removed by hand on a weekly basis.
- The construction infrastructure and stream diversions must at no time lead to upstream inundation or lead to the constriction of flow and downstream erosion.

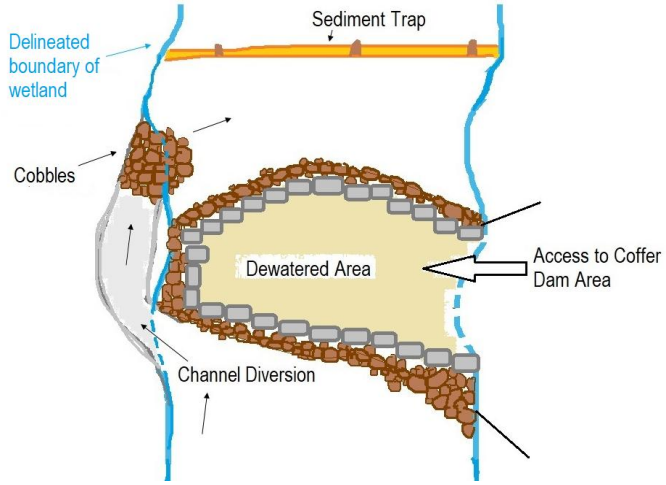

Figure B: Schematic drawing of a coffer dam and sediment trap recommended to be implemented around the construction area associated with activities within or in close proximity to the active channel.

Figure C: Examples of silt traps to be used during the construction phase, to limit additional sediment from entering the downstream portion of the watercourse.

- When necessary, steep banks must be re-sloped to prevent erosion, specifically:
  - Topsoil should be stripped prior to the excavation activities and stockpiled for reuse once excavation for these features has occurred. The topsoil must be stockpiled upstream of the watercourses and not moved to another area. This will limit the movement of vehicles and associated disturbance within the watercourses. Topsoil must be reinstated after resloping as indigenous vegetation seeds will be present within the soil.
  - All embankments should be earthed banks and landscaped with indigenous watercourse vegetation, and if necessary to provide further stability, with a commercially available product such as BioMac®, coir logs, Geojute, or MacMat-R®, all of which provide erosion control whilst simultaneously supporting the establishment of vegetation (Figure D below);

Responsible Persons	Proponent Project/Site Manager	Environmental Officer Independent Environmental Control Officer
Objective/ Requirement	Control measures	
	  **Figure D: Example of coir logs used to stabilise steep banks until vegetation is re-established. It must be noted that the slope within these example pictures is not considered appropriate.** • Additional erosion protection/outlet stabilisation structures such as riprap is recommended at the culvert outlets. In addition, it is recommended that the inlet of the culvert be able to allow the stream to flow through all the culverts to avoid the stagnant and ponding of water in some of the culverts. Figure E depicts culverts that are partially (not recommended) and fully functional (recommended).    **Figure E: (Top left): culvert outlet and (top right): inlet within freshwater ecosystem associated with the road crossing. Scouring is evident and water flows below the culvert structure; (bottom) example of a culvert crossing designed across the entire width and in line with the beds of the watercourse, allowing throughflow during the rainfall season.**
Erosion Prevention and Topsoil Management	➢ Any area where active erosion is observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is reinstated to conditions which are as natural as possible; ➢ Ensure that the creation of the diversion (by means of sandbags) does not result in a significant water level difference upstream or downstream of the installation site; It is recommended that a suitably qualified freshwater specialist and ECO should monitor any coffer dam areas created on site as well as sediment traps at least bimonthly during the construction period to monitor the watercourse conditions during construction and after the removal of the diversion; ➢ Exposed slopes along the edge of the rehabilitated watercourses are highly prone to erosion, particularly given the naturally erodible nature of the soils. Drainage control features such as earth berms or perimeter berm/swales (see below) must be used to intercept and convey runoff from above disturbed areas to suitable dispersal areas or drainage systems. This helps to reduce the sedimentation from exposed areas. Walker *et al*. (2009) and USEPA (2005) have identified the following methods:	

Responsible Persons	Proponent / Project/Site Manager	Environmental Officer / Independent Environmental Control Officer
Objective/ Requirement	**Control measures**	
	• **Brush layering** is when branches are placed perpendicular to the slope contour. This method is effective for earth reinforcement and mass stability. Brush layers break up the slope length, preventing surface erosion, and reinforce the soil with branch stems and roots, providing resistance to sliding or shear displacement. Brush layers also trap debris, aid infiltration on dry slopes, dry excessively wet sites, and mitigate slope seepage by acting as horizontal drains. Brush layers facilitate vegetation establishment by providing a stable slope and a favourable microclimate for growth of vegetation (USEPA 2005). • **Live gully repair** is a technique that is similar to branch packing but is used to repair rills and gullies. Live gully repairs offer immediate reinforcement and reduce the velocity of concentrated flows. They also provide a filter barrier that reduces further rill and gully erosion and must be used where gully erosion is taking place on the project footprint (USEPA 2005). ➢ Ensure that no further incision or canalisation occurs within the rehabilitated watercourse reach. If incision is identified, remediation must commence immediately, and the surrounding area is to be reprofiled to a slope not greater than a 1:4 slope, covered with a commercially available geotextile as described above, which is to be staked to the surface of the slopes until indigenous watercourse vegetation can be re-instated (Task 3 below). ➢ Actions to be taken to prevent any further erosion from occurring within the rehabilitated areas are as follows: • Re-vegetating the disturbed and rehabilitated areas (See Task 3 below); • Ensure no AIP species proliferate within the disturbed area (See Task 2 below); • Stabilise the soil through the use of geotextiles, especially effective with growing vegetation; and • Apply a layer of mulch to the rehabilitated areas to allow the soil to slowly soak up the water and reduce the impact of rain on bare soil.	
Stormwater Management	**Control of stormwater runoff from the road surface during the operational phase** ➢ Sheet runoff from the road surface must be appropriately managed. As such, the areas where stormwater runoff from the road surface enters the receiving environment must be attenuated by means of the strategic placement of rocks or cobbles to ensure that preferential flow paths and scour of the streambed does not occur as a result of stormflows.	
General Good housekeeping	**Waste and Litter Problems** ➢ Any excessive mud and silt generated from the rehabilitation activities must be removed from the watercourse by hand. Silt traps should be erected downgradient of all activities (as per above examples) prior to commencing with the rehabilitation activities in order to minimise the risk of excess sedimentation of the watercourse; ➢ All rubble and litter located within the study area should be removed and disposed of at a registered waste facility; ➢ Any waste concrete and other foreign material used or generated during construction must be appropriately contained and removed from site. All rubble and waste will be disposed of at a suitably registered landfill site and not dumped into the watercourse features; ➢ Suitable general waste receptacles must be provided; ➢ Disposal of waste or litter must be prohibited within the watercourses. Any waste noted must be cleared immediately; and ➢ Suitable ablution facilities need to be provided for all personnel.	

3.2.2.2 Task 2: Alien and Invasive Plant Management

Vehicle movement, clearing of indigenous vegetation, and earthworks will unavoidably increase the likelihood of alien invasive plants establishing in areas adjacent to the freshwater ecosystems. All disturbed areas must be cleared of alien invasive plants (AIPs) before any re-vegetation activities commence, particularly in zones where no infrastructure is planned. In line with Section 28 (Duty of Care) of NEMA, AIPs within freshwater ecosystems are also required to be removed. The Riestpruit River is already impacted by the spread of invasive reed species such as *Arundo donax* and *Phragmites australis*, which are highly likely to expand further in disturbed areas if not properly managed. Various AIPs were identified within the watercourses during the site assessment undertaken in March 2026, which indicated that the area has undergone varying degrees of transformation over a number of years as a result of upstream urbanisation, historical agricultural and mining activities which have disturbed the soil profile, resulting in a proliferation of alien vegetation species along the watercourse boundaries. Table 6 below lists the floral species that were observed during the site inspection.

Table 6: Dominant watercourse plant species encountered within the freshwater ecosystems and the immediate surrounding terrestrial habitat. Category 1b Alien species are indicated in red and an asterisk.

Species	Growth Form	Drainage Line (Rietspruit River)	Terrestrial Habitat
*Acacia cf. dealbata**	Shrub/Tree	x	x
Andropogon eucomus	Graminoid	x	
Aristida congesta barbicollis	Graminoid		x
*Cestrum parqui**	Forb	x	
Cyperus distans	Graminoid	x	
Cyperus erectus	Graminoid	x	
*Erigeron sumatrensis**	Forb	x	x
Fimbristylis dichotoma	Graminoid	x	
Gomphocarpus fruticosus	Forb		x
Hyparrhenia cf. hirta	Graminoid		x
Juncus effusus	Graminoid	x	
Leonotis leonurus	Forb		x
*Lespedeza cuneata**	Forb	x	x
Melinis repens	Graminoid		x
*Paspalum urvillei**	Graminoid	x	
*Persicaria sp. **	Forb	x	
Phragmites australis	Graminoid	x	
*Salvia tiliifolia**	Forb	x	x
*Schkuhria pinnata**	Forb	x	x
Searsia lancea	Shrub/Tree	x	
Searsia pyroides	Shrub/Tree	x	
Seriphium plumosum	Forb	x	x
*Solanum sisymbriifolium**	Forb	x	x
Sporobolus africanus	Graminoid	x	x

Species	Growth Form	Drainage Line (Rietspruit River)	Terrestrial Habitat
*Tagetes minuta**	Forb	x	x
Typha capensis	Graminoid	x	
*Verbena brasiliensis**	Forb	x	
*Xanthium strumarium**	Forb	x	x

The National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) Section 73 requires every person to exercise a Duty of Care relating to invasive species within their property, and as such the landowner and occupant are equally responsible for AIP control. Category 1b species require compulsory control and must be removed and destroyed as they have high invasive potential. The recommendations in the Alien Invasive Plant Control Plan (AIPCP) developed for the Kosmosdal Ext 92 development (SAS, 2016 and 2026) must take precedence for AIP control where applicable.

All recommended herbicides and active ingredients are listed under species specific control and for the control of Alien floral species, refer to Annexure D. It is important to note that AIP control must be done from the outer sections inwards in order to contain the existing AIP and prevent further spread.

3.2.2.3 Task 3: Revegetation and Landscaping

The natural topographic conditions of the watercourse and associated areas affected by the rehabilitation activities, i.e. site clearing activities including removal of vegetation, disturbance of soil, removal of topsoil and creation of topsoil stockpiles, can lead to compaction of soil, alterations of runoff patterns, smothering of vegetation and disturbance to soil.

The last stage of the rehabilitation activities should be to prepare the soil for revegetation and reinstate indigenous vegetation within the rehabilitation areas. Propagation and purchasing of the required species should have been undertaken as part of the Planning phase (Action 1) and must be ready and available for transplantation as soon as re-sloping and stabilisation of embankments and clearing of AIP activities have been completed.

Revegetation needs to commence as soon as possible after the soil is prepared to prevent AIPs proliferation, erosion and sedimentation of the watercourse areas. The successful establishment of a vegetation cover will also improve the watercourse habitat, providing a preferred habitat with adequate vegetation density for faunal species dispersal. Plugs may be sourced from a local nursery. Examples of indigenous grass, reed, sedge and forb species which may be utilised during revegetation, and the densities in which they should be planted are provided in Table 7 below.

Table 7: Examples of indigenous plant species which may be utilised during revegetation within the riparian zones of the Rietspruit River.

Sedges & Grasses (Drainage Line Habitat)	Graminoids (terrestrial buffer areas)	Trees/Shrubs (Drainage Line Habitat)
Andropogon eucomus	*Aristida congesta barbicollis*	*Searsia lancea*
Cyperus distans	*Cynodon dactylon*	*Searsia pyroides*
Cyperus eragrostis	*Eragrostis biflora*	
Cyperus erectus	*Eragrostis chloromelas*	
Cyperus marginatus	*Hyparrhenia hirta*	
Fimbristylis dichotoma	*Melinis repens*	
Juncus effusus	*Panicum maximum*	
Urochloa mosambicensis	*Setaria sphacelata*	
Urochloa panicoides	*Sorobolus africanus*	
	Themeda triandra	

Pennisetum clandestinum (Kikuyu) or other exotic lawn grasses, alien and invasive plant species or exotic ornamental plant species must not be used for revegetation. Potentially invasive and robust reed species e.g. *Phragmites australis* (Common reed) and *Typha capensis* (Bulrush) must also not be planted. The Mayford Biomosome Bushveld Reclamation Mix is an effective, easily accessible, and convenient product to use, and may also be used during the revegetation activities to establish a pioneer basal cover for areas devoid of vegetation.

Recommended planting densities:

- Grass, Reeds and Sedges: seedlings to a density of at least 24 kg/ha. Final species-specific composition and ratios to be refined by the appointed contractor with knowledge of local vegetation;
- Forbs: in groupings of 5-7 at a density of at least 200 plants/ha resembling natural communities;
- Shrubs and trees: in groupings of 5-7 at a density of 50-100 plants/ha. Consider maximum width and height of the species when deciding on densities and planting distance between individual plants.

Plants must be watered immediately after planting and watered regularly to aid in establishment. Revegetation must take place in spring as far as possible (between September and October) to ensure maximum survival rates of planted species.

3.2.3 Action 3: Monitoring and Auditing

Prudent monitoring of the rehabilitation areas is of utmost importance to ensure success and to provide a continual flow of data, enabling all parties involved to accurately assess and

manage water resource related progress and issues. To ensure accurate gathering of data, the following techniques and guidelines should be followed:

- The on-site ECO must ensure that all aspects as stipulated in this implementation plan are being adhered to and that the rehabilitation and implementation is being undertaken according to good freshwater resource management principles.
- Site walk through surveys should be applied as the preferred method of monitoring with specific focus on:
  - AIP clearing activities and proliferation;
  - Burn sites;
  - Erosion monitoring;
  - Watercourse rehabilitation;
  - Waste and litter problems; and
  - Vegetation regrowth.
- The rehabilitation areas must be inspected for erosion after all significant rainfall events;
- Areas where re-vegetation has taken place must be monitored annually to ensure vegetation becomes established, and that no new AIPs establish;
- If any areas of excessive sedimentation are observed, the excess sediment should be carefully removed, preferably by hand;
- All data gathered should be measurable (qualitative and quantitative);
- Monitoring actions should be repeatable and temporally and spatially comparable;
- Data should be auditable;
- Data gathered should be an accurate representation of the various floral communities and habitat units represented by each monitoring site;
- Data, when compared to previous sets, should show spatial and temporal trends; and
- Reports should present and interpret the data obtained.

Table 8 below summarises data capturing for the monitoring plan. It is important to note that the Independent ECO must review and assess all monitoring findings during the external audits.

Table 8: Monitoring actions for the affected watercourse.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting	Report Content	Equipment
Erosion	Kosmosdal Ext 92 bridge development Open space area adjacent to the proposed development showing any signs of erosion or incision occurring	Monitoring of erosion should occur during construction after every rainstorm and / flood. In the operational phase monitoring should occur twice a year in the operational phase until it is determined that the area is geomorphologically stable.	**Construction phase** 1. After every major rainstorm and / flood. 2. Results should be included as appropriate in the monthly monitoring report compiled by the appointed EO during the construction phase. **Operational phase** 1. Any areas of excessive erosion that require intervention must be reported to the relevant managers for intervention as required.	1. Brief indication of the method of assessment; 2. Assumptions and Limitations must be listed; 3. Photos and GPS point locations taken of existing erosion in the watercourse features and buffer zones prior to and post construction and operation must be incorporated into the report. 4. Any erosion observed must be discussed in detail; 5. Map indicating where erosion is present; and 6. Recommended mitigation should be presented.	1.GPS 2. Camera 3. Field Form 4. Measuring Tape
Surface Water Quality					
Pre-construction	Upstream and downstream of the proposed development footprint.	Water must be tested at least once a month for a minimum of three months before construction commences. GPS points must be taken so that monitoring takes place consistently at the same points.	Report must be compiled after field work was completed and form part of the EO reporting function.	Results of the following must be discussed in detail: 1. pH; 2. Dissolved Oxygen; 3. Electricity Conductivity; and 4. Temperature	1.GPS 2. Camera 3. Field Form 4. Handheld multi probe 5. Clarity Tube 6. DO Probe (not essential)
Construction	Monitoring must take place at the GPS point localities that were taken for the pre-construction monitoring.	Water monitoring must be assessed on a weekly basis for the same variables during the pre-construction.	Report must be compiled on a monthly basis for all data collected and form part of the ECO reporting function.	Compare results to pre-construction assessments and aspects as listed in pre-construction report content.	As listed in Pre-Construction Equipment

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting	Report Content	Equipment
Operation	Monitoring must take place at the GPS points that were taken for the pre-construction monitoring.	Every month for three months after completion of construction. (or until baseline WQ values are reached)	A once off report to be compiled.	Compare results of pre-construction, construction and operational assessments and aspects as listed in pre-construction report content.	As listed in Pre-Construction Equipment
Alien Vegetation Control	1. The watercourse feature 2. Any disturbed areas within the area adjacent to the construction area. *As per the recommendations set out in the AIPCP (SAS, 2026).	1. Monitoring must be done during and after growing season; 2. Regrowth of alien vegetation should be monitored monthly during the first year after the construction phase; and 3 Thereafter monitoring must be done annually.	1 Monthly monitoring report must be compiled by the appointed ECO during the construction phase and alien vegetation reported on at least quarterly; and 2. During operational phase an annual report must be developed highlighting hotspots that require control and intervention.	1. Provide a list of species occurring within the study area; 2. Discuss the density of species 3. Watercourse integrity and risk to be discussed; 4. Fixed point photo (Taking photo at specific point within priority area to show effect of alien vegetation control.); and 5. Map indicating where alien vegetation is present.	1. GPS; 2. Field Form; and 3. Camera

***Note: This monitoring plan must be implemented by a competent person and the findings must be submitted to the responsible authority for evaluation.**

In accordance with the South African water quality guidelines volume 7, Aquatic ecosystems (DWAF, 1996), the below percentage change guidelines must be followed:

- Electrical conductivity (EC)/Total Dissolved Solids (TDS) concentrations should not be changed by > 15 % from the normal cycles of the water body under unimpacted conditions at any time of the year, and the amplitude and frequency of natural cycles in EC/TDS concentrations should not be changed;
- pH values should not be allowed to vary from the range of the baseline pH values for a specific site and time of day, by > 0.5 of a pH unit, or by > 5 % temporal variation, and should be assessed by whichever estimate is the more conservative; and
- Note that EC and pH comparisons refer to temporal comparisons. However, as no guidelines are available for spatial comparisons, the same percentages as those for temporal change should be considered significant.

An example of a field form which is to be completed by the Implementing Agent and/or the on-site ECO is available in Annexure E of this report. This form should be completed during the annual follow-up prior to mobilisation of any clearing teams in order to inform the planning of equipment, personnel and thus required funding.

4 WATERCOURSE REHABILITATION AND MANAGEMENT PLAN REVIEW

- The independent ECO is authorised to change and re-issue the WRMP should the need for amendment become apparent during the project development phase of the proposed development;
- The EO is authorised to change and re-issue the WRMP should the need for amendment become apparent during the construction phase of the proposed development;
- The provincial authority, the local authority, site supervisor, project manager are to be informed of any changes made by the EO and ECO;
- The site supervisor or contractor is responsible for ensuring construction personnel are complying with procedures and informing the work crew of any changes. The site supervisor is responsible for ensuring the work crew is aware of changes before starting any work; and
- If the contractor cannot comply with any of the activities as described above, they should inform the EO with reasons within 7 working days in order to allow the EO to adjust the WRMP.

5 CONCLUSION

SAS (Pty) Ltd was appointed to develop a Watercourse Rehabilitation and Management Plan (WRMP) as part of the Environmental Authorisation (EA) and Water Use Authorisation (WUA) processes for the Kosmosdal Extension 92 bridge in Centurion, Gauteng Province. A freshwater ecological assessment undertaken prior to this study confirmed that, within the 500 m investigation area, the only primary drainage system affected is a reach of the Rietspruit River. This reach was therefore assessed and is considered to be largely to seriously modified (PES Category D/E), with low to marginal ecological importance and sensitivity (EIS).

The risk assessment indicates that the proposed development poses a low risk to the watercourse. However, strict implementation of the WRMP, together with the recommendations of the freshwater assessment (SAS, 2026), is required to minimise potential impacts during construction and operation.

Furthermore, the correct implementation of the WRMP will aid in the possible enhancement of the PES and ecological service provision of the watercourses in the specific rehabilitation areas. In addition, the information gathered through monitoring programs will assist in managing impacts on the ecology of the affected watercourses and ensure proactive management of risks to the receiving environment associated with the proposed development.

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ANNEXURE A – TERMS OF USE AND INDEMNITY

INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as the available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS (Pty) Ltd and its staff reserve the right to, at their sole discretion, modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field, or pertaining to this investigation.

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ANNEXURE B –LEGISLATION

The National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) provides the framework and principles for sustainable development and sets national norms and standards for integrated environmental management (Section 24) where all spheres of Government and all organs of State must co-operate, consult and support one another. Section 28 of the Act also imposes a duty of care and remediation of environmental damage on any person who causes, has caused or may cause significant pollution or degradation of the environment. The guiding principles of NEMA refer specifically to biodiversity management in the following Clause: (4) (a) *Sustainable* development requires the consideration of all relevant factors including the following: (i) That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied. The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated 2017 Regulations (Listing No R. 325, No R. 326 and R. 327) as amended, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the EIA process depending on the nature of the activity and scale of the impact.
The National Environmental Management: Biodiversity Act, 2004 (NEMBA, Act 10 of 2004)	The objectives of this act are (within the framework of the National Environmental Management Act, 1998 (Act No. 107 of 1998)) to provide for: ➢ the management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity; ➢ the use of indigenous biological resources in a sustainable manner; ➢ the fair and equitable sharing among stakeholders of benefits arising from bio prospecting involving indigenous biological resources; ➢ to give effect to 'ratified international agreements' relating to biodiversity which are binding to the Republic; ➢ to provide for co-operative governance in biodiversity management and conservation; and ➢ to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act. This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of surrounding areas is not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of benefits arising from indigenous biological resources. Furthermore, a person may not carry out a restricted activity involving either: a) a specimen of a listed threatened or protected species; b) specimen of an alien species; or c) a specimen of a listed invasive species without a permit. Permits for the above may only be issued after an assessment of risks and potential impacts on biodiversity is carried out. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. The Minister may also prohibit the carrying out of any activity, which may negatively impact on the survival of a listed threatened or protected species or prohibit the carrying out of such activity without a permit. Provision is made for appeals against the decision to issue/refuse/cancel a permit or conditions thereof.
The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (Alien and Invasive Species Regulations, 2016)	The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998 (Act No. 107 of 1998). In terms of alien and invasive species. This act in terms of alien and invasive species aim to:

	➢ Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur, ➢ Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and ➢ Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats. Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) as: (a) a species that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
Restricted activities (GN R598 National Environmental Management: Biodiversity Act 10 of 2004)	The following activities, applicable to this project, are defined as restricted activities: ➢ The spread or allowing the spread of, any specimen of a listed invasive species; and ➢ Releasing any specimen of a listed invasive species.
Exempted Alien Species (R.509 National Environmental Management: Biodiversity Act 10 of 2004)	Species that are exempted from the provisions of section 65 of NEMBA include: ➢ Dead specimens of alien species; ➢ Alien species legally introduced to South Africa prior to the Regulations coming into effect, and which are not on the National List of Invasive Species, including species imported for agricultural purposes; and ➢ Alien species that are also indigenous species, including those regulated in terms of the Threatened and Protected Species (TOPS) Regulations promulgated under NEMBA; and ➢ Alien species that are regulated in terms of the Conservation of Agricultural Resources Act (CARA; Act 43 of 1983) as weeds and invader plants.
Categories According to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (Alien and Invasive Species Regulations, Notice number 864 of 29 July 2016 in Government Gazette 40166)	➢ **Category 1a: Invasive species that require compulsory control.** Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled and removed from all areas, including private property and officials from the Department of Environmental Affairs (DEA) must be allowed access to monitor or assist with control. ➢ **Category 1b: Invasive species that require control by means of an invasive species management programme**. Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All Category 1b species must be contained, and in many cases, they already fall under a government sponsored management program. ➢ **Category 2: Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread.** Category 2 species are invasive species that can remain in private gardens, but only with a permit, which is granted under very few circumstances. These species should be monitored and controlled to prevent spread to areas outside of permitted areas. Any Category 2 plants outside permitted areas should be dealt with as stipulated in Category 1b. ➢ **Category 3: Ornamentally used plants that may no longer be planted.** These are invasive species that may remain in private gardens. However these species may not be sold or propagated and must be controlled. In riparian zones (within 32 metres of the edge of a river, lake, dam, wetland or estuary, or within the 1:100 year floodline, whichever is the greater) or wetlands all Category 3 plants fall within Category 1b.

The Conservation of Agricultural Resources Act, 1983 (CARA, Act 43 of 1983)	Amendments to regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) ensures that landowners are legally responsible for the control of invasive alien plants on their properties. The CARA legislation divides alien plants into weeds and invader plants, with *weeds* regarded as alien plants with no known useful economic purpose, while *invader plants* may serve useful purposes as ornamentals, as sources of timber and may provide many other benefits, despite their aggressive nature. The Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) Regulations have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) – Alien and Invasive Species (AIS) Regulations, which became law on 1 October 2014 (http://www.arc.agric.za, retrieved 09062016).
The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (1947)	The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No. 36 of 1947) is administered by the Department of Environmental Affairs (DEA), and is focused on the registration, importation, sale, acquisition disposal or use of fertilisers, farm feeds and agricultural remedies, as well as the registration of sterilising pest and plant control operators. For the purpose of this report and this Act, herbicides are classified as agricultural remedies. An agricultural remedy (herbicide) needs to comply with the following criteria in order to be accepted for registration: ➢ It should be suitable and sufficiently effective for the purpose it is intended; ➢ It has to comply with all the prescribed requirements; ➢ It should not transgress against the public interest; and ➢ The factory in which it is manufactured should comply with certain requirements. The following specifications must be adhered to during the use of herbicides: ➢ The use or recommendation of a herbicide during the course of any trade, industry or business, may only be used or recommended for the purpose, in the manner that is specified on the container of the herbicide; ➢ Only a registered pest control operator, or a person working under the supervision of a registered pest control operator, are allowed to use or recommend any herbicides for application in any industry, trade or business; ➢ The minister of Agriculture is entitled to prohibit or regulate, the sale, use or acquisition of a herbicide within a specific area/s or by certain persons or groups of persons; and ➢ When herbicides are applied by the request of the owner or person in control of the area concerned, the operator first needs to notify the owner or person in control of the purpose of the application, the registered name and number of the herbicide, the necessary precautions as well as the number of the registration certificate of the operator. The notification can be verbally; however, it should be put in writing no later than three days after application.
The Occupational Health and Safety Act (Act No. 85 of 1993)	The Occupational Health and Safety Act (Act No. 85 of 1993) was administered by the Department of Labour and aim to provide: ➢ Health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; ➢ Protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; and ➢ Establish an advisory council for occupational health and safety, which must provide for matters connected therewith.
The National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998)	The purpose of the National Veld and Forest Fire Act, 1998 (Act No.101 of 1998) is to prevent and combat veld, forest and mountain fires throughout South Africa. The Act places the duty on every land owner on whose land a veld fire may start or burn, or from whose land it may spread, to prepare and maintain firebreak(s) on his/her side of the boundary between his/her land and the adjoining land. Fires causing damage to neighbouring land may result in claims against the landowner if the requirements of this Act are not adequately implemented. Furthermore this Act makes provision for the establishment of Fire Protection Associations, which are designed to administer minimum standards to be maintained by members in relation to all aspects of veld fire prevention and readiness for firefighting; and to regulate prescribed burning to conserve ecosystems and reduce fire danger.

	The following Sections pertain to the abovementioned Chapter 4 in the National Veld and Forest Fire Act, 1998 (Act No.101 of 1998) regarding firebreaks: ➢ Section 12 sets out the conditions for preparing and maintaining firebreaks. ➢ Section 12 (2) to (10) contains conditions on burning for the preparation and maintenance of any firebreaks. ➢ Section 15 involves the exemption from the duty to prepare and maintain firebreaks. ➢ Section 16 indicates the actions that can be taken to minimize negative environmental impacts when preparing and maintaining firebreaks. (6) **Contravention Categories and its associated penalties according to the National Veld and Forest Fire Act, 1998 (Act No.101 of 1998)** ➢ **Category 1**: Any person who lights, uses or maintains a fire in the open air in a region where the fire danger is high or extreme. Such a person may be liable on conviction for a fine, or two year imprisonment, or both. ➢ **Category 2**: Any person who does the following is guilty of a second category offence. Such a person is liable for a fine, or two year imprisonment, or both: • Fails to prepare a firebreak when obliged to do so • Fails to give notice of intention to burn a firebreak • Burns a firebreak when a Fire Protection Officer has objected to it • Fails to inform adjoining land owners • Fails to meet the standards of readiness for firefighting • Refuses to assist a Fire Protection Officer • Hinders/obstructs a Fire Protection Officer • Smokes where smoking is by notice prohibited • Leaves a fire unattended which he/she lit before that fire has been extinguished properly • Lights, uses, or maintains a fire with or without permission from the landowner, or spreads a fire, causing damage/injury. • Throws, puts down/drops a burning match or burning material of any kind. • Uses material capable of self-ignition to make a fire which spreads and causes injury and damage. ➢ **Category 3**: Any owner, occupier or person in control of land on which a fire occurs who fails to take reasonable steps to extinguish the fire or to prevent it from spreading, or who fails to prevent it from causing damage to property or adjoining land, is guilty of a third category offence. Such a person is liable for a fine, or six months imprisonment or both. Any person who prevent a Fire Protection Officer or any other officer (police official/forest ranger) from doing his/her work or interferes with the above when doing his/her work, is guilty of a Category 3 offence and is liable for a fine, or six months imprisonment, or both.
The National Water Act, 1998 (Act No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i).
Government Notice 4167 as published in the Government Gazette 49833 of 08 December 2023 as it relates to the NWA (Act 36 of 1998) as amended	GN 4167 outlines the parameters and process of a General Authorisation (GA), which replaces the need to apply for a licence in terms of Section 40 of the NWA, provided that the water use is within the limits and conditions of the GA. The notice **replaces GN 509 of 2016.** The GA sets out the need to determine the regulated area of a watercourse, as well as the degree of risk posed by an activity/ies related to a particular water use. In accordance with GN 4167 of December 2023, the regulated area of a watercourse for Section 21 (c) and 21 (i) of the NWA, 1998 is defined as: a) the outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake, or dam; b) in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m distance from the edge of a watercourse where the edge of the

	watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or c) In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans. The GA only applies to the use of water in terms of Section 21(c) and (i) of the NWA where the risk class is LOW as determined through the application of the Risk Matrix as prescribed in the Notice. The GA also does not apply where other Section 21 water uses are triggered, does not apply for most sewage infrastructure and pipelines carrying hazardous materials, water uses associated with hazardous materials, water uses associated with water and wastewater treatment works, and for most mining-related water uses. The GA may be exercised as follows: i. Section 21(c) or (i) water use activities that are determined to pose a LOW Risk as determined through the application of the Risk Matrix as prescribed in the Notice can be undertaken subject to the general conditions of the GA; ii. Section 21(c) or (i) water use activities set out in Appendix D1 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA. Such water use activities in Appendix D1 include inter alia emergency river crossings, fence erection, solar renewable infrastructure that has no direct impact on watercourses and mini-scale hydropower developments; iii. Prescribed water use activities undertaken by certain State Owned Entities as detailed in Appendix D2 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA; iv. Maintenance work associated with an existing lawful water use in terms of Section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix can be undertaken ; v. River and stormwater management activities including maintenance of infrastructure as contained in a river management plan or similar management plan, may be conducted subject to the approval of such a plan by the relevant DWS regional office or catchment management agency; vi. Rehabilitation of wetlands or rivers where such rehabilitation activities has a LOW risk class as determined through the Risk Matrix can be conducted; and vii. Emergency work arising from an emergency situation and or incident associated with the persons' existing lawful water use entitlement can be undertaken, provided that all work is executed and reported in the manner prescribed in the Emergency protocol contained in Appendix C of the Notice. A GA issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence with the water use as contemplated in the GA.

ANNEXURE C – RECEIVING ENVIRONMENT

The following information on the ecological characteristics of the watercourse associated with the proposed development is taken from a report titled: "Freshwater Ecological Assessment as part of the Environmental Impact Assessment and Water Use Authorisation Processes for the proposed construction of a bridge crossing over the Rietspruit River, in Olievenhoutbosch, Midrand, Gauteng Province" (SAS, 2026), which provides further information if required.

The National Freshwater Ecosystem Priority Areas (NFEPA 2011) database indicated the following applicable important background information:

Table C1: Conservation characteristics associated with the locality of the proposed development.

NFEPA database (2011)	➢ According to the NFEPA database (2011), there are no natural or artificial wetlands indicated to be located within the investigation area.
Wetland Vegetation (NFEPA, 2011)	➢ The study and investigation area is located within the Dry Highveld Grassland Group 3 Wetland Vegetation (WetVeg) type. The WetVeg is considered to be in a Least Threatened threat status according to Mbona et al. (2015).

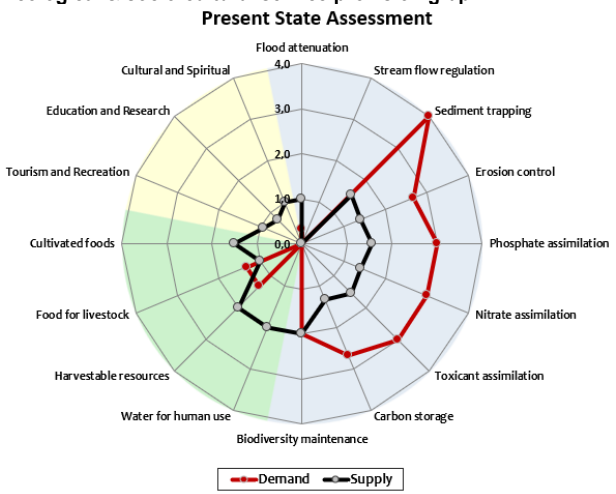
Following the completion of the freshwater assessment (SAS, 2026), it was apparent that the proposed activities will directly traverse the freshwater ecosystem. A summary of the results of the freshwater assessment are provided in the table below; for a detailed analysis, please refer to the full freshwater ecological assessment (SAS, 2026).

Table C2: Summary of results of the field assessment as discussed in Section 4 of SAS, 2026.

Present Ecological State (PES)	Ecoservice provision	Ecological Importance and Sensitivity (EIS)	Recommended Ecological Category (REC) / Recommended Management Objective (RMO) / Best Attainable State (BAS)
Category: D/E (Largely to Seriously Modified)	Demand: Very High to Low Supply: Moderate to Very Low	Low/Marginal	**REC:** D; **RMO:** Improve; **BAS:** D

Table C3: Summary of the assessment of CVB wetland (Rietspruit Tributary) associated with the proposed access roads and bridge crossing.

Ecological & socio-cultural service provision graph



Photographic Notes: Representative photographs of the crossing to be upgraded (left), and a section of the Rietspruit River to the north of the crossing.

Ecoservice provision	**Demand: Very High to Low** **Supply: Moderate to Very Low** Demand for the provision of ecological services such as sediment trapping, erosion control and assimilation of nutrients and toxicants is considered elevated due to the urbanised catchment and associated land uses. However, the capacity to provide such services is greatly diminished as a result of the compromised ecological integrity. Conversely, the demand for socio-cultural services is significantly diminished (due to the urban setting), although the capacity to provide limited benefits such as water, harvestable resources and recreational functions is considered low to moderate.
PES discussion	**PES Category: D/E (Largely to Seriously Modified)** The assessed reach of the Rietspruit River has been subjected to various pressures relating to agriculture and urban development over the course of several decades. These have not only led to diminished ecological functioning and integrity, but most notably have resulted in a change in the characterisation of the system, i.e. from that of a channelled valley bottom wetland to a strongly channelled riverine system possessing riparian habitat. Impacts include impoundment, erosion and bank incision, increased sedimentation, altered water quality, increased water inputs as a result of catchment hardening and transformation of the floral community associated with the system.
EIS discussion	**EIS Category: Low/Marginal** Ecological importance and sensitivity is considered decreased, and this is attributed to the lowered ecological integrity of the system. As a consequence, the system is unlikely to provide valuable faunal habitat, with only the most tolerant biota likely to occur. Subsequent to the assessment of the system undertaken by SAS in 2016, the conservation threat statuses of the various WetVeg types were revised; thus, this aspect, which previously contributed to an increased EIS rating is no longer valid.
REC, RMO & BAS Category	**REC: D; RMO: D Improve; BAS: D** Although the strict application of the method (outlined in Appendix C) indicates that the RMO is to maintain the system in its present state, since a PES Category E is considered unacceptable (Malan and Day, 2012), a default REC class D is allocated and by inference, the management objective is to improve the Ecostatus of the system. However, taking into consideration the landscape setting of the watercourse outside protected areas, in an environment highly transformed by urbanisation, mining and agriculture, it will take the effort of multiple responsible stakeholders at a local, municipal and provincial level to realistically improve the PES of the system. Notwithstanding this, responsibility rests on the proponent to ensure that the proposed bridge upgrade does not create additional stressors on the receiving reach of the Rietspruit River. To aid in this objective, multiple mitigation measures are provided in Section **Error! Reference source not found.** of the freshwater report (SAS, 2026) and must be strictly implemented to ensure avoidance or minimisation of impacts.

Freshwater ecosystem drivers and receptors discussion (hydraulic regime, geomorphological processes, water quality and habitat and biota):

The assessed reach of the Rietspruit River has undergone multiple impacts over the course of several decades. As demonstrated by Terrasoil Science (2015), it is likely that the system historically displayed characteristics consistent with those of a channelled valley bottom wetland, although according to Terrasoil Science (2015), few such characteristics remained at the time of that assessment. The findings of SAS during the current (2026) assessment supports this assertion, as the assessed reach has developed characteristics commensurate with those of a defined river channel, and a floral community resembling riparian, rather than wetland, habitat.

The hydraulic and geomorphological regimes have been significantly impacted through extensive land use changes in the catchment: urban and industrial development, development of road networks, indiscriminate disposal of solid waste (such as rubble) and infilling of the freshwater ecosystems including the Rietspruit River, historical agricultural practices which led to increased availability of sediment and granite quarrying in a tributary of the Rietspruit approximately 300 m north (and upstream) of the bridge crossing. Terrasoil Science (2015) noted significant inputs of sediment to the system, leading to long-term bed and bank incision (thus also contributing to sediment inputs and changes in sediment dynamics) as well as contributing to changes to flow dynamics and allowing for the establishment of vegetation where it may not otherwise have occurred. The incision and impoundment of the channel has likely led to a reduction in over-bank topping and in turn, reduction in wetland characteristics as well as reduced recharge to downstream reaches. Flows within the system are further inhibited and altered by the presence of instream infrastructure such as culverts and bridge crossings, affecting instream biota as oxygen saturation is likely to have been affected by such changes.

The floral assemblages have been significantly transformed over time, changing from communities typically expected in Highveld grassland (dominant graminoid layer with sparsely distributed forb species) to a more savanna-like structure (dominant graminoid layer, but with an increased occurrence of woody species). In addition to altered structure, the vegetation community is now dominated by Alien and Invasive Plant (AIP) species, such as *Acacia cf. dealbata, Cestrum parqui, Erigeron sumatrensis, Lespedeza cuneata, Paspalum urvillei, Salvia tiliifolia, Verbena brasiliensis* and *Xanthium strumarium*. Woody species recorded within the riparian zone included *Searsia lancea, S. pyroides* and *A. dealbata*. While the transition to riparian habitat does not necessarily remove faunal habitat, it will affect the faunal assemblages as wetland-dependent fauna becomes displaced as species more suited to the riparian structure encroach on the system. Notwithstanding this, it is postulated that due to the urbanisation of the catchment and related anthropogenic disturbances, only faunal species tolerant of such disturbance and pollution are likely to utilise the Rietspruit River.

Diatom analysis and water quality considerations:

Diatom sampling was undertaken and basic water quality parameters (temperature, Dissolved Oxygen (DO), pH and Electrical Conductivity (EC)) recorded at a single site adjacent to the bridge; the outcome of this sampling effort indicates organic contamination of the site, which is consistent with visual and olfactory observations during the site assessment as well as consideration of the urban setting. Although the water temperature can be considered normal for the time of day and season of sampling and the pH of 7.9 and EC of 22,8 mS/m are both in line with the ideal range limit according to DWAF (2011), the diatom analysis revealed moderate to high (meso-eutrophic) nutrient content, elevated electrolyte conditions, and extremely contaminated conditions. The results of the diatom analysis are summarise below; the detailed results are provided in Appendix F.

Table C3(a): Ecological and Biological traits summary of diatom samples.

Parameter	S1		
Dominant Taxa	*Nitzschia* sp., *Fragilaria biceps*, *Nitzschia linearis*, *Nitzschia palea*, *Gomphonema affine*, *Cymbella aspera*, *Aulacoseira granulata*	**SPI**	9.1 – Poor quality (Category D)
Functional Groups	Mix of benthic motile, attached/stalked, and planktonic centric taxa.	**%PTV**	28.3 – Some evidence of organic contamination.
Ecological Guilds	High-profile guild dominant with motile taxa present and some planktonic taxa.	**Diversity**	3.56 – High
Size Classes	Wide range of size classes including small motile and larger attached taxa.	**Evenness**	0.91 – High

Extent of modification anticipated	**Low** The proposed upgrade of the bridge crossing over the Rietspruit is expected to lead to some initial short-term impacts, however, it is not expected to result in long-term, spatially significant modification. Moreover, with the strict implementation of the mitigation measures provided in the freshwater report (SAS, 2026), the potential exists for improvement of local-scale conditions around the bridge crossing, and as such, the proposed upgrade is supported by the specialist.

Risk Assessment Outcome and Business Case:

Low	Taking into consideration the decreased ecological integrity and lowered EIS of the Rietspruit, as well as the intention of the proponent to undertake instream construction activities during the low-flow winter period, the proposed activities are anticipated to pose an overall 'low' risk significance to the system. Moreover, provided that the mitigation measures outlined in Section **Error! Reference source not found.** of the freshwater report (SAS, 2026) are strictly implemented, not only can the significance of the expected short-term negative impacts be reduced, but a long-term positive outcome can be achieved through improving hydraulic connectivity and geomorphological stability; therefore, the proposed bridge upgrade is supported by the specialist.

OUTCOMES OF RISK ASSESSMENT

The Risk Assessment was undertaken during the assessment of the wetland using the DWS Risk Assessment Matrix (2023). The risk assessment was applied for the proposed activities related to the proposed Kosmosdal Ext 92 bridge development, considering impacts during both the construction and operational phases (Table C5). It is assumed that all mitigation as described in the Freshwater Ecological Assessment (SAS, 2026) and those stipulated in the tables above will be implemented and adhered to.

ANNEXURE D – ALIEN FLORAL SPECIES CONTROL

The dominant alien floral species are predominantly associated with agricultural activities and should be identified by the ECO prior to the commencement of construction. An Alien and Invasive Plant (AIP) species control program should be developed for control of these species. The basic principles of a control program are presented below.
AIP control programs must include the following three phases (Campbell, 2000):

- Initial Control Phase: The existing population must be drastically reduced.
- Follow-up Control Phase: Control of coppice regrowth, root suckers and seedlings.
- Maintenance Phase: Low AIP density and numbers with a low annual control cost. During this phase, AIP are no longer considered a problem. It is important to monitor the situation of infestation during the growing season of the plants as to avoid re-infestation and to keep the control cost at a minimum.

Control Methods
In order to control AIP successfully, one must use a number of control methods. When using herbicides, the recommendations that are stated on the label of the specific product must be adhered to (Campbell, 2000).

Integrated control strategies
A combination of the most suitable and effective methods should be used to control a specific species in a particular situation. The following selection of suitable control methods should take into account the following (Campbell, 2000):

- Species of alien and invasive weeds;
- The type of growth form (i.e. seedling, sapling, shrub or tree);
- The density of infestation;
- Terrain where the infestation is present;
- Rehabilitation requirements
- What resources are available;
- Speed or urgency that the control of the infestation requires – physical removal and biological control will take longer than chemical control.

- **Initial control phase**
  - **Hand pull:** saplings and seedlings must be pulled out by hand and regrowth must be controlled with herbicide (Campbell, 2000). All guidelines for the application of herbicide listed in this Rehabilitation Plan must be adhered to;
  - **Frill:** a cane knife is used to cut frills into the stem. Herbicide must be applied (1-2 mm per frill) and must be done in 30min after frilling;
  - **Soil application:** herbicide is applied to the soil and taken up by the plants roots

Methods for controlling Coppice, saplings and seedlings:
AIP infestation can comprise of different growing forms, and some of the growth forms cannot be utilised. These plants need to be cut with a brush cutter and the stumps treated with herbicide that was mixed with a dye to show where treatment was done (however stumps must not be removed as they significantly contribute to soil stability).

Integrated strategies to control alien shrubs

- **Alien shrubs that are less than 1 m in height**:
  - Foliar application must be used in the general control of alien shrubs that are less than 1 m in height.
  - Registered herbicide must be used and where grass is present, selective broadleaf herbicide that will not impact on the grass. When grass is not present, a selective or non-selective registered herbicide must be used.
  - For dense seedling growth that are of uniform height a flat fan nozzle with knapsack must be used.
  - For seedling growth that are of uneven height, root suckers, short saplings, and coppice growth a cone nozzle must be used.

- **Alien shrubs that are taller than 1 m (Campbell, 2000):**
  - Shrubs that are taller than 1 m must be reduced cutting using brush cutter or cane knifes.
  - When large areas with dense growth are present a tractor mounted gyro-motor must be used.
  - For low – medium density infestation a cut stump treatment must be used. Stumps that are must be treated immediately. The best time to treat is during the active growing season.
  - Medium – High-density infestations must be slashed to knee height so that the plants can coppice. The best time to do this is during the winter months as the plants are dormant and the coppice will come out during the active growing period after good rain. The coppice must be sprayed when enough leaves are present to absorb the herbicide and a dye must also be used to indicate treated areas.
  - Pathways must be cut to increase exposed areas so that a foliar spray treatment is more effective without compromising the indigenous vegetation.
  - Mechanical uprooting of shrubs is not always a preferred method because the soil is disturbed and this increases the risk of alien vegetation infestation. Erosion is also promoted by this activity, and soil loss will occur. Mechanical uprooting can be done in areas that have a dense grass cover, as the roots of the grass will keep the soil intact. After uprooting the soil must be levelled and if grass seeds are present, some grass seeds must be placed on these areas to promote grass regrowth.

Integrated strategies to control alien herbs (Campbell, 2000)

- **Chemical Control:**
  - Alien herbs are soft non-woody species.
  - Some of the alien herbs have registered herbicides to control them and are either pre- or post-emergent herbicides.
  - When alien herbs are associated with woody alien plant, herbicides that are registered to control woody alien species are often used to control alien herbs. Alternatively, glyphosate can be used as it is often registered for both alien herb and alien woody species.

Follow up control (Campbell, 2000)

Introduction

Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made with the initial control work in the initial phase. If the follow up control phase is neglected, the alien infestation will become worse and denser than before the eradication process started. It is essential to sustain the follow up phase because it will prevent the suppression of alien seedlings on planted grasses.

Follow up treatment control must use the following methods:

- Chemical control methods: Only use registered herbicides to control any alien species. Instruction on the herbicide labels must be followed carefully.
- Mechanical control methods
- Biological control methods that are available.

Control methods for dense regrowth

After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers.

- **Chemical control / foliar application:**
  - Plants that are less than 1 m in height must be controlled by foliar application.
  - Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle.
  - If grass is present, the use of a registered selective herbicide must be used so as to not harm the grass, and if grass is not present a registered non-selective or selective herbicide can be used.
  - Suitable dye must be used at all times to limit over- or under spray of areas.
- **Mechanical control:**
  - Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.
  - When stump density is high, plants should not be cut. This is impractical and there will be many untreated stumps. Instead cut the stumps in dense areas with brush cutters and

remove the top growth. Stumps will start to coppice and foliar spay must be used to control the coppice regrowth.

Control methods for low-medium density regrowth

Neglecting to control low-medium density regrowth will result in densification and spreading as well as additional control costs.

- **Chemical control:**
  - Cut stump method must be used and stumps must be cut up to a height of 15 cm and must be sprayed within an hour of cutting the plant with a registered herbicide. Herbicide must be applied with knapsack sprayers set to a low pressure, using cone nozzles e.g. TG1 or CE1. Hand sprayers can also be used to apply herbicide. A suitable dye must be used to ensure all stumps are treated. Only the cut surface must be treated with herbicide and the side of the stumps must not be treated.
  - Foliar spray can be applied to regrowth that is up to the height of 1m. Herbicide must be applied using knapsacks with solid cone nozzle and must be mixed with a suitable dye to prevent over- or under spraying of treated areas.
- **Mechanical control:**
  - Seedlings can be removed from wet soil by hand pulling. Gloves can be used for hand protection during the operation.

ANNEXURE E – PROPOSED FIELD FORM FOR REPORT CONTENT

Table E1: Proposed field form for report content.

Date:			**Name of recorder:**			
Sensitive area:			**GPS point:**			
AIP control present:	**YES**	**NO**	**AIP regrowth present:**	**YES**	**NO**	
Description of Infestation: (Species, Diversity, Abundance, Density, Extent, level of recruitment and trends.)			**Photo of infestation:**			