Glencore Operations South Africa (Pty) Ltd

LAKENVLEI WETLAND REHABILITATION PROJECT PHASE 2

Wetland Assessment

41106116-REP-00002
AUGUST 2024

PUBLIC

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REPORT PUBLIC

PROJECT NO. 41106116

OUR REF. NO. 41106116-REP-00002

REPORT DATE: AUGUST 2024

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Wetland Assessment

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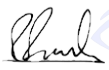
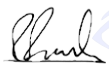
Signature	 Rowles, Rob (ZARR05387) 2025.05.21 19:39:08 +02'00'	 Rowles, Rob (ZARR05387) 2025.05.21 20:20:33 +02'00'
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DETAILS OF THE SPECIALIST

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DECLARATION OF INDEPENDENCE BY SPECIALIST

I, Lufuno Nemakhavhani, declare that I –

- Act as the independent specialist in this application;
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document.

Signature:

1 INTRODUCTION AND BACKGROUND

The approved 2006 Environmental Impact Assessment/Environmental Monitoring Program (EIA/EMP) for the Glencore Operations South Africa (Pty.) Ltd. – Goedgevonden Colliery (GGV) near Ogies, Mpumalanga Province, proposed that coal within the GGV mining rights area be mined using two methods, namely bord-and-pillar (underground mining) and opencast mining. Associated surface infrastructure was also included in the application. During specialist studies undertaken to inform the EIA, it was found that 45.40 ha of wetland habitat overlay the proposed bord-and-pillar mining area, while 584.21 ha of wetland was found to occur within the footprints of the proposed opencast mining areas. All wetlands within the opencast mining area were expected to be permanently lost following mining, with no means of mitigating this wetland loss within the GGV mining rights area. Wetland offsets were therefore proposed as a means of addressing the residual impact associated with loss of wetland habitat.

In order to give effect to conditions contained within the Water Use License (WUL) of the existing GGV, GGV has embarked on a wetland offset strategy targeting the upper Lakenvlei wetland system within the Greater Lakenvlei Protected Environment (GLPE) located between Belfast and Dullstroom in the Mpumalanga Province. The wetland offset strategy is required to compensate for the loss of wetland habitat resulting from the authorised and already commenced mining activities at GGV. The WUL requires an offset ratio of 1:2, resulting in an offset target in the region of 1,168 ha of wetland habitat. This is being achieved via implementation of rehabilitation measures in the GLPE area, including small engineered structures (dongalock ™), larger structures, and catchment management measures.

The first phase of rehabilitation, consisting of small engineered structures, has been completed under the ambits of a General Authorisation (GA) (DWS Ref 27/2/2/B141/14/3). These small structures associated with Phase 1 did not require EA, since no listed activities were triggered.

The larger structures proposed under Phase 2 do however trigger NEMA Listed Activities; and thus, require Basic Assessment (BA) to inform an Environmental Authorisation (EA) application for the construction of the proposed structures within the targeted wetland offset sites.

1.1 PURPOSE OF THE REPORT

This report describes the baseline wetland extent and condition within areas that will be impacted by the construction and operation of the proposed Phase 2 structures. Potential impacts, positive or negative, were assessed and practical mitigation/management measures developed for inclusion in the Environmental Management Programme (EMPr).

2 PROJECT LOCATION

The wetland rehabilitation project is situated within the upper Lakenvlei wetland system in the Greater Lakenvlei Protected Environment (GLPE), which is located 15 km North of Belfast and 10 km South of Dullstroom in the Mpumalanga Province.

The study area has been divided into eight wetland clusters for the purpose of implementing the offset strategy (Figure 2-1).

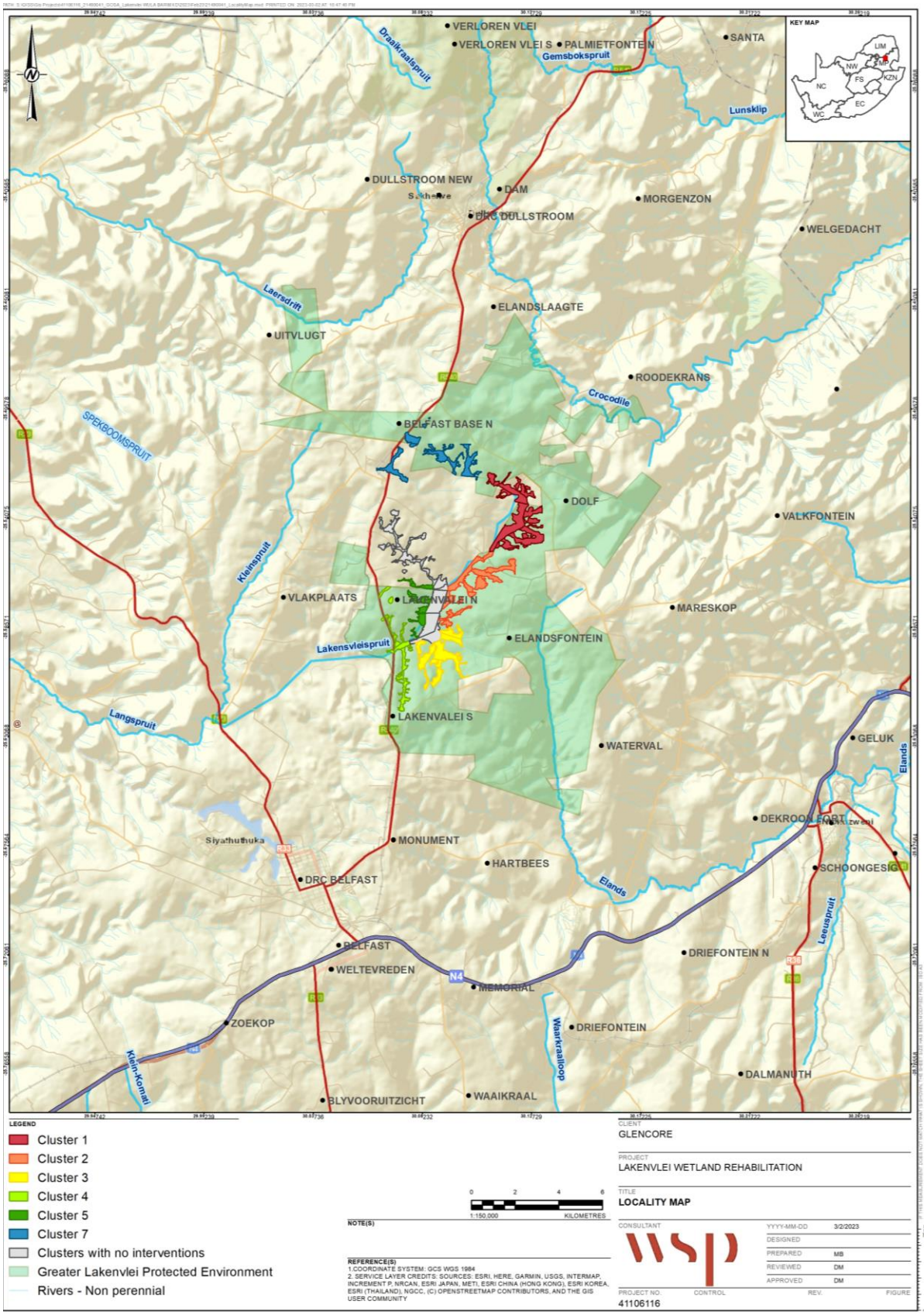


Figure 2-1 - Project locality map

3 PROJECT DESCRIPTION

The main objective of the GGV wetland offset strategy is to help improve the Present Ecological Status (PES) in all the wetland Clusters within the GLPE through rehabilitation and management initiatives. 162 rehabilitation initiatives have been proposed for the project area. The larger rehabilitation structures associated with Phase 2, are planned for Clusters 1-7.

Cluster 8 is the biggest and most ecologically sensitive wetland cluster. No rehabilitation measures have been proposed for Cluster 8 for various reasons, including that Cluster 8 itself is generally inaccessible, unsuitable for implementation of engineered structures, and forms the highly sensitive core breeding habitat of the White-winged Flufftail (*Sarothrura ayersi*), a Critically Endangered bird species. Improving the PES of Clusters 1-7 is anticipated to have a direct positive impact on the PES of Cluster 8.

The rehabilitation initiatives proposed for GLPE that require environmental authorisation include:

- Maintaining existing wetland rehabilitation structures already in place (44 x structures). Some of the existing structures in the wetlands require repair and maintenance, some additional structural construction, and others no intervention at all. Forty-four (44) existing structures have been identified for maintenance and repair work;
- Repairing and formalising damaged spillways. Seventeen (17) spillways have been identified for repair and upgrade;
- Formalising existing wetland crossings/access routes. Twenty (20) crossings within the wetlands have been identified for formalising/upgrade;
- Stabilising headcuts. Six (6) headcuts have been identified for stabilising;
- Constructing new wetland rehabilitation structures (dongalocks) in strategic locations within the wetlands. Five (5) single-sheet dongalocks, sixty (60) double-sheet dongalocks and two (2) triple-cascading dongalock systems have been proposed;
- Erecting bird-friendly fences to restrict future and further agricultural infringement in the wetlands. Seven (7) areas have been identified for fencing. This activity does not require EA; and
- Removing heavy alien invasive vegetated areas within the GLPE area. Eight areas (up to 97.78ha) of alien invasive vegetation have been identified for clearing from within the wetland areas.

The larger structures and instream rehabilitation activity planned for clusters 2, 3, 4, 5, 6 and 7 trigger the need for a Water Use Licence under the ambits of a General Authorisation (for obstructing and diverting flow) in terms of WULA Regulations GN R 267 and environmental authorisation (for infill and removal of more than 10m^3 of material within a watercourse and the clearance of more than 300m^2 of indigenous vegetation within a protected ecosystem type) in terms of the EIA Regulations GN R.324 to GN R.327 as amended, published under the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) (NEMA). The relevant wetland clusters that will be assessed are illustrated in Figure 3-1. The proposed activities that will be implemented in the project site clusters are briefly described in Table 3-1.

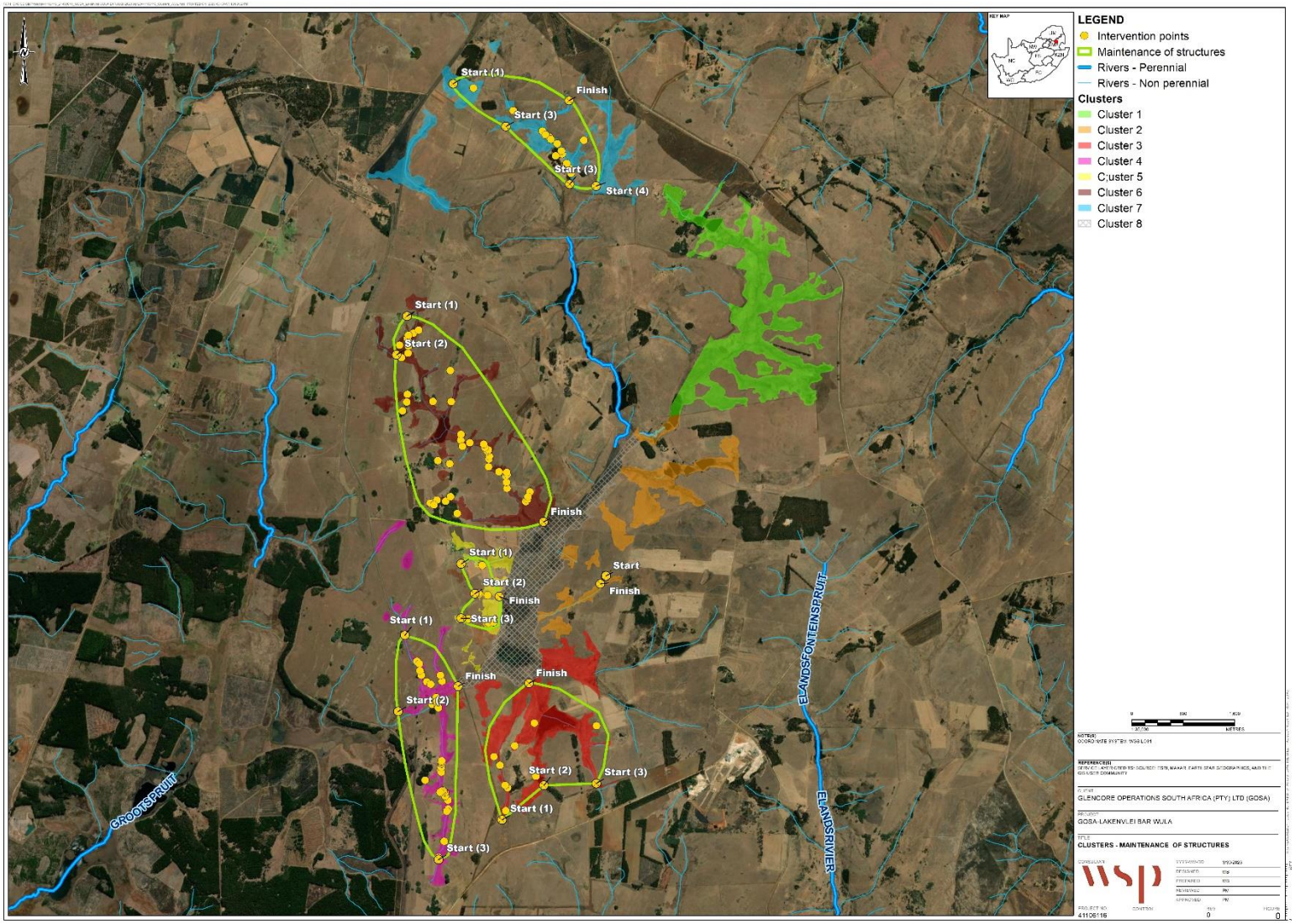


Figure 3-1 - Wetland clusters for rehabilitation

Table 3-1 – Description of project activities per wetland cluster

Cluster	Wetland Type	Wetland area (ha)	Description of activities
Cluster 1 (Figure 3-2)	▪ Hillslope Seep ▪ Unchannelled Valley Bottom	311.61	▪ Dongalocks installed in 2020
Cluster 2 (Figure 3-3)	▪ Channelled Valley Bottom ▪ Hillslope Seep	139.50	▪ Dongalocks proposed ▪ Removal of alien vegetation
Cluster 3 (Figure 3-4)	▪ Channelled Valley Bottom ▪ Hillslope Seep	188.15	▪ Formalise spillways of 6 farm dams, with one dam wall also to be lowered ▪ 2 dams to be removed ▪ Dongalock installation ▪ Removal of alien vegetation ▪ One headcut to be stabilised, and ▪ One area to be levelled and shaped.
Cluster 4 (Figure 3-5)	▪ Hillslope Seep ▪ Channelled Valley Bottom	94.72	▪ Improve existing structures (Dongalocks) in 9 areas along the non-perennial stream ▪ Four springs to be fenced off ▪ Remove one farm dam ▪ Removal of alien vegetation
Cluster 5 (Figure 3-6)	▪ Hillslope Seep ▪ Channelled Valley Bottom	48.4185	▪ Dongalocks installed in 2021 ▪ Improve existing structures (Dongalocks) in 2 areas ▪ Two headcuts to be stabilised ▪ Incised channels to be rehabilitated ▪ Three springs to be fenced off
Cluster 6 (Figure 3-7)	▪ Hillslope Seep ▪ Unchanneled Valley Bottom	147.73	▪ Dongalock installation ▪ Berms and drains, incised channels, erosion, and breached dam to be rehabilitated ▪ Removal of alien vegetation
Cluster 7 (Figure 3-8)	▪ Hillslope Seep ▪ Channelled Valley Bottom	151.45	▪ Dongalocks installed in 2021 ▪ Structures along non-perennial stream to be improved ▪ Three road crossings ▪ Two areas to be levelled and shaped ▪ Five biological weirs to be constructed ▪ Removal of alien vegetation
Cluster 8		214.22	▪ No interventions

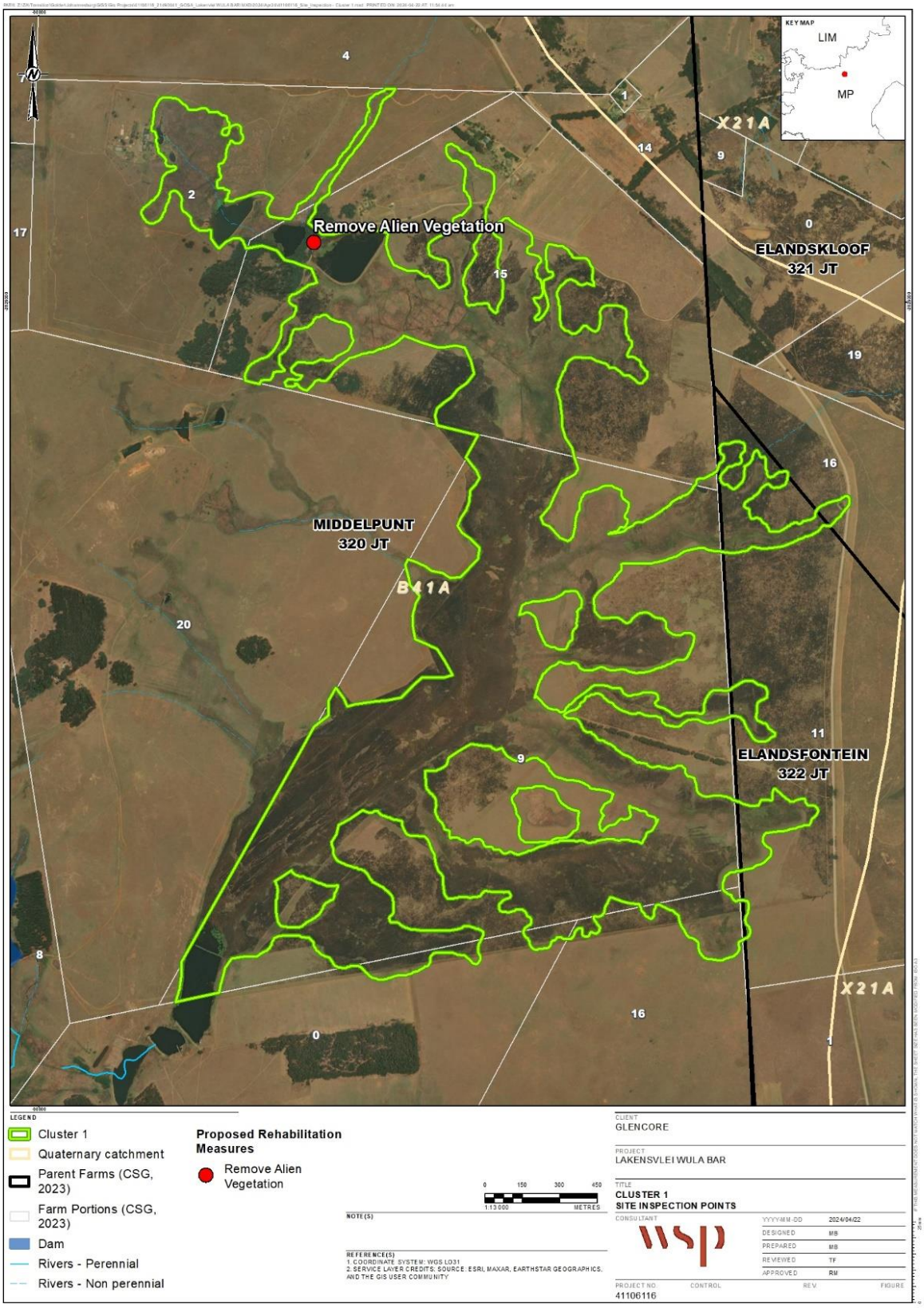


Figure 3-2 - Cluster 1 - proposed rehabilitation measures

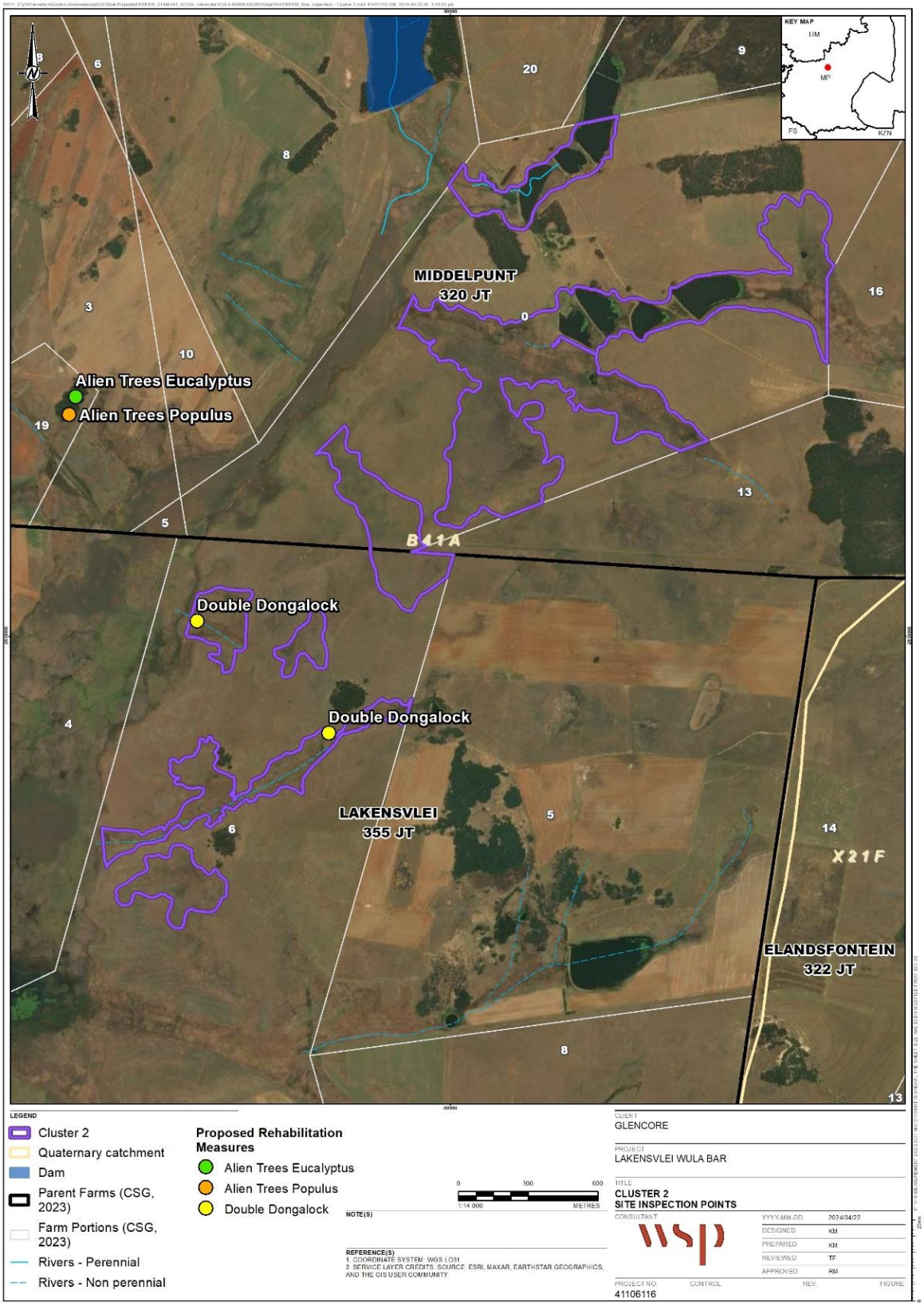


Figure 3-3 - Cluster 2 - proposed rehabilitation measures

Figure 3-4 – Cluster 3 - proposed rehabilitation measures

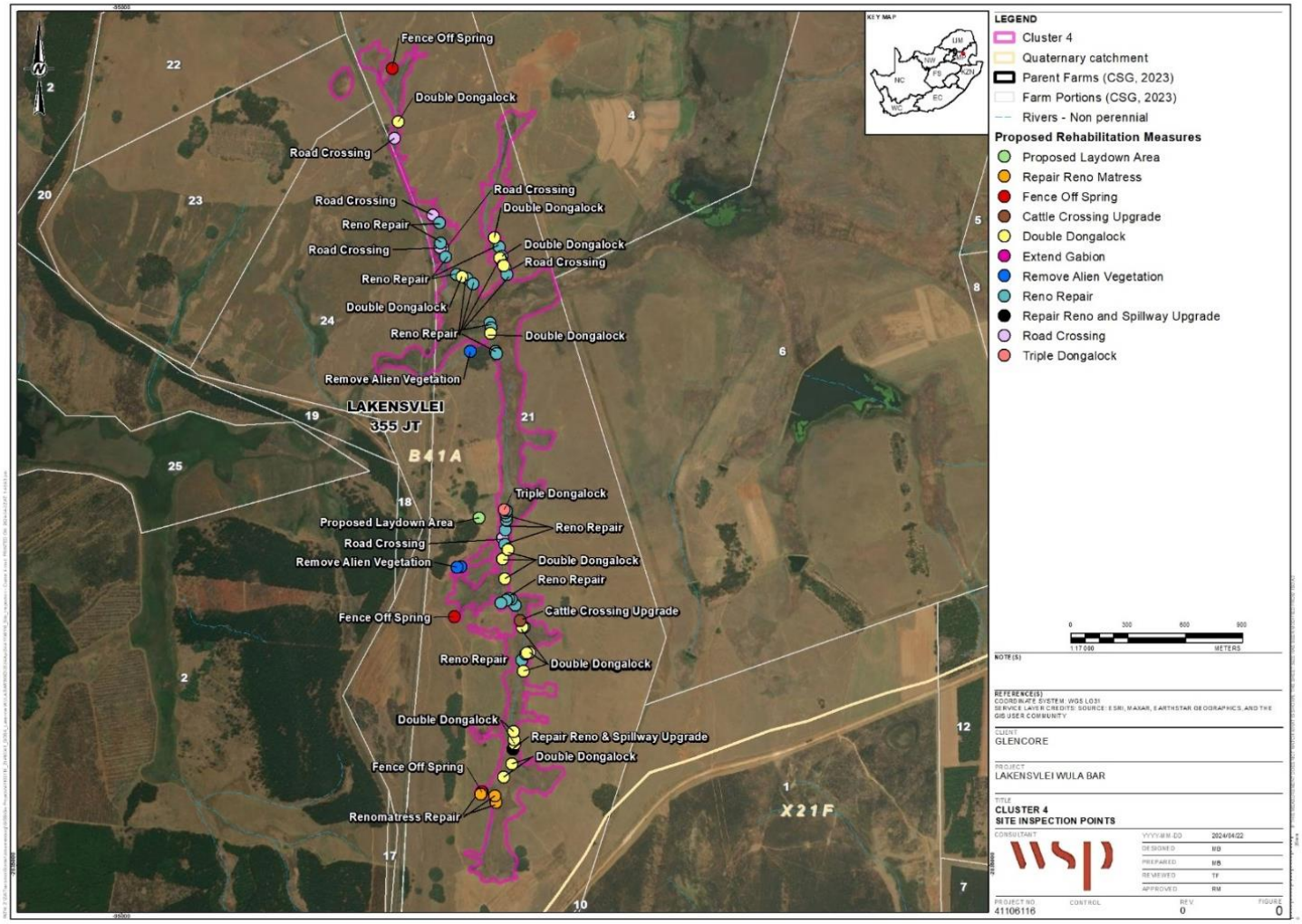


Figure 3-5 - Cluster 4 - proposed rehabilitation measures

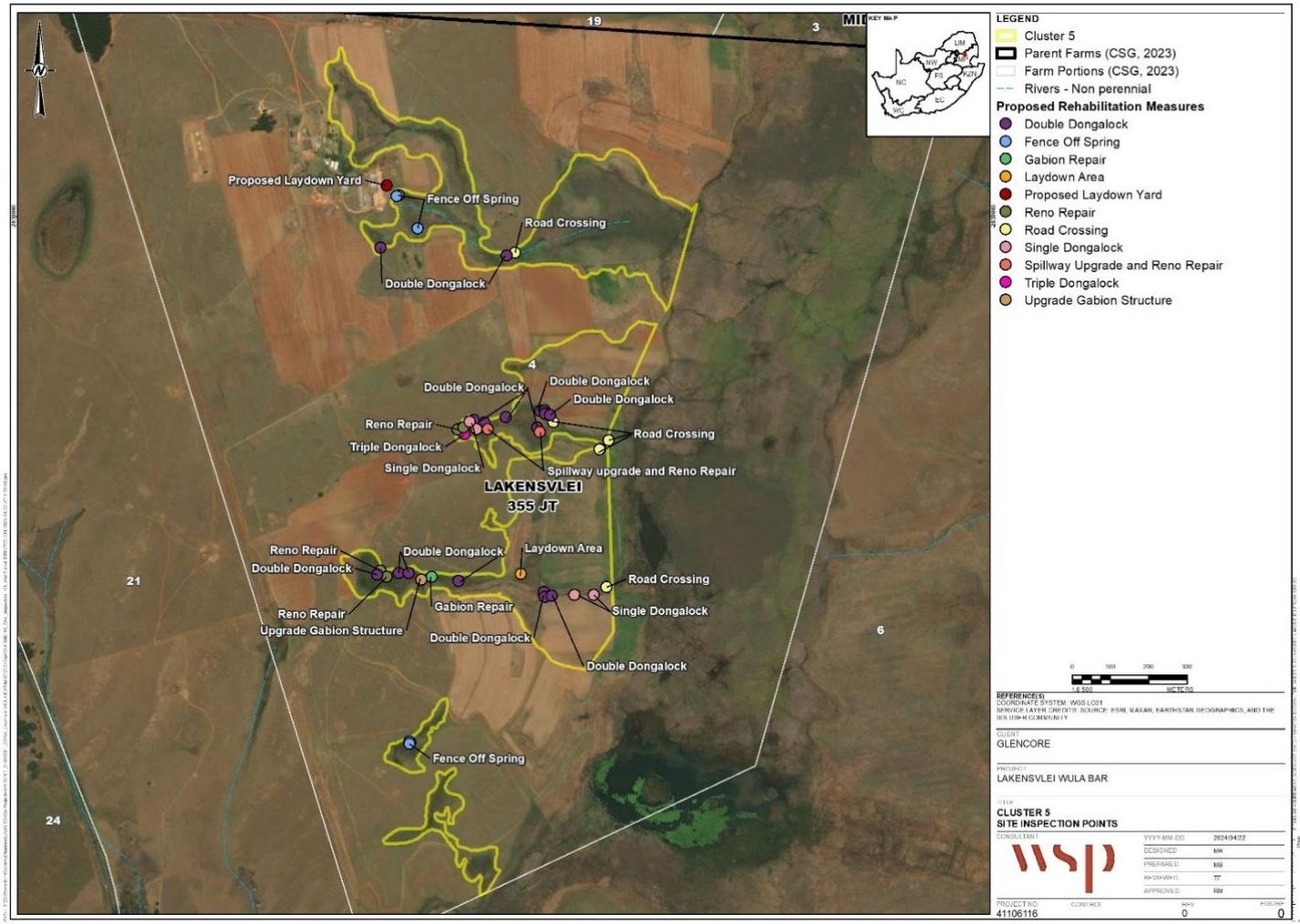


Figure 3-6 - Cluster 5 - proposed rehabilitation measures

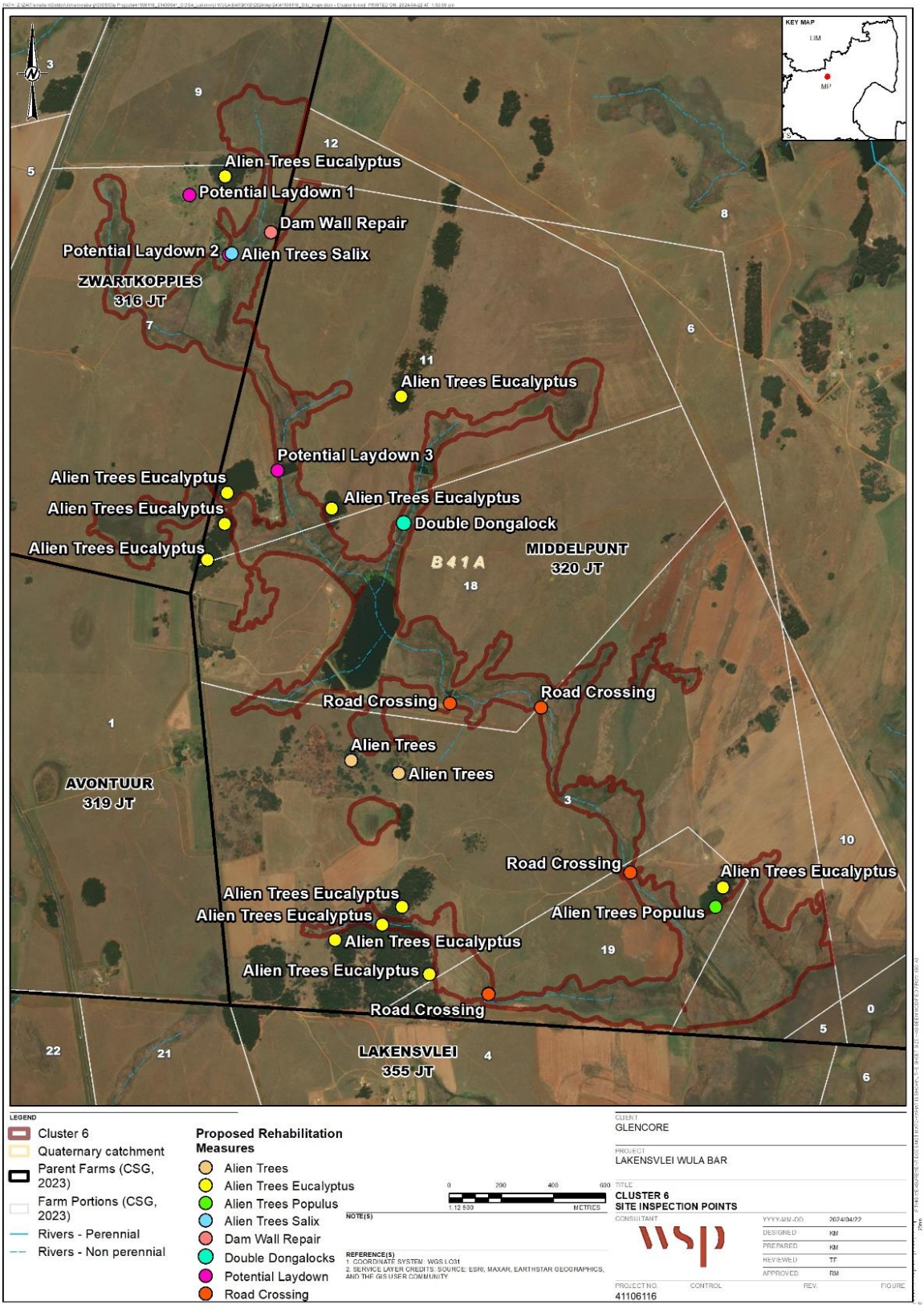


Figure 3-7 - Cluster 6 - proposed rehabilitation measures

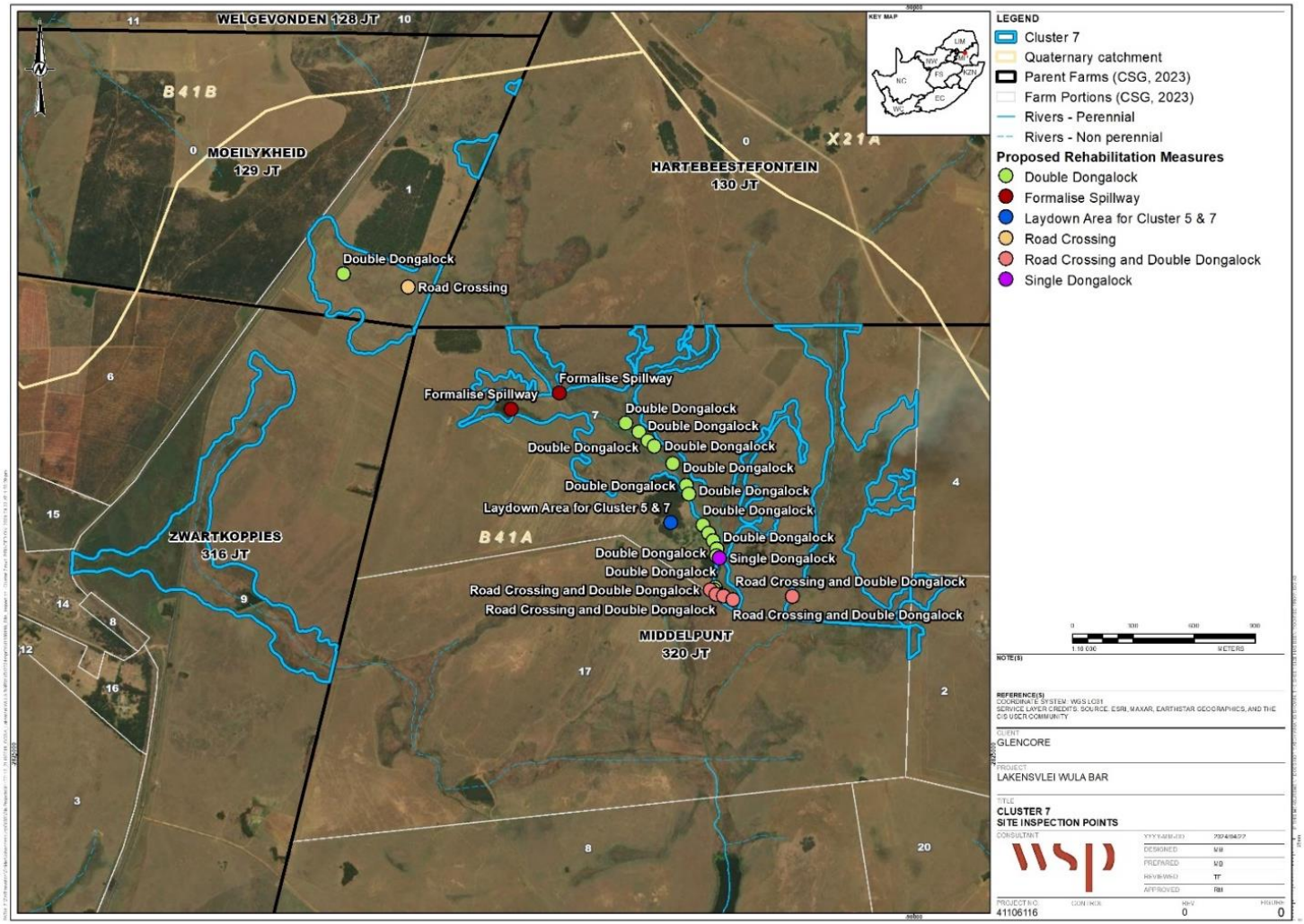


Figure 3-8 - Cluster 7 - proposed rehabilitation measure

4 APPLICABLE LEGISLATION AND GUIDELINES

The legislative context for aquatic biodiversity (including wetlands) studies which applies to the proposed project are listed and discussed below.

- **National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)** – Section 24 (1)(a) and (b) states that "the potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment must be considered, investigated and assessed before their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.
- **National Water Amendment Act (Act No. 27 of 2014) (NWA)** – The NWA aims to protect, use, develop, conserve, manage and control water resources including rivers, dams, wetlands, the surrounding land, groundwater, as well as human activities that influence them. The NWA intends to protect these water resources against over exploitation and to ensure that there is water for social and economic development and water for the future.
- **National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA)** – The NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act regulates the protection of species and ecosystems that require national protection and considers the management of alien and invasive species.
- **Mpumalanga Nature Conservation Management Act (Act No. 10 of 1998)** – aims to consolidate and amend the laws relating to nature conservation within the Province and to provide for matter connected therewith.

5 METHODOLOGY

The baseline description and impact assessment took cognisance of Government Notice No. 320, published in 2020 under the National Environmental Management Act (1998) concerning '*Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Theme in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (1998), when applying for Environmental Authorisation'*.

The key steps taken to describe the baseline extent and condition of wetlands within the study area are described in the sections that follow.

5.1 LITERATURE REVIEW

The aim of the desktop literature review component was to collate and review the extensive available ecological information related to important wetland features in the Project's area of influence, key wetland processes and function, and the composition and structure of the wetland communities.

Sources that were used in the description of the regional aquatic resources included:

1. Nationally available datasets which were consulted to inform the site sensitivity verification for wetland habitat include the South African National Wetland Map version 5 (NWM5) (Van Deventer et al., 2019), and the National Freshwater Ecosystem Priority Area database;
2. National spatial planning datasets, namely the Mpumalanga Biodiversity Sector Plan (freshwater), Threatened Ecosystems, and the Strategic Water Source Area (SAWS), provide a regional/national context for assessing the biodiversity significance of the site;
3. Linstrom & Grundling, 2014: A Basic Broad-scale Assessment of Lakenvlei Wetlands and its Carbon Capacity: Draft Report;
4. Wetland Consulting Services (2018): Glencore Goedgevonden Wetland Offset Strategy Lakenvlei Wetlands – Cluster 1: Baseline Monitoring Report;
5. Wetland Consulting Services (2020): Glencore Goedgevonden Wetland Offset Strategy Lakenvlei Wetlands – Cluster 6: Baseline Monitoring Report; and
6. Annual wetland monitoring reports, conducted by Golder (2018-2021) and WSP (2022-2023).

5.2 WETLAND DELINEATION AND CLASSIFICATION

The wetlands within the study area (GLPE) were initially delineated and classified by Linström (2014), according to the guidelines set out by the Department of Water Affairs and Forestry (DWAF, 2005). This delineation was subsequently updated by Wetland Consulting Services (2015) – this updated wetland delineation and hydrogeomorphic (HGM) unit classification was utilised for the current study, since no changes in land use in wetland areas has occurred in the intervening time-period.

Delineated wetlands were grouped into Clusters (Cluster 1 – 8) for the purposes of phased implementation of rehabilitation activities.

5.3 PRESENT ECOLOGICAL STATE (PES)

The Level 2 WET-Health assessment as described in Macfarlane *et al.* (2008) was applied for the determination of the baseline Present Ecological State (PES) score for each of the affected wetland units. This was done for each wetland cluster, prior to the implementation of the Phase 1 rehabilitation interventions – these baseline PES scores and categories are reported for each cluster in this report.

A description of the PES scores and linked impact categories is provided in (Table 5-1).

Table 5-1 - Impact scores and categories of Present Ecological State used by WET-Health for describing the integrity of wetlands (Macfarlane *et al.*, 2008)

Impact Category	Description	Impact Score Range	Present Ecological State Category
None	Unmodified, or approximates natural condition	0 – 0.9	A
Small	Largely natural with few modifications, but with some loss of natural habitats	1 – 1.9	B

Impact Category	Description	Impact Score Range	Present Ecological State Category
Moderate	Moderately modified, but with some loss of natural habitats	2 – 3.9	C
Large	Largely modified. A large loss of natural habitat and basic ecosystem function has occurred	4 – 5.9	D
Serious	Seriously modified. The losses of natural habitat and ecosystem functions are extensive	6 – 7.9	E
Critical	Critically modified. Modification has reached a critical level and the system has been modified completely with almost complete loss of natural habitat	8 – 10.0	F

5.4 ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

As was the case for PES, the EIS score was calculated for wetlands in each cluster, prior to the implementation of the Phase 1 rehabilitation interventions – these baseline EIS scores and categories are reported for each cluster in this report.

In the previous assessments, the EIS was determined using the methodology developed by Rountree *et al*. (2013). It is a rapid scoring system to evaluate:

- Ecological Importance and Sensitivity;
- Hydrological Functions; and
- Direct Human Benefits.

The scoring assessment incorporates:

- EIS score derived using aspects of the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999);
- Hydro-function importance score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze et al. (2020); and
- Direct human benefits score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze et al. (2020).

The highest score of the three derived scores (each with range 0 – 4) was then used to indicate the overall importance category of the wetland (Table 5-2).

Table 5-2 - Ecological importance and sensitivity categories

Ecological Importance and Sensitivity Category Description	Range of EIS score
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers	> 3 and ≤ 4
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	> 2 and ≤ 3

Ecological Importance and Sensitivity Category Description	Range of EIS score
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers	> 1 and ≤ 2
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	> 0 and ≤ 1

5.5 BUFFER ZONES

Generally, buffers are adopted to protect freshwater ecosystems from physical disturbance and to protect the water resource from pollution from the adjacent landscape. The buffer distances are largely associated with the buffer functions that contribute towards protecting the water resource rather than biodiversity. The width of a buffer is determined by the type of development proposed.

The buffers were derived for the wetland habitat within the study area using 'The Estuary, River and Wetland Buffer Guidelines' model (Macfarlane *et al*. 2015), which is based on the characteristics of the freshwater ecosystems, the potential impacts associated with the proposed development and the characteristics of the derived buffer zones.

Scientific Buffer zones weren't determined since the rehab will take place in wetlands, and associated works and laydown areas will be situated in existing farmyard facilities or similar, in agreement with landowners, as has been the practise throughout the Phase 1 implementation stage.

5.6 RECOMMENDED ECOLOGICAL CATEGORY

The recommended ecological category (REC) is the target or desired state of freshwater ecosystems required to meet water resource management objectives and quality targets. It is determined through the consideration of the PES, EIS and realistic opportunities to improve the PES that are driven by the context / setting.

The rationale followed by DWAF's Directorate: Resource Directed Measures (RDM) is that if the EIS is high or very high, the ecological management objective should be to improve the condition of the watercourse (Kleynhans & Louw, 2007). However, the causes related to a PES should also be considered to determine if improvement is realistic and attainable (Kleynhans & Louw, 2007). This relates to whether the problems in the catchment can be addressed and mitigated (Kleynhans & Louw, 2007). Similarly, if the EIS is evaluated as moderate or low, the ecological aim should be to maintain the river in its PES (Kleynhans & Louw, 2007). A matrix for the determination of RECs for water resources is shown in Table 5-3 below.

Table 5-3 - Matrix for the determination of REC for water resources

			EIS			
			Very high	**High**	**Moderate**	**Low**
PES	**A**	**Pristine/Natural**	A Maintain	A Maintain	A Maintain	A Maintain
	B	**Largely Natural**	A Improve	A/B Improve	B Maintain	B Maintain
	C	**Good - Fair**	B Improve	B/C Improve	C Maintain	C Maintain
	D	**Poor**	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	**Very Poor**	D Improve	E/F Improve	E/F Maintain	E/F Maintain

5.7 IMPACT ASSESSMENT

The significance of identified impacts was determined using the approach outlined below (terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998). This approach looks at five impact criteria as indicated in (Table 5-4).

Table 5-4 - Impact Criteria Scores used for wetland impact assessment (Based on impact significance criteria determined by DEAT, 1998)

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M)	**Very low**	**Low**	**Medium**	**High**	**Very high**
The degree of alteration of the affected environmental receptor					
Impact Extent (E)	**Site:**	**Local:**	**Regional:**	**National:**	
The geographical extent of the impact on a given environmental receptor	Site only	Inside	Outside	National scope or level	**International:** Across borders or boundaries
		activity area	activity area		
Impact Reversibility (R)	**Reversible:**		**Recoverable:**		**Irreversible:**
The ability of the environmental receptor to rehabilitate	Recovery without rehabilitation		Recovery with rehabilitation		Not possible despite action
or restore after the activity has caused environmental change					

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Duration (D)	**Immediate:**	**Short term:**	**Medium term:**	**Long term:**	**Permanent:**
The length of permanence of the impact on the environmental receptor	On impact	0-5 years	5-15 years	Project life	Indefinite
Probability of Occurrence (P)					
The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	**Improbable**	**Low Probability**	**Probable**	**Highly Probably**	**Definite**
ENVIRONMENTAL SIGNIFICANCE = (MAGNITUDE + EXTENT + REVERSIBILITY + DURATION) x PROBABILITY					
TOTAL SCORE	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
ENVIRONMENTAL SIGNIFICANCE RATING	**Very low**	**Low**	**Moderate**	**High**	**Very High**

Table 5-5 - Environmental Significance Rating

Negative	Positive
Very Low	**Very Low**
Low	**Low**
Moderate	**Moderate**
High	**High**
Very High	**Very High**

5.8 STUDY LIMITATIONS

The baseline description was compiled based on the findings of annual wetland ecological monitoring surveys conducted annually by WSP (formerly Golder) since 2018, as well as previous assessments (e.g. WCS 2015, Linstrom & Grundling, 2014). No limitations in the comprehensive dataset were identified.

5.8.1 DATA USED FOR THE SPECIALIST REPORT

The wetland delineation and classification was originally produced by Linstrom & Grundling (2014), and subsequently updated by WCS (2015). The baseline PES of the wetlands has been updated using field-based data gathered over the course of phased baseline assessments prior to the commencement of Phase 1 rehabilitation activities. Land use in the GLPE or wetland catchments has not significantly changed in the intervening years. Ecological monitoring data used in this report is gathered in the peak wet season annually, which is the optimum period for surveying wetland

vegetation and biota. The data used in the report is therefore considered to be comprehensive for the purposes of this specialist assessment.

5.8.2 ASSUMPTIONS, UNCERTAINTIES OR GAPS IN KNOWLEDGE

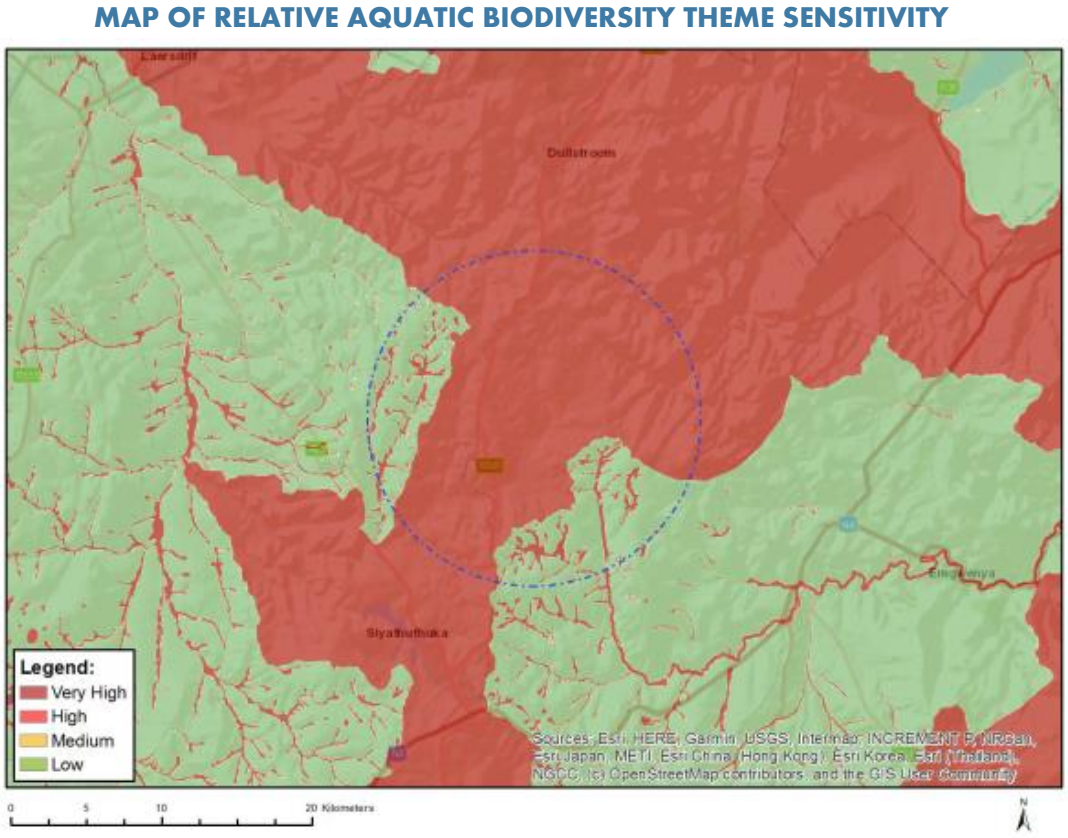
None applicable.

6 REGIONAL CONTEXT

This section summarises the regional biodiversity context of the study area. It draws upon existing studies, published information and local knowledge.

6.1 ENVIRONMENTAL SCREENING TOOL

The Environmental Screening Tool rates the aquatic biodiversity theme as 'Very High Sensitivity' due to the presence of wetlands and areas mapped as Aquatic Critical Biodiversity Areas, Strategic Water Source Areas and Freshwater Ecosystem Priority Area (Figure 6-1).



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Figure 6-1 – Relative Aquatic Biodiversity Theme Sensitivity

6.2 CATCHMENT

The Project lies within the primary drainage region B of the Olifants Water Management Area (WMA) and the B41A quaternary catchment. The Lakensvleispruit Sub-Quaternary Reach (SQR; B41A-01005) drains the project area (Figure 6-2).

6.3 STRATEGIC WATER SOURCE AREAS

The Study Area is located downstream of the Mpumalanga Drakensberg Strategic Water Source Area (SWSA) (Figure 6-3). According to Le Maitre *et al.* (2019), SWSAs are defined as land that either supply large volume of mean annual surface water runoff in relation to their size or have relatively high groundwater recharge, and so are considered nationally important. A SWSA is one where the water that is supplied is considered to be of national or sub-national importance for water security (Le Maitre *et al.* 2019).

6.4 FRESHWATER ECOSYSTEM PRIORITY AREAS (FEPA) SUB-CATCHMENTS

The Study Area is located within a Freshwater Ecosystem Priority Area (FEPA) as illustrated on Figure 6-4 respectively. FEPA sub-catchment areas provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting the sustainable use of water resources. Areas mapped as FEPA sub-catchments provide direction on which watercourses should remain in a natural or near natural condition to support the water resource protection goals of the National Water Act.

The wetlands in the study area fall within the Mesic Highveld Grassland Group 4 wetland vegetation type, which is considered Least Threatened.

6.5 FRESHWATER CRITICAL BIODIVERSITY AREAS (CBAS) AND ECOLOGICAL SUPPORT AREAS (ESAS)

Some of the wetland habitats in cluster 1, 3 and 6 study area coincides with areas mapped and classified as Critical Biodiversity Areas (CBA) by the Mpumalanga Biodiversity Sector Plan Freshwater Assessment (2011) (Figure 6-5). The majority of the rest of the wetland habitat within the study area are mapped as Ecological Support Areas (ESA), including wetland clusters and important sub-catchments (Figure 6-5).

6.6 NATIONAL WETLAND MAP 5

The South African National Wetland Map version 5 (NWM5) portrays the most up-to-date spatial data for the extent and types of estuarine and inland aquatic (freshwater) ecosystems of South Africa (Van Deventer et al., 2019). The study area in relation to wetlands mapped as part of the National Wetland Map 5 project is illustrated on Figure 6-6. Based on NWM5, the study area is dominated by wetland systems.

The Ecosystem Threat Status (ETS) and Ecosystem Protection Level (EPL) for all wetland ecosystem types in South Africa was also determined, based on NWM5 and used to inform the National Biodiversity Assessment (2018). The ETS and EPL for wetlands in the study area are shown on Table 6-1.

Table 6-1 – Ecosystem Threat Status and Ecosystem Protection Level

Wetland ecosystem type	EPL	ETS
Mesic Highveld Grassland bioregion – valley bottom	Not protected	Critically Endangered
Mesic Highveld Grassland bioregion – depression	Poorly protected	Least Concern
Mesic Highveld Grassland bioregion – seep	Poorly protected	Critically Endangered

6.7 RAMSAR SITE

Middelpunt Nature Reserve, in the central part of the study area (Figure 6-7) was recently (2023) declared a RAMSAR site, that is, an internationally important wetland.

It is the only confirmed breeding site of the White-winged Flufftail (*Sarothrura ayresi*) in in South Africa, a critically endangered waterbird with an estimated global population of fewer than 250 mature individuals (RSIS, 2023). It also supports threatened and endemic birds such as the blue crane (*Anthropoides paradiseus*), secretary bird (*Sagittarius serpentarius*), African grass owl (*Tyto capensis*) and Denham's bustard (*Neotis denhami*) (RSIS, 2023).

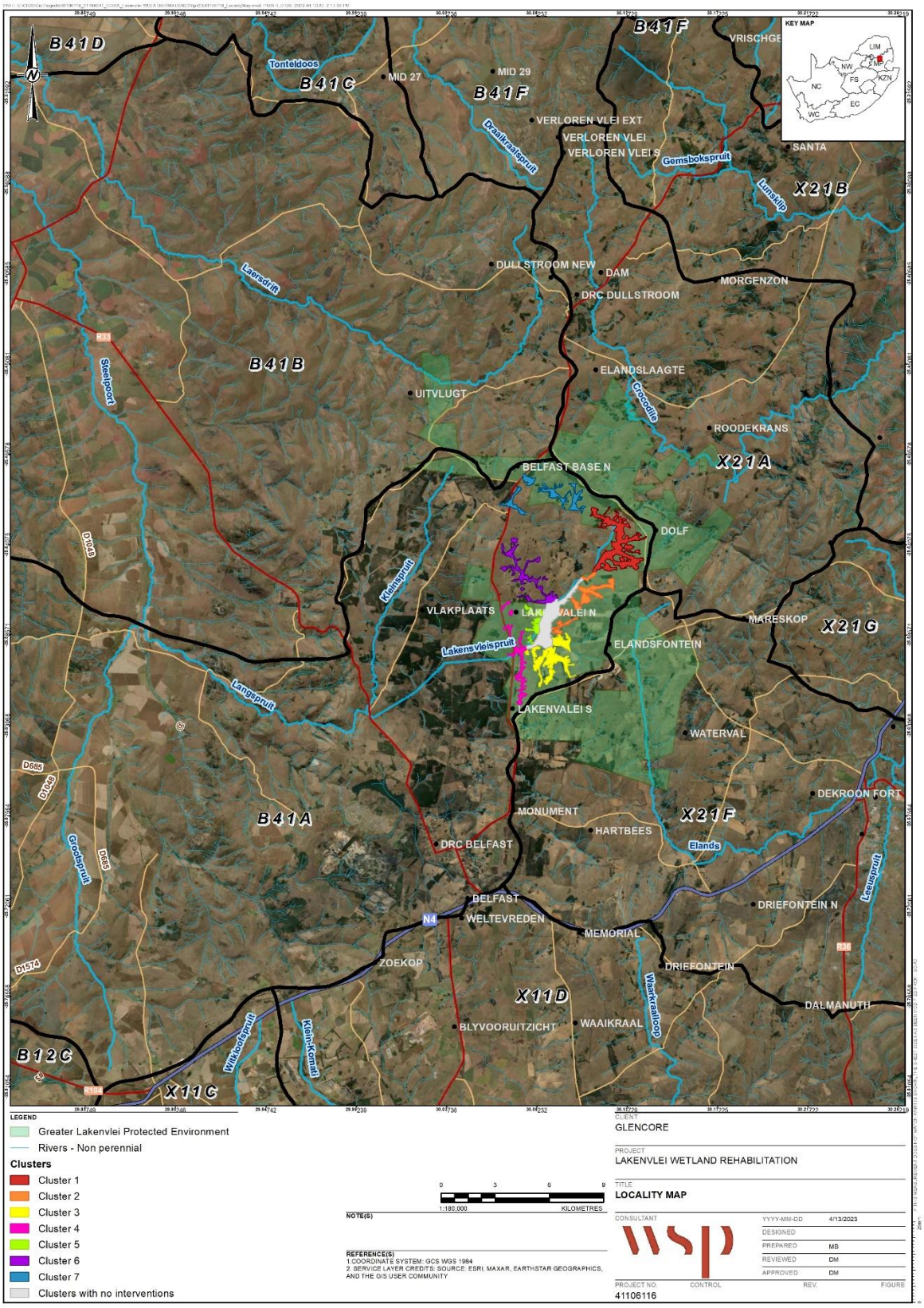


Figure 6-2 – Sub-catchment hydrology

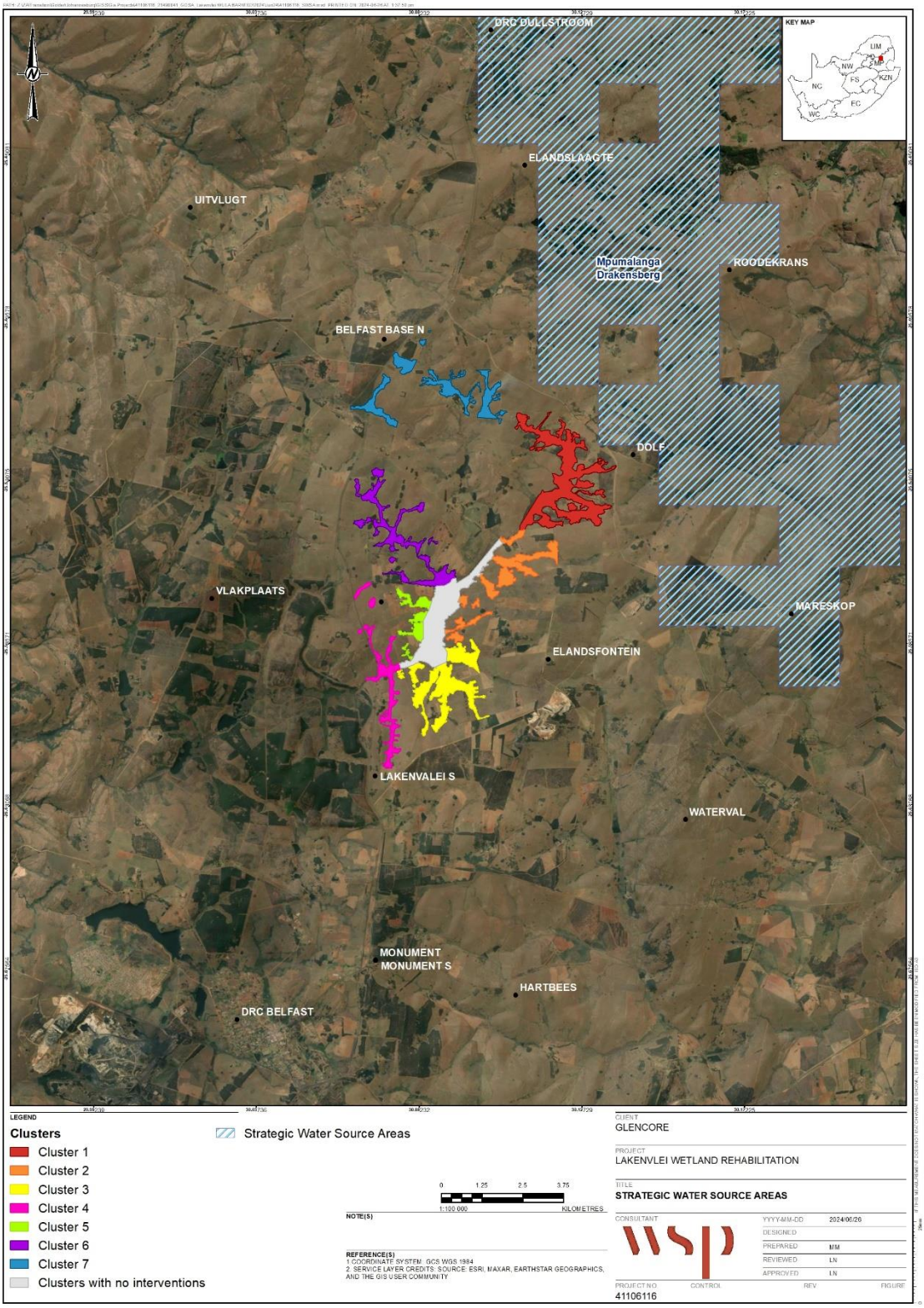


Figure 6-3 - Study Area in relation to SWSAs

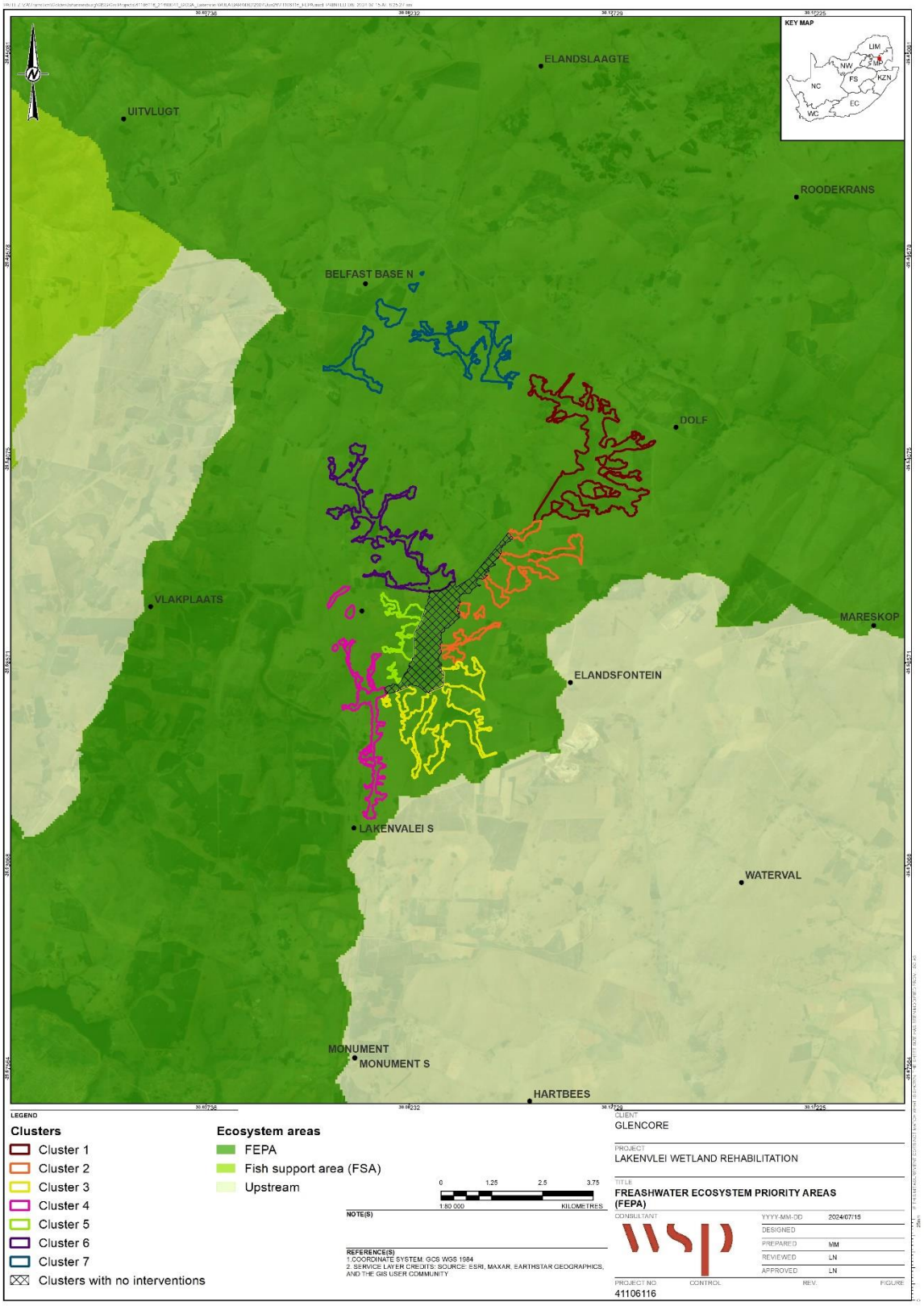


Figure 6-4 - Study Area in relation to FEPAs

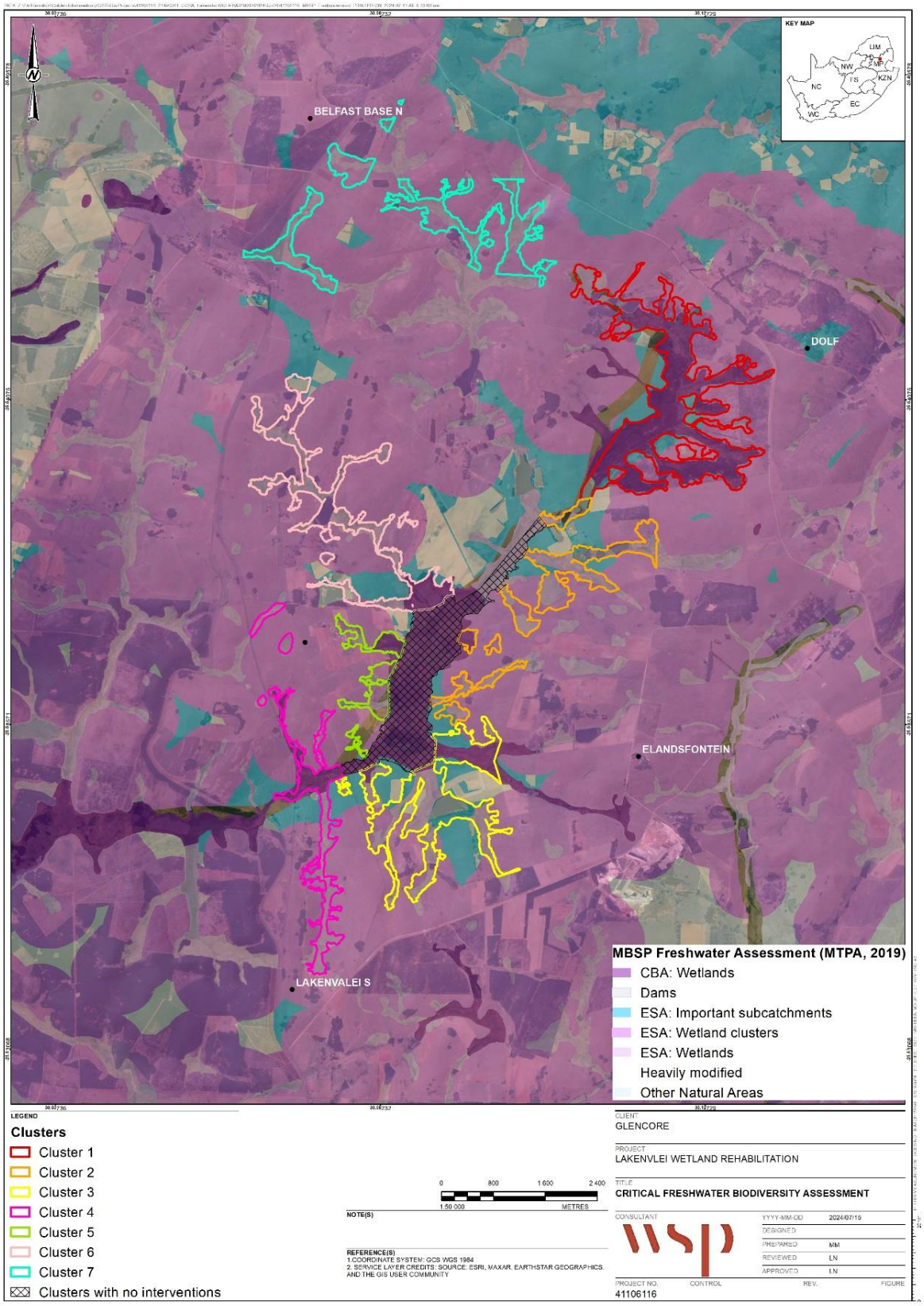


Figure 6-5 - Study area in relation to MBSP Freshwater Assessment

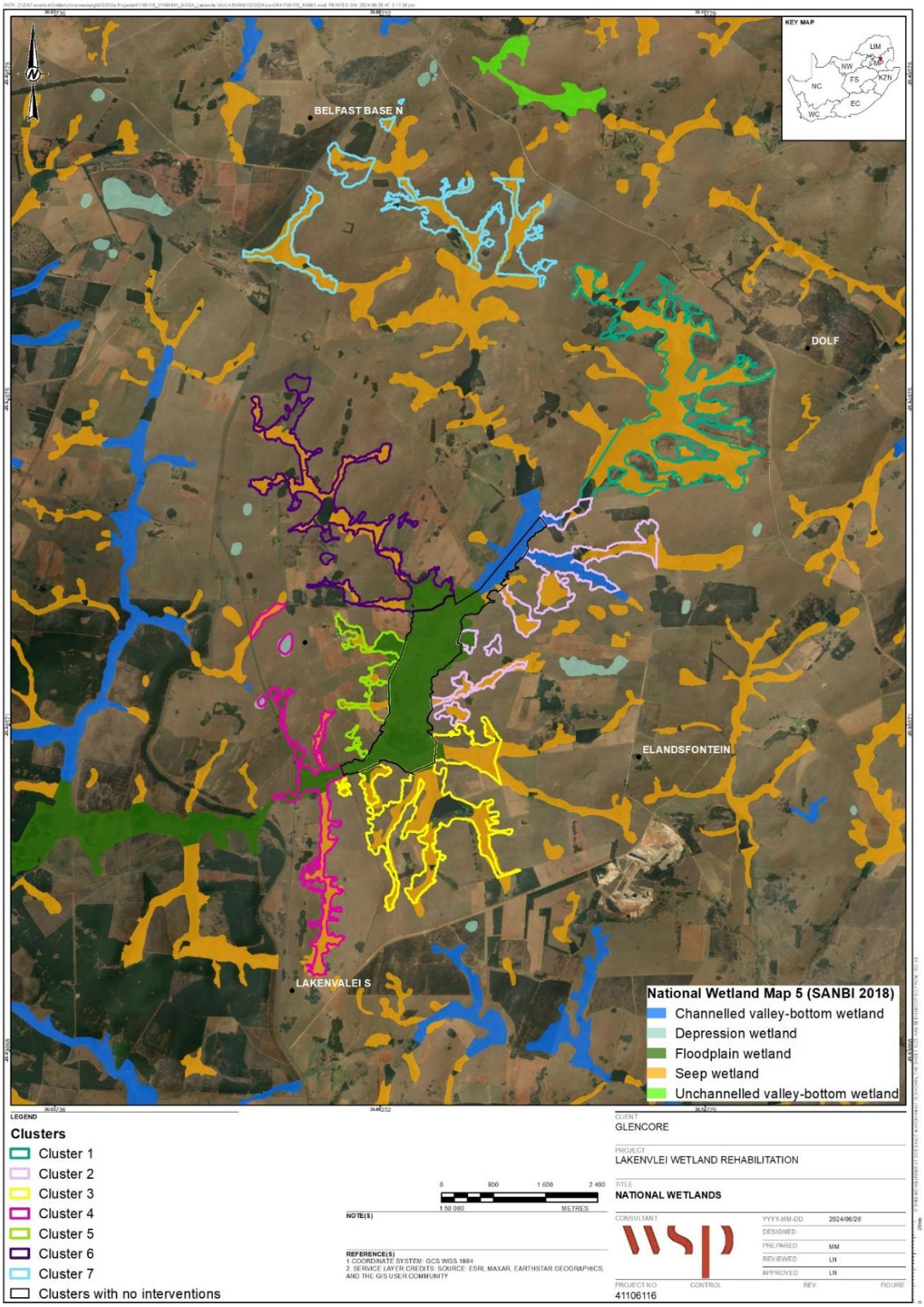


Figure 6-6 – Wetland habitat in the Project area, according to the NWM5

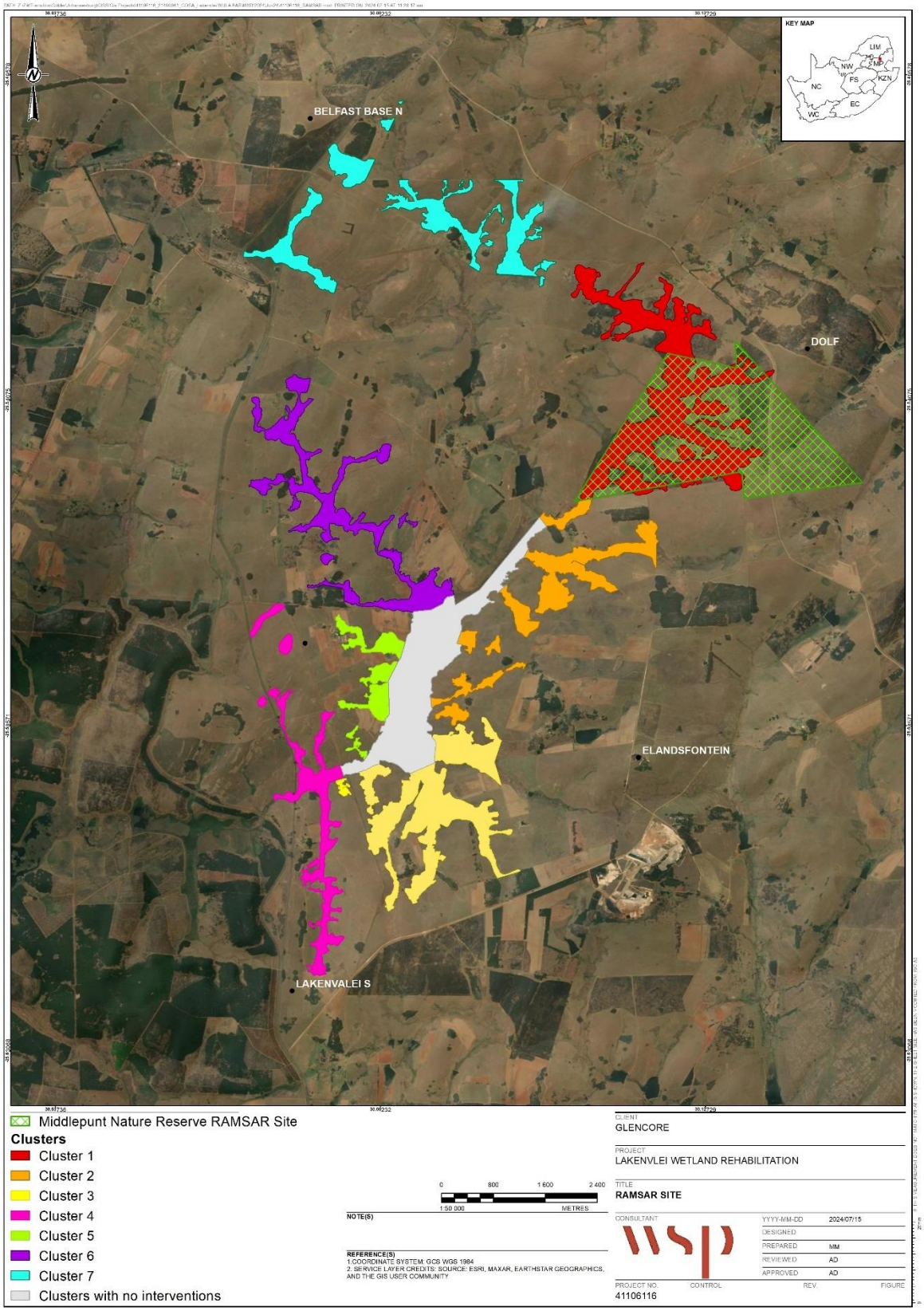


Figure 6-7 – Middelpunt Nature Reserve RAMSAR site

7 WETLAND BASELINE

The wetlands that are the focus of the proposed wetland rehabilitation interventions are those situated within Clusters 1-7, upstream of the R540 road between Belfast and Dullstroom (Figure 2-1). The classification and extent of wetland HGM units within each cluster, and their PES and EIS, are described in the sections that follow.

7.1 WETLAND CLASSIFICATION

7.1.1 CLUSTER 1

Cluster 1 forms the headwaters to the Lakenvlei wetland system and is located in the north east of the Lakenvlei sub-catchment. The wetlands in Cluster 1 cover 312 ha and consist of the uppermost reach of the main Lakenvlei Unchannelled Valley Bottom wetland, as well as a number of small tributaries and Seep wetlands along the lateral slopes.

Figure 7-1 - View of Cluster 1 wetlands

7.1.2 CLUSTER 2

The wetlands in Cluster 2 cover an area of approximately 173.3ha. The topography of the study area is gently undulating, and the dominant land use is livestock grazing and agriculture/farming activities. Wetlands within Cluster 2 consist of unchannelled valley bottom wetlands, and hillslope seepage wetlands. The natural flow is in a westerly direction through the wetlands. It also has three large dams at the head of the cluster.

Figure 7-2 - View of Cluster 2 wetlands

7.1.3 CLUSTER 3

The wetlands at Cluster 3 cover an area of approximately 187.74 ha. The topography of the catchment area is gently undulating, and the dominant land use is livestock grazing and agriculture/farming activities. Wetlands within Cluster 3 consist of unchanneled valley bottom wetlands, and hillslope seepage wetlands. The natural flow is in a northerly direction through the wetlands. It also has a large dam at the centre of the cluster.

Figure 7-3 - View of Cluster 3 wetlands

7.1.4 CLUSTER 4

The wetlands in Cluster 4 cover an area of approximately 93.27 ha. The wetland system comprises of two tributaries entering the main valley bottom system from the north and south, directly adjacent to the R540. Numerous rock-pack/gabion interventions were placed in this system via the Working for Wetlands programme, many of which are now degraded and require repair.

Figure 7-4 - Dilapidated gabion structures in Cluster 4

7.1.5 CLUSTER 5

The wetlands in Cluster 5 consist mainly of hillslope seep habitat, covering an area of approximately 48.2 ha, with agricultural pasture and cultivated fields in their immediate catchment. The wetlands consist of three tributaries entering the main valley bottom system from the west. Several older interventions (placed by Working for Wetlands many years prior to commencement of Phase 1 of the rehab programme) intended to prevent head cut erosion are located in the upper reaches of these seeps.

Figure 7-5 - View of Cluster 5 wetlands

7.1.6 CLUSTER 6

Cluster 6 is characterised by an unchannelled valley bottom wetland system that forms a tributary to the Lakensvleispruit, and the main body of the Lakenvlei wetland (Cluster 8) which is situated downstream. Cluster 6 wetlands cover an area of approximately 128.9 ha. Other wetland HGM types occurring within the cluster include hillslope seepage and depression wetlands.

Figure 7-6 - Wetland habitat in Cluster 6, consisting of seeps, dammed areas, and evidence of channelisation

7.1.7 CLUSTER 7

The wetlands in Cluster 7 (Figure 7-7) consist of three major unchannelled valley bottom systems, with associated hillslope seeps, which cover an area of approximately 150.8ha. The unchannelled valley bottom systems have become characterised by deeply incised channels, as a factor of land-use practises (damming, cattle grazing) and the steep gradient profile of the catchment.

Figure 7-7 - View of some wetlands within Cluster 7

7.2 PRESENT ECOLOGICAL ASSESSMENT

The majority of the wetlands in the study area are in a Largely Natural Present Ecological State (PES B), which means that although largely natural, the area has experienced some slight degradation of natural habitats. Most of the identified impacts in the study are largely as a result of cattle husbandry practises, such as drains, impoundments of watercourses for use as watering points or fishing dams, cattle grazing, and subsequent erosion contributed to the changes to the natural state of the wetlands.

Table 7-1 - Summary of the wetland PES category

HGM Unit	Unit no.	Extent (ha)	PES category
Cluster 1			
Unchannelled Valley Bottom	UVB1	123.6	A - Unmodified
Unchannelled Valley Bottom	UVB 3	13.3	A - Unmodified
Hillslope Seep	Seep 2	24.7	A - Unmodified
Hillslope Seep	Seep 3	11.8	A - Unmodified
Hillslope Seep	Seep 4	6.5	A - Unmodified
Hillslope Seep	Seep 4	25.8	A - Unmodified
Cluster 2			
Unchannelled Valley Bottom	UVB1	26.8	C - Moderately Modified
Unchannelled Valley Bottom	UVB2	15.3	B - Largely Natural
Hillslope Seep	Seep 1	6.3	B - Largely Natural
Cluster 3			
Unchannelled Valley Bottom	UVB1	36.83	C- Moderately Modified

HGM Unit	Unit no.	Extent (ha)	PES category
Unchannelled Valley Bottom	UVB2	28.64	C - Moderately Modified
Unchannelled Valley Bottom	UVB3	58.49	C - Moderately Modified
Hillslope Seep	Seep 1	4.78	C - Moderately Modified
Cluster 4			
Unchannelled Valley Bottom	UVB 1	64.74	C - Moderately Modified
Hillslope Seep	Seep 1	4.14	B - Largely Natural
Hillslope Seep	Seep 2	0.00	B - Largely Natural
Hillslope Seep	Seep 3	6.97	B - Largely Natural
Hillslope Seep	Seep 4	1.24	B - Largely Natural
Hillslope Seep	Seep 5	1.00	B - Largely Natural
Hillslope Seep	Seep 6	2.94	B - Largely Natural
Hillslope Seep	Seep 7	0.95	B - Largely Natural
Hillslope Seep	Seep 8	0.96	B - Largely Natural
Hillslope Seep	Seep 9	0.72	B - Largely Natural
Hillslope Seep	Seep 10	0.51	B - Largely Natural
Hillslope Seep	Seep 11	0.67	B - Largely Natural
Hillslope Seep	Seep 12	2.71	B - Largely Natural
Depression	Depression 1	1.33	B - Largely Natural
Depression	Depression 2	4.14	B - Largely Natural
Cluster 5			
Hillslope Seep	Seep 1	19.66	C - Moderately Modified
Hillslope Seep	Seep 2	25.61	C - Moderately Modified
Hillslope Seep	Seep 3	1.03	C - Moderately Modified
Hillslope Seep	Seep 4	2.11	C - Moderately Modified
Cluster 6			
Unchannelled Valley Bottom	UVB 1	32.87	C - Moderately Modified
Unchannelled Valley Bottom	UVB 2	6.74	C - Moderately Modified
Unchannelled Valley Bottom	UVB 3	33.54	B - Largely Natural
Unchannelled Valley Bottom	UVB 4	7.14	D – Largely Modified
Unchannelled Valley Bottom	UVB 5	9.08	B - Largely Natural
Hillslope Seep	Seep 1	0.41	B - Largely Natural

HGM Unit	Unit no.	Extent (ha)	PES category
Hillslope Seep	Seep 2	1.46	B - Largely Natural
Hillslope Seep	Seep 3	4.23	B - Largely Natural
Hillslope Seep	Seep 4	1.59	B - Largely Natural
Hillslope Seep	Seep 5	1.87	B - Largely Natural
Hillslope Seep	Seep 6	1.80	B - Largely Natural
Hillslope Seep	Seep 7	3.66	B - Largely Natural
Hillslope Seep	Seep 8	2.18	D – Largely Modified
Hillslope Seep	Seep 9	2.98	C - Moderately Modified
Hillslope Seep	Seep 10	3.00	D – Largely Modified
Hillslope Seep	Seep 11	1.86	C - Moderately Modified
Hillslope Seep	Seep 12	8.21	B - Largely Natural
Hillslope Seep	Seep 13	4.74	C - Moderately
Depression	Depression	3.99	B - Largely Natural
Cluster 7			
Unchannelled Valley Bottom	UVB 1	38.10	C - Moderately Modified
Unchannelled Valley Bottom	UVB 2	26.58	C - Moderately Modified
Unchannelled Valley Bottom	UVB 3	36.53	C - Moderately Modified
Hillslope Seep	Seep 1	0.21	B - Largely Natural
Hillslope Seep	Seep 2	2.25	B - Largely Natural
Hillslope Seep	Seep 3	22.76	B - Largely Natural
Hillslope Seep	Seep 4	0.88	B - Largely Natural
Hillslope Seep	Seep 5	0.41	B - Largely Natural
Hillslope Seep	Seep 6	6.93	B - Largely Natural
Hillslope Seep	Seep 7	9.18	B - Largely Natural
Hillslope Seep	Seep 8	1.33	B - Largely Natural
Hillslope Seep	Seep 9	1.51	B - Largely Natural
Hillslope Seep	Seep 10	1.96	B - Largely Natural
Hillslope Seep	Seep 11	0.81	B - Largely Natural
Hillslope Seep	Seep 12	1.98	B - Largely Natural

7.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY

The Ecological Importance and Sensitivity of each wetland is summarised in Table 6-2.

From a hydro-functional importance, the majority of the wetlands play an important role in moderating the quantity and quality of water in wetlands downstream. The intactness of the wetlands contributes to their ability to attenuate and regulate stream-flow, and ecosystems services such as maintenance of biodiversity, groundwater recharge and water quality regulation. The conservation value of the wetland habitat in the study area is high, since much of the wetland habitat consists of Mesic Highveld Grassland valley bottoms and seeps, which are considered Critically Endangered, and the majority of the Clusters (with the exception of Cluster 6) lie within the GLPE, which is a protected area. IN addition, some wetland habitat (e.g. the Middelpunt Nature Reserve) supports the Critically Endangered White-winged Flufftail. The ecological importance and sensitivity of the majority of wetland habitat within the study area is therefore High, with tributary seeps typically being of Moderate EIS.

Table 7-2 - Summary of the wetland EIS Assessment

HGM Unit	Unit no.	Extent (ha)	EIS category
Cluster 1			
Unchannelled Valley Bottom	UVB 1	123.6	Very High
Unchannelled Valley Bottom	UVB 3	13.3	High
Hillslope Seep	Seep 2	24.7	High
Hillslope Seep	Seep 3	11.8	High
Hillslope Seep	Seep 4	6.5	High
Hillslope Seep	Seep 5	25.8	High
Cluster 2			
Unchannelled Valley Bottom	UVB 1	26.8	Very High
Unchannelled Valley Bottom	UVB 2	15.3	Very High
Hillslope Seep	Seep 1	6.3	Very High
Cluster 3			
Unchannelled Valley Bottom	UVB1	36.83	Very High
Unchannelled Valley Bottom	UVB2	28.64	Very High
Unchannelled Valley Bottom	UVB3	58.49	Very High
Hillslope Seep	Seep 1	4.78	Very High
Cluster 4			
Unchannelled Valley Bottom	UVB 1	64.74	High
Hillslope Seep	Seep 1	4.14	Moderate
Hillslope Seep	Seep 2	0.00	Moderate
Hillslope Seep	Seep 3	6.97	Moderate
Hillslope Seep	Seep 4	1.24	Moderate
Hillslope Seep	Seep 5	1.00	Moderate

HGM Unit	Unit no.	Extent (ha)	EIS category
Hillslope Seep	Seep 6	2.94	Moderate
Hillslope Seep	Seep 7	0.95	Moderate
Hillslope Seep	Seep 8	0.96	Moderate
Hillslope Seep	Seep 9	0.72	Moderate
Hillslope Seep	Seep 10	0.51	Moderate
Hillslope Seep	Seep 11	0.67	Moderate
Hillslope Seep	Seep 12	2.71	Moderate
Depression	Depression 1	1.33	Moderate
Depression	Depression 2	4.14	Moderate
Cluster 5			
Hillslope Seep	Seep 1	19.66	Moderate
Hillslope Seep	Seep 2	25.61	Moderate
Hillslope Seep	Seep 3	1.03	Moderate
Hillslope Seep	Seep 4	2.11	Moderate
Cluster 6			
Unchannelled Valley Bottom	UVB 1	32.87	High
Unchannelled Valley Bottom	UVB 2	6.74	High
Unchannelled Valley Bottom	UVB 3	33.54	High
Unchannelled Valley Bottom	UVB 4	7.14	Moderate
Unchannelled Valley Bottom	UVB 5	9.08	Moderate
Hillslope Seep	Seep 1	0.41	Moderate
Hillslope Seep	Seep 2	1.46	Moderate
Hillslope Seep	Seep 3	4.23	Moderate
Hillslope Seep	Seep 4	1.59	Moderate
Hillslope Seep	Seep 5	1.87	Moderate
Hillslope Seep	Seep 6	1.80	Moderate
Hillslope Seep	Seep 7	3.66	Moderate
Hillslope Seep	Seep 8	2.18	Moderate
Hillslope Seep	Seep 9	2.98	Moderate
Hillslope Seep	Seep 10	3.00	Moderate
Hillslope Seep	Seep 11	1.86	Moderate
Hillslope Seep	Seep 12	8.21	Moderate
Hillslope Seep	Seep 13	4.74	Moderate
Depression	Depression	3.99	Moderate
Cluster 7			
Unchannelled Valley Bottom	UVB 1	38.10	High

HGM Unit	Unit no.	Extent (ha)	EIS category
Unchannelled Valley Bottom	UVB 2	26.58	High
Unchannelled Valley Bottom	UVB 3	36.53	High
Hillslope Seep	Seep 1	0.21	High
Hillslope Seep	Seep 2	2.25	High
Hillslope Seep	Seep 3	22.76	High
Hillslope Seep	Seep 4	0.88	High
Hillslope Seep	Seep 5	0.41	High
Hillslope Seep	Seep 6	6.93	High
Hillslope Seep	Seep 7	9.18	High
Hillslope Seep	Seep 8	1.33	High
Hillslope Seep	Seep 9	1.51	High
Hillslope Seep	Seep 10	1.96	High
Hillslope Seep	Seep 11	0.81	High
Hillslope Seep	Seep 12	1.98	High

7.4 RECOMMENDED ECOLOGICAL CATEGORY

With the exception of wetlands in Cluster 1, which are PES Category A and High-Very High EIS, the recommended ecological objective for all wetlands is to improve their ecological condition – the objective for Cluster 1 wetlands is to maintain their condition.

8 IMPACT ASSESSMENT

Scenarios considered for impact assessment included the construction of the project as proposed (see Section 2) and the No-go scenario.

The construction of the proposed rehabilitation structures will have temporary impacts on the affected wetland habitat, which are expected to be limited to the construction phase of the project. Impacts expected during the construction of the project will include the disturbance of wetland habitat due to vegetation and topsoil removal near wetlands, interruption in hydrology, effects on water quality in affected systems during construction, sediment deposit into wetlands and wetland soil erosion as well as the establishment and spread of alien invasive species that could last through to the operational phase.

The operational phase of the project, which is considered to be permanent as the structures will remain in-situ, is expected to ultimately have a positive impact on currently impacted wetlands.

The No-Go scenario can be described as maintaining the current status quo, that is, not implementing the proposed rehabilitation measures to address problems that are negatively affecting ecosystem health. In these areas, it is expected that the factors which are currently causing degradation of ecosystem health will remain unmanaged, contributing to a negative trajectory of change in terms of ecosystem health and thus a decreasing trend in PES scores;

ultimately reducing the ecological importance of the wetlands by reducing their capacity to deliver services such as biodiversity support, stream flow regulation, flood attenuation, sediment trapping and nutrient assimilation.

8.1 CONSTRUCTION PHASE

Construction phase impacts on wetland systems largely arise as a result of direct impacts on the receiving environment due to clearing of land within wetlands or their immediate catchments in advance of project development, and resultant loss of biodiversity.

The earthworks and activities involved during the construction phase of this rehabilitation Project could potentially exert negative impacts on sensitive ecosystems including direct loss of wetland habitat, and disturbance of the vegetation communities of the immediate wetland catchment which could then result in increased sediment entry to downstream systems, or contamination of water bodies by construction materials/vehicles (hydrocarbons etc).

For the purposes of this impact assessment, construction phase impacts are considered to include earthworks involved in the upgrade of road crossings that presently typically consist of informal gravel tracks over (in some instances) culvert pipes, formalisation of farm dam spillways, removal or lowering of dam walls, and in-stream construction of larger rehabilitation structures.

The predicted construction-phase project impacts are described in the sections that follow and summarised on Table 8-1.

8.1.1 DISTURBANCE OF WETLAND HABITAT

Earthwork activities associated with the proposed rehabilitation activities has the potential to result in physical disturbance of wetland habitat and wetland catchments, although no direct losses are currently foreseen. Wetland habitat may be disturbed by heavy vehicles (temporary vegetation loss, dust deposition), which could be an impact of high magnitude for affected wetland systems.

Although disturbance of wetland habitat could potentially be an impact of high magnitude, the impact will be limited to the site extent and the duration will be short-term (lasting for the duration of the construction phase), resulting in a Low impact significance prior to mitigation. With the application of recommended mitigation measures, such as scheduling construction activities during the dry season, the use of existing roads to access the wetlands, placing laydown areas outside of wetland habitat and buffer zones, the use of sediment control mechanisms where necessary, and minimising the direct interaction of vehicles/workers in wetland areas outside of the specific construction footprint, the potential magnitude, extent and probability of the impact occurring as predicted can be controlled, resulting an impact of Very Low significance post-mitigation.

8.1.2 INTERRUPTION OF WETLAND HYDROLOGY

The construction of large infrastructure and the removal of farm dams within wetland systems have the potential to interrupt the hydrology of affected wetlands, temporarily during the construction period.

The presence of heavy machinery and the works themselves may interrupt surface and/or subsurface flows, leading to flow concentration, change in flow pathways, flow impoundment, increased surface runoff and increased risk of erosion within the wetland. It is also important that the movement of water through the catchment, not only within the wetlands, be maintained. Any

activity or infrastructure that impedes or changes the natural subsurface flow in the catchment's soils could have indirect, but potentially significant, effects on the wetlands.

The potential significance of such impacts on the affected wetlands is determined to be Low, as effects would be of potentially moderate magnitude, temporary, and local in extent. Provided that the mitigation measures are implemented prior to commencement of construction and are maintained for the duration of the construction phase, the extent of impact and impact magnitude can be reduced, resulting in a residual impact of Very Low significance post-mitigation.

8.1.3 SOIL EROSION

The removal of wetland vegetation and disturbances to wetland soil during the construction of large rehabilitation structures along wetland systems, will reduce surface roughness in and around wetlands and reduce the exposed soil's potential to absorb surface run-off, resulting in increased surface water flow velocity and subsequently heightened erosion risk in these high-altitude, steep gradient wetlands. Erosion of the wetland soils may lead to habitat deterioration, changes in the natural wetland hydrology, concentration of flows, lowering of the water table within the wetlands and possible desiccation of wetland areas in the vicinity of channelled areas.

The magnitude of the potential impact to wetland health is potentially high, although temporary, and may affect wetlands on a local scale, beyond the immediate footprint of the proposed Project activities. This amounts to a potential impact of Moderate significance without mitigation.

With mitigation, such as limiting vegetation removal to the Project footprint, use of the recommended sod and soil handling techniques, and re-vegetating exposed soils immediately post-construction, the magnitude of the impact will be low, the extent site-based, and the probability of the impact occurring will be reduced, resulting in a residual impact of Very low significance.

8.1.4 ESTABLISHMENT AND SPREAD OF AIS

Soil disturbance arising from activities such as vegetation clearing and/or earthworks during construction activities, as well as during the proposed removal of alien vegetation in wetlands and their catchments, have the potential to facilitate the establishment/spread of alien invasive weed species, if not carefully managed. Unmanaged spread of invasive species such as black wattle, particularly into wetland or riparian areas, will result in loss of wetland vegetation and may cause desiccation of the wetland soils in areas of dense growth.

Consequently, this impact is considered to be of a medium magnitude, potentially lasting beyond construction, occurring on a local scale, and with a high probability of occurrence without mitigation, resulting in an impact of Moderate significance prior to mitigation.

With the development of an auditable AIS Management Plan for the project and the use of appropriate protocols for vegetation rehabilitation and AIS removal during the construction phase, and continued active control and monitoring measures throughout the lifetime of the project, the impact likelihood and magnitude can be reduced, resulting in a residual impact of Very Low significance.

8.1.5 WATER QUALITY DETERIORATION

Water quality deterioration within the wetland may occur during the construction phase as a consequence of vegetation removal, and the increased risk of erosion and sediment transport, as

well as contaminants from machinery and construction materials, from exposed soils - particularly after rainfall events.

Potential impacts on water quality in the wetlands have a Moderate impact score without mitigation, as although the effects may be short-term, they could occur on a local scale and result in a high magnitude of deterioration as a result of entry of sediments and other contaminants to the wetlands and subsequently the downstream water courses.

Limiting vehicular movements and vegetation and topsoil clearance to the site area, preparation of construction materials at laydown areas away from wetlands and their catchments, and scheduling construction activities for the dry season, as well as applying additional mitigation measures discussed in section 8, the extent of potential impacts can be reduced to a site-only scale; the duration of impacts can be reduced to immediately after the impact is sustained (e.g. a pollution event is immediately cleaned up), and the probability of the impact ever occurring can be reduced to low. In this scenario a residual impact of Very Low significance is predicted. The implementation of the recommended mitigation measures is key in ensuring that no adverse impacts on water quality of wetlands are sustained as a result of the proposed rehabilitation works.

8.1.6 BIODIVERSITY LOSS

The construction phase will entail increased presence of people and machinery in the project area. Many of the wetlands that will be affected are considered to be of Moderate to High EIS, playing an important role in biodiversity support through the provision of feeding and refuge opportunities for faunal species of conservation interest including the Critically Endangered White-winged Flufftail (*S. ayersi*), Endangered Secretarybird (*Sagittarius serpentarius*) and the Vulnerable Blue Crane (*Anthropoides paradiseus).* Increased human presence and mechanical noise will reduce the attractiveness of the study area for some mammal and bird species, which may avoid the area for the duration of the construction phase.

The potential significance of the loss of biodiversity is assessed as being Moderate prior to mitigation, with effects being temporary and occurring on a local scale to the Project. The implementation of the recommended mitigation measures reduces the magnitude and probability of the impact, resulting in a residual impact of Very Low significance post-mitigation.

8.2 OPERATION PHASE

The operational phase of the project is not expected to have any negative impacts on wetlands, based on the assumption that the required mitigation measures for construction phase impacts, and subsequent monitoring, are implemented.

The rehabilitation interventions are expected to maintain and/or improve the functionality of the wetlands through the deactivation of old farm drains, restoration of more natural diffuse wetland flow regimes through the removal/lowering of farm dams and spillway formalisation, as well as increasing subsurface water availability and soil stability through the removal of alien vegetation in catchment. The wetland rehabilitation measures are expected to have a positive impact on wetlands, providing that they function in-situ as envisaged at design stage – this will be monitored closely in alignment with the existing Phase 1 monitoring scheme, so that any unforeseen risks can be addressed via adaptive management measures, where required.

8.2.1 IMPROVED HEALTH (PES) OF WETLAND HABITAT

Deactivation of old farm drains and stabilisation/removal of farm dams is expected to improve the health and thus the functionality of wetlands, since the intention of the rehabilitation programme is to re-wet wetland areas which have become desiccated as a result of drains, and restore natural flow regimese in wetlands that are currently impounded by farm dams.

The impact magnitude is high, the extent local and the duration is permanent. The probability of occurrence of this impact is considered high. The impact significance is Moderate assuming that the mitigation measures recommended for the construction phase are implemented. Given that this is a positive impact on the wetland's functionality, no mitigation measures are proposed, apart from the continual monitoring of wetland functionality to ensure that the rehabilitation interventions have yielded a positive outcome.

8.2.2 RESTORATION OF NATURAL DIFFUSE WETLAND FLOW REGIMES

The removal/lowering of farm dams and spillway formalisation is expected to have a positive impact on wetlands by restoring the natural diffuse wetland flow regimes. Farms dams impact on the natural flow of water in a wetland through the impoundment of water in dams and thus potentially creating channels in wetland affecting the natural diffuse flow regimes in wetlands, particularly of unchannelled wetlands. The study area is dominated by unchannelled valley bottom wetlands and hillslope seeps, which will benefit from the removal of farm dams and the formalisation of spillways. The removal of farm dams and formalisation of spillways has the potential to have a positive impact of Moderate significance on wetlands, as a result of restoration of natural flow and sediment regimes, and minimisation of current erosive forces.

8.2.3 INCREASED SUBSURFACE WATER AVAILABILITY AND SOIL STABILITY

The removal of alien vegetation in the catchment and the removal/lowering of farm dams has the potential to yield positive impacts on the wetlands such as improving the subsurface water availability and soil stability of the wetland and its catchment. The increased subsurface water availability and soil stability will have a moderate significance on wetland hydrology therefore improving the functionality of the wetland. The potential significance of the improvement in water retention in the wetland, and reduced likelihood of erosion as a result of the presence of exotic plantations with a high water demand, is assessed as being a positive impact of Moderate significance, with effects being permanent and occurring on a local scale to the Project.

Table 8-1 – Impact Assessment Summary (Definitions and descriptions for the rating parameters used are outlined in section 5.7)

CONSTRUCTION																		
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D) x**	**P=**	**S**	**Rating**	**(M+**	**E+**	**R+**	**D) x**	**P=**	**S**	**Rating**
Impact 1:	Wetland habitat	Disturbance of wetland habitat	Construction	Negative	Moderate	4	1	3	2	2	**20**	**N2**	2	1	1	2	2	**12**	**N1**
					Significance	**N2 - Low**							**N1 - Very Low**						
Impact 2:	Wetland hydrology	Interruption of wetland hydrology	Construction	Negative	Moderate	3	2	3	2	2	**20**	**N2**	2	1	1	1	2	**10**	**N1**
					Significance	**N2 - Low**							**N1 - Very Low**						
Impact 3:	Soil Erosion	Wetland soil erosion	Construction	Negative	Moderate	4	2	3	2	3	**33**	**N3**	2	1	1	2	2	**12**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						
Impact 4:	Alien invasive species	Spread of AIS	Construction	Negative	Moderate	3	2	3	4	4	**48**	**N3**	2	1	1	2	3	**18**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
Impact 5:	Biodiversity Loss	Loss of wetland biodiversity	Construction	Negative	Moderate	4	2	3	2	3	**33**	**N3**	2	1	1	1	2	**10**	**N1**
					Significance	**N3 - Moderate**						**#N/A**	**N1 - Very Low**						
Impact 6:	Water Quality Deterioration	Deterioration of wetland water quality	Construction	Negative	Moderate	3	2	3	2	4	**40**	**N3**	2	1	1	1	2	**10**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						
OPERATIONAL																			
Impact number	**Aspect**	**Description**	**Stage**	**Character**	**Ease of Mitigation**	**Pre-Mitigation**							**Post-Mitigation**						
						(M+	**E+**	**R+**	**D) x**	**P=**	**S**		**(M+**	**E+**	**R+**	**D) x**	**P=**	**S**	
Impact 1:	Wetland Functionality	Improvement of wetland functionality	Operational	Positive	High	4	2	3	5	4	**56**	**P3**	4	2	3	5	4	**56**	**P3**
					Significance	**P3 - Moderate**							**P3 - Moderate**						
Impact 2:	Wetland Hydrology	Restoration of more natural diffuse wetland flow regimes	Operational	Positive	High	4	2	3	5	4	**56**	**P3**	4	2	3	5	4	**56**	**P3**
					Significance	**P3 - Moderate**							**P3 - Moderate**						
Impact 3:	Wetland Hydrology and Soils	Increase of subsurface water availability and soil stability	Operational	Positive	High	4	2	3	5	4	**56**	**P3**	4	2	3	5	4	**56**	**P3**
					Significance	**P3 - Moderate**							**P3 - Moderate**						

9 MITIGATION MEASURES

Mitigation measures that are designed to avoid and minimise the loss and degradation of the wetland habitat and functioning of the wetland habitat during the construction phase are summarised in the sections that follow.

9.1 IDENTIFICATION OF AREAS TO BE AVOIDED (INCLUDING BUFFERS)

- Grassland and wetland habitat where no rehabilitation work is planned, must be avoided. Existing access tracks should be utilised by workers and machinery, and laydown areas must only be situated in currently hardstanding or cultivated areas, as is the current agreement with landowners for the Phase 1 rehabilitation project.

9.2 MINIMISATION OF CONSTRUCTION PHASE IMPACTS

- To prevent disturbance and loss of natural habitat in wetlands beyond the direct disturbance footprint, prior to commencement of works, the development footprints should be clearly marked out with flagging tape/posts in the field.
- Vegetation clearing should be restricted to the proposed project footprints only, with no clearing permitted outside of these areas.
- Sods of natural vegetation that exist in areas where works will take place, should be carefully removed and stored on plastic sheeting and watered frequently, so that they can be used for rehabilitation of bare soil areas once construction is completed.
- Topsoil removal, if required, must be limited to the development footprint. Topsoil must be stored separately from subsoil and must be stored in a manner that it can be reused after construction.
- Any excavated soils should be offloaded at designated stockpile areas situated at least 100 m away from the watercourse.
- Existing roads/tracks should be utilized for access to the construction areas where possible, and clearly defined access routes should be set out for contractors.
- The extent of disturbance should be limited by restricting all construction activities to the project footprint as far as practically possible.
- Locate all laydown areas and temporary construction infrastructure at least 100 m from the edge of the delineated wetland.
- Upgraded wetland crossings will be constructed utilizing designs that ensure that hydrological integrity of the affected wetland is preserved, and natural flow regimes are maintained or improved (i.e. no impoundment or flow concentration upstream or downstream of wetlands.
- Construction activities have to take place between May and August inclusive to avoid the White-winged Flufftail breeding season, which will minimise the risk of erosion and sedimentation during rainfall events.
- Install erosion prevention measures where required, prior to the onset of construction activities, to prevent flow concentration.
- Sediment barriers such as silt fences or the placement of hay bales around the lower edge of bare soil areas may be required for larger areas, and active re-vegetation of disturbed areas as soon as possible is required.

9.3 REHABILITATION OF CONSTRUCTION PHASE IMPACTS

During site reinstatement, soils should be replaced in the appropriate manner, i.e. subsoils first, followed by topsoils, then followed by replacement of the carefully stored sods on top. The re-growth of vegetation in rehabilitated areas must be monitored during and post construction. The monitoring schedule and methods should be included in the existing wetland monitoring programme during future monitoring events.

9.4 ALIEN AND INVASIVE SPECIES MANAGEMENT

An alien and invasive species management plan should be developed for the Project, which includes details of strategies and procedures that must be implemented on-site to control the spread of alien and invasive species. An initial implementation phase prior to construction consisting of a combined approach using both chemical and mechanical control methods, with periodic follow-up treatments informed by regular monitoring, is recommended.

10 MONITORING PROGRAMME

The existing monitoring programme should be updated and extended to cover the proposed rehabilitated wetlands. In accordance with the guidance provided in the WETRehab Evaluate guideline document (Cowden and Kotze, 2008), a Level 2 monitoring programme is currently in place. The following outcomes are included in the monitoring programme:

1. Ecological outcomes – wetland integrity assessments (Present Ecological State (PES) both pre and post rehabilitation).
2. Survival outputs - Structural integrity and erosion assessment. Erosion measured pre and post implementation of rehabilitation interventions.
3. Aesthetic outcomes - Visual and morphological change assessment of the system. Photographic record taken and kept pre and post implementation of rehabilitation interventions.
4. Hydro-geochemical outcomes - Water levels, water distribution and water retention.

11 CONCLUSION AND ENVIRONMENTAL IMPACT STATEMENT

The National Web-based Environmental Screening Tool rates the Aquatic Biodiversity Theme for the proposed Project area as ‘Very High’ sensitivity on account of the presence of FEPAs and wetland habitats, which is substantiated by the findings of this report, which confirm that the ecological importance and sensitivity of much of the wetland habitat in the study area is high, as a result of its situation in the GLPE, and its support of critically endangered wetland vegetation type (Mesic Highveld seeps and valley bottoms, and numerous bird species of conservation concern, most notably the White-winged Flufftail. Nevertheless, the ecological integrity of many of the wetlands in the study area have been compromised by farming activities – mostly channels and dams – and as such, provide an opportunity for achieving functional and ecosystem gains through the rehabilitation of the target wetlands, as is envisaged by the Project being assessed in this report.

While some impacts on wetlands may occur as a function of the construction works required for installation of engineered measures, and removal of AIS plantations, these impacts are expected to be localised and temporary; all can be mitigated to acceptable levels. The operation phase impacts will be positive, since once operational, the rehabilitation interventions will improve 'problem' areas within the wetland – provided that they operate as intended.

This was evident in some of the wetlands in Cluster 1, during Phase 1 of the project, where some wetland vegetation species were recorded for the first-time during monitoring post-construction of the smaller structures. This indicated an increase in wetness in the area, since significant improvements in vegetation cover were also noted post-construction. These positive impacts can therefore be expected for phase 2 provided that the recommended mitigation measures are implemented, and the rehabilitation interventions operate as intended.

The existing long-term monitoring programme in place for Phase 1, must be extended to the Phase 2 interventions to ensure that they are functioning as intended, and any issues are detected early and addressed accordingly – this should be included as a condition of the environmental authorisation.

In accordance with the outcomes of the impact assessment and taking cognisance of the baseline conditions and impact management measures presented herein, the proposed Project is not deemed to present significant negative ecological issues or impacts, and it should thus be authorised.

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Appendix A

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