Glencore Operations South Africa (Pty) Ltd

LAKENVLEI WETLAND REHABILITATION – PHASE 2

Surface Water Baseline and Impact Assessment

41106116-REP-00001
MAY 2025

CONFIDENTIAL

Glencore Operations South Africa (Pty) Ltd

LAKENVLEI WETLAND REHABILITATION – PHASE 2

Surface Water Baseline and Impact Assessment

TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 41106116

OUR REF. NO. 41106116-REP-00001

DATE: MAY 2025

Glencore Operations South Africa (Pty) Ltd

LAKENVLEI WETLAND REHABILITATION – PHASE 2

Surface Water Baseline and Impact Assessment

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

QUALITY CONTROL

Issue/revision	First issue
Remarks	Surface Water IA
Date	May 2025
Prepared by	O Malete
Signature	Malete, Oliver (ZAOM05461) Pr.Sci.Nat - 400034/13
Checked by	L Boyd
Signature	21.05.2025
Authorised by	L Boyd
Signature	21.05.2025
Project number	41106116
Report number	41106116-REP-00001

CONTENTS

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

The Goedgevonden Colliery (GGV) Water Use License (WUL) 24084063 of 19 April 2007 requires an offsite wetland rehabilitation as an offset for the wetland loss and requires that any offset is in the ratio 1: 2 (for every 1 hectare lost, 2 hectares must be rehabilitated). Given the direct wetland loss of 584 hectares within the GGV opencast area, the offset target was determined as 1,168 hectares. Development of the GGV wetland offset strategy commenced in 2005 with initial work focussing on the identification and selection of a suitable site, and at the time no suitable target site was found in close proximity to GGV, and a new approach was proposed by GGV in 2014 and presented to the Department of Water and Sanitation during a meeting held on 22 April 2014 in Pretoria, and the proposed site Lakenvlei wetland system site within the Greater Lakenvlei Protected Environment (GLPE) was accepted by the authorities. The requirement of a 1:2 offset ratio was reaffirmed resulting in an offset target of 1,168 hectares within the Lakenvlei wetland system that would be rehabilitated.

Water users in the area are predominantly agricultural related, with limited tourism. The Town of Belfast and the Belfast Colliery are located approximately 7 km and 9.5 km southwest of the project site, respectively. The Belfast Dam is located approximately 6.5 km southwest of the site and neither the town, mine nor dam will be impacted by the project, as the project site is located in an adjacent sub-catchment.

In respect of the protection of water resources through Chapter 3 of the National Water Act (Act No. 36 of 1998) (NWA) classification and resource quality objectives have been set, and a comprehensive Reserve has been undertaken for the Olifants Water Management Area. The project site is located in Integrated Unit of Analysis 6 (IUA 6) which relates to the Steelpoort River catchment and has been classified as a Class III River, meaning that it is a workhorse river.

The project site is located in quaternary catchment B41A of the Steelpoort sub-catchment within the Olifants Water Management Area (WMA2), primary drainage region B. This is the headwaters of the Steelpoort River with the Grootspruit and Langspruit confluence at the outlet of the quaternary catchment where it becomes the Steelpoort River. The Langspruit is fed by the Kleinspruit that drains north to south, west of the project site and the Lakensvleispruit that drains the project site.

The Steelpoort River drains approximately 70 km to the De Hoop Dam, and a further 75 km from the De Hoop Dam to the Olifants River. It is expected that the implementation of the GGV Wetland offset project will improve the surface water aspects in respect of quantity, quality and instream biota in the sub-catchment of the Kleinspruit and Langspruit and ultimately the upper Steelpoort draining into the De Hoop Dam.

In this respect the project aspects that relate to potential impacts to the surface water component during the construction of the various project components are:

- Increased sediment loads to the river system due to erosion from the following construction activities:
  - Upgrade of road crossings that are currently just gravel roads through the riverbed
  - Formalisation of farm dam spillways

- Removal of dams
- Instream Dongalock improvements, and
- Alien vegetation removal.

- Discharge of water and sediment that may contain higher levels of nutrients where farm dams are removed.

In respect of the impact assessment, in all cases the significance rating was low for any construction activities, and positive ratings after mitigation.

While it will be important to monitor the various clusters to assess the improvements or maintenance from the baseline to ensure that the offset actions have worked, it is understood that these areas are predominantly wetlands and monitoring should be done according to the wetland monitoring programme which will include biomonitoring. It is however proposed that flow and water quality and water quality are at least monitored at the outlet of the Cluster 4 at the R540 road where it is essentially the outlet of the project.

Contact name Lee Boyd

Contact details 0828851799 | leeann.boyd@wsp.com

ACRONYMS AND ABBREVIATIONS

Abbreviation	Explanation
BFS	Bankable Feasibility Study
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EI	Ecological Importance
ES	Ecological Sensitivity
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
GLPE	Greater Lakenvlei Protected Environment
GGV	Goedgevonden Colliery
ha	hectares
HN	Hydronode (sites identified in respect of modelling and monitoring requirements)
PES	Present Ecological State
REC	Recommended Ecological Category

DETAILS OF THE SPECIALIST

Specialist Information	
Name:	Lee Boyd
Cell phone number:	082 885 1799
Telephone number:	011 254 4915
Email:	Leeann.boyd@wsp.com
Qualifications	▪ BSc. Biological Sciences, University of the Witwatersrand Johannesburg (1987) ▪ BSc. Honours, University of the Witwatersrand Johannesburg, 1990 ▪ MSc. Water Utilisation, University of Pretoria, 1994
Career enhancing courses	▪ Certificate in Project Management, Intec College, 1997 ▪ Water Quality Management – Advanced Course, University of Pretoria, 2000
Professional Affiliations	▪ Water Institute of Southern Africa (Senior Fellow) ▪ Professional Scientist registration (SACNASP): 400070/95
Summary of experience	Technical inputs and project manager for projects related to amongst others: Various surface water baseline and impact assessments for mines in South Africa, Ghana and DRC; Integrated Water Resources Management projects including the development of an Integrated Water Quality Management Plan for the Olifants Water Management Area; Determination of the water resource classes for significant water resources in the Crocodile (West)/Marico WMA and Mokolo and Matlabas catchments; Determination of Water Resource Classes and Resource Quality Objectives of Priority Water Resources for the Thukela catchments, and update of the Catchment Management Strategy for the Breede-Gourit Water Management Area.

Declaration of Independence by Specialist

I, Lee Boyd declare that I –

Act as the independent specialist for the undertaking of a specialist section for the proposed Lakenvlei Wetland Improvement Project.

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;

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.

21.05.2025

1 INTRODUCTION AND BACKGROUND

Glencore Operations South Africa (Pty) Ltd. (GOSA) manages several coal mining operations including Goedgevonden Colliery (GGV), an existing opencast coal mining operation near the town of Ogies in the Mpumalanga Province.

The approved 2006 Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) for GGV highlighted that mining would take place using both bord-and-pillar (underground mining) and opencast mining methods. The specialist studies indicated that 45.40 hectares (ha) of wetland habitat overlayed the proposed bord-and-pillar mining area (underground mining) and this was mitigated on site. However, 584.21 hectares of wetland was within the footprint of the proposed opencast mining area and were expected to be permanently lost. There was also no means of mitigating the 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.

The GGV Water Use License (WUL) 24084063 of 19 April 2007 requires an offsite wetland rehabilitation as an offset for the wetland loss and requires that any offset is in the ratio 1: 2 (for every 1 hectare lost, 2 hectares must be rehabilitated). Given the direct wetland loss of 584 hectares within the GGV opencast area, the offset target was determined as 1,168 hectares.

Development of the GGV wetland offset strategy commenced in 2005 with initial work focussing on the identification and selection of a suitable site, and at the time no suitable target site was found in close proximity to GGV, and a new approach was proposed by GGV in 2014 and presented to the Department of Water and Sanitation during a meeting held on 22 April 2014 in Pretoria, and the proposed site Lakenvlei wetland system site within the Greater Lakenvlei Protected Environment (GLPE) was accepted by the authorities. The requirement of a 1:2 offset ratio was reaffirmed resulting in an offset target of 1,168 hectares within the Lakenvlei wetland system that would be rehabilitated.

Golder Associates Africa (Pty) Ltd (Golder) developed the preliminary engineering and high-level costing for this mitigation strategy and General Authorisation for the installation of Dongalocks during 2019, and the prioritisation framework for the project also identified a number of larger structures that will need to be implemented and that will trigger the need for water use licence and/or environmental authorisation in terms of WULA Regulations GN R 267 and the EIA Regulations GN R.324 to GN R.327 published under the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) (NEMA).

To date, the proposed wetland rehabilitation work has been implemented in a phased approach. Phase 1 of the offset plan involved the installation of small dongalock structures in Cluster 1 and 2 under the ambits of a GA (DWS Ref 27/2/2/B141/14/3). The small structures associated with Phase 1 did not require EA. This study addresses the impact of the larger structures that will trigger NEMA Listed Activities, that require EA within Clusters 1-7 associated with Phase 2 of the wetland rehabilitation.

1.1 REPORT OBJECTIVE

This surface water report has been compiled to describe the baseline and assess potential impacts to the surface water component during the construction and operational phase (Phase 2) of the rehabilitation project, including recommendations for required mitigation and a monitoring programme.

2 PROJECT LOCATION

The project site is located in quaternary catchment B41A of the Steelpoort sub-catchment within the Olifants Water Management Area (WMA2), primary drainage region B in the Mpumalanga Province. The closest town is the Town of Belfast located approximately 7 km southwest of the project site, with the Belfast Dam located approximately 6.5 km southwest of the site (Figure 2-1).

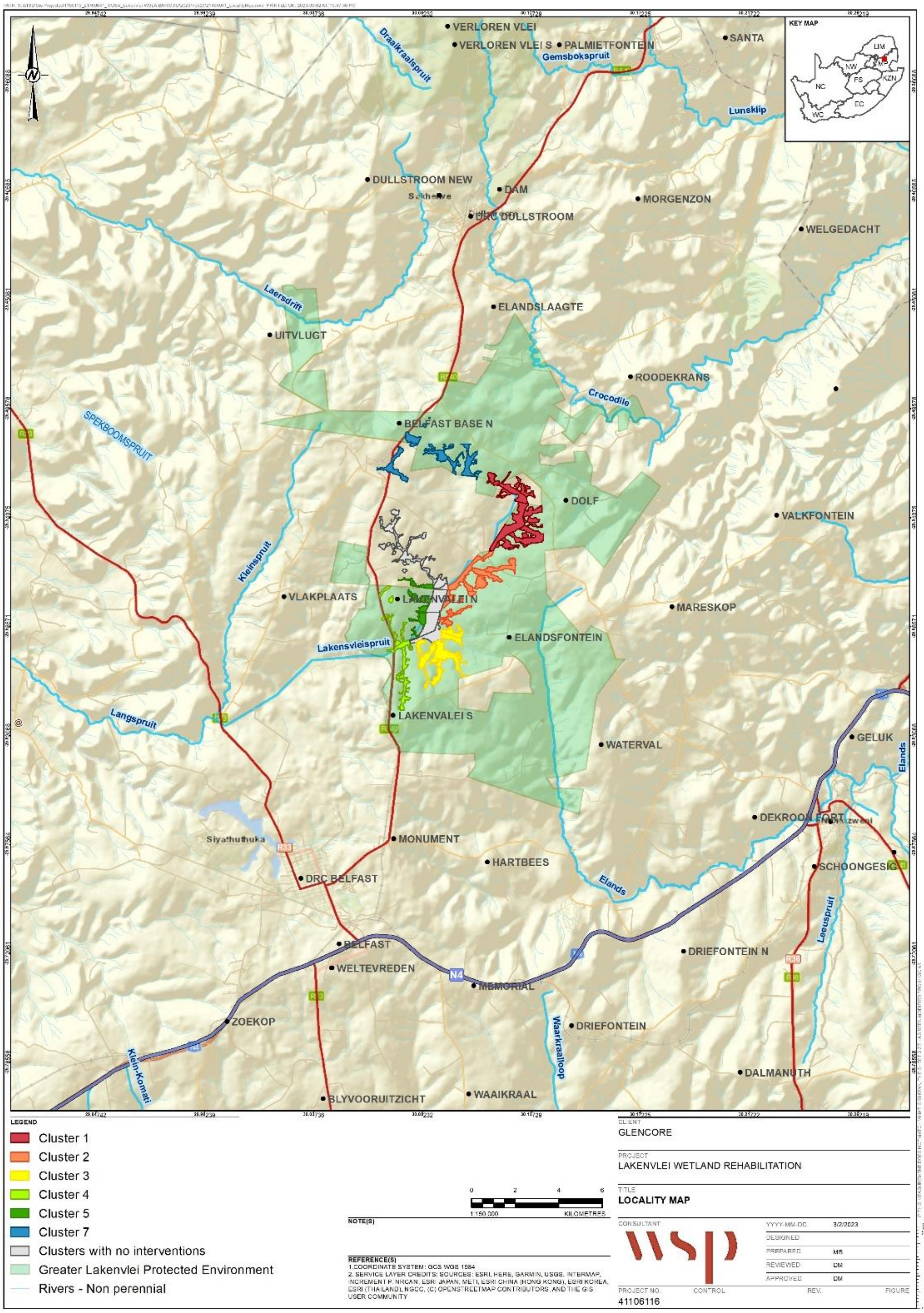

Figure 2-1 - Project Locality

3 PROJECT DESCRIPTION

The project relates to rehabilitation of 1,168 ha of wetlands in the Greater Lakenvlei Protected Environment (GLPE) being undertaken to offset wetland destruction by the GGV mining operations in the Zaaiwaterspruit sub-catchment in quaternary catchment B11F, as per Water Use License (WUL) 24084063.

The area of wetlands that will be destroyed in QC B11F is 584 ha, and the area that has been marked for rehabilitation in QC B41A is 1,168 ha (Figure 3-1).

Golder Associates Africa (Pty) Ltd (Golder) developed the preliminary engineering and high-level costing for this mitigation strategy and General Authorisation for the installation of Dongalocks during 2019. Dongalocks were installed at wetland Cluster 1 in 2020 and in 5 and 7 in 2021.

The prioritisation framework for the project also identified a number of larger structures to be implemented that trigger the need for water use licence and or environmental authorisation in terms of WULA Regulations GN R 267 and the EIA Regulations GN R.324 to GN R.327 published under the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) (NEMA). The relevant wetland clusters that will therefore be assessed are illustrated in Figure 3-1.

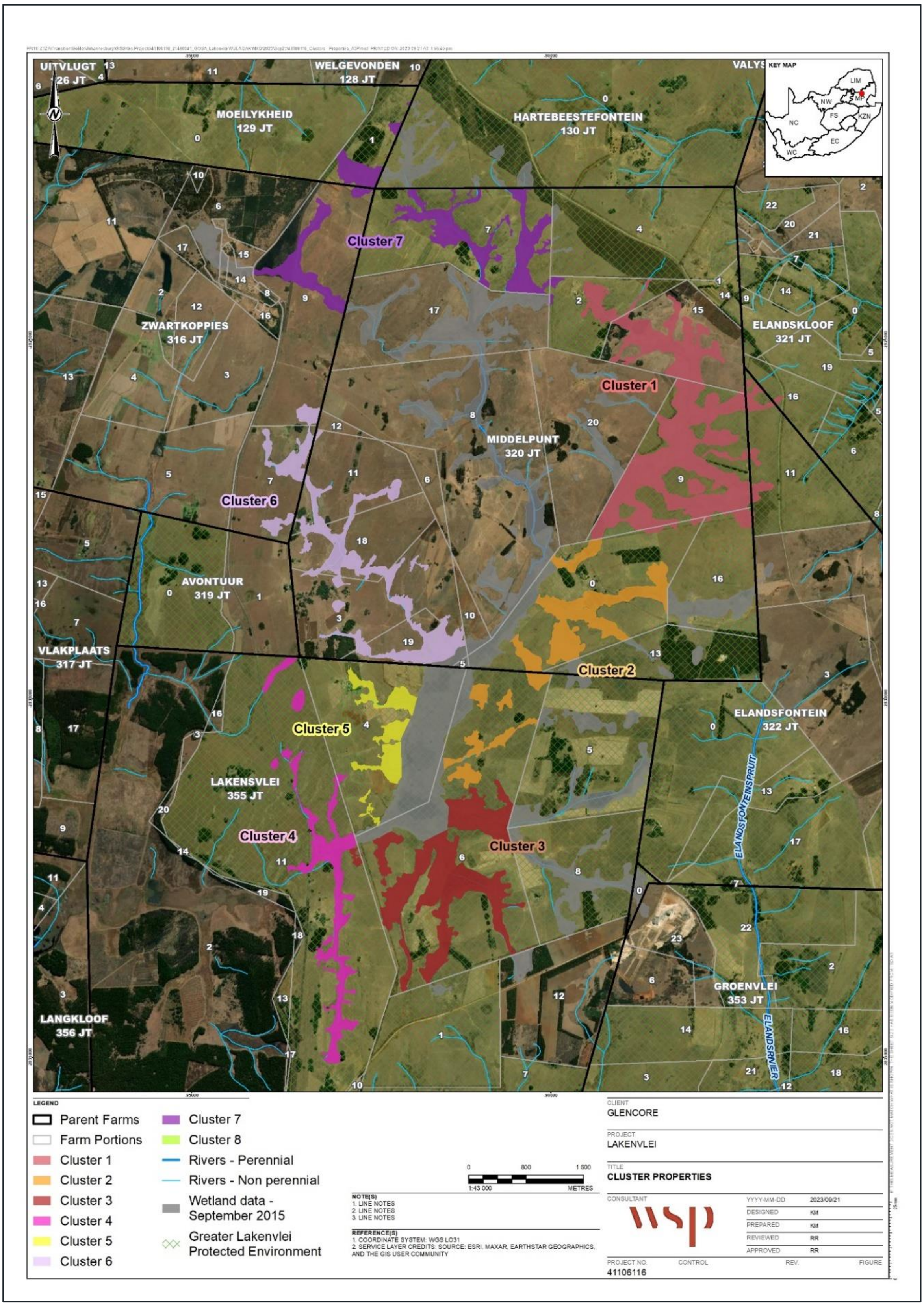

Figure 3-1 - Wetland clusters for rehabilitation for which a WUL is needed

The interventions points are highlighted in Figure 3-2 to Figure 3-7 below for the following clusters:

- Cluster 2
- Cluster 3
- Cluster 4
- Cluster 5
- Cluster 6, and
- Cluster 7.

The proposed activities that will be implemented in the project site clusters where water use licences are needed are briefly described in Table 3-1. The calculations regarding wetland infill/ removal, structure sizing and vegetation clearing are based on the conceptual design drawings. These calculations where based on the following parameters, as advised by the design engineers:

- Maintaining the existing wetland rehabilitation structures already in place (44 x structures). Some of the existing structures require repair and maintenance and minor structural modification. Most of the maintenance work planned for the existing structures will not require EA. The planned work will not involve clearing indigenous vegetation or excavation or infilling within the wetlands.
- Repairing and formalising damaged spillways (17 x spillways). The current informal spillway area (m^2) x 0.2 m (depth) was used to calculate the area of impact and volume of infill and excavation for the 6 x spillways that are planned to be formalised;
- Formalising existing wetland crossings (20 x crossings). The current footprint of the existing crossings (area) x 0.2 m (volume) of crusher stone was used to calculate the area and volumes that are expected to be placed within the wetlands to formalise the crossings;
- Repairing a dam wall within the wetland. The parameters were calculated using the area of the damaged dam wall, multiplied by the height of the dam wall to calculate the area and volume that would be required for the repair;
- Stabilising headcuts (6 x drop structures). These calculations were based on the size of the incised wetland channel or erosion area needing repair. The drop structure anchors will typically be 0.3m deep and as wide as the width of the necessary drop structure. There is an anchor trench at the top and bottom of the slope which helps anchor in the concrete macmat or canvas to the ground. The volumes of the anchor trenches and area of the macmat/ concrete canvas were used to calculate area and volume of infill for these structures;
- Constructing new wetland rehabilitation structures (Dongalocks) in strategic locations (67 x new structures). The length, breadth and height of the proposed structures were used to calculate the area and volume of infill; and

Removing heavy alien invasive vegetated areas within the GLPE area (up to 97.78 ha). The identified areas of alien invasive species were identified on-site and measured on desktop, with Google Earth Pro.

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

Cluster	Description of activities	Wetland area (ha)
Cluster 1	▪ Removal of 20.06 ha of alien vegetation	311.61
Cluster 2 (Figure 3-2)	▪ Install double donga locks x 2 ▪ Clearing Approx 8.75 m^2 within the proposed structure footprints. ▪ Infill approx. 4.3 m^3 within wetland	139.50
Cluster 3 (Figure 3-3)	▪ The formalisation of 7 x spillways, ▪ Stabilise 1 x headcut ▪ Install 3 x double dongalock structures, ▪ Infill – 5 628 m^3 within wetland ▪ Indigenous vegetation "clearance" – 879 m^2 within the proposed structure footprints. ▪ Remove 71.37 ha of alien vegetation	188.15
Cluster 4 (Figure 3-4)	▪ Install 25 new dongalock structures ▪ Repair 36 existing rehabilitation structures ▪ Upgrade/formalise 6 road crossings ▪ Upgrade 3 spillways ▪ Construction footprint – 665 m^2 of "structure" within wetland and clearance of indigenous vegetation. ▪ Infill – 87.33 m^3 within wetland ▪ Removal of 6.35 ha of alien vegetation	94.72
Cluster 5 (Figure 3-5)	▪ Install 23 new dongalock structures ▪ Existing Structure maintenance/ repair ▪ Upgrade 2 spillways ▪ Upgrade/formalise 6 road crossings ▪ Infill of 243.13 m^3 within wetland ▪ Indigenous vegetation "clearance" – 923.5 m^2	48.4185
Cluster 6 (Figure 3-6)	▪ Installing one dongalock structure ▪ Repairing one dam wall ▪ Upgrading 2 wetland road crossings ▪ Infill of 206.2 m^3 within wetland ▪ Indigenous vegetation "clearance" – 370 m^3	147.73
Cluster 7 (Figure 3-7)	▪ Installing 16 new dongalock structures ▪ Repairing 2 x spillways ▪ Installing 2 x headcuts ▪ Formalising 6 x Farm Tracks, ▪ Infill of 969.8 m^3 within wetland ▪ Removal of 945 m^2 of indigenous vegetation within the proposed structure footprints.	151.45
Cluster 8	▪ No interventions	214.22

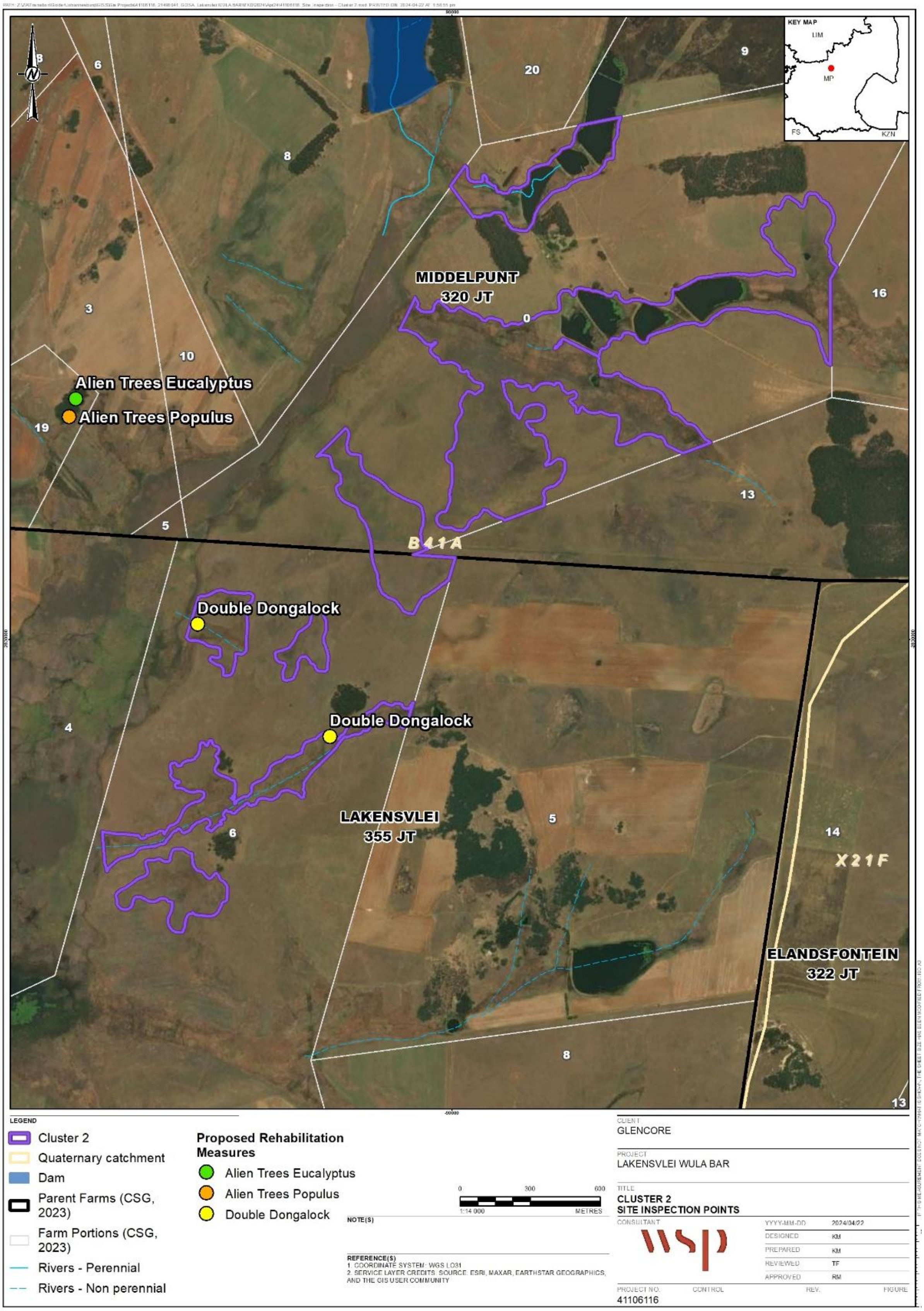

Figure 3-2 - Cluster 2 interventions

Figure 3-3 - Cluster 3 interventions

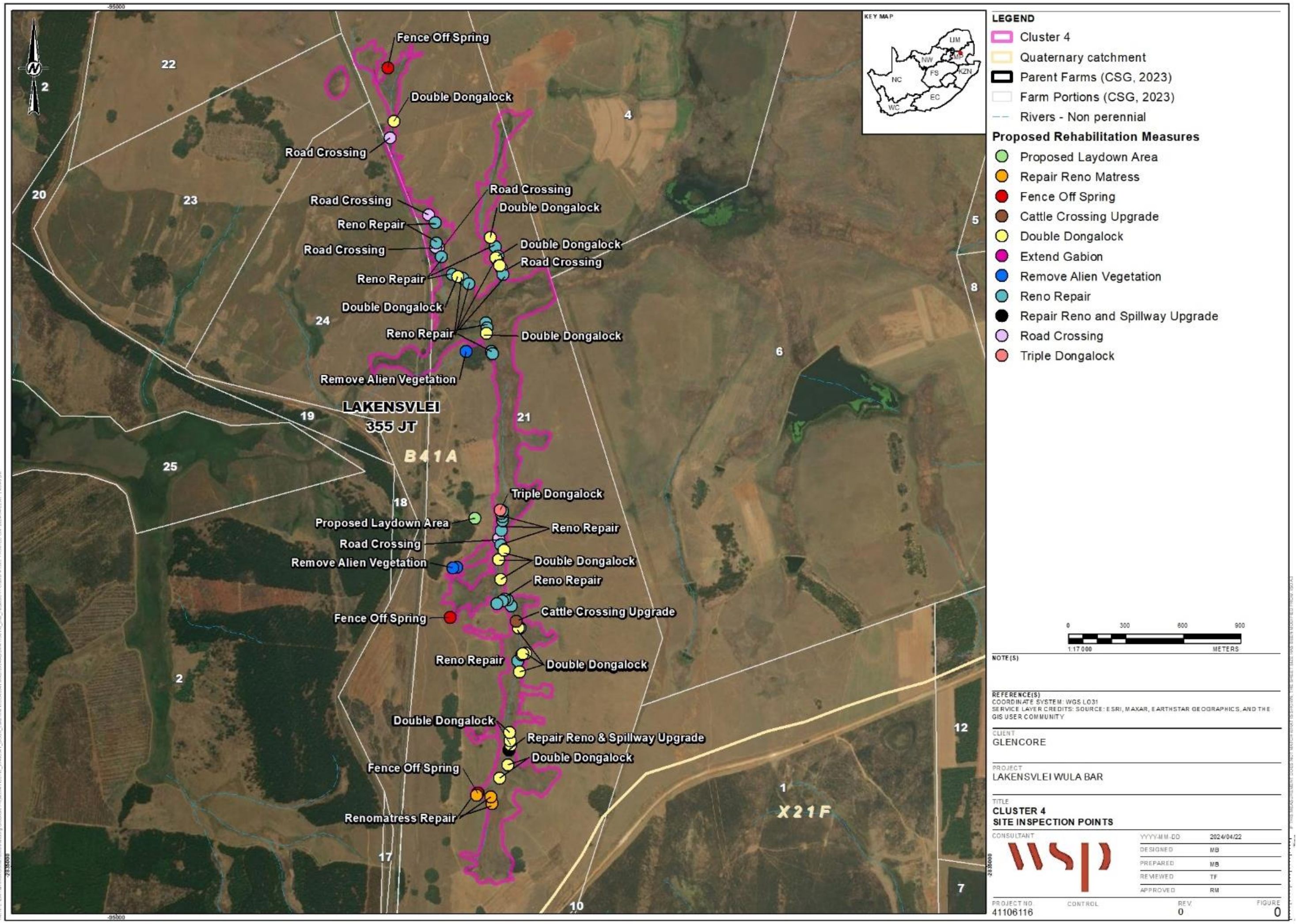

Figure 3-4 - Cluster 4 interventions

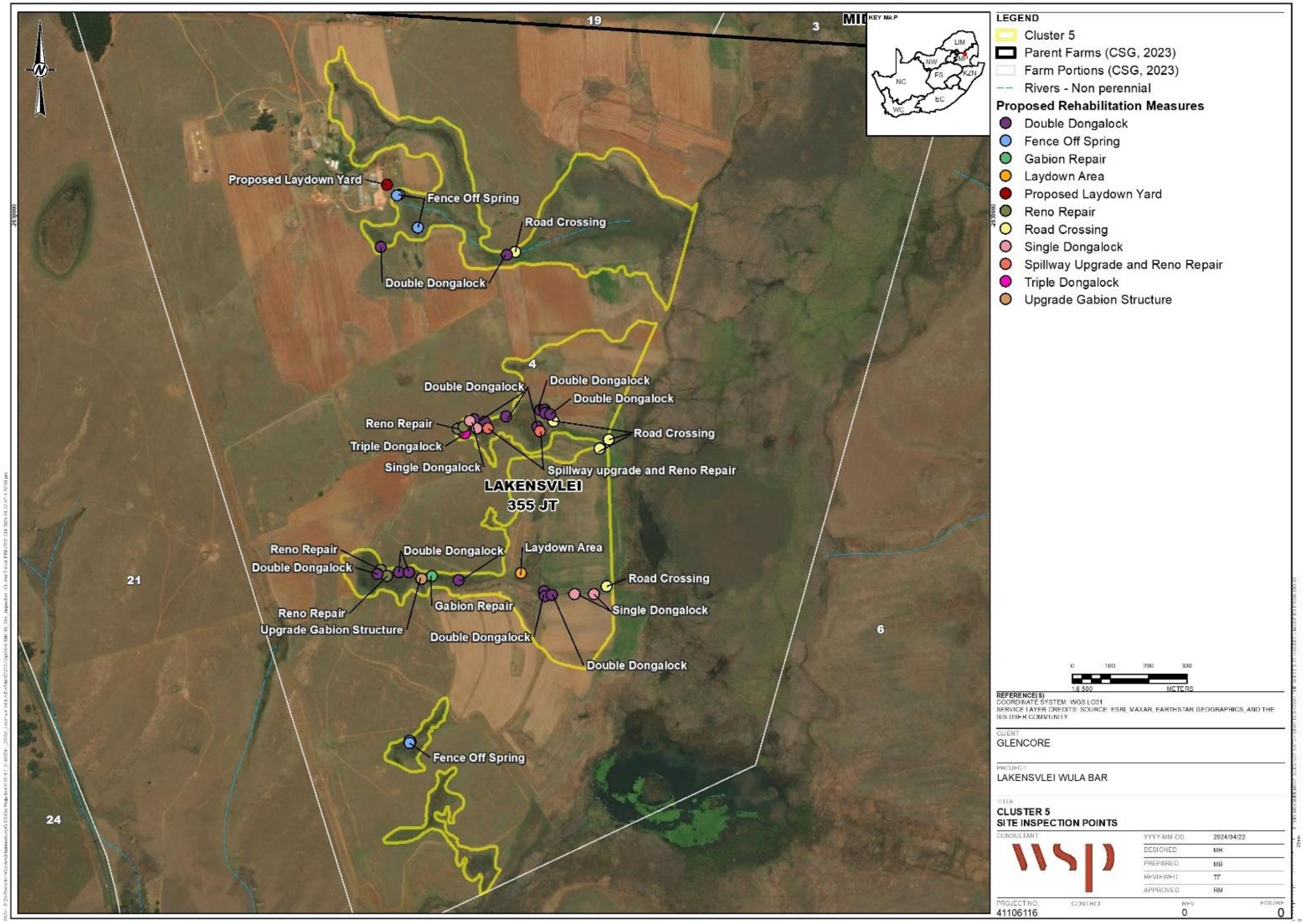

Figure 3-5 - Cluster 5 interventions

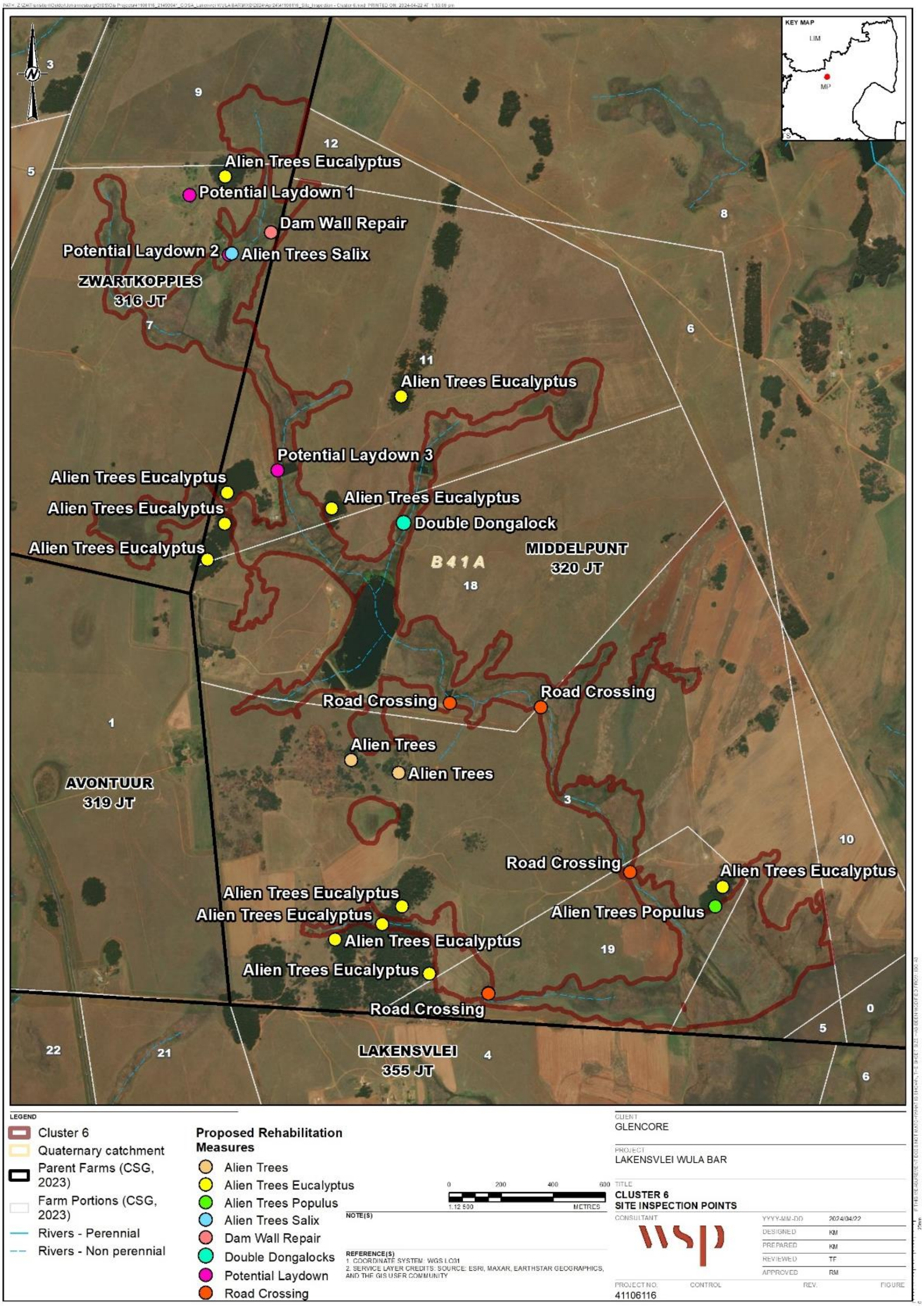

Figure 3-6 - Cluster 6 interventions

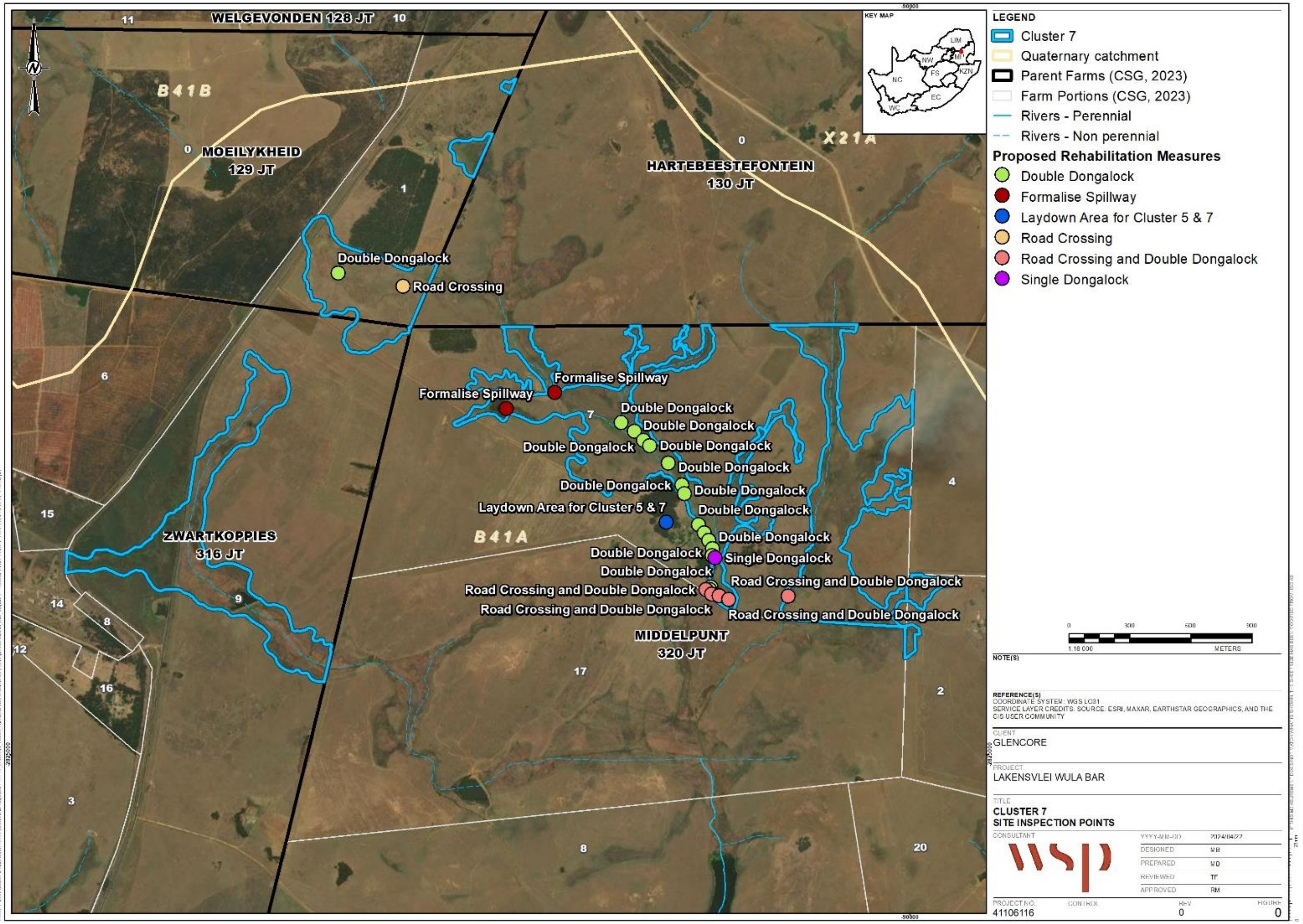

Figure 3-7 - Cluster 7 interventions

4 APPLICABLE LEGISLATION AND GUIDELINES

4.1 RESOURCE DIRECTED MEASURES

Resource Directed Measures (RDM) is enabled through Chapter 3 of the National Water Act (Act No. 36 of 1998) (NWA) that provides for the protection of water resources through the classification of water resources, determination of resource quality objectives (RQOs) and determination of the Reserve. These measures collectively aim to ensure that a balance is reached between the need to protect and sustain water resources on one hand and the need to develop and use them on the other.

The classification system and the Reserve are intended to ensure comprehensive protection of all water resources. Once the water resources class and the Reserve have been established, RQOs are established to give effect to determined water resources classes and the Reserve.

The definition of a water resource, as in the NWA, includes a watercourse, surface water, estuary, or aquifer, and a watercourse is defined as a river or spring, a natural channel in which water flows regularly or intermittently, a wetland, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Classification and resource quality objectives have been set, and a comprehensive Reserve has been undertaken for the Olifants Water Management Area.

The following gazettes are relevant:

- National Water Act, 1998, (36/1998), Classes and Resource Quality Objectives of Water Resources for the Olifants Catchment – GN 466, 22 April 2016, and
- Updated (Comprehensive) Reserve (2018) for the Olifants WMA.

4.1.1 Water Resource Class (Classification)

Classification of water resources aims to ensure that a balance is reached between the need to protect and sustain water resources on one hand and the need to develop and use them on the other. The goal of the classification process is the implementation of the water resource classification system which has as its final product the selection of one of three water resource classes (Table 4-1). The purpose of the water resource class is to establish clear goals relating to the quantity and quality of the relevant water resource, and conversely, the degree to which it can be utilised by considering the economic, social, and ecological goals from an integrated water resource management perspective.

The water resource classification system places the following principles at the forefront of implementation:

- Maximising economic returns from the use of water resources
- Allocating and distributing the costs and benefits of utilising the water resource fairly, and
- Promoting the sustainable use of water resources to meet social and economic goals without detrimentally impacting on the ecological integrity of the water resource.

Table 4-1 - Water resource classes

Class	Description of use	Ecological Category	Description of resource
I	Minimally used	A-B	Water resource is one which is minimally used, and the overall condition of that water resource is minimally altered from its pre-development condition
II	Moderately used	C	Water resource is one which is moderately used, and the overall condition of that water resource is moderately altered from its pre-development condition
III	Heavily used	D	Water resource is one which is heavily used, and the overall condition of that water resource is significantly altered from its pre-development condition

4.1.2 Resource QUALITY OBJECTIVES

The purpose of resource quality objectives is to establish clear goals relating to the quality of the relevant water resources. Resource quality objectives provide statements about:

- what the quantity of water should be (water level, pattern, timing)
- what the water quality should be (physical, chemical, biological)
- what the condition of the instream and riparian (riverbank) habitat should be, and
- what the condition of the aquatic (water) animal and plant life should be.

4.1.3 Reserve

The Reserve (quantity and quality of water resources) which has priority over other water uses, provides for two components:

- Basic human needs (BHN), ensuring that the essential needs of individuals served by the water resource in question are provided for; and
- The ecological Reserve ensuring the water required to protect aquatic systems of the water resource are provided for.

In terms of the NWA the preliminary determinations of Reserves may be made if a water resource has not been classified. However, once water resources have been classified the preliminary Reserve must be superseded by the Reserve.

4.1.4 Project site RDM requirements

As part of the classification and RQO process the first step is to delineate the integrated units of analysis (IUA) and define Resource Units (RUs). Each integrated IUA represents a homogenous catchment area of similar impacts for which a water resource class is set and must be considered in the determination of RQOs. A RU on the other hand is a water resource component within an IUA that is sufficiently ecologically distinct to warrant its own specification of RQOs. The IUA delineation of the catchments of the Olifants WMA resulted in 13 IUAs (Figure 4-1), and 121 resource units were delineated. The project site is in IUA 6 which relates to the Steelpoort River catchment and has been classified as a Class III, meaning that it is a workhorse river.

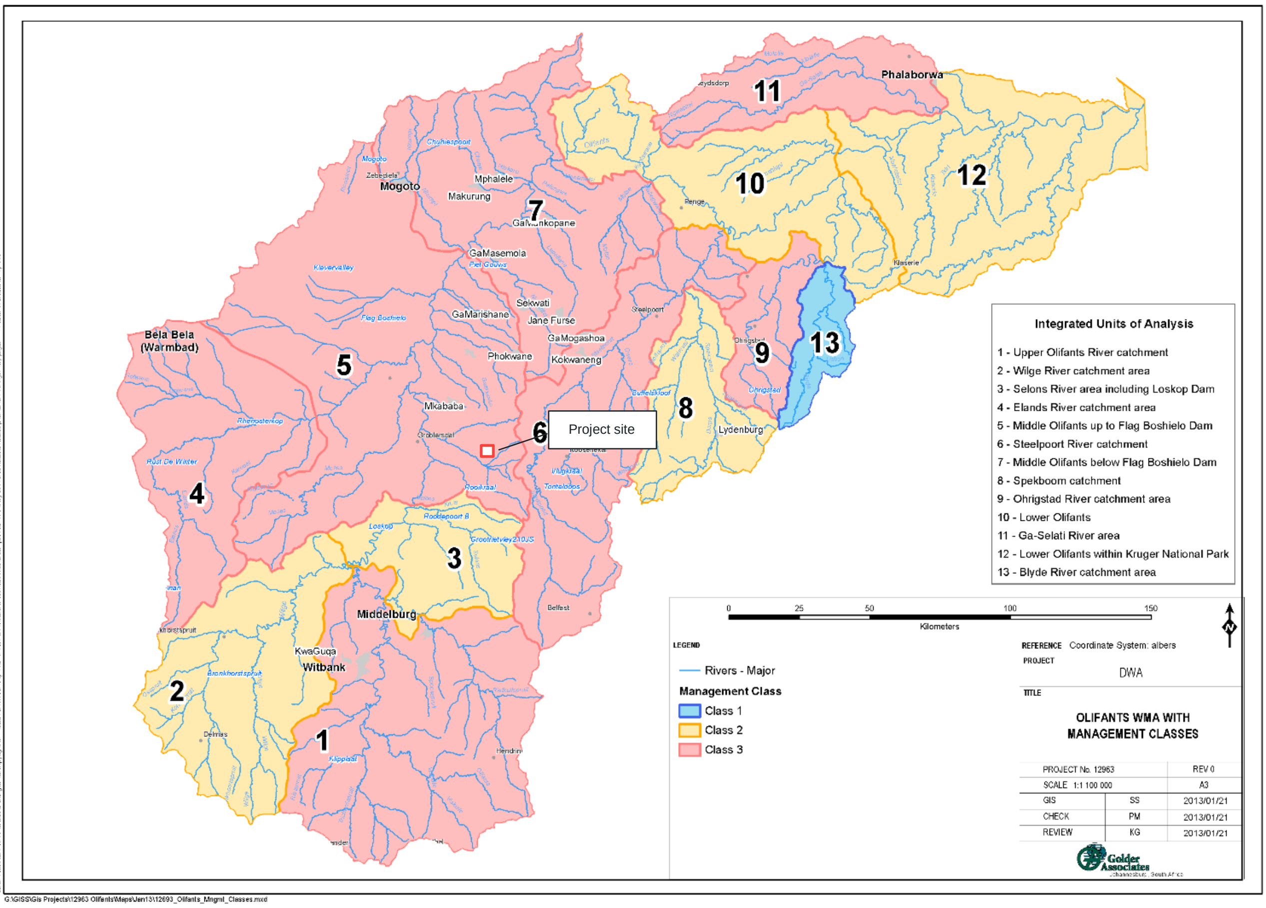

Figure 4-1 - IUAs for the Olifants WMA showing water resources classes and project site

Table 4-2 - Summary of Eco-classification and water resource class for relevant quaternary catchments in IUA 6

IUA	Class	Biophysical node name and *Resource Unit*	Quaternary catchment	River Name	Ecological category to be maintained	Natural MAR (million m³/a)	EWR as % of natural MAR[1]
IUA 6: Steelpoort River catchment	III	HN54	B41A	One node at outlet of B41A. Included: Grootspruit (outlet of quaternary) Langspruit, including Lakensvleispruit and Kleinspruit	C	41.9	207.8
		HN55 - OLI-EWR2 (Rapid site)	B41B	Steelpoort	C	63.5	20.78

Notes: EWR: Ecological Water Requirements site; HN: hydronode (sites identified in respect of modelling and monitoring requirements); MAR: mean annual run-off; [1]Based on EWR for maintenance and drought flows only.

The quantity (flow) RQOs set for the quaternary catchment in which the Lakenvlei site is located are set out in Table 4-3.

In respect of water quality, no specific water quality objectives have been gazetted for this quaternary catchment, with the closest EWR site at which quality has been set being downstream in quaternary catchment B41H. This is below the De Hoop Dam so is not very relevant to the upstream reach in quaternary catchment B41A in which the project site is located.

In this respect to enable the downstream RQOs water quality component to be achieved, water quality planning limits have been set, and these are described in chapter 4.1.5.

Table 4-3 – Resource Quality Objectives - quantity

Variable		Steelpoort/ Olifants B41A	
Water Resource Class		III	
Resource Unit		54	
Ecological Category		C	
	Month	**Maintenance (Percentile)**	**Drought (Percentile)**
Flows	October	0.157 (70)	0.086 (99)
	November	0.242 (70)	0.058 (99)
	December	0.319 (70)	0.172 (99)
	January	0.418 (80)	0.224 (99)
	February	0.529 (70)	0.282 (99)
	March	0.446 (70)	0.224 (99)
	April	0.417 (70)	0.220 (99)
	May	0.322 (70)	0.146 (99)
	June	0.251 (70)	0.138 (99)
	July	0.189 (70)	0.105 (99)
	August	0.157 (70)	0.089 (99)
	September	0.143 (70)	0.082 (99)

4.1.5 Water Quality Planning Limits

Considering that RQOs are not necessarily set for every quaternary catchment and for every variable that may be relevant for the overall catchment, water quality planning limits (WQPL) can be set at a finer scale. For the Olifants Water Management Area, WQPLs were set as guidelines for specific Management Units (MU) as part of the Olifants Water Quality Management Strategy (DWS, 2018). Management Units were delineated based on aspects including land use and water users, socioeconomics, and climatic, hydrogeological, and geographical zones. These may be similar to the quaternary catchments, although not always.

The project area falls into MU 59 and the water quality planning limits (WQPL) are set out in Table 4-4.

Table 4-4 – Water Quality Planning Limits

Variable	Unit	WQPL
Calcium (dissolved)	mg/L	15
Chloride (dissolved)	mg/L	25
Total Dissolved Solids	mg/L	260
Electrical Conductivity	mS/m	30
Fluoride (dissolved)	mg/L	0.75
Potassium (dissolved)	mg/L	50
Magnesium (dissolved)	mg/L	30
Sodium (dissolved)	mg/L	70
Ammonium (NH_4-N)	mg/L	0.05
Nitrate	mg/L	0.5
Total Phosphorus	mg/L	0.25
pH		6.5 - 8.4
Orthophosphate as P	mg/L	0.01
Sulphate (dissolved)	mg/L	20
Total Alkalinity	mg/L	70
Dissolved Organic Carbon	mg/L	5
Dissolved Oxygen	mg/L	9
Sodium Absorption Ratio		2
Suspended Solids	mg/L	25
Chlorophyll a	µg/L	1
Escherichia coli	CFU/ 100mL	130
Faecal coliforms	CFU/ 100mL	130
Aluminium	mg/L	0.01
Boron	mg/L	0.5
Chromium (VI)	µg/L	7
Iron	mg/L	0.1
Manganese	mg/L	0.02

5 BASELINE DESCRIPTION

5.1 OBJECTIVES OF THE BASELINE OVERVIEW

It is expected that the project will improve the surface water aspects in respect of quantity, quality and instream biota in the sub-catchment of the Kleinspruit and Langspruit and ultimately the upper Steelpoort draining into the De Hoop Dam. The objective of the surface water baseline overview is therefore to get an understanding of the current situation so that trends can be established over time as the project progresses, and once the improvements are in place.

5.2 CLIMATE

There are no active climate stations in the area in which the study site is located. Historic rainfall data has however been retrieved for the period 1920 to 2009 from Rainfall Station 517039W.

5.2.1 Temperature

Average temperatures at the Town of Belfast are recorded in Table 5-1.

Table 5-1 – Average monthly temperatures at the Town of Belfast

Month	Average high temperatures (°C)	Average low temperatures (°C)
January	26	15
February	26	15
March	26	14
April	23	12
May	21	9
June	18	6
July	18	5
August	21	8
September	26	12
October	26	14
November	26	15
December	26	15

5.2.2 Rainfall

The site is located in B4A (WR 2012) and rainfall data for this area was taken from the WR 2012 data for Rainfall Station 517039W which has monthly rainfall records for the period 1920 to 2009.

The highest rainfall months are, November, December and January respectively, and the lowest rainfall months are June, July and August as illustrated by Figure 5-1, Figure 5-2 and Figure 5-3.

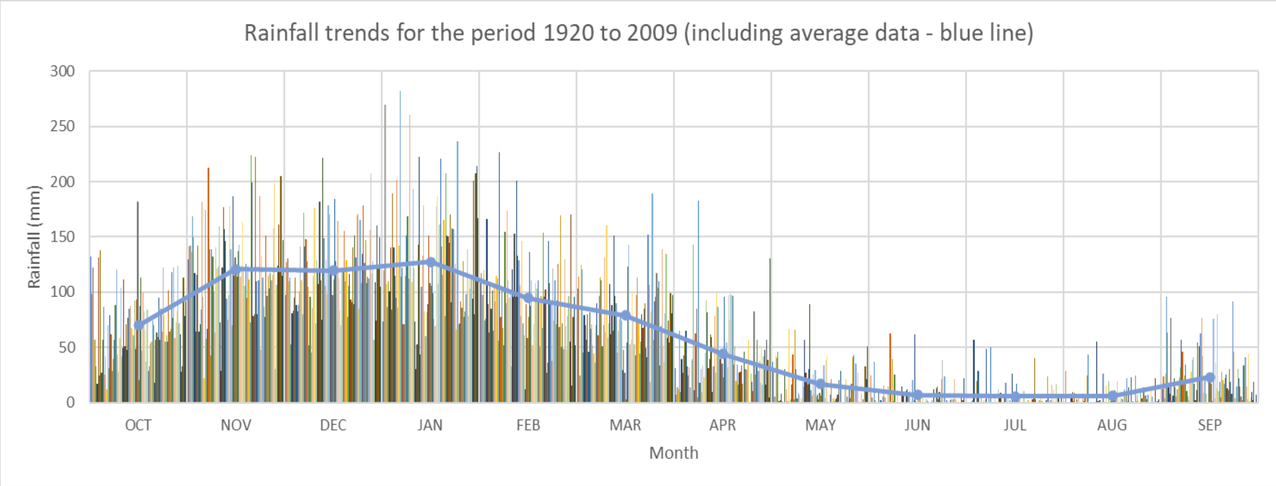

Figure 5-1 - Rainfall trends for Rainfall Zone B4A (WR 2012)

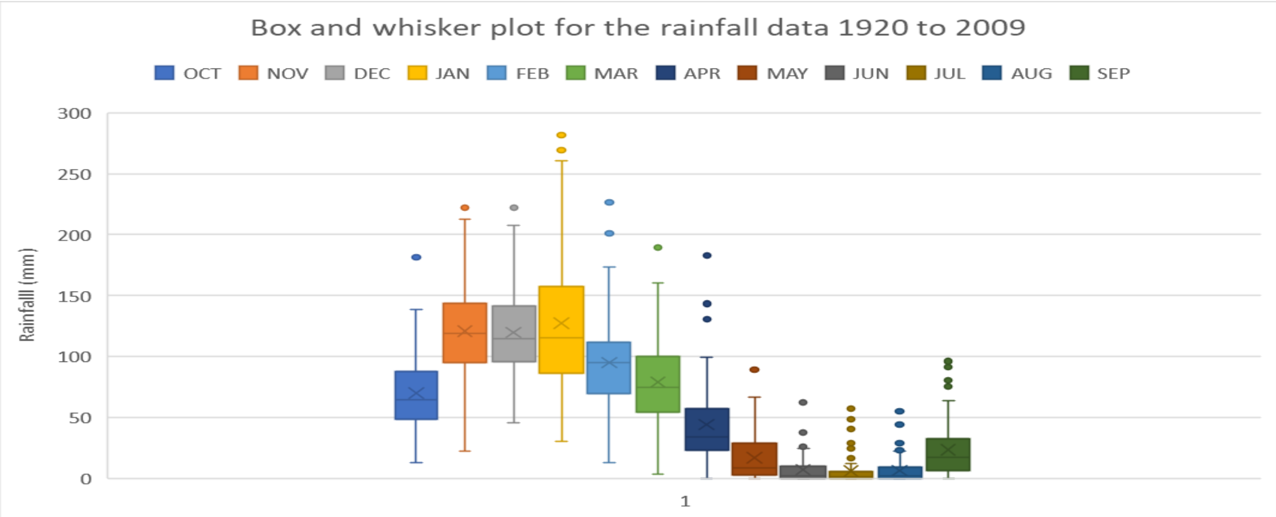

Figure 5-2 - Box and whisker plot for B4A Rainfall Zone

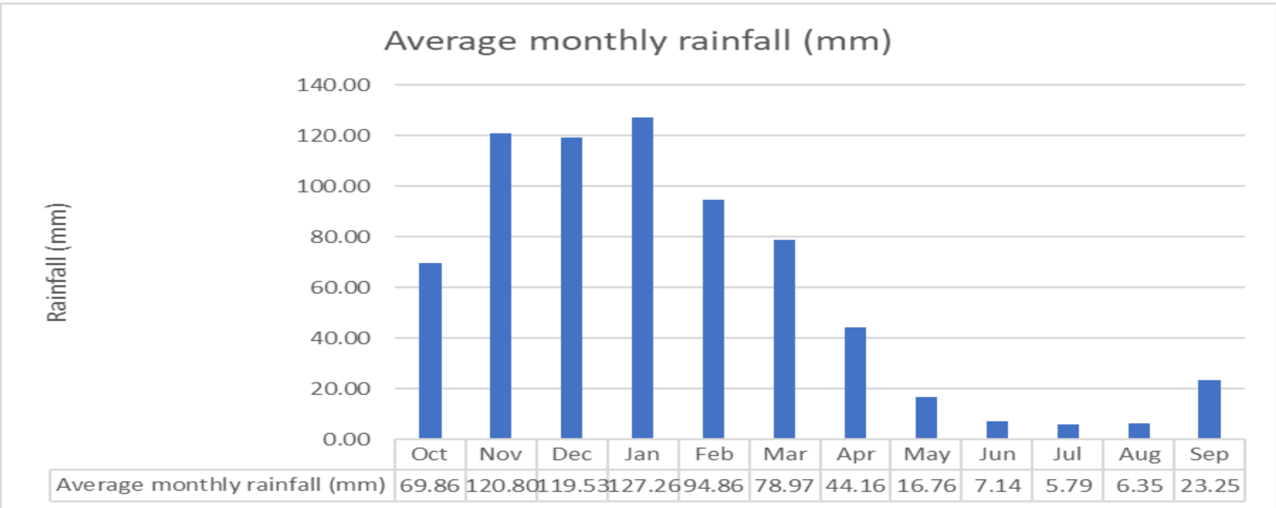

Figure 5-3 - Average monthly rainfall data for Rainfall Zone B4A

5.2.3 Evaporation

The average evaporation for this area is estimated as 1,500 mm per annum.

5.2.4 Climate change

The Department of Water and Sanitation's National Integrated Water Information System (NIWIS), has a dashboard that sets out Climate Change indicators (- DWS - NIWIS - Climate and Weather -). These include changes in temperature, wet spells, dry spells, irrigation demand, potential evaporation, mean annual precipitation and streamflow. The available climate change data used is at quinary scale (i.e., sub-division of the quaternary catchments).

The project site falls within quinary catchment B41A1. The expected percentage change for the present (1975 – 2006) and future (2016 to 2045) for various parameters are set out in

Table 5-2 – Climate change estimation (DWS, NIWIS)

Aspect considered			% Change
Wet spells (number)	Present (1975 - 2006)	50.8	-3%
	Future (2016 - 2045)	49.3	
Dry Spells (number)	Present (1975 - 2006)	53.8	-10%
	Future (2016 - 2045)	48.5	
Streamflow (m^3/s)	Present (1975 - 2006)	179.8	-7%
	Future (2016 - 2045)	168.1	
Rainfall (mm/a)	Present (1975 - 2006)	766.2	1%
	Future (2016 - 2045)	773.8	
Potential Evaporation (mm/a)	Present (1975 - 2006)	1,526.10	11%
	Future (2016 - 2045)	1,694.30	
Temperature (°C)	Present (1975 - 2006)	13.6	18%
	Future (2016 - 2045)	16.1	

5.3 WATER USERS

Water users in the area are predominantly agricultural related, with limited tourism. The Town of Belfast and the Belfast Colliery are located approximately 7 km and 9.5 km southwest of the project site, respectively.

The Belfast Dam is located approximately 6.5 km southwest of the site and neither the town, mine nor dam will be impacted by the project, as the project site is located in an adjacent sub-catchment.

5.4 HYDROLOGICAL DESCRIPTION

5.4.1 Catchment description

The project site is located in quaternary catchment B41A of the Steelpoort sub-catchment within the Olifants Water Management Area (WMA2), primary drainage region B. This is the headwaters of the Steelpoort River with the Grootspruit and Langspruit confluence at the outlet of the quaternary catchment where it becomes the Steelpoort River (Figure 5-4). The Langspruit is fed by the Kleinspruit that drains north to south, west of the project site and the Lakensvleispruit that drains the project site.

The Steelpoort River drains approximately 70 km to the De Hoop Dam, and a further 75 km from the De Hoop Dam to the Olifants River.

5.4.2 Local Hydrology

The local hydrology of the site is described in Table 5-3 and illustrated in Figure 3-1.

Table 5-3 – Hydrological description for each cluster

Cluster	Hydrological description	Catchment area (hectares)
Cluster 1	The cluster is located in the North, north-western area of QC B41A. There are 3 large farm dams in the northwestern area of the cluster and several small farm dams in almost all of the small tributaries draining southeast, south, and west to the Lakensvleispruit. Springs feed the tributaries which are mostly ephemeral.	311.61
Cluster 2	The cluster is located in the eastern area of the cluster. There are three dams on the Lakensvleispruit at the inlet of Cluster 2 draining from the outlet Cluster 1, and into Cluster 8. There are 4 small tributaries that drain to the Lakensvleispruit in Cluster 8, with 4 dams on the most dominant tributary draining west. The Middelpunt Road crosses between several of the dams in Cluster 2. Springs feed the tributaries which are mostly ephemeral.	139.50
Cluster 3	The cluster is located south of Cluster 8 with 4 tributaries draining north, and one tributary draining west to the Lakensvleispruit in Cluster 8. Several small farm dams and one larger dam are located in the cluster. Springs feed the tributaries which are mostly ephemeral.	188.15
Cluster 4	The cluster is located at the most downstream (southern) point of the project site with two small tributaries draining south in the Lakensvleispruit and one tributary draining north into the Lakensvleispruit. The R540 road crosse this cluster at the point that is the point which is essentially the outlet of the project. Springs feed the tributaries which are mostly ephemeral.	94.72
Cluster 5	The cluster is located directly west of Cluster 8. Four small tributaries drain int Cluster 8, Lakensvleispruit. Springs feed the tributaries which are mostly ephemeral.	48.4185
Cluster 6	The cluster is located south of Cluster 7 in the western area of the project site, with four tributaries draining southeast to a dam in the centre of the cluster and then to the Lakensvleispruit in Cluster 8. A fifth tributary drains east directly to Cluster 8. Springs feed the tributaries which are mostly ephemeral.	147.73
Cluster 7	The cluster is located in the most northern area of QC B41A. There are two small dams and several springs that all flow south and drain to 3 larger dams and ultimately the Lakensvleispruit that drains southwest before the confluence with the Kleinspruit. The tributaries are predominantly ephemeral. Springs feed the tributaries which are mostly ephemeral.	151.45

Cluster	Hydrological description	Catchment area (hectares)
Cluster 8	The cluster is the central cluster to which clusters 1, 2, and 3 drain. The Lakensvleispruit flows through the centre of the cluster.	214.22

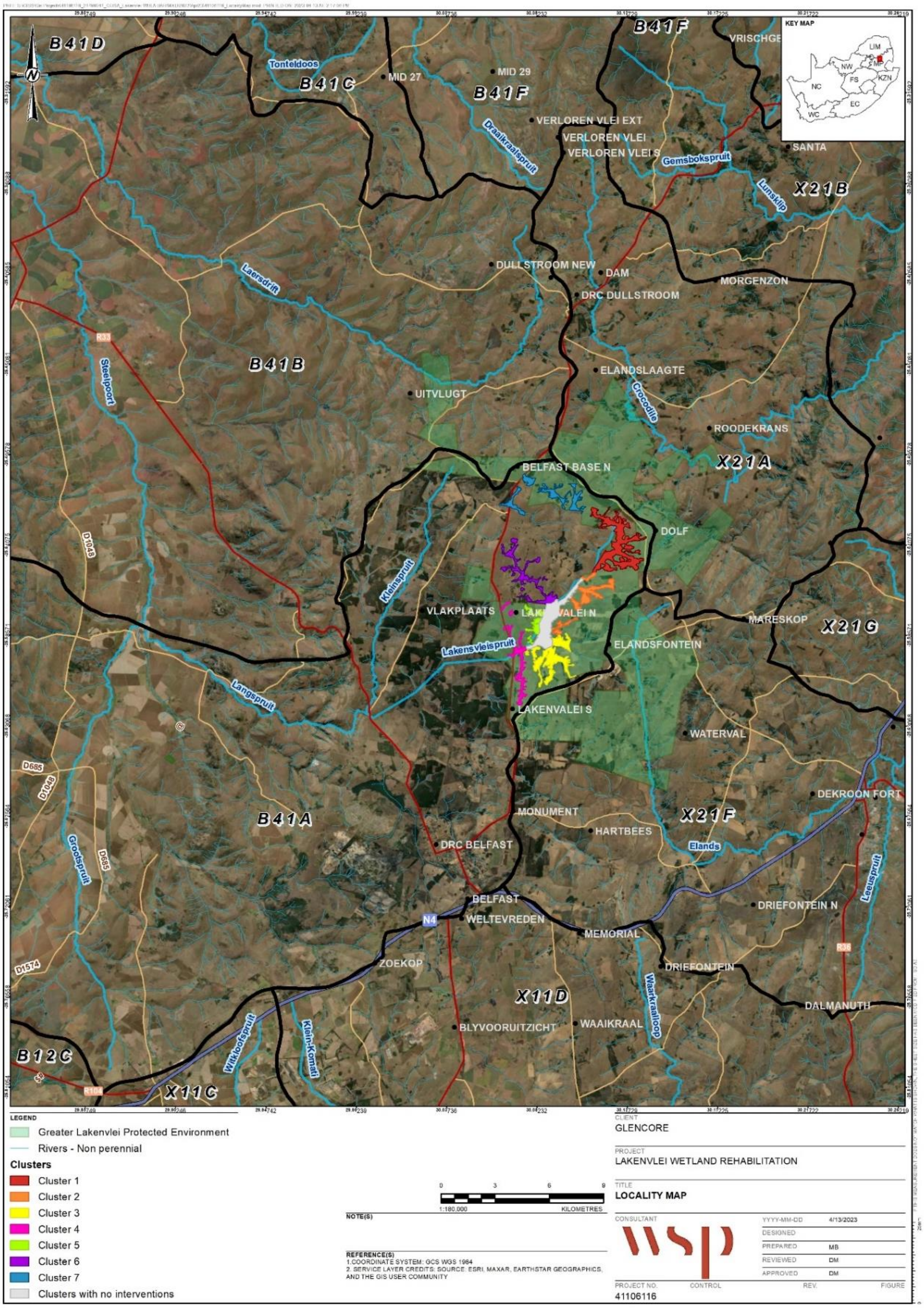

Figure 5-4 – Sub-catchment hydrology

5.4.3 Surface water quality

There are currently no water quality sampling sites in the Lakensvleispruit, and as the streams are predominantly ephemeral, no historical data is available for the small tributaries. The water quality of the dams is not seen to be representative for the Lakensvleispruit due to the concentration of chemicals during the dry season.

Statistics of the historical data for the Lakensvleispruit at the R543 bridge from the Department of Water and Sanitation Water Management System, site B1_10000009851 (April 2004 to June 2010) is however good reference data.

This data is compared against the WQPLs set out in Table 4-4 and highlights that only nutrients (orthophosphate and ammonium) (95 and 50 percentile data) have been moderately higher than the WQPLs set and are likely due to the agricultural activities that occur in the area, however are not at concentrations that would be harmful to the river ecology. Some eutrophication is noted (visually) in the farm dams.

Table 5-4 – Water quality statistics at the downstream site at R543 bridge

Parameters	Unit	WQPL	95th percentile	50th percentile	5th percentile
Calcium (dissolved)	mg/L	15	46.15	5.38	3.35
Chloride (dissolved)	mg/L	25	7.88	4.01	2.00
Total Dissolved Solids	mg/L	260	51.39	43.77	36.73
Electrical Conductivity	mS/m	30	9.57	7.10	5.00
Fluoride (dissolved)	mg/L	0.75	0.14	0.10	0.03
Potassium (dissolved)	mg/L	50	1.51	0.73	0.37
Magnesium (dissolved)	mg/L	30	18.75	4.25	2.89
Sodium (dissolved)	mg/L	70	6.35	3.78	1.68
Ammonium (NH_4-N)	mg/L	0.05	0.20	0.10	0.02
Nitrate	mg/L	0.5	0.04	0.04	0.04
pH		6.5 - 8.4	8.02	7.03	6.43
Orthophosphate as P	mg/L	0.01	0.63	0.10	0.01
Silica	mg/L	-	5.18	4.98	4.72
Sulphate (dissolved)	mg/L	20	7.20	2.00	2.00

6 IMPACT ASSESSMENT

6.1 MAJOR AREAS OF CONCERN FOR SURFACE WATER IMPACTS

The project aspects that relate to potential impacts to the surface water component during the construction of the various project components are:

- Increased sediment loads to the river system due to erosion from the following construction activities:
  - Upgrade of road crossings that are currently just gravel roads through the riverbed
  - Formalisation of farm dam spillways
  - Removal of dams
  - Instream Dongalock improvements, and
  - Alien vegetation removal.
- Discharge of water and sediment that may contain higher levels of nutrients where farm dams are removed.

Once these are implemented, the improvements to the catchment will be positive, and for that reason, only the construction phase impacts are assessed.

6.2 IMPACT ASSESSMENT METHODOLOGY

The significance of identified impacts will be determined using the approach outlined below (terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998). This approach incorporates two aspects for assessing the potential significance of impacts, occurrence and severity, which are further subdivided as:

- Occurrence:
  - Probability of occurrence
  - Duration of occurrence
- Severity:
  - Scale or extent of impact
  - Magnitude of impact

The following definitions are applicable to the ranking scales outlined in Table 6-1.

Magnitude is a measure of the degree of change in a measurement or analysis which for the surface water component is the concentration of a constituent of concern in water compared to the limit or guideline value for the constituent of concern; in this case the RQO, the WQPL or even a WUL condition. Magnitude is classified as none/ negligible, low, moderate, or high. The categorisation of the impact magnitude may be based on a set of criteria (e.g., health risk levels, ecological concepts, and professional judgement) pertinent to each of the discipline areas and key questions analysed. The specialist study must attempt to quantify the magnitude and outline the rationale used.

Scale/Geographic extent refers to the area that could be affected by the impact and is classified as site (river reach within the project site), local (local river sub-catchment), regional (quaternary catchment), national (water management area), or international (transboundary water resources).

Duration refers to the length of time over which an environmental impact may occur i.e., immediate/transient, short-term (0 to 7 years), medium-term (8 to 15 years), long-term (greater than 15 years with impact ceasing after closure of the project), or permanent; and

Probability of occurrence is a description of the probability of the impact actually occurring as improbable (less than 5% chance), low probability (5% to 40% chance), medium probability (40% to

60% chance), highly probable (most likely, 60% to 90% chance) or definite (impact will definitely occur).

Table 6-1 - Ranking scales for magnitude, duration, scale and probability

Magnitude	Duration
10- Very high/ unknown	5 – Permanent. Residual impacts will remain after decommissioning and closure.
8- High (change in chemical/ physical/ microbiological constituents <20% from the relevant limits/ guidelines, depending on the constituents in relation to the potential impact of the constituent of concern on the downstream users, including the ecology)	4: Long-term. May occur throughout the life of the mine but will cease after operations cease either because of natural processes or human intervention (15 – 50 years, impact ceases after site closure has been obtained).
6- Moderate (change in chemical/ physical/ microbiological constituents <15% from the relevant limits/ guidelines, depending on the constituents in relation to the potential impact of the constituent of concern on the downstream users, including the ecology)	3: Medium-term. May occur for the first few years of the project, during construction. Impacts reversible within a three-year period.
4- Low (change in chemical/ physical/ microbiological constituents ≤5 -10% from the relevant limits/ guidelines, depending on the constituents in relation to the potential impact of the constituent of concern on the downstream users, including the ecology)	2: Short-term. Impact may occur for weeks or a few months and is rapidly reversible.
2- Minor (change in chemical/ physical/ microbiological constituents predominantly within the relevant limits/ guidelines)	1: Immediate, and rapidly reversible.
Scale	**Probability**
5- International (transboundary rivers)	5- Definite/Unknown
4- National (Water Management Area)	4- Highly Probable
3- Regional (quaternary catchment)	3- Medium Probability
2- Local (sub-catchment of the local river)	2- Low Probability
1- Site Only (river reach within the project site)	1- Improbable
0- None	0- None

Once these factors are ranked for each impact, the significance of the two aspects, occurrence and severity, is assessed using the following formula:

Significance Points= (Magnitude + Duration + Scale) x Probability

The maximum value is 100 significance points (SP). The impact significance will then be rated as set out in Table 6-2.

Table 6-2 – Significance rating

Points	Significance	Description
SP>60	High environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 - 60	Moderate environmental significance	An impact or benefit which is sufficiently important to require management, and which could have an influence on the decision unless it is mitigated.
SP<30	Low environmental significance	Impacts with little real effect and which will not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/effects.

6.3 IMPACT ASSESSMENT FOR PROJECT CONSTRUCTION

6.3.1 Impact 1: Increased sediment loads to the river system due to erosion

The following will require some clearing of vegetation and before revegetation is possible that erosion can occur from the sites and increase the sediment load to the system as follows.

Upgrade of road crossings that are currently just gravel roads through the riverbed:

Designed stormwater systems will be put in place, specifically in Cluster 7, where roads are currently gravel roads that pass through the riverbed. During the construction, it is possible that erosion may occur where the area is cleared to construct the culverts. During construction of the culverts, it is expected that the impacts from erosion will have a low significance as shown in Table 6-3, based on scores for magnitude – minor, scale - local, duration - short-term where the impact may occur for weeks or a few months at most and is rapidly reversible.

Even though the significance impact is low, the following mitigation will ensure positive consequences and downstream effects.

- Good housekeeping around the area
- Limited clearing to only the area needed, and
- Clearing and construction during the dry season

Formalisation of farm dam spillways:

Formalisation of dam spillways, 6 farm dams, with one dam wall also to be lowered in Cluster 3. During the construction, it is possible that erosion may occur where the area is cleared to construct the dam walls. During construction of the dam walls, it is expected that the impacts from erosion will have a low significance as shown in Table 6-3, based on scores for magnitude – minor, scale - local, duration - short-term where the impact may occur for weeks or a few months at most and is rapidly reversible once the construction activities are completed.

Even though the significance impact is low, the following mitigation will ensure positive consequences and downstream effects.

- Good housekeeping around the area
- Limit clearing to only the area needed, and
- Clearing and construction during the dry season.

Instream Dongalock improvements and stabilisation of headcuts as well as improvement of structures along certain non-perennial rivers:

The improvement activities may lead to some areas that are disturbed for a short period. This may lead to some erosion, however it is expected that the impacts from erosion will have a low significance as shown in Table 6-3, based on scores for magnitude – minor, scale - local, duration - short-term where the impact may occur for weeks or a few months at most and is rapidly reversible once the construction activities are completed.

Even though the significance impact is low, good housekeeping around the activities being worked on will ensure positive consequences and downstream effects.

Alien vegetation removal:

Removal of alien vegetation may lead to areas that are denuded before the indigenous vegetation grows back. It is expected however that the significance will be low as shown in Table 6-3, based on scores for magnitude – minor, scale - local, duration - short-term where the impact may occur for weeks or a few months at most and is rapidly reversible once indigenous vegetation returns.

Even though the significance impact is low the removal should be accompanied by good housekeeping on the site, and if necessary, indigenous vegetation could be encouraged by spreading of seeds where land is cleared of all vegetation. The removal of alien vegetation will lead to a positive environmental outcome, for water quantity as well as ecosystems improvement.

Table 6-3 – Impact matrix – Risk of erosion

Risk	Impact	Magnitude	Duration	Scale	Probability	Significance	After mitigation
1. Erosion	Increased sediment loads to the river system due to erosion from upgrade of road crossings that are currently just gravel roads through the riverbed	2	2	2	3	18	+ve
	Increased sediment loads to the river system due to erosion from the formalisation of farm dam spillways	2	2	2	3	18	+ve
	Increased sediment loads to the river system due to erosion from Instream Dongalock improvements, and	2	2	2	3	18	+ve
	Increased sediment loads to the river system due to erosion from Alien vegetation removal.	2	2	2	3	18	+ve

6.3.2 Discharge of water and sediment that may contain higher levels of nutrients where farm dams are removed.

As farms dams are removed the water and sediment will be discharged naturally further downstream. The dams may be eutrophic, and the release of the water and sediment will be transported downstream increasing the nutrient load. It is not expected that this will contribute considerably to the downstream Steelpoort River catchment.

It is expected that the impacts from the removal of the farm dams will have a low significance as shown in Table 6-4, based on scores for magnitude – moderate with changes to nutrient concentrations expected to be <10% from the baseline, scale - local, duration - short-term where the impact may occur for weeks or a few months at most and is rapidly reversible once the activities are completed, and the first rainfall flushes the system.

Considering the climate change aspects where rainfall is expected to increase by 1%, however evaporation by 11%, the removal of farms dams should be a positive impact by reducing the surface area.

Table 6-4 - Impact matrix – Risk of discharge when removing farm dams

Risk	Impact	Magnitude	Duration	Scale	Probability	Significance	After mitigation
Nutrient rich sediment and water discharge	1.5 Discharge of water and sediment that may contain higher levels of nutrients where farm dams are removed.	4	2	2	3	24	+ve

7 MONITORING PROGRAMME

While it will be important to monitor the various clusters to assess the improvements or maintenance from the baseline to ensure that the offset actions have worked, it is understood that these areas are predominantly wetlands and monitoring should be done according to the wetland monitoring programme which will include biomonitoring.

It is however proposed that flow and water quality and water quality are at least monitored at the outlet of the Cluster 4 at the R540 road where it is essentially the outlet of the project, as a minimum, at coordinates:

- Latitude: 25°35'47.03"S; and Longitude: 30° 04'13.28"N

8 CONCLUSIONS

The GGV Water Use License (WUL) 24084063 of 19 April 2007 requires an offsite wetland rehabilitation as an offset for the wetland loss and requires that any offset is in the ratio 1: 2 (for every 1 hectare lost, 2 hectares must be rehabilitated). Given the direct wetland loss of 584 hectares within the GGV opencast area, the offset target was determined as 1,168 hectares.

Development of the GGV wetland offset strategy commenced in 2005 with initial work focussing on the identification and selection of a suitable site, and at the time no suitable target site was found in close proximity to GGV, and a new approach was proposed by GGV in 2014 and presented to the Department of Water and Sanitation during a meeting held on 22 April 2014 in Pretoria, and the proposed site Lakenvlei wetland system site within the Greater Lakenvlei Protected Environment (GLPE) was accepted by the authorities. The requirement of a 1:2 offset ratio was reaffirmed resulting in an offset target of 1,168 hectares within the Lakenvlei wetland system that would be rehabilitated.

The implementation of the GGV Wetland offset project being undertaken by Glencore Operations, South Africa in the Lakenvlei wetland system located within the Greater Lakenvlei Protected Environment (GLPE) will have an overall positive impact for the surface water component.

9 REFERENCES

Department of Water and Sanitation (2016) National Water Act, 1998, (36/1998), Classes and Resource Quality Objectives of Water Resources for the Olifants Catchment – GN 466, 22 April 2016

Department of Water and Sanitation (2018) Updated (Comprehensive) Reserve for the Olifants Water Management Area

Department of Water and Sanitation, National Integrated Water Information System (NIWIS) - DWS - NIWIS - Climate and Weather –

Appendix A

DOCUMENT LIMITATIONS

DOCUMENT LIMITATIONS

This document has been provided by WSP Group Africa Pty Ltd ("WSP") subject to the following limitations:

i) This Document has been prepared for the particular purpose outlined in WSP's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.

ii) The scope and the period of WSP's Services are as described in WSP's proposal, and are subject to restrictions and limitations. WSP did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by WSP in regard to it.

iii) Conditions may exist which were undetectable given the limited nature of the enquiry WSP was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

iv) In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. WSP's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed WSP to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

v) Any assessments made in this Document are based on the conditions indicated from published sources and the investigation described. No warranty is included, either express or implied, that the actual conditions will conform exactly to the assessments contained in this Document.

vi) Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by WSP for incomplete or inaccurate data supplied by others.

vii) The Client acknowledges that WSP may have retained sub-consultants affiliated with WSP to provide Services for the benefit of WSP. WSP will be fully responsible to the Client for the Services and work done by all its sub-consultants and subcontractors. The Client agrees that it will only assert claims against and seek to recover losses, damages or other liabilities from WSP and not WSP's affiliated companies. To the maximum extent allowed by law, the Client acknowledges and agrees it will not have any legal recourse, and waives any expense, loss, claim, demand, or cause of action, against WSP's affiliated companies, and their employees, officers and directors.

viii) This Document is provided for sole use by the Client and is confidential to it and its professional advisers. No responsibility whatsoever for the contents of this Document will be accepted to any person other than the Client. Any use which a third party makes of this Document, or any reliance on or decisions to be made based on it, is the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party because of decisions made or actions based on this Document.

WSP GROUP AFRICA (PTY) LTD

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com