ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR THE 2 SEAM MINE PROJECT

Portions 6, 29, 31 and 50 of the Farm Vlaklaagte 45 IS, Portion RE of the Farm Lourens 472 IS.

DMRE REF: MP 30/5/1/2/3/2/1 (405) EM

November 2022

Submitted as part of an application process for environmental authorisation in terms of the National Environmental Management Act (Act 107 of 1998) [as amended] in respect of listed activities that have been triggered by application in terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002) [as amended]

DOCUMENT HISTORY

Document Control, Quality Control and Disclaimer

Report	**ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT FOR 2 SEAM (PTY) LTD – 2 SEAM MINE PROJECT: MINING RIGHT, DMRE REF MP 30/5/1/2/3/2/1 (405) EM**		
Client	2 Seam (Pty) Ltd. – 2 Seam Mine Project		
Responsible Person	Responsible Person: Mr. Paul Eskrine Tel: 082 523 7328 Email: paul@2seamcoal.com		
Report Number	V0.0	**Report Status**	Draft for Public Review 14 November 20 to 13 December 2022
Draft Report	Public Review	**Final Report:**	To be confirmed

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DOCUMENT COMPILED AND REVIEWED BY

Responsible person	Date	Position
Sonja van de Giessen	09 Novembver 2022	EAP – Senior Specialist (Pr.Sci.Nat) EAPASA
Signature		
Reviewer person	**Date**	**Position**
		Project Manager
Signature		

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

FOR LISTED ACTIVITIES ASSOCIATED WITH THE MINING RIGHT FOR 2 SEAM (PTY) LTD – 2 SEAM MINE PROJECT

PORTIONS 6, 29, 31 AND 50 OF THE FARM VLAKLAAGTE 45 IS, PORTION RE OF THE FARM LOURENS 472 IS.

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

Name of Applicant	2 Seam (Pty) Ltd.
Project	2 Seam Mine Project
Contact person	Mr. Paul Eskrine
Tel No	082 523 7328
Email	paul@2seamcoal.com
Postal Address	PO Box 20762 Durban North, 4016
Physical Address	Block 5 Bureau de Paul, 9 Corridor Crescent, Route N4 Business Park, Ben Fleur, Witbank, 103
File Reference Numbers	MP 30/5/1/2/3/2/1 (405) EM

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17(1)(c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

(a) Determine the policy and legislative context within which the activity is located and document how the activity complies with and responds to the policy and legislative context;

(b) Describe the need and desirability of the activity, including the need and desirability of the activity in the context of the preferred location;

I Identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) Determine the—-

- (i) Nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
- (ii) Degree to which these impacts—
  - (aa) can be reversed;
  - (bb) may cause irreplaceable loss of resources, and
  - (cc) can be avoided, managed or mitigated;

(d) Identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

I Identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(f) Identify suitable measures to manage, avoid or mitigate identified impacts; and

(g) Identify residual risks that need to be managed and monitored.

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ABBREVIATIONS

Abbreviation	Description
ARC	Agricultural Research Council
BoQ	Bill of Quantities
BPEO	Best Practicable Environmental Option
DAFF	Department of Agriculture, Forestry and Fisheries
DEFF	Department of Environment, Forestry and Fisheries
DEA	Department of Environmental Affairs
DESTEA	Free State Department of Economic, Small Business Development, Tourism and Environmental Affairs
DM	District Municipality
DMRE	Department of Mineral Resources and Energy (previously Department of Mineral Resources - DMR)
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (Act 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIR	Environmental Impact Assessment Report
EMPR	Environmental Management Programme
ESMS	Environmental and Social Management System
GNR	Government Notice Regulation
I&APs	Interested and Affected Parties
IDP	Integrated Development Programme
IEM	Integrated Environmental Management
IHAS	Invertebrate Habitat Assessment System
IHIA	Intermediate Habitat Integrity Assessment
IWUL	Integrated Water Use License
IWULA	Integrated Water Use License Application
LED	Local Economic Development
LM	Local Municipality
LOM	Life of Mine
MAMSL	Meter Above Mean Sea Level
MPRDA	Mineral and Petroleum Resources Development Act (Act 28 of 2002)
MRA	Mining Right Application
NAEIS	National Atmospheric Emission Inventory System
NEMA	National Environmental Management Act (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Act, 39 of 2004
NEMBA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEMWA	National Environmental Management: Waste Act (Act 59 of 2008)
NFA	National Forest Act (Act 84 of 1998)
NHRA	National Heritage Resources Act (Act 25 of 1999)
NWA	National Water Act (Act 36 of 1998)
PAIA	Promotion of Access to Information Act (Act 2 of 2000)
PAJA	Promotion of Administrative Justice Act (Act 3 of 2000)
PES	Present Ecological State
PGMs	Platinum-Group Metals
PM10	Thoracic Particulate Matter
PM2.5	Inhalable Particulate Matter

PPP	Public Participation Process
ROM	Run of Mine
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency Limited
SANS	South African National Standard
SASS	South African Scoring System (Currently Version 5 is utilised)
SIA	Social Impact Assessment
SMME	South African Small, Medium and Micro Enterprise
TPA	Tons Per Annum
TSP	Total Suspended Particulates
WUL	Water Use License
WML	Waste Management License

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 CONTACT PERSON AND CORRESPONDENCE ADDRESS

1.1 DETAILS OF THE EAP

The details of the Environmental Assessment Practitioner's (EAPs) are provided in Table 1.

Table 1: Details and Name of the EAPS

Name of the Practitioner:	Sonja van de Giessen
Tel No.:	083 388 4633
Fax No.:	None
Email address:	sonja@elemental-s.co.za
Name of the Practitioner Reviewer	Corlien Lambrechts
Tel No.:	064 618 2646
Fax No.:	None
Email address:	corlien@elemental-s.co.za

1.2 EXPERTISE OF THE EAP

1.2.1 THE QUALIFICATIONS OF THE EAP (WITH EVIDENCE)

Elemental was appointed to assist 2 Seam with the environmental authorisation application in terms of the National Environmental Management Act (Act 108 of 1998), the Waste Management Licence in terms of National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) as amended, and the Environmental Impact Assessment Regulations of 2014, for the 2 Seam Mine Project. Refer to Appendix 1 for more details (CV).

Ms Sonja van de Giessen (Pr.Sci.Nat & EAPASA):

- University of South Africa / North West University, BSc Honours Environmental Management 2011
- North West University, MSc. Environmental Management, 2018

Ms Corlien Lambrechts (Pr Sci.Nat, EAPASA, SASAQS, BLSA):

- University of Pretoria, BSc Hons Zoology – 2016
- University of South Africa, BSc Environmental Management – 2009

1.2.2 SUMMARY OF THE EAPS PAST EXPERIENCE (IN CARRYING OUT THE ENVIRONMENTAL IMPACT ASSESSMENT PROCEDURE)

*(Attached the EAP's curriculum vitae as **Appendix 1**)*

Provided here is a summary of the qualification and experience of the EAP. Refer to Appendix 1 for copies of the curriculum vitae's.

Sonja van de Giessen is an Environmental Scientist with nearly 10 years of experience in environmental management, specifically the mining industry sector, focusing on Environmental Impact Assessments, Environmental Management Programmes, Water Use Licence Applications and Integrated Water and Waste Management Plans and Environmental Auditing. Sonja has extensive experience in public participation. She is registered as a Natural Professional Scientist (*Pr. Sci.Nat.* Number: 400084/18) with SACNASP and as an Environmental Assessment Practitioner South Africa (EAPASA Number: 2019/1496).

Corlien Lambrechts completed her (BSc) Environmental Management & Zoology through UNISA and completed practical Zoology courses at the North West University Potchefstroom Campus. She completed her final year Biodiversity Study at Vredefort Dome and an Entomology Project at the Roodeplaat Dam on Avifauna species, Anhinga rufa (African Darter). After working as a student at Geo Pollutions Technologies (Pty) Ltd and TUKS University Onderstepoort Campus, she started her career in Environmental Consulting at M2 Environmental Connections (MENCO) in 2013. She moved to the sister company (which is managed under the same Directors) of M2 Environmental Connections cc, namely Prescali Environmental Consultants (Pty) Ltd.
In 2015 she enrolled for her Honors degree in Zoology at the University of Pretoria where she completed a project in the Cathedral Peak Drakensberg Mountain range studying differences in community structures of invertebrate species between natural grasslands and grasslands subjected to rehabilitation by South African Environmental Observation Network (SAEON) and in association with the University of Pretoria Centre of Invasion Biology (CIB). Since 2018, she has joined the team of Elemental-S on a permanent basis as a specialist and is also the owner of Enviridi Environmental Consultants (Pty) Ltd. where she specializes in the field of Ecology, Aquatic Ecology Biomonitoring. She has since gained competency and accreditation through the Department of Water and Sanitation (DWS) for aquatic monitoring (SASS5 Accredited) in 2018 and competency re-evaluation in 2021 (every three years). In 2021, she enrolled and completed the Rhodes University: Tools for Wetland Assessment Course and is currently awaiting the results.
She is a Professional Natural Scientist with the South African Council of Natural Scientific Professions (Pr.Sci.Nat: 009135) for Environmental Sciences and registered with EAPASA (2020/935). She is also an active member of the Southern African Society of Aquatic Scientists Registration number (SASAQS Registration number: SASAQS0025) and the South African Bat Assessment Association (Registration number: 0054). She is a member of Bird Life South Africa (BLSA) (SABAP Citizen scientist number: 20686) and BLSA Membership number: 1041760

Natasha Graaf is a junior consultant with three years of experience in environmental impact assessments and environmental management at the Department of Mineral Resources and Energy (DMRE). Her experience is in the mining industry sector, focusing on Environmental Impact Assessment Reports, Environmental Management Programmes, Basic Assessment Reports, Financial Provisioning, Compliance and Complaint Inspections, Compiling Records of Decision and Environmental Authorisations. Her role includes assisting with the compilation of Environmental Impact Assessment Reports, Environmental Management Programmes and Basic Assessment Reports.

2 DESCRIPTION OF THE PROPERTY

2.1 SITE LOCATION

The project is situated in the Mpumalanga province of South Africa, which is governed locally by the eMalahleni Local Municipality and regionally by the Nkangala District Municipality. The closest town to the project is Kriel (approximately 11 km southwest of the 2 Seam Mine). The R547 provincial road provides access to the town. Refer to Table 2 below for the property description.

Table 2: Property description and surveyor codes

Farm Name:	Portions 6, 29, 31 and 50 of the Farm Vlaklaagte 45 IS Portion RE of the Farm Lourens 472 IS.
Application area (Ha)	Existing MR: ±695ha Area of the proposed infrastructure: ±3ha Opencast mining 191 ha
Magisterial district:	Nkangala District Municipality
Distance and direction from nearest town	30km south of eMalahleni 11km northwest of Kriel

21 digit Surveyor General Code for each farm portion	**Farm Name**	**Landowner**	**21 Digit SG Code**	**Title Deed Nr**
	Lourens 472 IS	Exxaro Coal Central Dorstfontein West Regional	T0IS00000000047200000	T3712/2010
	Portion 31 of the Farm Vlaklaagte 45 IS	South 32 SA Coal Holdings Pty Ltd.	T0IS00000000004500031	T65609/1991
	Portion 29 of the Farm Vlaklaagte 45 IS	South 32 SA Coal Holdings Pty Ltd.	T0IS00000000004500029	T65609/1991
	Lourens 472 IS	Exxaro Coal Central Dorstfontein West Regional	T0IS00000000047200000	T3712/2010
	Portion 31 of the Farm Vlaklaagte 45 IS	South 32 SA Coal Holdings Pty Ltd.	T0IS00000000004500031	T65609/1991

2.2 LOCALITY MAP (SHOW NEAREST TOWN, SCALE NOT SMALLER THAN 1:250 000)

(Show nearest town, scale not smaller than 1:250000 attached.

2 Seam (Pty) Ltd (2 Seam) is in possession of the mining right ((MP) 30/5/1/2/3/2/1 (405) EM) over portions 6, 29, 31, and 50 of the Farm Vlaklaagte 45 IS and portion RE of the Farm Lourens 472 IS within the eMalahleni local municipality in the Mpumalanga Province. 2 Seam is proposing to establish a coal wash plant and a tailings facility on site, to divert the Olifants River, to add two Pollution Control Dams (PCD) and a contractor's yard and to include an additional opencast mining area within the approved mining right boundary. Figure 2 indicates the locality of the 2 Seam Mine.

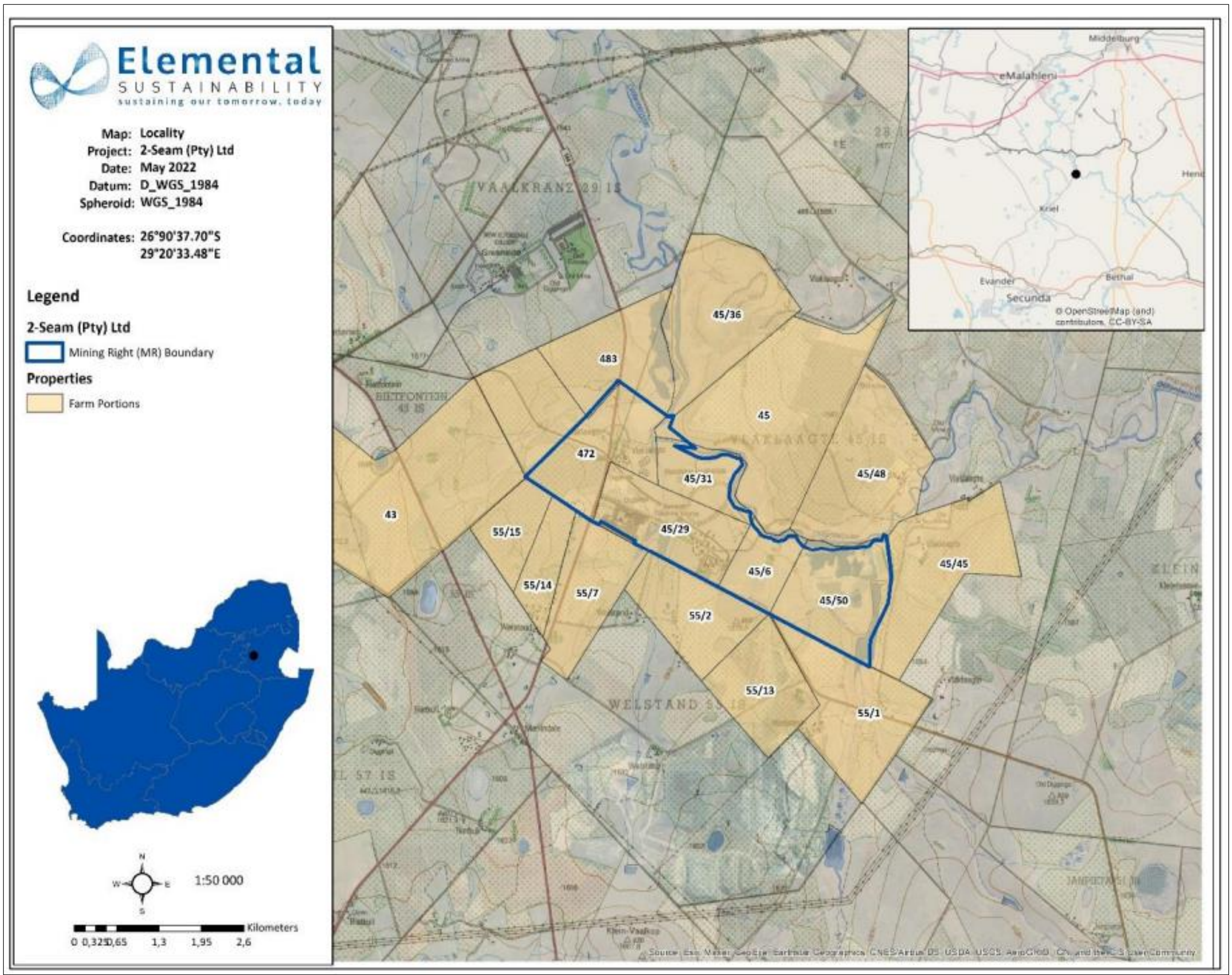

Figure 1: The regional locality of the proposed project

3 DESCRIPTION OF THE SCOPE OF THE OVERALL ACTIVITY

This section provides a detailed project description. The aim of the project description is to indicate the activities that are planned to take place.

3.1 LISTED AND SPECIFIED ACTIVITIES

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site and attach as Appendix.

Refer to Appendix 2.

Table 3 provides the listed and specified activities that are applicable to the 2 Seam Mine Project

Table 3: Listed and specified activities

Legislation	Listed activities	Applicability of the activity	Competent Authority
NEMA and the EIA Regulations, 2014, as amended (2021)	**<u>GN 983 of 2014, as amended:</u>** • **<u>Listing Notice 1 - Activity 9:</u>** *The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more; excluding where* *(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.* **- Stormwater infrastructure** • **<u>Listing Notice 1 – Activity 10:</u>** *The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes with an internal diameter of 0,36 metres or more; or with a peak throughput of 120 litres per second or more; excluding where* *(a) such infrastructure is for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.* **- Pipelines for process water** • **<u>Listing Notice 1 – Activity 11</u>** *The development of facilities or infrastructure for the transmission and distribution of electricity* *(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or* *(ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is* *(a) temporarily required to allow for maintenance of existing infrastructure;* *(b) 2 kilometres or shorter in length;* *(c) within an existing transmission line servitude; and* **- Powerlines to plant** • **<u>Listing Notice 1 – Activity 12</u>** *The development of* *i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs* *a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a water course excluding*	Section 102, Environmental Authorisation Waste Management License for all Tailings Facility (permanent or temporary) in terms of NEM: WA**.**	Mpumalanga Department Mineral Resources and Energy and Department of Water and Sanitation

Legislation	Listed activities	Applicability of the activity	Competent Authority
	aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of the development and where indigenous vegetation will not be cleared.* **- Pollution Control Dam** • <u>**Listing Notice 1 – Activity 13**</u> *The development of facilities or infrastructure for the off stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.* **- Pollution Control Dam** • <u>**Listing Notice 1 – Activity 19**</u> *The infilling or depositing of any material of more than [5] 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than [5] 10 cubic metres from [–(i)] a watercourse;* *[(ii) the seashore; or iii)the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or estuary, whichever distance is the greater—] but excluding where such infilling, depositing, dredging, excavation, removal or moving—* *a) will occur behind a development setback;* *b) is for maintenance purposes undertaken in accordance with a maintenance management plan; [or]* *c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;* *d) occurs within existing ports or harbours that will not increase the development* *footprint of the port or harbour; or* *e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies.* **- River diversion, PCD and Opencast Mining** • <u>**Listing Notice 1 – Activity 21D**</u> *Any activity including the operation of that activity which requires an amendment or variation to a right or permit in terms of section 102 of the Mineral and Petroleum Resources Development Act, as well as any other applicable activity contained in this Listing Notice or in Listing Notice 3 of 2014, required for such amendment.* **- Amendment to Mining Right** • <u>**Listing Notice 1 – Activity 24**</u> *The development of a road—*		

Legislation	Listed activities	Applicability of the activity	Competent Authority
	(i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or *(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding a road—* *(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;* *(b) where the entire road falls within an urban area; or* *c) which is 1 kilometre or shorter* **- Additional haul roads** • **<u>Listing Notice 1 – Activity 27</u>** *The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for* *(i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.* **- Opencast Mining and PCD** • **<u>Listing Notice 1 – Activity 30</u>** *Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).* **- Opencast Mine, Haul roads, PCD, Contractors Yard and plant area including RoM Stockpile** • **<u>Listing Notice 1 – Activity 56</u>** *The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.* **- Haul Road**		
	<u>GN 984 of 2014, as amended:</u> • **<u>Listing Notice 2 – Activity 6</u>** *The development of facilities or infrastructure for any process or activity which requires a permit or license or an amended permit or license in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.* **- Opencast Mine, Haul road, PCD, Contractors Yard and plant area including RoM Stockpile** • **<u>Listing Notice 2 – Activity 15</u>** *The clearance of an area of 20 hectares or more of indigenous vegetation (Alternatively more than >1 ha consequently triggering Activities from Listing Notice 1, Activity 27).* **- Opencast Mine, Haul road, PCD, Contractors Yard and plant area including RoM Stockpile** • **<u>Listing Notice 2 – Activity 16</u>**		

Legislation	Listed activities	Applicability of the activity	Competent Authority
	The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the highwater mark of the dam covers an area of 10 hectares or more. **- PCD may trigger this activity**		
	GN 985 of 2014 as amended*:** • **Listing Notice 3 – Activity 4** *The development of a road wider than 4 metres with a reserve less than 13,5 metres* ***(f) Mpumalanga *((i) Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas, where such* **- Haul Roads** • **Listing Notice 3 – Activity 12** *The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.* ***f) Mpumalanga*** *(i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;* *(ii) Within critical biodiversity areas identified in bioregional plans; or* *(iii) On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA.* **- Opencast Mine, Haul road, PCD, Contractors Yard and plant area** • **Listing Notice 3 – Activity 18** *The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *(f) Mpumalanga* *(i) Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;*		

Legislation	Listed activities	Applicability of the activity	Competent Authority
	(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation;* **- Road development**		
	Waste License Activities Triggered: • ***NEM:WA GNR 632, as amended* – Activity B1** *The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage* **- Pollution Control Dam** • ***NEM:WA GNR 632, as amended* – Activity B7** *The disposal of any quantity of hazardous waste to land.* **- Rom Stockpile** • ***NEM:WA GNR 632, as amended* – Activity B10** *The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).* **- Pollution Control Dam**		
Legislation	**Listed activities**	**Applicability of the activity**	**Competent Authority**
NWA Section 21 Water Uses	**Water Use Activities Triggered:** • Section 21(a): Abstraction of water for use at the wash plant and on site for dust suppression • Section 21 (c): Impeding or diverting the flow of water in a watercourse • Section 21(g): Disposing of water in a manner which may detrimentally impact on a water resource • Section 21(i): Altering the bed, banks course or characteristics of the watercourse; and • Section 21(j): Removing, discharging or disposing of water found within the opencast pits	Water Use Licence	Department of Water and Sanitation (DWS)

3.2 DESCRIPTION OF THE ACTIVITIES TO BE UNDERTAKEN

(Describe Methodology or technology to be employed, including the type of commodity to be mined and for a linear activity, a description of the route of the activity)

Refer to Appendix 3 for Master Layout

This section provides a detailed description of the current and proposed activities at the 2 Seam Mine. Furthermore, the detailed mine/project description is presented to facilitate the understanding of the project related activities, which result in the impacts identified and assessed, and for which management measures have been proposed.

3.2.1 BACKGROUND

2 Seam is an existing opencast coal mine, consisting of the original 2 Seam Mine Blocks OC1, OC2, OC2A, OC4, OC5 and OC6. The 2 Seam Mine Block OC6 and Block OC06A project fall within the footprint of historical underground mining operation known as Transvaal Navigation Colliery (TNC). 2 Seam has existing Run of Mine (RoM) stockpile areas located on rehabilitated opencast areas. 2 Seam holds one mining right (Mining Right (MP) 30/5/1/2/3/2/1 (405) EM). It produces coal for the local market.

The roll over strip mining method is utilised to extract coal. The existing opencast operations have an approximate extent of 257 ha (some of this area has already been mined and other areas are currently being mined in accordance with the previous approved mine plan) while the applicant wishes to authorise an additional 11 ha of opencast mining.

2 Seam is planning to add additional opencast mining areas (i.e., OC04A and OC04B) within the existing mining right areas to extend the life-of-mine (LoM). As such a MPRDA S102 amendment process is being undertaken by the mine, supported by the integrated EIA/WML and WULA applications. The EIA process will result in a consolidation of the numerous authorisation processes that have been undertaken to date to produce a single overarching EMPr for holistic management of the 2 Seam Mine going forward.

2 Seam Mine will be applying for the relevant approvals to cover their extended LoM which will include future opencast and associated infrastructure. Various amendments to the existing EA/EMP, as well as the IWUL will also be applied for to align the specific conditions with the current status of the mine as well as to provide more clarity on certain conditions. Furthermore 2 Seam will be applying for a coal washing plant and Run of Mine Stockpile on site, associated stormwater management infrastructure (PCD and clean and dirty water berms) and a contractor's yard. 2 Seam will also be applying for the diversion of the Olifants River.

Figure 2 indicates the existing and proposed boxcut areas, the existing infrastructure, as well as the planned infrastructure for the 2 Seam Mine.

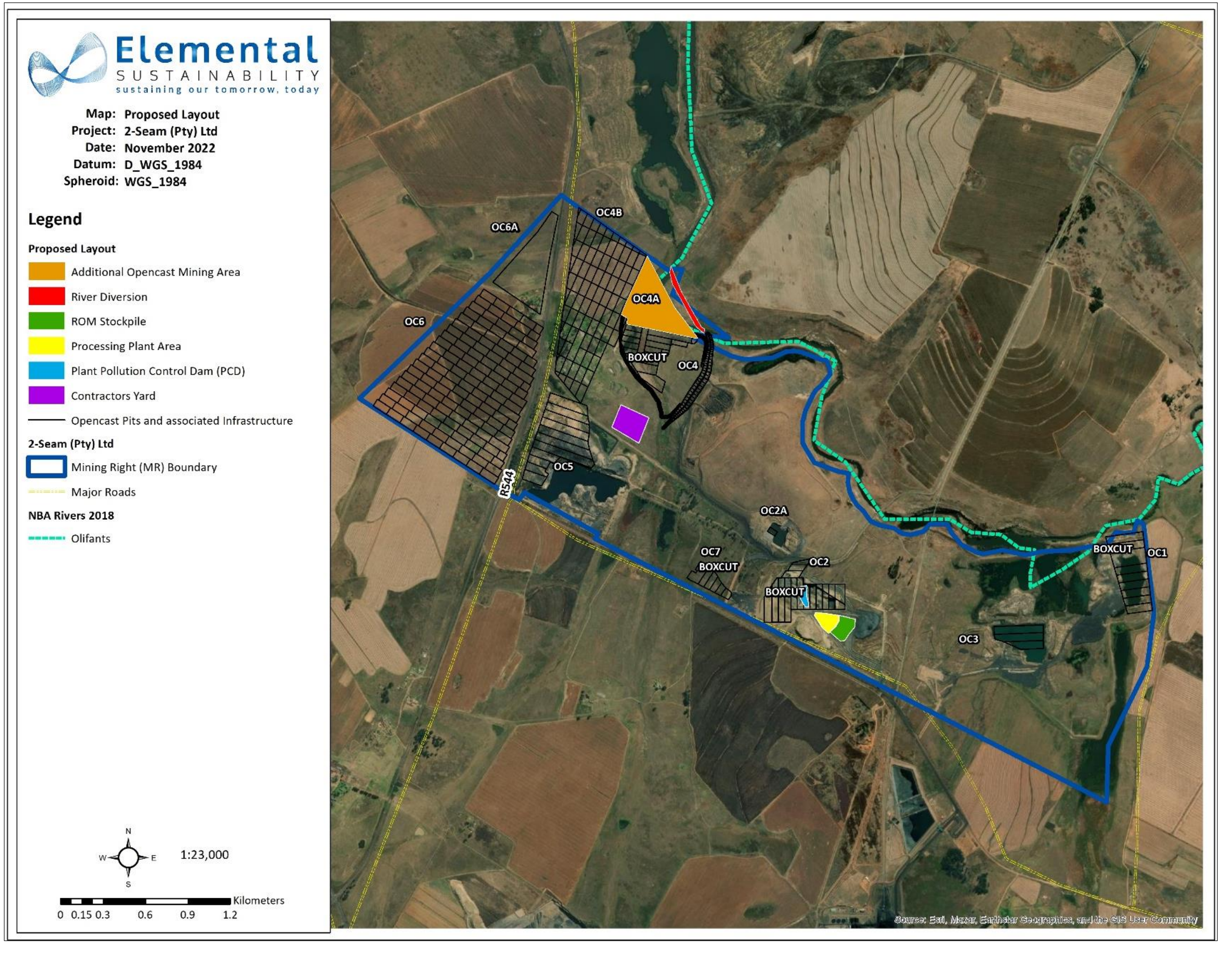

Figure 2: Current opencast cuts and future layout plan for 2 Seam Mine

3.2.2 THE MINERAL RESOURCE

2 Seam Mine has mined four opencast pits (i.e., OC1, OC02, OC02A and OC3) in recent years and is currently mining the fifth opencast pit (OC4), using conventional opencast strip-mining techniques (i.e., drilling, blasting, loading and hauling). Mining of an additional four opencast pits (OC4A, OC4B, OC5 and OC6) is proposed. Based on background information provided by the client, the proposed mining and infrastructure are summarized below:

- The remaining opencast pits to be mined, in sequence, are OC4A, OC4B, OC5 and OC6.
- Mining will be conducted in a phased approach, i.e., mining will start and cease in each opencast prior to the commencement of mining in the next opencast.
- ROM and clean coal will be stockpiled in approved demarcated areas before being transported off-site.
- Stripped topsoil and subsoil will be stockpiled in demarcated areas.
- Haul roads will be constructed and used during the operational phase of the mining for transporting coal materials to a processing facility. In addition, internal service roads will be constructed on an as needs basis.

Mining of OC4 will target the No. 2 seam and is based on the mine plan for OC4. Mining will be conducted over twelve (12) months and will commence after mining at OC2A is completed (estimated around November 2022). For the proposed opencast and mine expansion to take place (referred to as OC4A – extension to OC4 and OC4 Box cut – orange polygon), there will need to be a stream diversion of a portion of the Olifants River, flowing in the mining right area. The following is proposed:

- Initially, a 40 to 50 m buffer zone will be maintained between OC4 and the Olifants River, and then the expansion of OC4A into the river with a river diversion is proposed;
- A 50m buffer will then be maintained between the opencast and the diverted section of the Olifants River;
- Diversion of the tributary of the Olifants River that flows across the OC4A area, to a position approximately 450 m east of its current position within the central section of the OC4A layout;
- The construction of a berm between OC4A and the Olifants River corresponds to the 1:100-year flood line for the diverted Olifants River section;
- A clean water berm is situated west and south of OC4A, to prevent overland flow into the opencast area; and
- A barrier pillar of 30 m will be maintained between the historical underground workings and OC4 & OC4A.

Table 4 summarises the key aspects of the various pit designs, and proposed schedules for mining activities of opencast pits. Where multiple seams are targeted, the seams will be mined simultaneously.

Table 4: Key aspects of the various pit designs and proposed mining schedules

Opencast (O/C)	Target seam(s)	Pit Design					
		Pit Floor Elevation	Pit Floor Depth	Surface Area	Duration		
		(mamsl)	(mbgl)	(m^2)	Start	End	Total (months)
1	No.4 and 2 seams	1506 - 1511	23 - 36	75 300	Mining Completed (Dec-2018 to August-2019)		
2	No.4 and 2 seams	1508- 1515	35 - 43	42 100	Jan-20	Oct-20	10
2A	No.4 and 2 seams	1503 - 1507	41 - 47	17 300	Oct-20	Mar-21	6
3	No.4, 2 and 1 seams	1515 - 1518	16 - 22	61 700	Mining Completed (Jun-2018 to Nov-2018)		
4	No. 4 and 2 seams	1502 - 1503	28 - 33	85 500	Jun-21	Feb-23	9
4A	No. 4 and 1 seams			329 454	Jan-23	Feb24	11
4B	No. 4 and 1 seams			1 481 654	Mar-23	Feb24	11
5	No. 4 seam	1530 - 1535	11 - 38	222 500	Jan-23	Jun-24	16
*6	No. 4 seam	1532 - 1542	16 - 36	697 100	Jan-22	Dec-23	24

* OC6 - currently commercial unviable

Block	Block	Overburden		Coal		IN-situ	Geol Loss	Mineable	Seam	Seam	Raw Qualities (air dried)						
Name	Area	Thick	Volume	Area	Vloume	Tonnes		Tonnes	Name	Thickness	RawRD	CV	Ash	Moist	Vols	FC	Sulph
OC4	83 841	19.18	1 608 010	83 841	234 145	401 702	15%	341 447	S2R	2.79	1.72	17.79	37.91	2.44	19.59	40.07	0.60
	83 841	0.00	1	83 841	292 626	424 969		361 224	S2S	3.49	1.45	27.13	15.89	2.55	27.17	54.40	0.70
	83 841	0.40	33 398	83 041	66 508	103 556		88 023	S2F	0.80	1.56	23.94	24.54	2.26	23.67	49.54	1.01
	83 841	0.39	33 024	83 841	356 615	564 590		479 902	S1	4.25	1.58	22.84	27.52	2.25	22.55	47.69	0.51
	335 364	**4.99**	**1 674 433**	**334 564**	**949 894**	**1 494 817**		**1 270 594**		**2.84**	**1.57**	**22.78**	**26.80**	**2.39**	**23.15**	**47.68**	**0.62**
OC4A	82 989	19.69	1 634 010	82 989	257 656	433 682	15%	368 630	S2R	3.10	1.68	19.12	35.40	2.32	20.01	42.27	0.74
	82 989	0.21	9 774	80 487	231 600	349 192		296 813	S2S	2.88	1.51	25.30	20.49	2.55	26.10	50.85	1.00
	82 989	0.66	28 550	82 989	108 947	175 058		148 799	S2F	1.31	1.61	22.60	29.20	2.04	25.07	43.67	1.45
	82 989	0.56	21 710	82 989	311 452	492 768		418 853	S1	3.75	1.58	23.11	26.99	2.08	22.89	48.04	0.60
	331 956	**5.28**	**1 694 044**	**329 454**	**909 655**	**1 450 700**		**1 233 095**		**2.76**	**1.59**	**22.38**	**28.21**	**2.26**	**23.06**	**46.46**	**0.84**
OC4B	376 947	26.29	9 908 398	376 947	1 006 078	1 738 226	15%	1 477 492	S2R	2.67	1.73	17.53	39.24	2.13	19.02	39.61	0.54
	376 947	0.03	10 155	376 947	1 357 076	2 020 500	75%	505 125	S2S	3.60	1.49	25.73	19.02	2.55	27.12	51.28	1.08
	376 947	0.05	16 511	350 813	339 384	546 373		136 593	S2F	0.97	1.60	21.71	29.16	2.22	23.49	44.46	1.21
	376 947	2.12	797 803	376 947	1 297 689	2 074 391	15%	1 763 232	S1	3.44	1.60	22.64	28.18	1.97	23.09	46.77	0.75
	1 507 788	**7.12**	**10 732 867**	**1 481 654**	**4 000 227**	**6 379 490**		**3 882 443**		**2.70**	**1.59**	**21.07**	**31.23**	**2.11**	**22.08**	**44.55**	**0.73**
OC5	87 245	26.95	2 348 499	41 201	30 120	48 217	15%	40 984	S4U	0.73	1.60	22.25	28.77	2.22	22.94	46.08	1.96
	148 263	3.49	516 794	133 338	251 760	414 528		352 349	S4L	1.89	1.65	20.52	32.75	2.30	20.60	44.36	1.66
	148 263	54.96	8 148 652	148 263	274 478	478 720		406 912	S2R	1.85	1.75	17.03	41.64	2.09	19.14	37.13	0.43
	148 263	0.00	269	148 263	517 333	764 177	75%	191 044	S2S	3.49	1.47	26.32	18.02	2.67	27.53	51.86	1.25
	61 018	0.09	3 817	60 893	61 979	99 252		24 813	S2F	1.02	1.63	21.30	30.75	2.17	22.43	44.79	0.77
	148 263	3.93	577 806	148 263	628 982	1 006 531	15%	855 551	S1	4.24	1.60	22.43	28.26	2.08	22.81	46.85	0.64
	741 315	**15.66**	**11 595 837**	**680 221**	**1 764 652**	**2 811 425**		**1 871 654**		**2.59**	**1.59**	**22.24**	**28.51**	**2.28**	**23.13**	**46.11**	**0.95**
OC6	676 138	19.50	13 183 852	581 193	480 709	770 186	15%	654 658	S4U	0.83	1.60	22.24	28.65	2.44	23.35	45.57	2.00
	697 089	2.93	2 042 455	690 194	1 405 116	2 344 013		1 992 411	S4L	2.04	1.67	19.96	34.15	2.50	21.69	42.05	1.20
	587 708	26.17	15 381 748	535 062	1 212 469	2 067 593		1 757 454	S2R	2.27	1.71	18.46	37.30	1.95	20.26	40.50	0.94
	547 722	0.64	218 985	492 459	1 993 832	2 924 817	75%	731 204	S2S	4.05	1.47	26.74	17.23	2.75	29.23	50.80	1.61
	504 402	0.36	120 220	373 427	593 410	959 068		239 767	S2F	1.59	1.62	21.73	29.72	2.29	22.21	45.78	0.95
	692 082	2.63	1 823 694	665 789	2 084 851	3 362 282	15%	2 857 940	S1	3.13	1.61	21.83	29.35	2.52	23.97	44.16	1.31
	3 705 141	**8.90**	**32 770 954**	**3 338 124**	**7 770 387**	**12 427 959**		**8 233 434**		**2.33**	**1.60**	**21.12**	**31.09**	**2.40**	**22.99**	**43.62**	**1.27**
OC6A	113 520	28.99	3 291 121	113 520	284 029	469 161	15%	398 787	S2R	2.50	1.65	20.82	32.61	1.90	21.41	44.08	0.48
	113 520	0.02	1 774	113 520	454 399	672 481	75%	168 120	S2S	4.00	1.48	25.98	18.23	3.02	32.55	46.17	1.01
	113 520	0.24	257	112 796	79 051	121 599		30 400	S2F	0.70	1.56	23.42	25.48	2.60	23.29	48.55	1.13
	113 520	5.88	667 439	113 520	375 440	612 736	15%	520 826	S1	3.31	1.63	21.45	30.95	2.02	23.19	43.84	0.90
	454 080	**8.78**	**3 960 591**	**453 356**	**1 192 919**	**1 875 977**		**1 118 132**		**2.63**	**1.57**	**21.96**	**29.48**	**2.14**	**23.97**	**44.40**	**0.77**
Total Resources (In-situ)						**26 440 368**		**17 609 353**									
Depletion (mined at OC4 Pit)						**469 740**		**415 304**	**as at March 2022**								
Total Remaining Resources						**25 970 628**		**17 194 049**									

Figure 3: Total coal Resources remaining at 2 Seam Mine

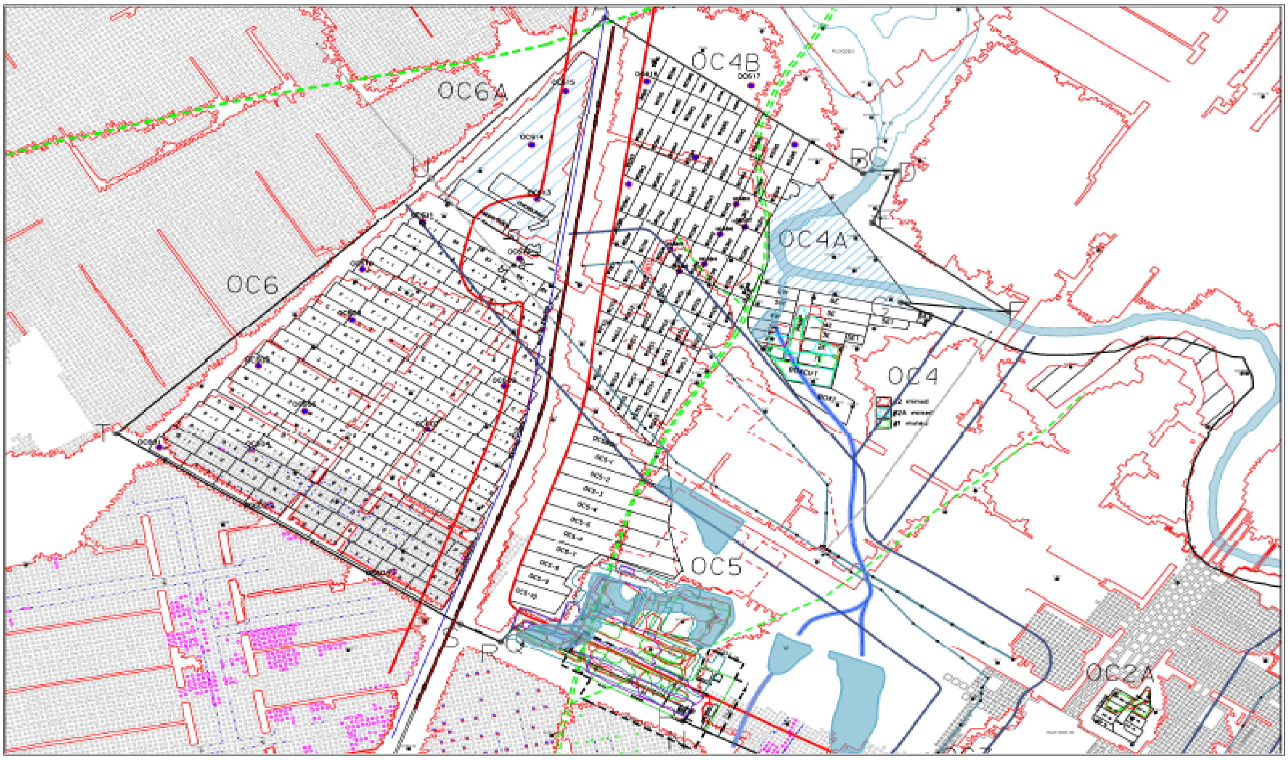

Figure 4: Location of coal reserves (approved and proposed)

3.2.3 MINING METHOD

3.2.3.1 SOIL REMOVAL AND STORAGE

Topsoil will be excavated using a hydraulic excavator and three articulated dump trucks to topsoil stockpile sites selected along the peripheral portions of the property, this will create a barrier to the public that will be signposted and it will form a visual barrier to passing traffic.

The topsoil will be excavated to a maximum depth of 1.0m over the entire area of occurrence. The topsoil will be stacked in a user-friendly manner in a solid berm approximately 3,0m in height. Excess topsoil will be placed on the topsoil stockpile berms on the solid areas until the area is ready for concurrent rehabilitation. As one strip is top soiled, the topsoil will be hauled to a finally rehabilitated strip and the topsoil will be placed on this strip to be fertilised and seeded with an acceptable mixture of legumes and grass seeds for the growing season.

3.2.3.2 SOFTS REMOVAL AND STORAGE

The softs will be excavated using a hydraulic excavator and three articulated dumpers to rejection of the breakout force of the softs excavator bucket. This excavation will average 5.0m depth over the immediate strip area.

The softs will be placed onto previous rehabilitation to generate barriers to contain water that will be pumped out of the underground workings and will be used for storage for later use, inside the topsoil berms to enhance the visual and physical barrier created by the topsoil berms. This barrier will be approximately 4.0m high.

Excess softs will be stacked on the indicated softs dumps to the south of each of the mini pits and to the South of the pit on the partially rehabilitated old opencast. Softs will be placed in future strips concurrently to close out on the rehabilitation planned. In some shallow instances, the coal will be exposed by the soft’s removal process. Sufficient room exists on current softs stockpiles to accommodate any excess softs that do not fit into the voids.

3.2.3.3 BOXCUT HARDS REMOVAL AND PLACEMENT

The box cut hards that will be excavated using four shovel and truck fleets to the floor of the 2 Lower coal seam and 1 seam where present. This box cut will be excavated 50.0 metres wide to enable a 45.0 metre rollover to take place. The original ramp and three new sub ramps will be excavated to enable the various layers to be extracted.

The hards of the box cut will be placed on the no coal zone where final voids are planned for final void filling at the end of the mining planned in the area. Extra hards will be placed alongside planned hards dumping areas that will be bulldozed closed in the future.

While the box cut is being excavated, the first strip topsoil and then softs will be excavated, hauled and placed on the topsoil stockpile. The hards of strip one will be drilled and blasted and then dozed over into the box cut to commence the roll over where available.

3.3.3.4 COAL MINING

The opencast mining areas are mined using the truck and shovel, roll-over mining method. Refer to Figure 5 for a schematic presentation of the opencast mining process. Coal will be broken out using a large excavator where economically possible, when it is not economical, then the coal will be drilled and blasted to create easy digging conditions. A box-cut is developed and the overburden and topsoil are stockpiled.

The coal will be transported to coal stockpiles and will be loaded from the coal stockpiles into road haulers for transport to the designated beneficiation facility. Provision has been made on the surface to utilize the beneficiation plant and the crushing and screening plants.

The floor of the excavation and the high wall of the excavation will be cleaned off by bulldozer and grader blading to remove loose coal on the high wall and floor area and to clean these areas of loose coal. Once all the coal has been mined out, the final rehabilitation will commence. The opencast area will be backfilled with overburden material and levelled concurrently with mining. Once backfilled to the correct level, topsoil is replaced and the area re-vegetated. Refer to Figure 6 for a schematic presentation of the rehabilitation process.

Coal stockpiles ROM will be placed on backfilled ground for sampling and upliftment. It is not envisaged to store more than 100 000 tons at any one time. Coals from different coal seams will be stored separately to enable sampling and blending to Eskom and Export contractual specifications prior to upliftment.

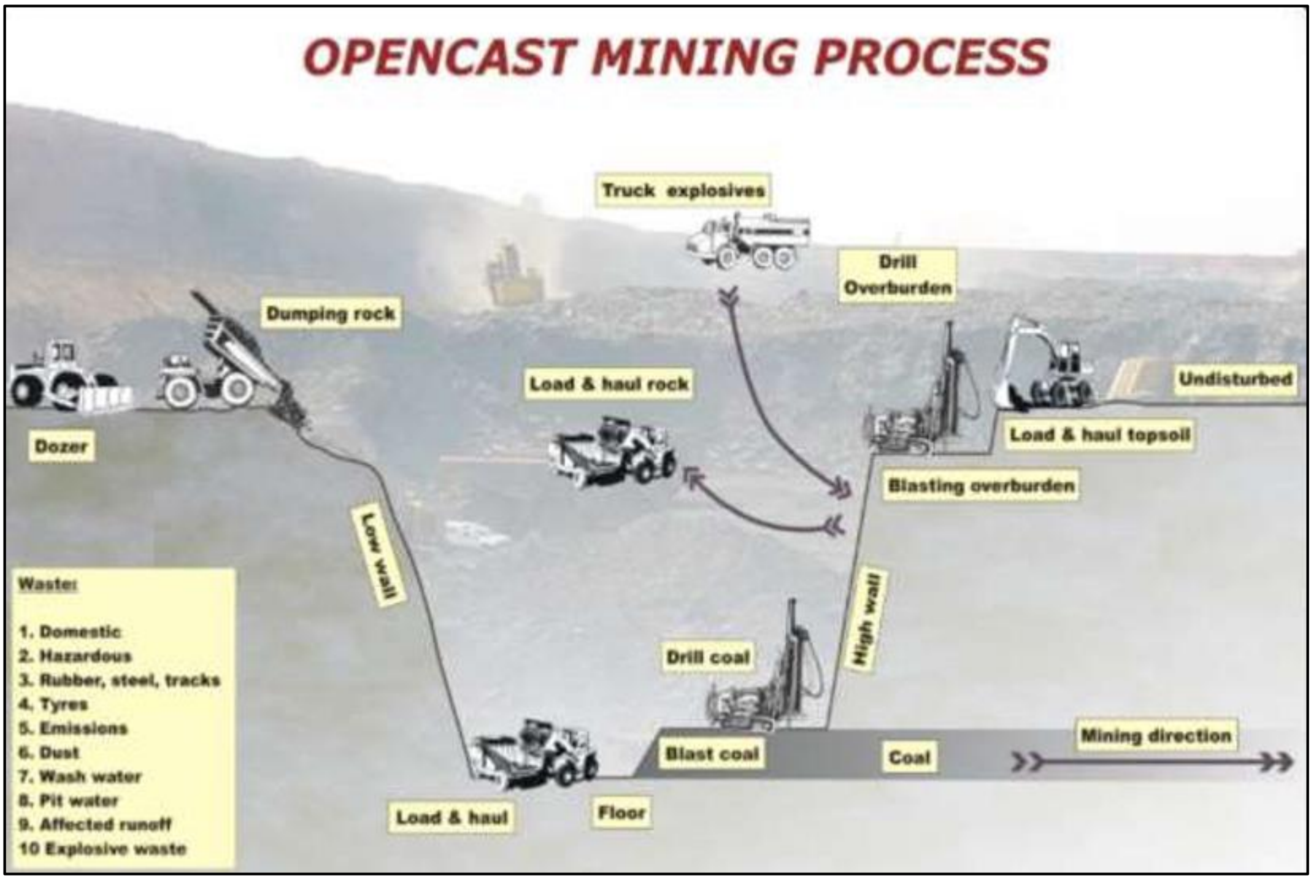

Figure 5: Typical Bord and Pillar Layout

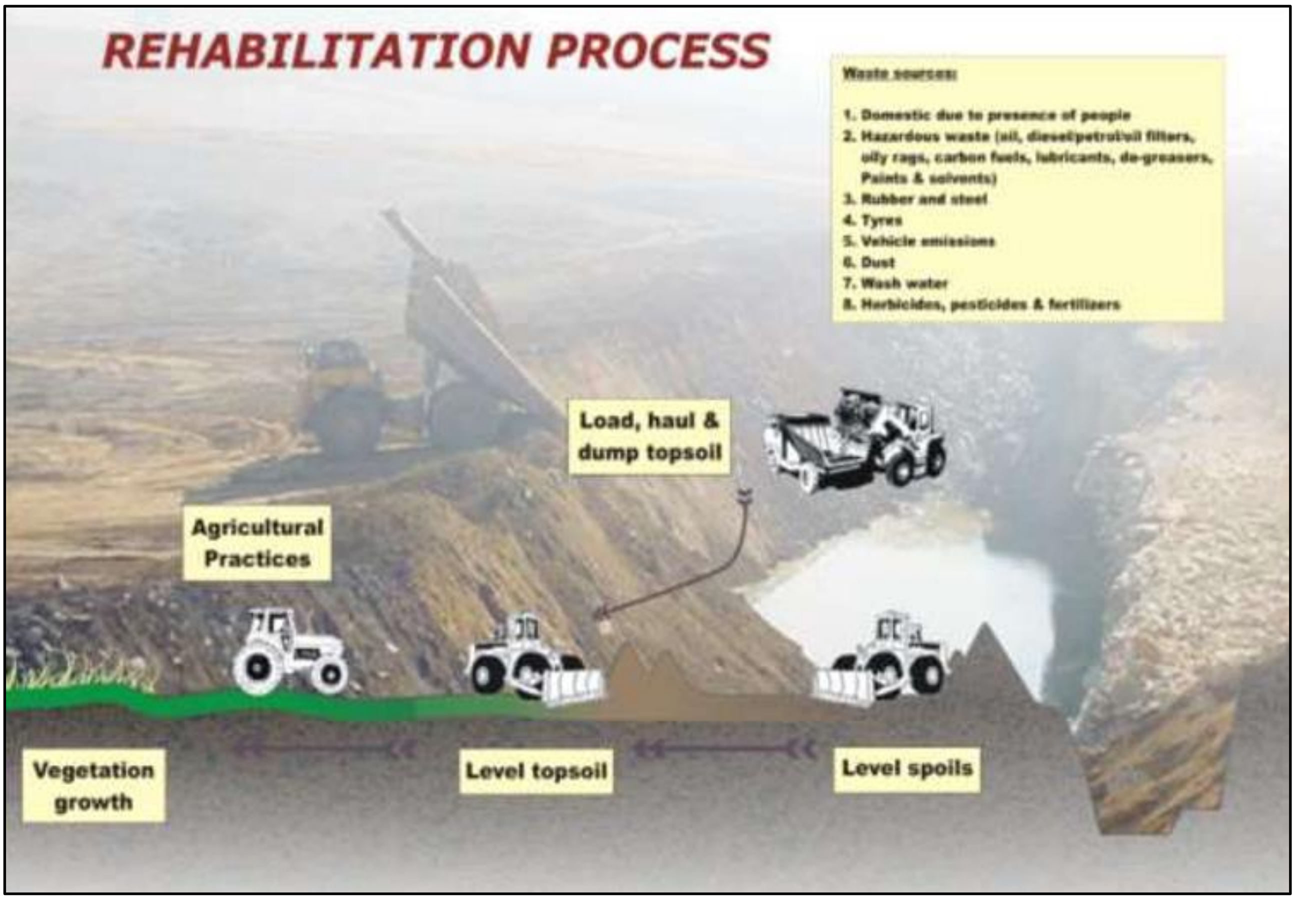

Figure 6: Typical Rehabilitation Process (Wells et al., 1992)

3.2.4 MINE DESIGN MAP

Figure 7 shows the potential sequencing of the main opencasts to be mined to be mined.

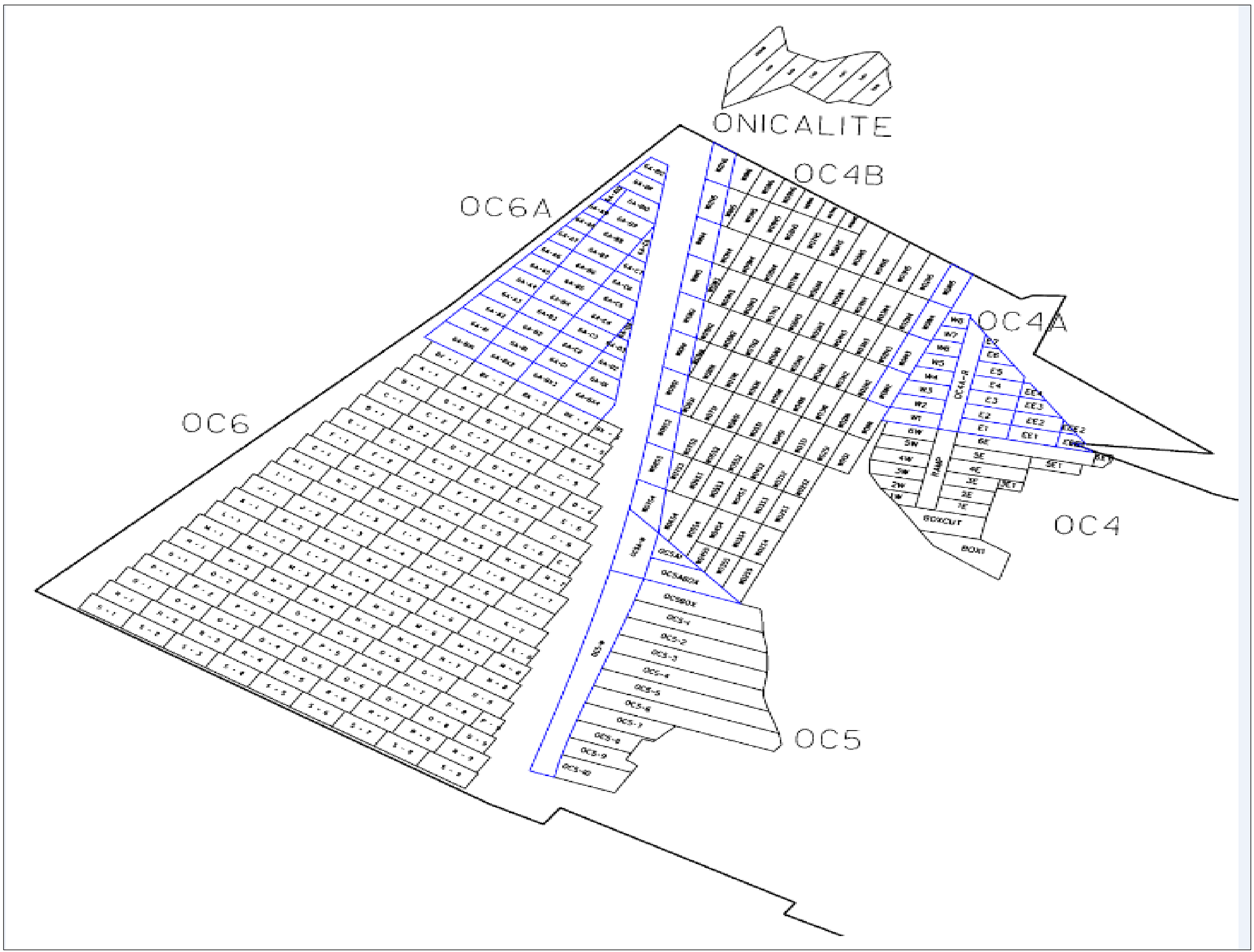

Figure 7: Sequencing of the proposed opencast mining

The map above shows the potential sequencing of the main opencasts to be mined to be mined

3.3 DESCRIPTION OF MINERAL PROCESSING OPERATIONS

3.3.1 COAL PRODUCT

A B-Grade quality coal is obtained from the 2 Seam Mine. The B-grade coal is screened and sized as a duff, peas and nuts products and sold to Chandler Coal on contract.

3.3.2 SCREENING AND CRUSHING

Three different sized products are currently being produced: peas, nuts and duff and equates to approximately 61.8% of the total coal mined.

Once the proposed beneficiation facility is complete then the sales will be of washed and crushed coal. Once the proposed washing plant has been constructed, the coal will be crushed to < 50mm and will be beneficiated to the various grades for export and inland requirements:

3.3.2 COAL WASHING AND PROCESSING

There are two main types of washing processing technology which could be used for coal beneficiation, namely:

- Dry processing: A dry coal separator uses less water than a conventional wet processing alternative. The main and most obvious advantage of dry processing of coal is that no water is required. Dry processing is, however, not applicable on all mines and with all coal types and quantities.
- Wet washing: This is the conventional processing alternative employed at most processing facilities.

2 Seam proposes to use wet washing as the technology alternative.

3.3.3 PRODUCT STORAGE

ROM and clean coal will be stockpiled in approved demarcated areas before being transported off-site.

3.3.4 PRODUCT AND MARKETS

This product is currently produced and supplied to the inland and domestic markets.

- Export: 60% 6 000KCAL (RB 1), 5 500KCAL (RB 2) and 4 800KCAL (RB 3)
- Inland: 10% Peas
- Eskom/ Sasol: 30% 21,5MJ/KG and 20,0 MJ/KG

2 Seam has already submitted quality and quantity contractual documentation to both Arnot and to Sasol to obtain offtakes.

3.3.4.1 EXPORT MARKET

Export: Europe, North Africa, China, Japan and India.
Total market 6 500 000 tons per month
(2 Seam market potential 50 000 tons per month)

3.3.4.2 LOCAL MARKET

Local: Peas to Sappi, Mondi, steam generating boiler users and hospitals,
Total market 160 000 tons per month
(2 Seam potential market 20 000 tons per month)

Regional: ESKOM Power Stations and Sasol,
Total market 16 500 000 tons per month
(2 Seam market 50 000 tons per month)

3.4 MINE INFRASTRUCTURE

The operation currently includes the following: -

- Opencast pits;
- Access and haul roads;
- Security access;
- Bulk hydrocarbon storage facilities;
- Overburden stockpiles;

- Topsoil stockpiles;
- ROM stockpiles and crusher area at Block 3;
- Dirty water management berm around the overburden stockpiles;
- Management of dirty water in the pit – pumped to the Block 3 PCD;
- A 200 mm outside diameter pipe that connects the pit with the PCD; and
- Storm water drainage.

The existing and proposed mine layouts are presented in Figure 2.

3.4.1 GENERAL AND HAZARDOUS WASTE

General and hazardous waste will be generated during the construction and operational phases. General or domestic waste will mainly occur due to the presence of people at the different sites/activities. General waste includes food scraps, cool drink cans, air filters, paper, cardboard, wood and other packaging materials. Hazardous waste is generated mainly by the chemical toilets as well potential spills. This includes oil, oil filters, oily rags, carbon fuels, diesel/petrol filters, hydraulic pipes, paints, degreasers, solvents and other chemicals. Waste originating from fertilizers, herbicides and pesticides used during the rehabilitation process will also be classified as hazardous waste.

Any hydrocarbon contaminated soils will be removed and dealt with as hazardous waste. These wastes will be handled, sorted and temporarily stored on site in a waste/salvage yard. Where waste can be re-used or recycled this shall be undertaken, or alternatively the waste will be removed by approved waste handling companies for recycling, re-use or final disposal at permitted waste disposal facilities.

3.4.2 Sewage

There are existing ablution facilities at the 2 Seam Mine. Domestic sewage is treated at an existing package sewage treatment plant and the purified effluent is disposed of at the PCD and not discharged to the natural environment.

3.4.3 MINE ACCESS

Access to the mine is from the R544.

3.4.4 SECURITY AND ACCESS CONTROL

The mine implements access control.

3.4.5 WATER AND SERVICES

The nearby towns surrounding the project area have adequate access to water which is supplied through the Municipal infrastructure. Potable water will be obtained from boreholes in the mining area. The proposed mine will re-use contaminated water for dust suppression, the water will be obtained from the PCD.

3.5 PROPOSED INFRASTRUCTURE

The proposed processing plant is a heavy media cyclone plant, the ROM coal is brought to the primary section and fed through a primary crusher; a recirculating load secondary crusher reduces the coal to -50.0mm.

The coal is then fed via conveyors into a mixing tank where magnetite and water are mixed with the coal and are fed into the cyclone that spins out the rock and the clean coal. The clean coal goes to screens to create different products and the rock goes to discard for rewash or stacking.

Fine coal is screened out to go to the filter press or to the spiral section. The < 3.0mm coal is fed into a spiral circuit with water where the effect of centrifugal forces and gravity separate the coal from rock. Refer to Figure 8 for the proposed layout of the coal wash plant.

A series of water only Jig plants may be used instead of the DMS type plant. A double stage wash can be used if extra jigs are put in series. The discard from the water jigs is placed in the pit below the shale horizon.

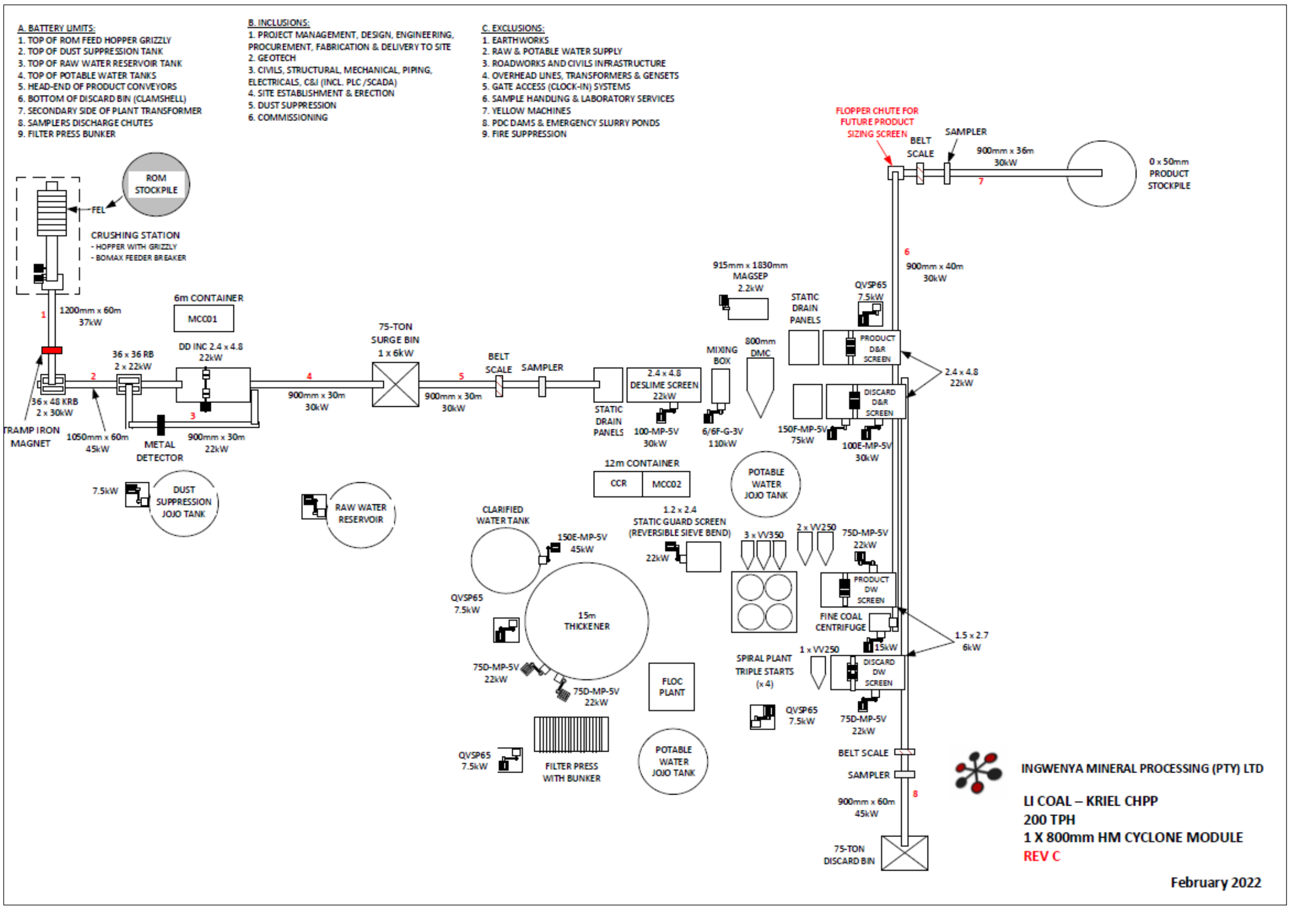

Figure 8: Proposed Coal Wash Plant Layout

2 Seam also proposed to establish a contractor's yard on site. The area proposed is about 3.5 ha in size.

Stormwater Management infrastructure will need to be established on site, including stormwater management berms and a PCD, for the proposed coal wash plant.

A diversion of the Olifants River is proposed in order to access additional coal resource. An original river diversion was proposed in 1986 to the DWS and it is understood that the DWS approved the diversion. The river diversion was dug in 1987, but never utilised and can be seen on the photograph below (Figure 9).

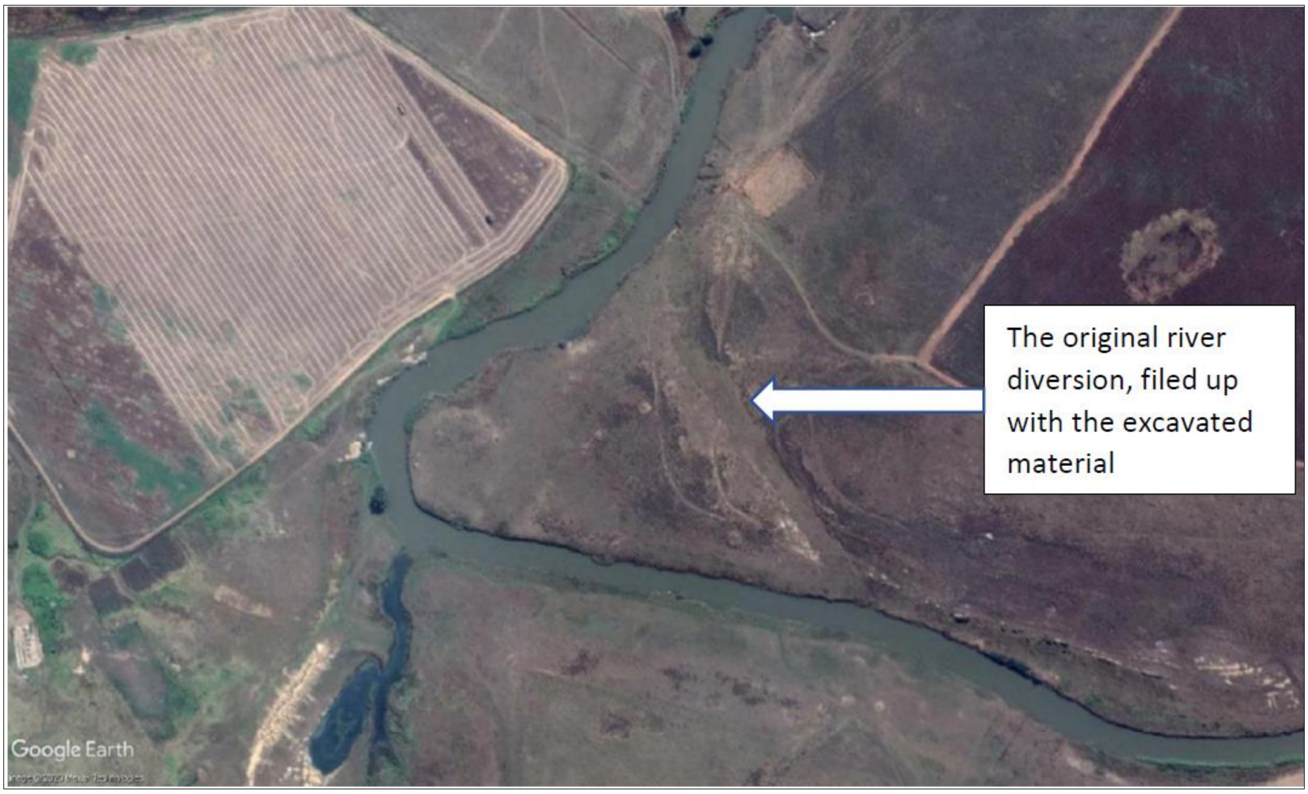

Figure 9:Original dug river diversion site

This diversion can easily be dug open again and the original plan put into use with the clean sandstone material being utilised to form the flood barriers that will prevent the Olifants River from topping the berm Gabion baskets will be used to prevent the river from eroding the berm and a backup weir will be installed to control the upriver flow rate.

3.5.1 OLIFANTS RIVER DIVERSION BERM AND CHANNEL DESIGN

The preliminary design of the flood protection and diversion berm/channel for the Olifants River for the proposed extension of existing opencast pit OC4 is based on the 1:100-year floodline as calculated to include the effect of the berm and channel, with a 1m freeboard.

The berm will have to have a clay core in areas where the river water will permanently pond against the proposed berm (such as at the existing river sections). In the same areas grouting of the embankment(berm) foundation may be required to minimise seepage into the pit.

The river side zone of the berm has to be rockfilledor will have to have adequate rip-rap protection (with a natural appearance). The pit side zone of the embankment has to be from material with a fairly high angle of repose in order to have a slope as steep as possible in order to not encroach on the proposed pit edge. The mine's Rock Engineer will have to confirm the safe pit edge distance from the berm.

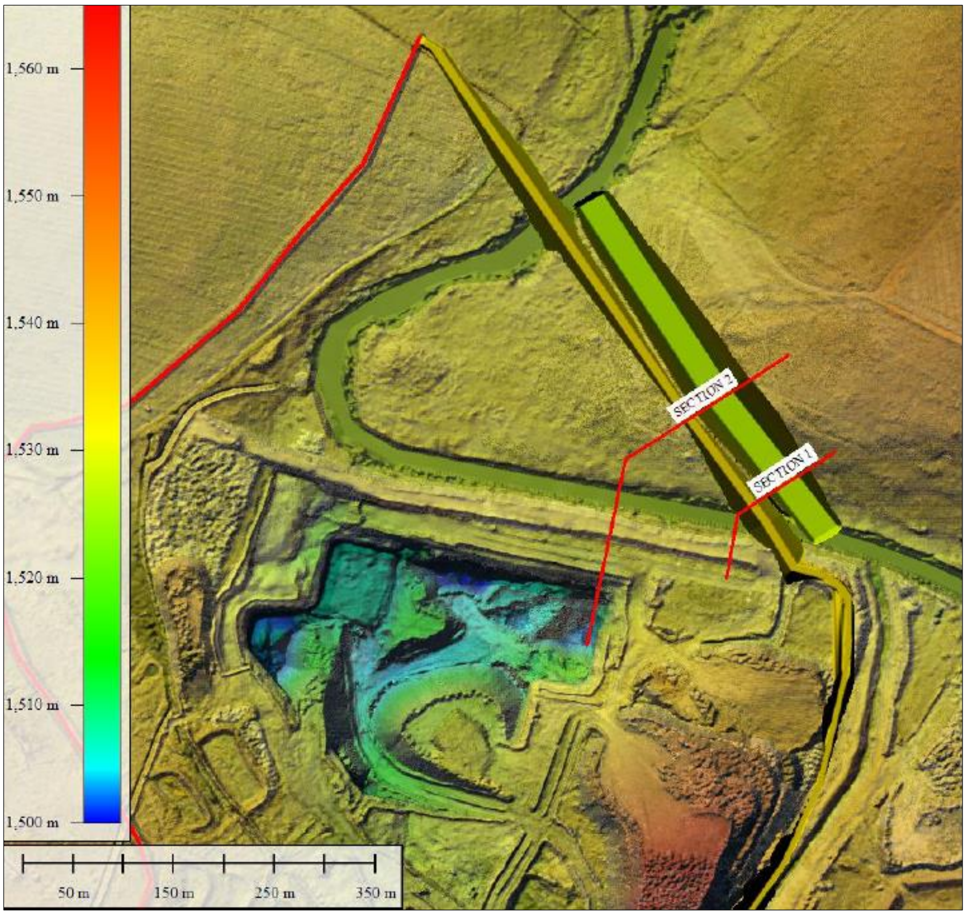

Figure 10: Proposed Berm and Channel

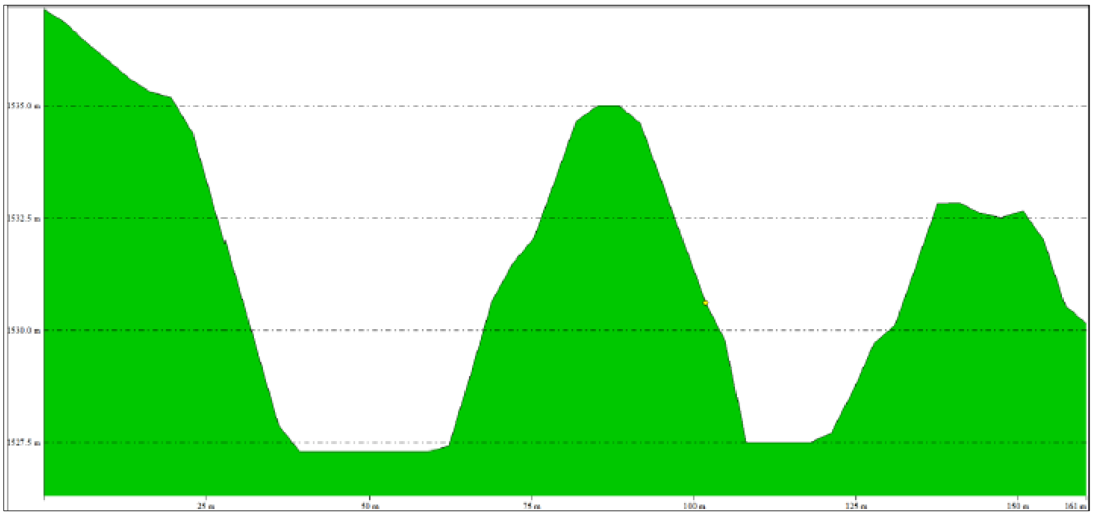

Figure 11: Section 1 with proposed channel left, 2,5m vertical intervals, 25 m horizontal

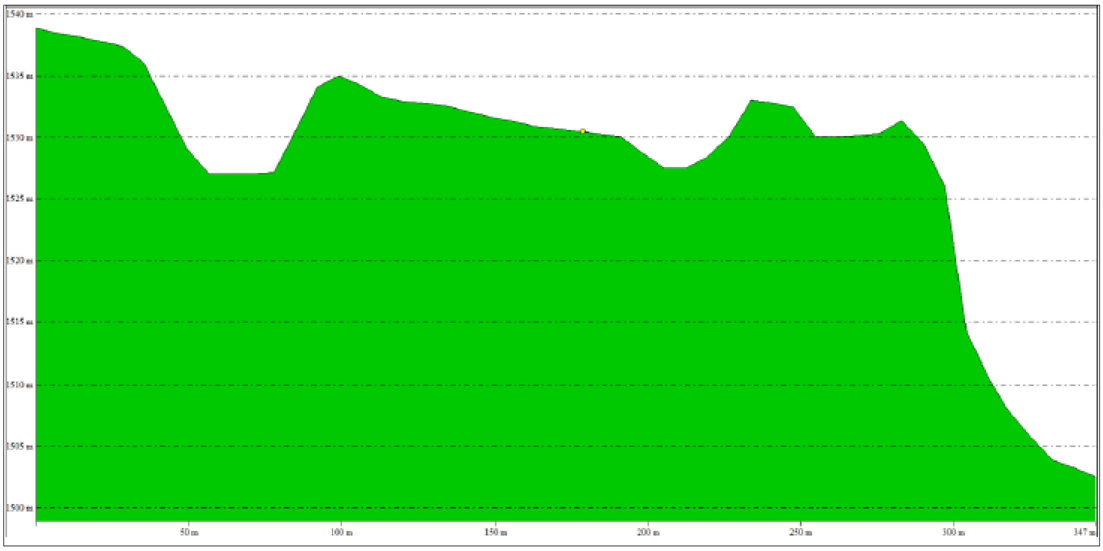

Figure 12: Section 2 with proposed channel left, 5m vertical intervals, 50 m horizontal

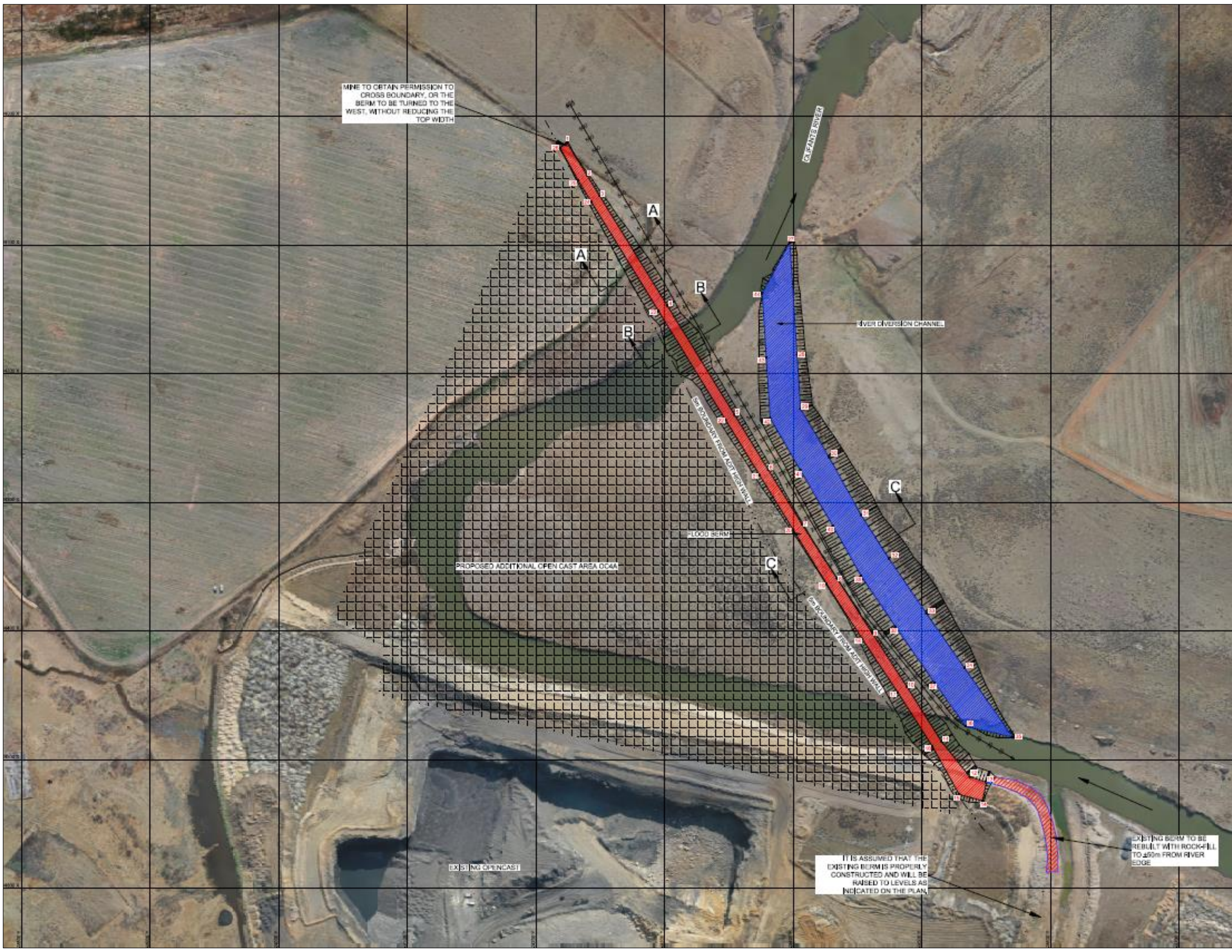

Figure 13: Proposed layout of Olifants River Diversion

3.6 EXISTING AND PROPOSED ACTIVITIES

The main mining actions, activities and process that are planned to take place on site are listed in Table 5. All actions, activities and processes have been grouped into each of the relevant project phases namely: pre-construction, construction, operation, decommissioning, rehabilitation and closure. For this report, the following broad definitions apply:

- Pre-construction refers to the phase in which planning takes place;
- Construction refers to the phase in which the site is prepared, and infrastructure is established;
- Operation refers to the phase in which physical mining and production takes place;
- Decommissioning refers to the phase in which infrastructure is removed and rehabilitation efforts are applied, and their success monitored; and
- Closure refers to the phase in which maintenance and rehabilitation monitoring are undertaken to ensure that the mine's closure objectives are met.

Table 5: List of main action, activities or processes on site and per phase

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
Site preparation	Vegetation clearance for the establishment of infrastructure, river diversion and opencast pits		As required	As required	As required	
	Planned placement of infrastructure		At start of phase	As required		
Human resource management	Employment/recruitment		At start of phase	As required	As required	As required
	I&AP consultations		At start of phase	On-going	On-going	On-going
	CSI initiatives		At start of phase	On-going	On-going	On-going
	Skills development programmes	At start of phase	On-going	On-going	On-going	On-going
	Environmental awareness training		At start of phase	On-going	On-going	As required
	HIV/AIDS Awareness programmes		At start of phase	On-going	On-going	
	Integration with Municipalities' strategic long-term planning	At start of phase	On-going	On-going	On-going	
Earthworks	Stripping and stockpiling of soils (Ventilation shaft)		At start of phase	As required	As required	
	Cleaning, grubbing and bulldozing (Ventilation shaft)		At start of phase	As required	As required	
	Removal of cleared vegetation		At start of phase	As required		
	Digging trenches and foundations		At start of phase	As required	As required	
	Civil Blasting		As required	As required	As required	
	Maintenance of storm water management measures		At start of phase	As required	As required	
	Maintenance of firebreak		At start of phase	As required	As required	
Civil Works	Maintenance of infrastructure and services		At start of phase	As required		
	Mixing of concrete and concrete works		As required	As required		
	PCD		At start of phase	As required	On-going	
	Establishment of dewatering pipelines		At start of phase	As required		
	Sewage and sanitation		At start of phase	On-going	On-going	
	Fuel storage area		Ongoing			

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	Chemical storage area		Ongoing			
	General waste area		Ongoing	On-going		
	Access control and security		Ongoing	As required	As required	
	General site management		On-going	On-going	On-going	On-going
Opencast Mining	Drilling		As required	As required		
	Blasting		As required	As required		
	Excavations		As required	As required		
	Removal of overburden by dozing and load haul			As required		
	Establishment of internal haul roads			As required	As required	
	Removal of ore			On-going		
	Use of RoM stockpiles		Ongoing	As required	As required	
	Use of Product Stockpiles			On-going	On-going	
	De-watering of opencast workings			On-going	On-going	
	Pumping of water to PCD			On-going	On-going	
	Waste rock dumps for backfilling			On-going	On-going	
	Soil management		On-going	On-going	On-going	On-going
	Water management		On-going	On-going	On-going	On-going
	Concurrent rehabilitation			On-going	On-going	On-going
	Water treatment			On-going	On-going	On-going
Infrastructure removal	Dismantling and demolition of infrastructure				As required	
	Blasting				As required	
	Safety control				On-going	On-going
Rehabilitation	Backfilling of pits			On-going	On-going	
	Slope stabilisation			On-going	On-going	On-going
	Erosion control			On-going	On-going	On-going
	Landscaping			On-going	On-going	On-going
	Replacing topsoil			On-going	On-going	On-going
	Removal of alien/invasive vegetation			On-going	On-going	On-going
	Re-vegetation			On-going	On-going	On-going

Main Activity/Action/Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning	Closure
	Restoration of natural drainage patterns				On-going	On-going
	Remediation of ground and surface water			On-going	On-going	On-going
	Rehabilitation of external roads				On-going	On-going
Maintenance	Initiate maintenance and aftercare program				At end of phase	On-going
	Environmental aspect monitoring			On-going	On-going	On-going
	Monitoring of rehabilitation					On-going

4 POLICY AND LEGISLATIVE CONTEXT

Relevant South African legislation requires various authorisations prior to the commencement of the project. Although cognisance of all applicable legislation is being taken, the following table details the relevant environmental authorisations, which are required:

Table 6: Policy and Legislative Context

<table>
<tr><th>Applicable Legislation and Guidelines Used to Compile the Report</th><th>Reference Where Applied</th></tr>
<tr><td>Constitution of South Africa, 1996 (Act No. 108 of 1996) [as amended]
Section 24
Environment: Everyone has the right-
to an environment that is not harmful to their health or well-being; and
to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that-
i) prevent pollution and ecological degradation;
ii) promote conservation; and
Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</td><td>The proposed project has the potential to harm the environment and poses a risk to the health and wellbeing of people. The development, however, also has the potential to secure sustainable development through reusing process products and thereby limiting the use of natural resources.

The Applicant has the overall responsibility to ensure that the rights of people in terms of Section 24 of the Constitution is protected in terms of the proposed development activity.</td></tr>
<tr><td>National Environmental Management Act (No. 107 of 1998) [as amended]
Section 28 (1)
Duty of Care and responsibilities to minimise and remediate environmental degradation.</td><td>The Applicant is the developer and overall responsibility of the mine rests with him, especially in terms of liabilities associated with the operational phase.</td></tr>
<tr><td>EIA Regulations, 2014 (Government Notices 982 -984) [as amended]

The proposed construction, operational and closure activities of the proposed development triggers listed activities that are listed in the EIA regulations for which a Scoping and Environmental Impact Assessment (EIA) process have to be conducted:

Listing Notice 1, 2 & 3 have been triggered as well as GN633 for several waste activities requiring a Waste License as well.</td><td>The proposed project requires an amendment application for the existing mining right.

An integrated NEMA and NEM:WA application has been launched with the DMRE (This application).</td></tr>
<tr><td>EIA Regulations, 2014 (Government Notices 982 -984)

Chapter 6: Regulation 39 to 44: Public Participation;

Chapter 4: Application for Environmental Authorisation:

Part 3 Scoping and Environmental Impact Report (S&EIR)

Appendix 2: Scoping Report</td><td>The EIA Regulations, 2014 [as amended] prescribes inter alia:

the manner in which public participation needs to be conducted as well as the requirements of a scoping and environmental impact assessment process and the content of a scoping report, environmental impact assessment report and environmental management programme.</td></tr>
</table>

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
Appendix 3: Environmental Impact Assessment Report *Appendix 4: Environmental Management Programme* *Appendix 5: Closure Plan* *Appendix 6: Specialist Reports*	The content of specialist reports, closure plans and environmental audit reports are also provided.
Mineral and Petroleum Resources Development Act, 2002 (Act. 28 of 2002) [as amended]:	A Section 102 amendment will be submitted to the DMRE.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended] • *Section 16* *General duty in respect of waste management;* • *Section 17;* *Reduction, re-use, recycling and recovery of waste;* • *Section 18; and* *Extended producer responsibility; and* • *Section 21* *General requirements for storage of hazardous and general waste.*	The proposed mining area will produce general and hazardous waste which need to be managed and disposed of according to best practices such as recycling, safe storage, etc. An integrated NEMA and NEM:WA application has been launched with the DMRE (this application).
National Water Act, 1998 (Act No. 36 of 1998) [as amended] • *Section 3* *Regulation of flow and control of all water* • *Section 19* *Prevention of pollution to watercourses* • *Section 21* *The water use activities associated with the proposed development requires compliance with the requirements of the NWA as listed under GN No. 19182. An application for an integrated water use license is lodged in terms of Section 21 of the National Water Act, 1998 (Act 36 of 1998) [as amended] to undertake the following activity:* *Section 21: (a) Taking water from a water resource;* *Section 21: (c) Impeding or diverting the flow of water in a watercourse;* *Section 21: (g) disposing of waste in a manner which may detrimentally impact on a water resource;* *Section 21(i): Altering the bed, banks course or characteristics of the watercourse; and* *Section 21(j); Removing, discharge or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people*	The proposed mine will have to apply for a Water Use License for the following Section 21 water uses: - Section 21(a): Abstraction of water for use at the wash plant and on site for dust suppression - Section 21 (c): Impeding or diverting the flow of water in a watercourse - Section 21(g): Disposing of water in a manner which may detrimentally impact on a water resource - Section 21(i): Altering the bed, banks course or characteristics of the watercourse; and - Section 21(j): Removing, discharging or disposing of water found within the opencast pits Water management on the mine will be in line with the requirements of the site specific WUL and GN R704 National Water Act, 1998 (Act No. 36 of 1998).
Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals	

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
published in terms of NWA in Government Notice 267 of March 2017 Several General Authorisations have been published in terms of Section 39 of the NWA (various dates)	The Regulations will be taken into consideration during the Water Use Licence Application process. The hydrological assessment will al take the regulation into account.
Mine Health and Safety Act, 1996 (Act No. 29 of 1996) [as amended] and associated regulations • *Chapter 2, Sections 2 – 4* *Responsibilities of owner* • *Chapter 2, Sections 5 – 13* *Responsibilities of manager;* • *Chapter 2, Sections 14 – 18;* *Documentation requirements;* • *Chapter 2, Section 19 – 20 and 22 to 24* *Employee's rights and duties; and* • *Chapter 2, Section 21* *Manufacturer's and supplier's duty for health and safety*.	The proposed project activities may create an environment that is not safe and healthy for workers on and visitors to the site (if not managed correctly). The act provides for measures to prevent threats to the health and safety of humans in the development area.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) • *Section 44 (1);* *Preservation and protection of heritage resources;* • *Section 3 Types and ranges of heritage resources (i) (i);* *Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens*.	Protection of indigenous heritage resources on the property.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) [as amended] • *Section 32* *Control of dust* • *Section 34* *Control of noise*	Impacts on surrounding landowners need to be managed through dust and noise mitigation measures.
List of Activities which Result in Atmospheric Emissions, published in terms of NEM:AQA in Government Notice 893 of 2013 (as amended)	The proposed mining activities will not trigger any of the activities.
National Dust Control Regulations, 2013 (Government Notice 827 of 2013) • *Section 3* *Dust fall standard* • *Section 4* *Dust fall monitoring program* • *Section 6* *Measures for control of dust* • *Section 7*	Dust fallout needs to be monitored in accordance with the standards set out in the monitoring programme with the specified measures due to the Applicant being liable to offences and penalties associated with non-conformance to dust which may influence employees and surrounding landowners.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
Ambient air quality monitoring (PM10) • *Section 8* *Offences* • *Section 9* *Penalties*	
National Greenhouse Gas Emission Reporting Regulations, published in terms of NEM:AQA in Government Notice of July 2017	The mine will be required to report in the prescribed format.
Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) [as amended] • *Section 12 (1)* *Duty of the landowner to prevent fire from spreading to neighbouring properties.*	Cautionary steps in avoiding the spread of fires to and from neighbouring properties.
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) [as amended] • *Section 9* *Norms and standards* • *Section 27* *Delegation of power and duties* • *Section 30* *Financial accountability* • *Section 43* *Biodiversity management plans.*	Indigenous vegetation needs to be protected and managed in accordance with management measures set out in the management plans developed for the mine and the Applicant need to ensure he is aware of and covers his liabilities. An activity for removing and clearance of vegetation has been applied for within this application and no other vegetation clearance will be permitted other than that approved in terms of the EA when/if the Competent Authority makes its decision.
Alien and Invasive Species Regulations (Government Notice 598 of 2014) and Alien and Invasive Species List, 2014 in terms of NEMBA (Government Notice 599 of 2014), as amended • *Notice 2* *Exempted Alien Species in terms of Section 66 (1)* • *Notice 3* *National Lists of Invasive Species in terms of Section 70(1) – List 1, 3-9 & 11* • *Notice 4* *Prohibited Alien Species in terms of Section 67 (1) – List 1, 3-7, 9-10 & 12*	It is the responsibility of the Applicant to ensure that all prohibited plant and animal species are eradicated as far as possible.
Conservation of Agricultural Resources Act (no. 43 of 1983) • *Section 5* *Prohibition of spreading of weeds* • *Section 12* *Maintenance of soil conservation works and maintenance of certain states of affairs* • *Section 16* *Regional Conservation Committees*	Listed invader/alien plants occurring on site which requires management measures to be implemented to strive to maintain the status quo environment, especially through the guidelines provided by the Regional Conservation Committee.

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
Mining and Biodiversity Guideline (2013)	The Act, regulation and guideline have informed project planning and will be taken into account in the assessment and mitigation of impacts.
National Biodiversity Offset Policy, 2021	Not applicable to this project.
Hazardous Substances Act, 1973 (Act 15 of 1973) [as amended] • *Section 2* *Declaration of grouped hazardous substances;* • *Section 4* *Licensing;* • *Section 16* *Liability of employer or principle* • *Section 9 (1)* *Storage and handling of hazardous chemical substances* • *Section 18* *Offences*	The Applicant must ensure the safety of people working with hazardous chemicals (specifically fuels), as well as safe storage, use and disposal of containers during the on-site operational phase together with the associated liability should non-compliance be at the order of the day.
Hazardous Chemical Substances Regulations, 1995 (Government Notice 1179 of 1995) • *Section 4* *Duties of persons who may be exposed to hazardous chemical substances* • *Section 9A (1)* *Penalties*	Hazardous substances will be stored and utilised on the site and non-compliance to management measures will result in prosecution of the Applicant in terms of his liabilities to the socio-economic environment.
Waste Classification and Management Regulations and Norms and Standards for the assessment of for landfill disposal and for disposal of waste to landfill, 2013 (Government Notice 634 – 635 of 2013) promulgated in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) [as amended]; and Regulations regarding the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation (GN R. 632 of 2015)	The mining area will produce general and hazardous waste which need to be managed and disposed of according to best practices such as recycling, safe storage, etc. Disposal will take place at an existing approved waste disposal facility. Waste Classification will be done and a Waste License is required for the mine for the establishment of the Tailings Facility An integrated NEMA and NEM:WA application has been launched with the DMRE.
National Norms and Standards for the Storage of Waste, published in terms of NEM:WA in Government Notice 926 of 2013	The purpose of the norms and standards is to – a. Provide a uniform national approach relating to the management of waste storage facilities. b. Ensure best practice in the management of waste storage facilities; and c. Provide minimum standards for the design and operation of ne waste storage facilities. Management of the waste storage facility will be in line with the requirements.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
National Norms and Standards for the Sorting, Shredding, Grinding, Crushing, Screening or Baling of General Waste, published in terms of NEM:WA in Government Notice 1093 of 2017	The purpose of these Norms and Standards is to provide a uniform national approach relating to the management of waste facilities that sort, shred, grind, crush, screen, chip or bale general waste. The waste rock dump is not regulated under these Norms and Standards. No general waste will be processed in terms of these norms and standards on the mining area.
Guideline on the Need and Desirability, Department of Environmental Affairs, 2017	This guideline has been taken into account as part of project planning. The 2017 Guideline has been used within this process.
NEMA: Government Notice. 805 Companion Guideline on the Implantation of the Environmental Impact Assessment Regulations, 2010, October 2012.	The application for Environmental Authorisation is submitted in terms of the EIA Regulations.
NEMA: GN. 807 Public Participation Guideline, October 2012.	Consultation with Interested and Affected Parties and Communities.
Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, 2017	This guideline has informed the public participation process for the project.
Regulations Pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, 2015 (Notice 1147 of 2015), as amended • *Regulation 5: Scope of financial provision* • *Regulation 6: Method for determining financial provision* • *Regulation 12: Preparation and submission of plans and reports*	An applicant must determine the financial provision through a detailed itemisation of all activities and cost, calculated based on the actual cost of implementation of the measures required.
Regulations on use of Water for Mining and Related Activities Aimed at the Protection of Water Resources, 1999 (Notice 704 of 1999). • *Regulation 4: Restrictions on location of mining activities* • *Regulation 7: Protection of water resources* • *Regulation 12: Technical investigation and monitoring.*	Every person in control of a mine or activity must take measures to manage water in an effective manner as prescribe by the regulation.
Noise Control Regulations (The Republic of South Africa, 1992) published in terms of Section 25 of the Environment Conservation Act (Act no. 73 of 1989)	The regulations define the following • Controlled areas; and • Disturbing noise Limits are provided for rating levels for outdoor noise. To be utilised by the Noise specialist to determine the impact and mitigation measures.
NEM:AQA: GNR 283. National Atmospheric Emissions Reporting Regulations, 2015. *For purposes of these Regulations, emission sources and data providers are classified according to groups A to D listed in Annexure 1 to these Regulations.* Section 5(3): *For purposes of these Regulations, emission sources and data providers are classified according to groups A to D listed in Annexure 1 to these Regulations.*	Any person, that holds a mining right or permit in terms of the MPRDA. Emissions report must be made in the format required for NAEIS to the relevant air quality officer.
National Guideline on minimum information requirements for preparing Environmental Impact Assessments for mining activities that require	This guideline has been taken into account as part of project planning.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
environmental authorisation, published in terms of NEMA in Government Notice 86 of 2018	
Restitution of Land Rights Amendment Act, 2014 (Act 15 of 2014). The act deals with Land claims.	The validity of the amendment Act was challenged in the Constitutional Court. The Constitutional Court found the Amendment Act to be invalid because of the failure of Parliament to facilitate public involvement as required by the Constitution. The Amendment Act ceased to be law on 28 July 2018. The Constitutional Court ordered that the claims that were lodged between 1 July 2014 and 27 July 2016 are validly lodge, but it interdicted the Commission from processing those claims until the Commission has finalised the claims lodged by 31 December 1998 or until Parliament passes a new law providing for the re-opening of lodgement of land claims. It is important to note that the provisions of section 11(7) of the Restitution of land Rights Amendment Act, 1994 do not apply until after the Commission has accepted the claim for investigation and published its details in the Government Gazette. Where section 11(7) of Restitution of land Rights Amendment Act, 1994 applies, the land claim commission will be informed a month before any activity is undertake on the property.
Deeds Registries, 1937 (Act No. 47 of 1937) [as amended]	Registration of servitudes and deed titles.
South African Mining Charter	Focus on sustainable transformation of the mining industry. WCM is compliant with the BEE requirements. Social management and mitigation measures, developed as part of the SIA, are aligned to the Mining Charter.
National Strategy for Sustainable Development and Action Plan 2011 – 2014 (NSSD 1) (2011)	The Strategy for Sustainable Development and Action Plan (NSSD1) is a proactive strategy that regards sustainable development as a long-term commitment, which combines environmental protection, social equity and economic efficiency with the vision and values of the country. It is a milestone in an ongoing process of developing support, and initiating and up-scaling actions to achieve sustainable development in South Africa (DEA, 2011) and has outlined the following strategic objectives: • enhance systems for integrated planning and implementation; • sustain ecosystems and use natural resources efficiently; • move towards a green economy; • build sustainable communities; and • respond effectively to climate change. The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project, and will be taken into account in the assessment and mitigation of impacts during the EIA phase.

Applicable Legislation and Guidelines Used to Compile the Report	Reference Where Applied
National Spatial Development Perspectives (NSDP)	The NSDP (2006) provides a framework for a focused intervention by the State in equitable and sustainable development. It represents a key instrument in the State's drive towards ensuring greater economic growth, buoyant and sustained job creation and the eradication of poverty. It provides: • a set of principles and mechanisms for guiding infrastructure investment and development decisions; • a description of the spatial manifestations of the main social, economic and environmental trends that should form the basis for a shared understanding of the national space economy; and • an interpretation of the spatial realities and the implications for government intervention. The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project, and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
National Development Plan 2030 (2010)	The National Development Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality by 2030. The core elements of a decent standard of living identified in the plan are: • housing, water, electricity and sanitation; • safe and reliable public transport; • quality education and skills development; • safety and security; • quality health care; • social protection; • employment; • recreation and leisure; • clean environment; and • adequate nutrition The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project, and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
New Growth Path (2010)	South Africa has embarked on a new economic growth path in a bid to create 5 million jobs and reduce unemployment from 25% to 15% over the next ten (10) years. The plan aims to address unemployment, inequality and poverty by unlocking employment opportunities in South Africa's private sector and identifies seven job drivers. These job drivers have the responsibility to create jobs on a large scale. The seven key economic sectors or "job drivers" for job creation are listed below: • infrastructure development and extension: Public works and housing projects; • agricultural development with a focus on rural development and specifically • "Agro-Processing"; • mining value chains; • manufacturing and industrial development (IPAP);

Applicable Legislation and Guidelines Used to Compile the Report	**Reference Where Applied**
	• knowledge and green economy; • tourism and services; and • informal sector of economy The Act, development plans, development frameworks and bylaws have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
National Framework for Sustainable Development (2008)	The purpose of the National Framework on Sustainable Development is to enunciate South Africa's national vision for sustainable development and indicate strategic interventions to re-orientate South Africa's development path in a more sustainable direction. It proposes a national vision, principles and areas for strategic intervention that will enable and guide the development of the national strategy and action plan.
National Spatial Development Perspective (2006)	The NSDP 2006 provides a framework for a focused intervention by the State in equitable and sustainable development. It represents a key instrument in the State's drive towards ensuring greater economic growth, buoyant and sustained job creation and the eradication of poverty. Employment opportunities, direct and in-direct will be provide by the proposed mine.
Mpumalanga Economic Growth & Development Path, October 2011	The frameworks have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
Mpumalanga Spatial Development framework, January 2019.	Mining, especially coal mining remains one of the provinces key economic sectors, realising the contestation of resources through mining the negative impacts require management and positive mitigation interventions – environment, water, air pollution and agricultural land. The development frameworks have informed project planning and the need and desirability of the project, and will be taken into account in the assessment and mitigation of impacts during the EIA phase
Nkangala District Municipality IDP (2017-2022)	The Municipality is currently characterized by an increase in coal mining and related activities and other important sectors in this area are agriculture, agricultural product processing, industrial and manufacturing. Natural resources make a significant and direct contribution to the Municipalities economy. The development frameworks have informed project planning and the need and desirability of the project and will be taken into account in the assessment and mitigation of impacts during the EIA phase.
All other relevant national, provincial, district and local municipality legislation and guidelines that may be applicable to the application. Some of these are discussed in the next section but will be discussed in detail within the EIAr / EMPr report.	

5 NEED AND DESIRABILITY OF THE ACTIVITIES

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The main benefits of the proposed amendment to the mining project are:

- Continued direct economic benefits will be derived from wages, taxes and profits;
- Continued indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees;
- Continued provision of employment opportunities to employees already skilled in within the area.
- Implementation of the proposed project will result in skills development associated with mining;
- It will continue contributing to the economic welfare of the surrounding community by creating working opportunities;
- It will contribute to the upliftment of living standards and the health and safety of the local community;
- The project will result in economic mining of a known resource;
- Reduction in illegal mining and unregulated mining.

The proposed project is aligned with the objectives of the MPRDA (Act 28 of 2002):

- To promote economic growth and mineral development in the Republic;
- To promote employment and advance the social and economic welfare of all South Africans;
- To ensure that the nation's mineral resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- To ensure that mining developments contribute towards the social-economic development of the area in which they are operating.

The then Department of Environmental Affairs (DEA) published a Guideline on Need and Desirability (2017) in terms of the Environmental Impact Assessment (EIA) Regulations, 2014 (as amended). The key components are listed and discussed below:

- Securing ecological sustainable development and use of natural resources; and
- Promoting justifiable economic and social development.

According to DEA's (2017) Guideline on Need and Desirability, to describe the need for a development, it must be established whether it is the right time for locating the type of land use and/or activity being proposed. To describe the desirability for a development, it must be determined, whether it is the right place for locating the type of land use and/or activity being proposed. Need and desirability can be equated to the concept of wise use of land which can be determined through asking the question: "what is the most sustainable use of land?" Considering the above, the need and desirability of an application must be addressed separately and in detail answering *inter alia* the questions as indicated in Table 7.

Table 7: Need and desirability considerations

Securing ecological sustainable development and use of natural resources		
1. 1.1	How will this development (and its separate elements/aspects) impact on the ecological integrity of the area? How were the following ecological integrity considerations taken into account? 1.1.1 Threatened Ecosystems, 1.1.2 Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure, 1.1.3 Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs"), 1.1.4 Conservation targets, 1.1.5 Ecological drivers of the ecosystem, 1.1.6 Environmental Management Framework, 1.1.7 Spatial Development Framework, and 1.1.8 Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.).	The following specialist studies shall be conducted, or existing studies updated in support of this application: • Hydrogeological Assessment and AMD management; • Surface, aquatic and wetland assessment • Terrestrial Ecological Assessment; • Geotechnical Assessment; • Storm Water Management Plan (including floodlines and topography); • Hydropedology Assessment; • Heritage Impact Assessment; • Agricultural Impact Assessment • Paleontological Assessment; and • Closure Plan and Quantum Report. The conclusions of these studies, and the identified impacts and mitigation measures stemming there from have been included in this EIA and EMPR. The need of the project in terms of the eMalahleni SDF has been included in this report.
1.2	How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Refer to baseline ecological information in Section 10.5, and the impact assessment and mitigation measures in Section 14 and Section 15 of this EIAR.
1.3	How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	Refer to baseline ecological information in Section 10.5, and the impact assessment and mitigation measures in Section 14 and Section 15 of this EIAR.
1.4	What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	General waste, hazardous waste and litter will be generated during the life of the mine and these should be kept in designated areas and disposed of to a licensed landfill facility. Other wastes that may cause soil contamination, are from the use of vehicles and loaders during the mining process, which may lead to hydrocarbon spills. Regulations for soil clean-up and management have been prescribed in the EMPr.
1.5	How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly	A Heritage Impact Assessment has been undertaken for the proposed project. Refer to Section 10.13, Section 14 and Section 15 of this EIAR.

	avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	
1.6	How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The operation will remove a known resource (coal resource – limited resource) within the designated area. This cannot be reversed. The study area has already been transformed due to existing coal mining already taking place on site. Through implementing good practice environmental management measures and mitigation measures, it will ensure that both human and environment are not negatively affected by the development. Since coal seams are usually associated with wetland related terrain, as most coal seams are the result of peat and other organic carbon accumulations over the year, this will always be the areas where coal is found and may be characterised by sensitive features such as wetlands, pans and grasslands. This is why Mpumalanga is so rich in both, as one is usually not found without the other.
1.7	How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? 1.7.1. Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialized growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life). 1.7.2. Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?) 1.7.3. Do the proposed location, type and scale of development promote a reduced dependency on resources?	Renewable natural resources may be the use of borehole water, to a limited amount, on-site. Washing and screening (Primary processing) is proposed, which may require additional water. Water requirements have been described above and all water uses will be licensed in terms of the National Water Act. Stormwater management, and the water stemming from the primary processing, will be captured in the PCD infrastructure and re-used and recycled into the process, and may be used as dust suppression around the dirty footprint areas within the area. This will alleviate the requirement for clean make-up water to be sourced from groundwater. Water may also be needed to be removed from the opencast pit section during the project and this will also be re-utilised where possible. No discharges into the environment will be applied, or proposed, for the project.
1.8	How were a risk-averse and cautious approach applied in terms of ecological impacts? 1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? 1.8.2 What is the level of risk associated with the limits of current knowledge? 1.8.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	The current knowledge gaps include are discussed in Section 13 of this report. Details as indicated by the various specialist assessments that have been undertaken for this project are included in Section 10. The impacts on all environmental aspects have been explored in more detail and quantified wherever possible as per Section14 and Section 15. The mitigation measures associated with the impacts have been determined and are included in Section 15.
1.9	How will the ecological impacts, resulting from this development, impact on people's environmental right in terms following.	Refer to the impacts described in Section 14, the impact assessment and proposed mitigation measures included in Section 15.

	1.9.1 Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 1.9.2 Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	
1.10	Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Refer to the impact assessment and mitigation measures in Section 15 of this EIAR.
1.11	Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	The Environmental risk assessment for all environmental features have been assessed and included in the EIA/EMPr. Refer to Section14 and Section 15 of this report.
1.12	Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	Refer to Section 7 details of the alternatives considered, and Section14 and Section 15 the advantages and disadvantages of the proposed activity, of this EIA and EMPR.
1.13	Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Refer to Section 15 of this EIAR and EMPR.
"Promoting justifiable economic and social development"		
2.1	What is the socio-economic context of the area, based on, amongst other considerations, the following considerations? 2.1.1 The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area, 2.1.2 Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.), 2.1.3 Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and 2.1.4 Municipal Economic Development Strategy ("LED Strategy").	The project is aligned with the objectives as coal mining is already an ongoing and historic activity within the area and within Mpumalanga and therefore may not compromise the integrity of the surrounding land uses and neighbouring properties. According to the Nkangala IDP (2020-2021), mining is the largest contributor to the followed by manufacturing, finance, electricity production, construction and transportation. This indicates that coal mining within the local area is prevalent and aligned with current developments found within the local vicinity.
2.2	Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? 2.2.1. Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs? 2.2.2. Implementation on Social labor Plan (SLP)	Also refer to the comments made above. The proposed project will increase the life of mine on site and, therefore, continue with benefits for society and the surrounding communities both directly and indirectly by providing job security at the proposed operation and through the extraction of coal reserves within the Mpumalanga Province. Direct economic benefits will be derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees.
2.3	How will this development address the specific physical, psychological,	Refer to comments made above. All aspects and comments received from I&APs during

	developmental, cultural and social needs and interests of the relevant communities?	the process have been reasonably addressed and incorporated into the final EIA/EMPr submitted to the DMRE. Local economic growth and work opportunities will be main benefits from the project if approved and may address some of the physical, psychological, development, cultural and social needs. Refer to the proposed public participation process in Section **Error! Reference source not found.** of this EIAR and EMPR.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	Refer to the impact assessment and mitigation measures in Section 15 of this EIA and EMPR.
2.5	In terms of location, describe how the placement of the proposed development will; 2.5.1. result in the creation of residential and employment opportunities in close proximity to or integrated with each other, 2.5.2. reduce the need for transport of people and goods, 2.5.3. result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport), 2.5.4. compliment other uses in the area, 2.5.5. be in line with the planning for the area, 2.5.6. for urban related development, make use of under-utilised land available with the urban edge, 2.5.7. optimise the use of existing resources and infrastructure, 2.5.8. opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement), 2.5.9. discourage "urban sprawl" and contribute to compaction/densification, 2.5.10. contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs, 2.5.11. encourage environmentally sustainable land development practices and processes 2.5.12. take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), 2.5.13. the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential), 2.5.14. impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and 2.5.15. in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	Alternatives have been assessed during the process and the best suited alternative has been described within this application and depicted in the EIA Phase. Refer to Section 7, details of alternative considered, in this EIAR and Section 15.7.
2.6	How were a risk-averse and cautious approach applied in terms of socio-economic impacts? 2.6.1. What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Specialist studies have been undertaken for the EIA phase of the project. All gaps knowledges have been identified and are included in the EIA phase (Sections 13 and 17) of the project.

	2.6.2. What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? 2.6.3. Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	The expected potentially significant impacts have been identified as part of this EIA process and quantified in Section 15.1 EIA Phase. The mitigation measures associated with the impacts have been determined in Section 15.
2.7	How will the socio-economic impacts, resulting from this development impact, on people's environmental right in terms following: 2.7.1. Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? 2.7.2. Positive impacts. What measures were taken to enhance positive impacts?	Refer to the impact assessment and mitigation measures in Section 15 of this EIAR and EMPR. The project is proposed within the existing mining right boundary of the 2 Seam Mine, therefore, there are existing impact and mitigation measures in place.
2.8	Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	The area where the additional mining is proposed, is currently partly utilised for agriculture and grazing. A Soil, Land Use and Capability and Agricultural Assessment study has been undertaken for this EIAR (Section 10.4). Part of the proposed mining area is also part of the current river system for which the river diversion is being applied for. The proposed river diversion is discussed in detail in Section 3.5.1 of this report. The proposed impacts of the project are included in Section 14 and 14 of this report.
2.9	What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Refer to the impact assessment and mitigation measures in Section 14 and 15 of this EAR and EMPR.
2.10	What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Refer to the impact assessment and mitigation measures in Section 15 of this EIA report. The mine will be in line with the regulatory requirements and provide financial provision to ensure that the mitigation measures proposed can be carried out. Refer to Section 19 and Appendix 20. .
2.11	What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	By conducting a Scoping and Environmental Impact Assessment Process, the Applicant ensures that equitable access has been considered. Refer to the impact assessment and mitigation measures in Sections 14 and 15 of this EIAR and EMPR.
2.12	What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Refer to the impact assessment and mitigation measures in Section 15 of this EIA report. The EIA and EMPR specify timeframes within which mitigation measures must be implemented.
2.13	What measures were taken to: 2.13.1. ensure the participation of all interested and affected parties, 2.13.2. provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, 2.13.3. ensure participation by vulnerable and disadvantaged persons, 2.13.4. promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means, 2.13.5. ensure openness and transparency, and access to information in terms	Refer to Section 8 of this EIAR, describing the public participation process to be undertaken for the proposed project. A copy of the Public Participation Process, including the site notice locations, the newspaper advertisement, and comments and responses received to date from the public have been included in Appendix 4. The site notice locations, the newspaper advertisement, and comments and responses received to during the EIAR phase will be included in Appendix 4 of the Final EIAR.

	of the process, 2.13.6. ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and 2.13.7. ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted?	
2.14	Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)?	Refer to Section 8 of this EIAR, describing the public participation process that has been implemented for the proposed project. The Applicant has a Social Labour Plan in place, which further addresses this aspect.
2.15	What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	The Mining Right holder will need to draft an Environmental Policy and a Health and Safety Policy, which will regulate activities on the coal mining area. All workers and contractors will need to abide to the policies and framework as specified.
2.16	Describe how the development will impact on job creation in terms of, amongst other aspects: 2.16.1. the number of temporary versus permanent jobs that will be created, 2.16.2. whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area), 2.16.3. the distance from where labourers will have to travel, 2.16.4. the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and 2.16.5. the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).	The mine is existing and this project will extend the life of mine ensuring the job security of current workers at the mine. Refer to Section 15 of this EIAR.
2.17	What measures were taken to ensure: 2.17.1. that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and 2.17.2. that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	The applicant is in the process of applying for the following aspects across different legislation requirements: • Amendment to the Mining Right with a Section 102 Application (this application); • Environmental Authorisation in terms of the NEMA and NEM:WA (this application) • WUL (Department of Water and Sanitation –DWS – Has been initiated). • All legislation that has been incorporated within these processed were discussed within Section regarding Policy and Legislative Content above.
2.18	What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage?	Refer to Section 8 of this EIAR, describing the public participation process to be implemented for the proposed project, as well Section 15 and Section 21.1.2 (the impact on any national estate), in the EIAR. The Applicant also has a Social Labour Plan in place.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the impact assessment and mitigation measures in Section 14 and Section 15 of this report.
2.20	What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the	This has been addressed in Section 19 of the EIAR. A Closure report has been included as Appendix 15 of the EIAr.

	environment?	
2.21	Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Refer to Section 7 (description of the process followed to reach the proposed preferred site), of the EIAR.
2.22	Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area?	Refer to Section 15 of this report

6 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

The 2 Seam Mine is an existing operation. Mining should take place at optimal rates over a 20-year period. The total mine resource is 46 000 000 tons. This application covers 17 000 000 tons and the remaining resource that could be mined in the future is 39 000 000 tons. The mine may take longer than 14 years at 1 200 000 tons per year to mine due to market fluctuations in the long-term market cycles and a twenty-year period is applied for with a six-year rehabilitation period at the end of mining to ensure rehabilitation is conducted properly and the seeding settles down. The mine will be used to handle coal for a further seven years. Total period applied for 31 years.

6.1 EXPLANATION OF TIMEFRAMES

TNC is an ongoing operation, current mining activities are being undertaken on OC 4.

The infrastructure is already erected and will be utilized to support the mining and beneficiating the coal, service the trucks and excavators, crush, screen and blend the coal, weighbridge to measure the coal leaving site, a beneficiation plant will be erected. The western portion of the mine will be sealed off from the eastern portion using concrete walls placed in three tunnels, these walls will be pinned into the rock above and below the tunnels for extra stability.

The drilling, concreting, and pinning of the Seals will take 5 months from inception. The dewatering will take 6 months. The construction of the beneficiation plant will take 6 months from inception to commissioning.

The excavation and development of the river diversion and berm wall is 6 months. Continuity of mining from OC 4 to OC 4A can only commence once the river has been diverted.

Mining from OC 4 to OC 4B can only commence once the water level in the OC 4 area has been lowered sufficiently to enable the mining to start and thus after the walls are sealed and pinned and the water has been lowered, roughly 9 months from commencement of water sealing.

The OC 6 area can commence mining once the water sealing has taken place and the OC 6 area has been dewatered. OC 6A can commence Mining at the same time if required.

The OC 5 area can commence mining at any time and is not dependent on water management facilities as only the 4 upper and 4 lower seams will be accessed as this point in time.

During the operational phase the following activities will be conducted, the operational phase will last for 20 years:

- Construction of haul roads, 1 month. OC 4A and OC 4B do not require new haul roads but utilize the existing haul roads from OC 4.
- Preparation of topsoil, subsoil and overburden stockpiling areas, 1 month in the OC 6 and OC 6A areas, all other areas will commence with current roll over rehabilitation.
- Construction of the storm water diversion trenches takes place concurrently with the above;
- Excavation of extra box-cuts where necessary, OC 5 and OC 4A and OC 4B do not require box cuts;
- Construction of the pollution control facilities such as extra clean water and dirty water drains;

- Construction of infrastructure to support all mining and engineering operations. Formation of the topsoil, subsoil and overburden stockpiles for the various opencast pits.
- Systematic removal of the coal seams by opencast mining methods;
- Transporting and stockpiling of ROM;
- Disposal of mine affected water into the pollution control dams and to put out fires from underground sources; Transporting of coal products; Utilisation of mine infrastructure

The decommissioning phase is taken to begin once all economically exploitable coal reserves have been extracted. This phase the mine is expected to take not more than six years and includes the following:

- Removal of all mine infrastructures;
- Filling of all remaining voids and final shaping of the rehabilitated opencast pit;
- Removal of the carbonaceous layer from the product stockpiling area and haul roads;
- Ripping of all infrastructure areas; top soiling and
- Seeding of the mined out topsoiled and rehabilitated surfaces.

The mine closure phase will be dedicated to the maintenance of rehabilitated areas as well compiling a closure plan. Additional water management, product and overburden stockpiling areas will be constructed to service the new mining areas.

Post mining, the site will be used as a washing, beneficiating, crushing, screening and blending site for coal supply to the export, Eskom and Inland markets.

6.2 EXPLANATION OF THE PRODUCTION BUILD UP PERIOD ONCE PRODUCTION COMMENCES

OC 4A and OC 4B Opencast mining areas will commence with topsoil clearance, softs removal and drilling and blasting of the hard overburden above the number 2 seam as part of the steady state from OC 4 opencast.

It will take 2 months on the ramp up to be in steady state for these two opencasts, both the number 2 and number 1 seams will start on thin seam mining of the various layers the 2 and 1 seam steady state will be reached in month 3 at 60 000 tons per month.

OC 6 will commence with a major box cut from surface to the 4 upper coal seam, the overburden will be placed on an overburden dump, the topsoil will be placed as a visual barrier, the softs will be placed on a softs dump.

The coal will be removed to the crushing and screening area located at the

OC 2 area. Box cutting through the interseam parting to the 4 Lower will take place and then the 4 Lower will be removed. The major 4 Lower to 2 Seam parting will be drilled and blasted and placed on the overburden dump.

The number 2 seam will be extracted in three tranches; 2 roof and roadway mix will be taken to the crushing and screening area and then the 2 pillars removed to the stockpiling areas and then the 2 floor will be extracted.

The parting between the 2 and 1 seams will be drilled, blasted and placed on the overburden dump. The number 1 seam will be drilled and blasted and will be crushed and screened for markets.

The process starts again but the burdens are dozed into the box cut from strip 1 and each of the coal seams are removed. The mine will end up with 13 benches of which 6 may be linked to the mined box cut. On strip 3 concurrent

rehabilitation will commence and will be continuous. The mining method will be shovel and truck; roll over methodology, drilling and blasting of the hard burdens will take place when necessary.
Steady state will be 100 000 tons per month.

6.3 EXPLANATION OF PRODUCTION DECLINE PERIOD (AS GRADES DETERIORATE)

Production will decline towards the end of the mine's life not through a quality drop, but rather through having mined out all the coal.
During the 20-year life, the pits will be sequenced as they become available

- OC 4A, OC 4B, OC 5 can be mined in sequence
- OC 6 and OC 6A can be mined in sequence

7 MOTIVATION FOR THE OVERALL PREFERRED SITE, ACTIVITIES AND TECHNOLOGY ALTERNATIVE

NB!! to This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.

The identification of alternatives is a key aspect of the success of the process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider and assess in the EIA phase. There are, however, some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which will be discussed in the evaluation of the alternatives. Alternatives can typically be identified according to:

- Location/layout/design alternatives;
- Process alternatives;
- Technological alternatives; and
- Activity alternatives (including the No-go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts.
The alternatives are described, and the advantages and disadvantages are presented in this section. It is further indicated which alternatives are considered feasible from a technical as well as environmental perspective. Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process (DEAT; 2004).
Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint

alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

7.1 MOTIVATION FOR THE PREFERRED SITE, ACTIVITIES AND ALTERNATIVES

Numerous alternatives were evaluated about the extent of the area to be mined, mostly linked to the presence of surface infrastructure within and adjacent to the target coal resource. The layout alternatives at 2 Seam are limited due to existing infrastructure. The proposed layout for the coal wash plant and the PCD's is, therefore, determined by the location of existing infrastructure and previous opencast areas to minimise impacts on the environment. 2 Seam is a mining company holding a mining right over the proposed amendments within the mining right and, therefore, there is no practical development alternative for the future mining area. The proposed changes to the infrastructure and the additional opencast mining area have taken into consideration economic viability and practicality as well as the location of the coal resource.

It should be noted that subsequently to the scoping phase, the proposed tailings facility will no longer form part of the application process.

7.2 DETAILS OF THE DEVELOPMENT FOOTPRINT ALTERNATIVES CONSIDERED

With reference to the site plan provided as Appendix 3 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

According to DEA (2017), Guideline on Need and Desirability and Guidelines on Assessment of Alternatives and Impacts, Department of Environmental Affairs, feasible and reasonable alternatives must be identified for a development as required by the NEMA EIA Regulations and applicable to EIA. Each alternative is to be accompanied by a description and comparative assessment of the advantages and disadvantages that such development and activities will pose on the environment and socio-economy. Alternatives form a vital part of the initial assessment process through the consideration of modifications to prevent and/or mitigate environmental impacts associated with a particular development. Alternatives are to be amended when the development's scope of work is amended. It is vital that original as well as amended alternative identification, investigation and assessment together with the generation and consideration of modifications and changes to the development and activities are documented.

Although an array of alternatives could be investigated for each project, such alternatives will not necessarily be applicable to each project and/or project phase. However, there must always be strived to seek alternatives that maximises efficient and sustainable resource utilisation and minimise any negative impacts on the bio-physical and socio-economic environments. The following alternatives were considered as part of the Environmental

Authorisation Process for the proposed project:

7.2.1 SITE ALTERNATIVES

The proposed amendment of the existing MWP includes areas that are already included in the existing Mining Rights. Therefore, no other alternatives were considered with regards to the consideration of property.

7.2.2 THE PROPERTY ON WHICH THE LOCATION OR WHERE IT IS PROPOSED TO UNDERTAKE THE ACTIVITY

The proposed locations are the best option, for the following reasons:

- The mining right already belongs to 2 SEAM,
- There are proven coal reserves on the properties;
- The area is in close proximity of a potential market;
- There are already significant operational and process infrastructure available close by; and
- Access to the site will be easy.

The preliminary layout has been investigated further during the EIA phase. However, no alternative locations and options have been assessed. None of the planned infrastructure will be located in areas identified as being of high environmental sensitivity or if any other significant environmental concerns are noted with regards to the proposed layout then the layout may be amended based on these findings.

With regards to the river diversion the economic motivation of the proposed diversion is:

1. The LOM will be increase and the mine will be able to provide for Active treatment
    - The mine is in process of negotiating with the surrounding mine to contribute to an active treatment system as all the groundwater of the area will accumulate at OC4A as the lowest point.
2. OC4A will provide 1.2mil tons of coal
    - 2 Seam to sign contract with Eskom to supply coal from OC4A for a 2-year period.
3. The mine will be placed on care and maintenance for a period before historical underground sections can be mined, resulting in job losses.

Other motivations for the proposed river diversion include the following:

4. The river diversion will provide space where a passive treatment system can be installed to treat the possible AMD.
5. The river diversion will prevent AMD from entering the river system.
6. Mistake Lake can be used to offset any loss in wetland system
7. The banks of the diversion can be lined with soil and vegetation from the river.

7.2.3 THE TYPE OF ACTIVITY TO BE UNDERTAKEN

The land use of the proposed mine area consists predominantly of mining. 2 Seam currently holds a mining right over the proposed project area and, therefore, there is a practical development alternative for the future mining area. The proposed project of the area has taken into consideration the economic viability and practicality, as well as the location of the coal resource.

7.2.4 TECHNOLOGICAL ALTERNATIVES

There are two main types of washing processing technology which could be used for coal beneficiation, namely:

- Technology Alternative T1a - Dry processing: A dry coal separator uses less water than a conventional wet processing alternative. The main and most obvious advantage of dry processing of coal is that no water is required. Dry processing is, however, not applicable on all mines and with all coal types and quantities.
- Technology Alternative T1b - Wet washing: This is the conventional processing alternative employed at most processing facilities.

2 Seam proposes to use wet washing (T1b) as the technology alternative.

There are several coal product transport options. The feasibility of these options would hinge on the final market for the coal, as well as the proximity of available transport infrastructure. The following alternatives have been considered:

- Technology Alternative T2a – Road: This would involve the transport of the product by existing road networks to the respective buyer.
- Technology Alternative T2a – Rail: This option would involve transport of the coal by rail utilizing a railway siding.
- Technology Alternative T2a - Use of conveyor: This option would involve transport of the coal by conveyor to the buyer.

The existing operation makes use of road transport (Alternative T2 a) due to the easy access to the road network. This is the alternative currently used to transport the coal.

7.2.5 ACTIVITY ALTERNATIVES

No feasible activity alternatives exist, unless stating that farming and agriculture could be an activity alternative. This will not benefit many parties as the area has already been subjected to coal mining (and prospecting), thereby decreasing the carrying capacity and agricultural return.

7.2.6 NO GO OPTION

The no-go option refers to the alternative of the proposed project not going ahead at all. This alternative will avoid potentially positive and negative impacts on the environment and the status quo of the area would remain, which is the conditions of the current baseline environment without any deviations or expansions.

The No Go option would leave the valuable resource in the ground. The no-go option would result in no economic benefit, no job creation and no supply of coal to Eskom and exports.

8 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.

8.1 PUBLIC PARTICIPATION

The Public Participation Process (PPP) is a requirement of several pieces of South African legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their comments are considered and a record of all comments and responses is included in the reports submitted to the Authorities. The process ensures that all stakeholders are provided an opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises to ensure and promote:

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

8.2 LEGAL FRAMEWORK

The PPP for the proposed project will be undertaken in accordance with the requirements of the MPRDA and the NEMA EIA Regulations (2014), as amended in 2021, as well as the NWA and in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project and have their views considered and included as part of project planning.

8.2.1 SECTION 39: ACTIVITY ON LAND OWNED BY PERSON OTHER THAN THE PROPONENT - SUBREGULATION 1 AND 2(A), (B) AND (C)

(1) If the proponent is not the owner or person in control of the land on which the activity is to be undertaken, the proponent must, before applying for an environmental authorisation in respect of such activity, obtain the written consent of the landowner or person in control of the land to undertake such activity on that land.

(2) Subregulation (1) does not apply in respect of—

- *(a) linear activities;*
- *(b) activities constituting, or activities directly related to prospecting or exploration of a mineral and petroleum resource or extraction and primary processing of a mineral or petroleum resource; and*
- *(c) strategic integrated projects as contemplated in the Infrastructure Development Act,2014.*

As the application is for mining related activities, the proponent is not required to obtain written consent of the landowner or person in control of the land to undertake the activity.

8.2.2 SECTION 41: PUBLIC PARTICIPATION PROCESS

8.2.2.1 SECTION 41, SUBREGULATION 2 (A) – SITE NOTICES

1) *The person conducting a public participation process must take into account any relevant guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of an application or proposed application which is subjected to public participation by—*
   - a) *fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of—*
     - i. *the site where the activity to which the application or proposed application*
     - ii. *relates is or is to be undertaken; and*
     - iii. *any alternative site.*

Site notices were erected within and surrounding the proposed project area. The site notices have been placed in conspicuous areas that are accessible by the public at the boundary. The site notices include a short background to the proposed project, the locality of the project, information on the activities that are being applied for and details of how the Environmental Assessment Practitioner (EAP) can be contacted to provide any comments. Refer to Appendix 4 for a copy of the site notice and where these have been placed.

8.2.2.2 SECTION 41, SUBREGULATION 2 (B) – WRITTEN NOTICE

- b) *giving written notice, in any of the manners provided for in section 47D of the Act, to—*
  - i. *the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;*
  - ii. *owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;*

iii. *the municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area;*

iv. *the municipality which has jurisdiction in the area;*

v. *any organ of state having jurisdiction in respect of any aspect of the activity; and*

vi. *any other party as required by the competent authority;*

All preidentified I&APs have been provided with a written notice (refer to Appendix 4), together with a background information document (BID) (refer to Appendix 4 for a copy of the BID). Written notices have also been sent to the municipality that has jurisdiction in the area and all organs of state as preidentified and that register for the project. This includes the following:

- South Africa Heritage Resource Agency (SAHRA);
- Department of Roads and Transport;
- Nor Economic Development & Tourism which provides oversight role on the work of three agencies which are: Mpumalanga Economic Growth Agency (MEGA), Mpumalanga Economic Regulator (MER) and Mpumalanga Tourism and Parks Agency (MTPA).
- Mpumalanga Department: Agriculture, Rural Development, Land and Environmental Affairs;
- Department of Agriculture Forestry and Fisheries.
- Department of Mineral Resources and Energy (DMRE); and
- Department of Water and Sanitation (DWS).
- Department of Environmental Affairs and Forestry;
- Mpumalanga Agriculture, Land Reform and Rural Development;
- Mpumalanga Department of Economic Development and Tourism;
- Mpumalanga Parks and Tourism Agency;
- Mpumalanga Public Works, Roads and Transport;
- Mpumalanga Department of Human Settlements;
- Department of Social Development – Provincial;
- South African National Roads Agency;
- Provincial Heritage Authority;
- Eskom;
- eMalahleni Local Municipality;
- Nkangala District Municipality; and
- Ward Councillor/s

8.2.2.3 DETAILS OF BACKGROUND INFORMATION DOCUMENT (BID)

A BID in English has been compiled for distribution (refer to Appendix 4 for a copy of the BID). The BID contains the following information:

- Project name;
- Applicant name;
- Project location (including map of study area);
- Description of the EA application process, EIA flow chart, and public participation process;
- Information on future document review opportunities;
- A detailed questionnaire/ I&AP registration form; and
- Relevant EAP contact person for the project.

Copies of the BID were emailed to the current landowners and adjacent landowners. Copies of the BID were also given to occupiers of the site and I&APs via direct consultation or be emailed to potential I&APs. Copies of the BID documents were hand delivered to the local communities and also posted via registered mail to government departments and municipalities. The various government departments and municipalities shall receive copies of the BID.

Copies of the BID were distributed to any other parties if required by the competent authority. The BID and distribution of the BID’s are attached as Appendix 4.

8.2.2.4 SECTION 41, SUBREGULATION 2 (C), (D) & (E) – ADVERTISEMENTS

c) placing an advertisement in—

i. one local newspaper; or

ii. any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and

e) using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to—

i. illiteracy;

ii. disability; or

iii. any other disadvantage.

An advertisement was placed in the local newspaper, the Witbank News,” containing the following information:

- Project name;
- Applicant name;
- Project location;
- Availability of the draft Scoping Report for review;
- Nature of the activity; and
- Relevant EAP contact person for the project where I&APs can send comments/concerns.

A copy of the advert for the scoping phase is attached in Appendix 4.

An advert will be placed in the local newspaper during the draft EIA phase to advise the I&APs and stakeholders of the availability of the EIAR and EMPR. Information in the advert will include a short project background (including project and applicant name), project location, nature of the activity, information regarding the availability of the reports for review and contact details for the relevant EAP where I&APs can send comments/concerns. A copy of the advert will be included as Appendix 4 in the Final EIAR and EMPr to be submitted to the DMRE.

8.2.2.5 SECTION 41, SUBREGULATION 3

3) A notice, notice board or advertisement referred to in subregulation (2) must—

a) give details of the application or proposed application which is subjected to public participation; and

b) state—

i. whether basic assessment or S&EIR procedures are being applied to the application;

ii. the nature and location of the activity to which the application relates;

iii. where further information on the application or proposed application can be obtained; and

iv. the manner in which and the person to whom representations in respect of the application or proposed application may be made.

As indicated in Section 8.2.2.2 and Section 8.2.2.4 above, both the site notice and the adverts included all information as per the requirements of Section 41, subregulation 3.

The EAP's contact number and email address will be stated on the site notice and adverts. Comments/concerns and queries will be encouraged to be submitted in either of the following manners:

1. Electronically (email);
2. Telephonically; and/or
3. Written letters.

8.2.2.6 SECTION 41, SUBREGULATION 4

4) A notice board referred to in subregulation (2) must—

a) be of a size of at least 60cm by 42cm; and

b) display the required information in lettering and in a format as may be determined by the competent authority.

Site notices erected around the boundary of the proposed project area were at least 60cm by 42 cm. The proposed format is Arial and the font size is 14. A locality map was included on the site notice. Refer to Appendix 4 for a copy of the site notice, as well as a locality map of where the site notices have been placed.

8.2.2.7 SECTION 41, SUBREGULATION 5, 6 & 7

5) Where public participation is conducted in terms of this regulation for an application or proposed application, subregulation (2)(a), (b), (c) and (d) need not be complied with again during the additional public participation *process contemplated in regulations 19(1)(b) or 23(1)(b) or the public participation process contemplated in regulation 21(2)(d), on condition that—*

- *a) such process has been preceded by a public participation process which included compliance with subregulation (2)(a), (b), (c) and (d); and*
- *b) written notice is given to registered interested and affected parties regarding where the—*
  - *i. revised basic assessment report or, EMPr or closure plan, as contemplated in regulation 19(1)(b);*
  - *ii. revised environmental impact assessment report or EMPr as contemplated in regulation 23(1)(b); or*
  - *iii. environmental impact assessment report and EMPr as contemplated in regulation 21(2)(d);*

  may be obtained, the manner in which and the person to whom representations on these reports or plans may be made and the date on which such representations are due.

Subregulation 5 is not applicable to the project, as the Application is a new Application for the proposed project and does not include any revised reports.

6) When complying with this regulation, the person conducting the public participation process must ensure that—

- *a) information containing all relevant facts in respect of the application or proposed application is made available to potential interested and affected parties; and*
- *b) participation by potential or registered interested and affected parties is facilitated in such a manner that all potential or registered interested and affected parties are provided with a reasonable opportunity to comment on the application or proposed application.*

All relevant facts in respect of the proposed application, will be made available to potential I&APs. Both the Scoping Report and the Environmental Impact Assessment Report with the Environmental Management Programme Report will be made available for public review and comment for a period of 30 days each.

7) Where an environmental authorisation is required in terms of these Regulations and an authorisation, permit or licence is required in terms of a specific environmental management Act, the public participation process contemplated in this Chapter may be combined with any public participation processes prescribed in terms of a specific environmental management Act, on condition that all relevant authorities agree to such combination of processes.

As this is an integrated application, namely an environmental authorisation in terms of NEMA and a waste licence application in terms of the NEMWA, a S102 Amendment in terms of the MPRDA and a water use licence application in terms of the NWA, it is proposed to combine the public participation process with all notification documentation and other public participation opportunities referring to all three authorisation/permit or licence.

8.2.3 SECTION 42: REGISTER OF INTERESTED AND AFFECTED PARTIES

8.2.3.1 INTERESTED AND AFFECTED PARTY (I&AP) DATABASE

A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contain the names, contact details and addresses of—

a) all persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;

b) all persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and

c) all organs of state which have jurisdiction in respect of the activity to which the application relates.

As part of the PPP, an I&AP database has been developed and will be continuously updated for the project. A copy of the database for the scoping phase is included as Appendix 4. The database will be updated for the EIA phase.

8.2.4 SECTION 43: REGISTERED INTERESTED AND AFFECTED PARTIES ENTITLED TO COMMENT ON REPORTS AND PLANS

8.2.4.1 INTERESTED AND AFFECTED PARTIES AND COMMENTING AUTHORITIES

43) 1). A registered interested and affected party is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.

Stakeholders who are captured/registered on the database for the project shall include the following:

- The owners or persons in control of the land where the proposed mining is to be undertaken (if different than applicant);
- The occupiers of the property where the development is to be undertaken;
- The owners and occupiers of land adjacent to the mining area;
- Provincial and local government (relevant local and district municipalities);
- Organs of state, other than the authorising authority, such as the Department of Agriculture, Forestry and Fisheries (DAFF – now grouped with Environmental Affairs, forming DFFE since 2019) or Department of Roads, having jurisdiction in respect of any aspect of the proposed project;
- Relevant residents' associations, rates payers' organisations, community-based organisations and NGOs;
- Environmental and water bodies, forums, groups and associations; and
- Private sector (business, industries) in the vicinity.

8.2.4.2 DECISION MAKING AUTHORITIES IN TERMS OF THE ENVIRONMENTAL AUTHORISATION AND WATER USE LICENCE

The decision-making authorities includes the:

- Department of Mineral Resources and Energy (DMRE); and
- Department of Water and Sanitation (DWS) – (Water Use License).

I&APs who attend any public open days/public meetings and /or submitted contact details will be registered on the I&AP database. The database will be updated on an on-going basis throughout the process and included as an Appendix 4 to the Scoping Report and the Environmental Impact Assessment Report, as well as the Integrated Water and Waste Management Plan.

8.2.4.3 ENVIRONMENTAL AUTHORISATION AND MINING RIGHT APPLICATION

- Notification:

All potential I&APs will be notified by means of and advertisement, site notices and/or notification letter and be requested to register as an I&AP for the proposed project.

- Scoping Phase:
  1) During the Scoping phase the I&APs had the opportunity to comment on the Scoping Report, which was made available for public review for 30 days from 24 June 2022 to 25 July 2022. Registered I&APs were notified of the availability of the Scoping Report. The report was made available electronically via a downloadable link and a hard copy of the report was made available at the 2 Seam Mine. (All necessary measures were put in place to ensure that the COVID-19 protocols are adhered to when reviewing the document. Should you require a CD copy of the report, please contact ELEMENTAL. Upon request, Zoom, Microsoft teams and skype meetings will be arranged and communicated with registered I&APs,- please note that no meetings were requested during the);
  2) Copies of the Scoping Report were submitted to stakeholders (SAHRA and the Nkangala District Municipality and government departments (DMRE and DWS) for review.
  3) All comments received during the scoping phase have been included as an Appendix in the Final Scoping Report that was submitted to the DMRE.
- Environmental Impact Assessment Phase:

  4) The draft EIAR/ EMPR inclusive of all the specialist studies, will be made available for public review for 30 days from 14 November to 13 December 2022. Registered I&APs will be notified of the availability of the EIAR. The report will also be made available electronically via a downloadable link and a hard copy of the report will be made available at the 2 Seam Mine.
  5) Copies of the EIAR were also submitted to stakeholders and government departments for review.

- 6) All communication received during the environmental impact assessment phase will be included as Appendix 4 in the Final EIAr herewith submitted to the DMRE.

8.2.4.4 SECTION 44: COMMENTS OF INTERESTED AND AFFECTED PARTIES TO BE RECORDED IN REPORTS SUBMITTED TO COMPETENT AUTHORITY

8.2.4.4.1 PUBLIC MEETINGS AND OPEN DAYS

No public meeting was held for the scoping phase of the project. Zoom meetings, Microsoft Team Meetings, Skype, and/or phone calls with landowners and I&AP's were encouraged for the scoping phase. The purpose of these meetings for the Scoping Phase would have been to introduce the project and to get the potential Interested and Affected parties to register, as well as raise any concerns or issues that the I&APS may have with regards to the proposed 2 Seam mine amendment project. No online meetings were requested.

A public meeting will be held for the EIA phase of the project.

8.2.5 SUMMARY OF ISSUES RAISED BY I&APS FROM PUBLIC PARTICIPATION

All issues raised and / or comments received to date have been included in the Public Participation Report, which is attached in Appendix 4 in this report. Comments received to date from the PPP session during the scoping phase have been included in Table 8.

Summary of issues raised by I&APs

(Complete the table summarising comments and issues raised, and reaction to those responses)

Comments received to date are listed below. Comments received during the public review period to date are included below.

Table 8: Summary of issues raised

Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**		**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
AFFECTED PARTIES					
Landowner/s					
DORSTFONTEIN COAL MINES PTY LTD. and SOUTH32 SA COAL HOLDINGS PTY LTD	X		No comments received to date	All landowners received notification of the amendments withint the Mining Right Boundary of 2 Seam Mine together with a Background Information Document. A contract is in place with the 2 Seam Mine and the landowner.	Section 8 and Appendix 4
Lawful occupier/s of the land					
N/A	X		No land occupiers on the farm		
Landowners or lawful occupiers on adjacent properties					
Municipality					
No comments received to date	X		No comments have been received to date from the municipality	The municipality received notification of the amendments withint the Mining Right Boundary of 2 Seam Mine together with a Background Information Document and a hard copy of the Draft Scoping Report. The draft EIA & EMPr report will also be made available for public review.	Section 8 and Appendix 4
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWS					

Interested and Affected Parties		Date	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
List the names of persons consulted in this column, and		**Comments Received**			
Mark with an X where those who must be consulted were in fact consulted.					
National Road Agency			No comments received to date	All organs of the state received notification of the amendments withint the Mining Right Boundary of 2 Seam Mine together with a Background Information Document.	Section 8 and Appendix 4
Eskom	X		No comments received to date		
Communities					
Community			No comments received to date	Advertisements, site notices and emails were sent out to the public but to date no comments have been received.	Section 8 and Appendix 4
Dept. Land Affairs					
Department of Land Affairs	**X**		No comments received to date	The Department received notification of the amendments withint the Mining Right Boundary of 2 Seam Mine together with a Background Information Document.	Section 8 and Appendix 4
Traditional Leaders					
Refer to Communities					
Dept. Environmental Affairs					
No comment received	**X**		No comments received to date	The DFFE received notification of the amendments withint the Mining Right Boundary of 2 Seam Mine together with a Background Information Document	Section 8 and Appendix 4
Competent Authorities affected					
Department of Mineral Resources and Energy (DMR)	**X**		No comments received to date.	The DFFE received notification of the amendments withint the Mining Right Boundary of 2 Seam Mine together with a Background Information Document.	Section 8 and Appendix 4

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
Department of, Water and Sanitation	X	2 August 2022	MPUMALANGA Private Bag x11259, MBOMBELA, 1200 Prorom Building, Cnr Brown & Paul Kruger Street, MBOMBELA, 1200 Tel: 013 Enquiries: BN Mnguni Telephone: 013 591 8926 Reference: 27/4/2/1/E 2 Seam (Pty) Ltd PO Box 20762 Block 5 Bureau de Paul 9 Corridor Crescent Route N4 Business Park Ben Fleur EMALAHLENI 1030 Attention: Mr. Paul Eskrine 2 SEAM (PTY) LTD DRAFT SCOPING REPORT FOR LISTED ACTIVITIES AS WITH THE PROPOSED WASH PLANT, TAILINGS FACILITY, ADDITIONAL MINING AND RIVER DIVERSION MPUMALANGA PROVINCE (DMRE RE NUMBER: (MP) 30/5/1/2/3/2/1 (405)). Reference is made to the above-mentioned application submitted to the Depart June 2022. The above-mentioned application has been assessed by the Department and the comments are as follows: 1. Page 40, it is mentioned that the existing mine will have to apply for a Water Use Licence for the proposed section 21(a), 21(c), 21(i) and 21(j) water uses in terms of the National Water Act, 1998 (Act No.36 of 1998). The Applicant is advised to refer to the Reguation 267 – regulations regarding the procedural requirements for Water Use Licence Applications and Appeals for guidance on the requirements for water use authorisation application. 2. Stormwater Management: The	Good day Betty, Thank you for the comments from the DWS. A water use licence application will be submitted for the water uses that are triggered by the new activities on site and all DWS requirements will be met. Kind regards Sonja A preapplication phase has been launched on the eWULAAS system for the additional water use activities that are triggered by this project. The water use licence application and the technical document will be undertaken in terms of the requirements of the GNR 267.	Section 8 and Appendix 4

Interested and Affected Parties	Date	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
List the names of persons consulted in this column, and	Comments Received			
Mark with an X where those who must be consulted were in fact consulted.				
		Applicant is advised to refer to best Practice Guidlein G1: Storm Water Management available on www.dws.gov.za 3. The applicant shall ensure that the general and hazardous waste generated on site is separated and disposed of at the permitted waste disposa site in such a manner as not to cause any nuisance conditions or secondary pollution. 4. The applicant shall ensure no stockpilig of any material shall take place within 100m from the watercourse owing to high sedimentation. 5. The Applicant is referred to Section 19(1) of the National Water Act, 1998 (Act No 36 of 1998) and to report any pollution incidents origintaing from the proposed project to the regional office of the Department of Water and Sanitation within 24 hours. 6. The Applicant is advised not to commence with any water use activities before obtaining a Water Use Authorisation. Commencement with water	A stormwater management plan will be compiled and implemented as per the best practice guidelines. All general and hazardous waste will be separated on site and managed in such as manner as not to cause any nuisance condition or secondary pollution. This will also be addressed in the EIAR and EMPR. No coal stockpiling will take place within 100m of the watercourse. All pollution incidents will be reported to the Department of Water and Sanitation as per the requirements. This will also be included in the Integrated Water and Waste Management Plan and the EIAR and EMPR. Any water uses not authorised under the existing water use licences will not commence until the time that an authorisation is in place.	

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
		uses activities without authorisation is the contraventio of section 19, 12, 22 and 53 of the National Water Act, 1998 (Act No 36 of 1998). Should you have further queries, please do not hesitate to contact Ms. Bn Mnguni on Cell Number 060 9989210, email address mngunib@dws.gov.za. Yours faithfully, Guma PROVINCIAL HEAD: MPUMALANGA DATE: 02/08/2022		
OTHER AFFECTED PARTIES				
SAHRIS	14 July 2022	Enquiries: Natasha Higgitt Date: Thursday July 14, 2022 Tel: 021 462 4502 Email: nhiggitt@sahra.org.za Page No: 1 CaseID: 18879 **Interim Comment** **In terms of Section 38(3), 38(8) of the National Heritage Resources Act (Act 25 of 1999)** Attention: 2 Seam (Pty) Ltd. **The 2 Seam Mine is an existing opencast coal mine. 2 Seam (Pty) Ltd. is in the process of applying, interms of the Mineral and Petroleum Resources Development Act 2002 (MPRDA) (Act No. 28 of 2002), and the Environmental Impact Assessment Regulations (Listing Notice 1, 2 and 3, 2014 published in Government Notice**	A Heritage Impact Assessment as well as a Paleontological Assessment will be undertaken for the EIA phase of the project. The results of these studies will be included in the EIAr and EMPr.	Section 8 and Appendix 4

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
		(GN) No. 983, 984 and 985 of 4 December 2014 and amended in June 2021) under the National Environmental Management Act (Act No. 107 of 1998), and the National Environmental Waste Management Act (Act 56 0f 2008) for an Environmental Authorisation and Waste Management **Licence, to include a washing plant, tailings facility, associated stormwater management infrastructure, a contractor's yard and an opencast coal pit within the approved mining right boundary over portions 6, 29, 31, and 50 of the Farm Vlaklaagte 45 IS and portion RE of the Farm Lourens 472 IS.** **A Section 102 application in terms of the MPRDA (2002, as amended), will be submitted to the Department of Mineral Resources and Energy (DMRE) for the amendments to the Environmental Management Programme.** Elemental Sustainability has been appointed by 2 Seam (Pty) Ltd to undertake an Environmental Authorisation Application for proposed mining related activities within an existing open-cast coal mine on portions 6, 29, 31, and 50 of the Farm Vlaklaagte 45 IS and portion RE of the Farm Lourens 472 IS, near Kriel, Mpumalanga Province (MP 30/5/1/2/3/2/1 (405)).		

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
		A Draft Scoping Report (DSR) has been submitted in terms of the National Environmental Management Act, 1998 (NEMA) and the EIA Regulations for activities that trigger the Mineral and Petroleum Resources Development Act, 2002 (MPRDA)(As amended). The proposed activities include additional access/haul roads, wash plant, additional opencast mining, stormwater management facilities, pipelines, powerlines, tailings facility, pollution control dams, contractors yard and a river diversion. The life of mine will be extend by five years. It is noted that an existing Heritage Impact Assessment will be updated for the proposed project which will include a palaeontological component. **Interim Comment** The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit requests that the pending assessment of the impact to heritage resources comply with section 38(3) of the NHRA as required by section 38(8) of the NHRA. The HIA must include an archaeological and palaeontological component. The archaeological component of the HIA must be conducted by a qualified archaeologist and must comply with the SAHRA 2007 Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment		

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
		Reports (see www.asapa.co.za or www.aphp.org.za for a list of qualified archaeologists). The proposed development is located within an area of moderate and very high Palaeontological Sensitivity as per the SAHRIS Paleo Sensitivity map. As such, a field-based Palaeontological Impact Assessment (PIA) must be undertaken by a qualified palaeontologist. (See https://www.palaeosa.org/heritage-practitioners.html for a list of qualified palaeontologists). The report must comply with the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. Any other heritage resources as defined in section 3 of the NHRA that may be impacted, such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or viewscapes must also be assessed. Further comments will be issued upon receipt of the above requested reports and draft EIA inclusive of appendices. Should you have any further queries, please contact the designated official using the case number quoted above in the case header. Yours faithfully		

Interested and Affected Parties **List the names of persons consulted in this column, and** **Mark with an X where those who must be consulted were in fact consulted.**	**Date** **Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
MTPA	X	**Ref:** LUA 22/ 3069 **Unit:** LUA/SS **Enquiries:** F.N. Krige **E-mail:** frans@mtpa.co.za **Tel/Fax:** 013 - 2540279 Me Sonja van de Giessen **Elemental Sustainability (PTY) Ltd** Tel: 083 388 4633 Email: sonja@elemental-s.co.za Dear Me. Van de Giessen, **THE MTPA COMMENTS REGARDING THE DRAFT SCOPING REPORT FOR EA FOR PROPOSED 2 SEAM MINE PROJECT IN TERMS OF SECTION 40 OF THE MPRDA ACT 2002, (28 OF 2002) AND CHAPTER 3 SECTION 7 OF NEMA, APPLICATION BY 2 SEAM (PTY) LT RESPECT OF VARIOUS PORTIONS OF THE FARMS VLAKLAAGTE 45 IS AND PORTION RE LOURENS 472 IS, SITUATED WITHIN THE NKANGALA DISTRICT, WITBANK, MPUMALAN PROVINCE. MP 30/5/1/2/3/2/1 (405 MR).** With reference to your corresopndence: 2 Seam of date June, herewith the MTPA comments. MTPA has no objection to this application beacause the area lies within an approved mining right area. However, the MTPA is concerned about 1. A thorough rehabilitation plan designed to prevent AMD entering the natural system as well as the prevention of re-colonization by exotic vegegtaion should be implemented. 2. The post mining land use of the discard dump and coal stockpile areas with regards to the fertility (bioremidation	Good day Phumla, Thank you for the comments from the MTPA. Kind regards A water use licence application process will be undertaken, which will include the investigation of active water purification systems and AMD management, as well as the compilation of a storm water management plan to prevent pollution of the environment. Furthermore, a hyrdogeological impact assessment will be undertaken to address underground pollution plumes. The mine currently implements groundwater monitoring, which will be utilised to update the groundwater model to provide further management measures on site to address AMD. The prevention of exotic vegetation re-coloization will be addressed in the EIAR and EMPR A rehabilitation and closure costing report will be included in the EIAR and EMPr.	Section 8 and Appendix 4

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
		techniques of the soil and the prevention control methods of the possible recruitment exotic plants must be described in the EMPR. 3. An active water purification system must be investigated and must address the possible pollution through AMD decanting during and after the decommissioning phases, underground pollution plume, storm water pollution from discard dumps, overflow from pollution control facilities and leachates. Clean water must be provided back into the natural system. 4. The biophysical studies to be done include: a) Ecological study – terrestrial fauna and flora and wetland health. b) Accumulative effect of the surrounding mining actions and coperative mitigiation actions to remediate damage. c) Cost benefit analysis. Please do not hesitate to contact this	The mine will also apply for a Water Use Lience interms of the NWA (1998) which will address AMD, storm water management and water management on site. Various specialists studies will be undertaken for the EIA phase of the project, including: • Agricultural Impact Assessment • Heritage Impact Assessment • Paleontological Desktop Assessment • Terrestrial Ecological Impact Assessment; • Wetland Impact Assessment • Hydrogeological Assessment • Hydropedological Assessment • Updated Waste Classification; and • Updated Closure Costing. Cummulative impacts will be assessed and included in the EIA phase of the project together with the mitigation measures.	

Interested and Affected Parties	**Date**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
List the names of persons consulted in this column, and	**Comments Received**			
Mark with an X where those who must be consulted were in fact consulted.				
		office if there are any enquires. Kind Regards, MR MH VILAKAZI ACTING CHIEF EXECUTIVE OFFICER DATE: 29 / 07 / 2022	Due to the nature of the project and the fact that the land use within the mining right boundary has already changed due to historic and current mining activities, a cost benefit analysis will not be undertaken.	
SANRAL	X	Good day Due to limit working hours, working from home & limited internet access, I won't be able to download the attachments. Please send it via post to 38 Ida street, Menlo Park, Pretoria, 0081, to SANRAL's offices. Kind regards Ria	Good day Ria, Elemental will submit a copy to the Sanral office. Kind regards ***Sonja***	Section 8 and Appendix 4
OTHER:				

8.2.5 WAY FORWARD

All comments received from I&APs and organs of state and responses will be addressed in a transparent manner and included in the Public Participation Report (Appendix 4), in the final Environmental Impact Assessment Report to be submitted to the Competent Authority (CA). Any additional comments received after submission will be forwarded to the DMRE (if received after commenting period).

8.2.6 DMRE REVIEW OF ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGENT REPORT – FINALISED REPORT

The Department of Mineral Resources and Energy will decide whether the Environmental Authorisation will be approved or rejected based on the contents of the final report submitted.

9 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT FOOTPRINT ALTERNATIVES

(The environmental attributed described must include socio- economic, social, heritage, cultural, geographical, physical and biological aspects)

The mining right land is mostly under mining activities. There are small portions that are vacant and used for farming. Approximately 1,2 hectares is planted to summer grains. Small portions of the mining right area are utilised for grazing. The Olifants River borders the north north-western section of the mining right boundary. Various wetlands also occur within the mining right boundary.

10 THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITES: BASELINE ENVIRONMENT

(Its current geographical, physical, biological, socio- economic and cultural character)

This section of the EIA Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area, as well as specialist reports undertaken for the 2 Seam Mine Plant and River Diversion project.

10.1 GEOLOGY

10.1.1 REGIONAL GEOLOGY

All the known coal deposits in South Africa are hosted in sedimentary rocks of the Karoo Basin, a large foreland basin which developed on the Kaapvaal Craton and filled between the Late Carboniferous and Middle Jurassic periods. The Karoo Supergroup is lithostratigraphically subdivided into the Dwyka, Ecca and Beaufort groups and succeeded by the Molteno, Elliot, Clarens, and Drakensburg formations. The coal ranges in age from early Permian (Ecca Group) through to Late Triassic (Molteno Formation) and is predominantly bituminous to anthracitic in rank, which is classified in terms of metamorphism under influence of temperature and pressure.

Nineteen coalfields have been defined within the Karoo Basin, based on variations in sedimentation, origin, formation, distribution and coal quality. These variations are in turn related to specific conditions of deposition and the local tectonic history of each area.

Sediments of the Dwyka Group and the coal-bearing Ecca Group developed on an undulating pre-Karoo erosion surface. The undulating nature of this surface has had a large influence on the thickness and depth of the deposited coals seams. Post-Karoo erosion removed large parts of the stratigraphic column including substantial volumes of coal along the northern margin of the coalfield, exposing pre-Karoo rocks along the northern and western boundaries of the coalfield.

The coal seams are usually separated by coarse to fine-grained sandstone, siltstone and/or shale at the top. Glauconitic sandstones, indicative of transgressive marine periods, are present above the No.4 and No.5 Seams. The coal zone is overlain by another deltaic sequence, which consists of sandstone and sandy micaceous shale and siltstone with varying thickness (approximately 60 to 100m thick).

The Karoo sediments are practically undisturbed and geological structures (e.g. faults, shears, associated fracturing) are rare. However, fractures are common in rocks such as sandstone and coal. Dolerite intrusions, in the form of sills or dykes cause in some locations various mining problems (i.e. devolatised coal, weakened roof strata and/or displaced coal seams), where near vertical dykes have very little displacement associated transgression through the seam.

Sill transgressions, on the other hand, generally results in displacement of the coal seams and strata. The magnitude of these displacement being dependent on a number of factors, including sill thickness and presence / orientation of pre-existing zones of weakness. These intrusions introduce local structural complexity by displacing seams relative to one another and isolating blocks of coal. Figure 14 presents the geology of the regional study area.

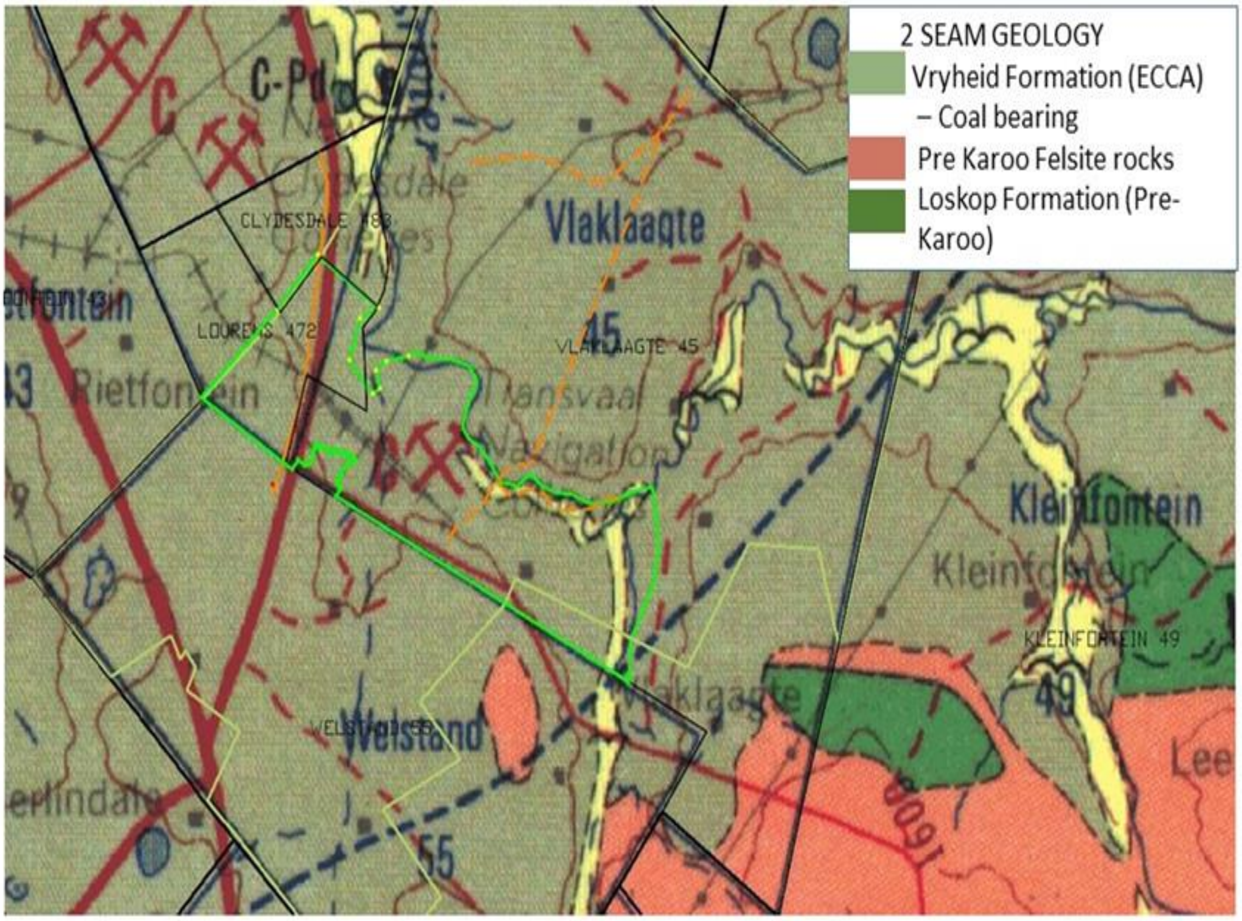

Figure 14: Regional geology

10.1.2 LOCAL GEOLOGY

The 2 Seam Mine falls within the Springs-Witbank Coalfield, comprising sediments of the Dwyka Group and the central lithostratigraphic coal-bearing unit of the Ecca Group, namely the Vryheid Formation. Together they represent part of the Karoo Supergroup, which were deposited on an undulating pre-Karoo floor comprising primarily felsites of the Bushveld Complex and other ancient strata such as the Waterberg Group and Transvaal Supergroup sedimentary rocks. These strata had a significant influence on the nature, distribution and thickness of many of the Karoo Supergroup sedimentary formations, including the coal seams.

The sequence typically comprises, from the base upwards a diamictite of probable glacial origin, pro-glacial varved siltstone and pebbly mudstone, and paraglacial gravel and conglomerate, overlain by swamp, fluviodeltaic and shoreline deposits. The five classically recognized coal seams of the Witbank Coalfield, numbered from the base up as numbers 1, 2, 3, 4 and 5 respectively, occur in strata comprised of sandstone with subordinate mudstone, siltstone and shale, and are typically contained within a 70m succession.

Gluaconitic sandstones, which form distinctive markers, occur above the Seam-4A and Seam-5. Strata overlying the Seam-5 are mainly arenaceous. The surface geology for the study area is presented in

Coal seam topography and distribution are commonly controlled by pre-Karoo topography, with surface topography limiting the distribution of the Seam-3, Seam-4 and Seam-5 seams. Parting thicknesses between seams remain remarkably constant. Steeper dips are encountered where seams abut against pre-Karoo hills. Seam thicknesses increase towards the deeper parts of depositional valleys and decreases towards the ridges. The Seam-1 is not always developed, or may be unrecognisable when followed directly by the Seam-2.Except for the central portion, virtually the whole Springs-Witbank Coalfield has been intruded by dolerite dykes and sills. The sills often transgress and lift the coal seams and have degraded large quantities of coal.

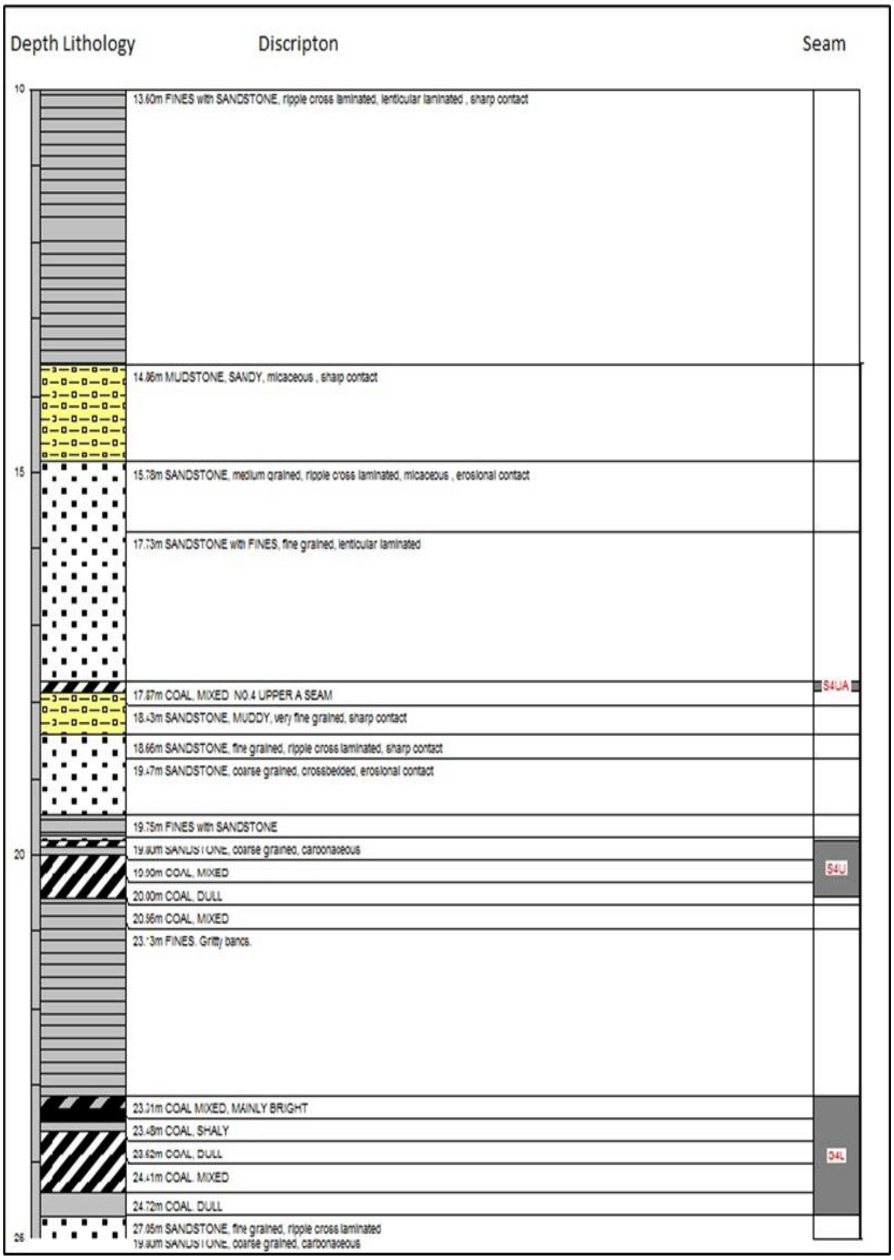

Figure 15: Generalised Stratigraphic Column

10.2 TOPOGRAPHY

The topography across the project site is slightly undulating with the general gradient forming (3° to 10°) towards the north-northeast where the Olifants River borders the site. Surface elevation ranges between ~1,530 m above Mean Sea Level (mamsl) and ~1,560 mamsl with some old, flooded, opencast mine workings and rehabilitated waste rock dumps superimposed on the relief. Wetlands have formed in some of the flooded opencasts and vary from small scale vegetated depressions to large deeply etched features.

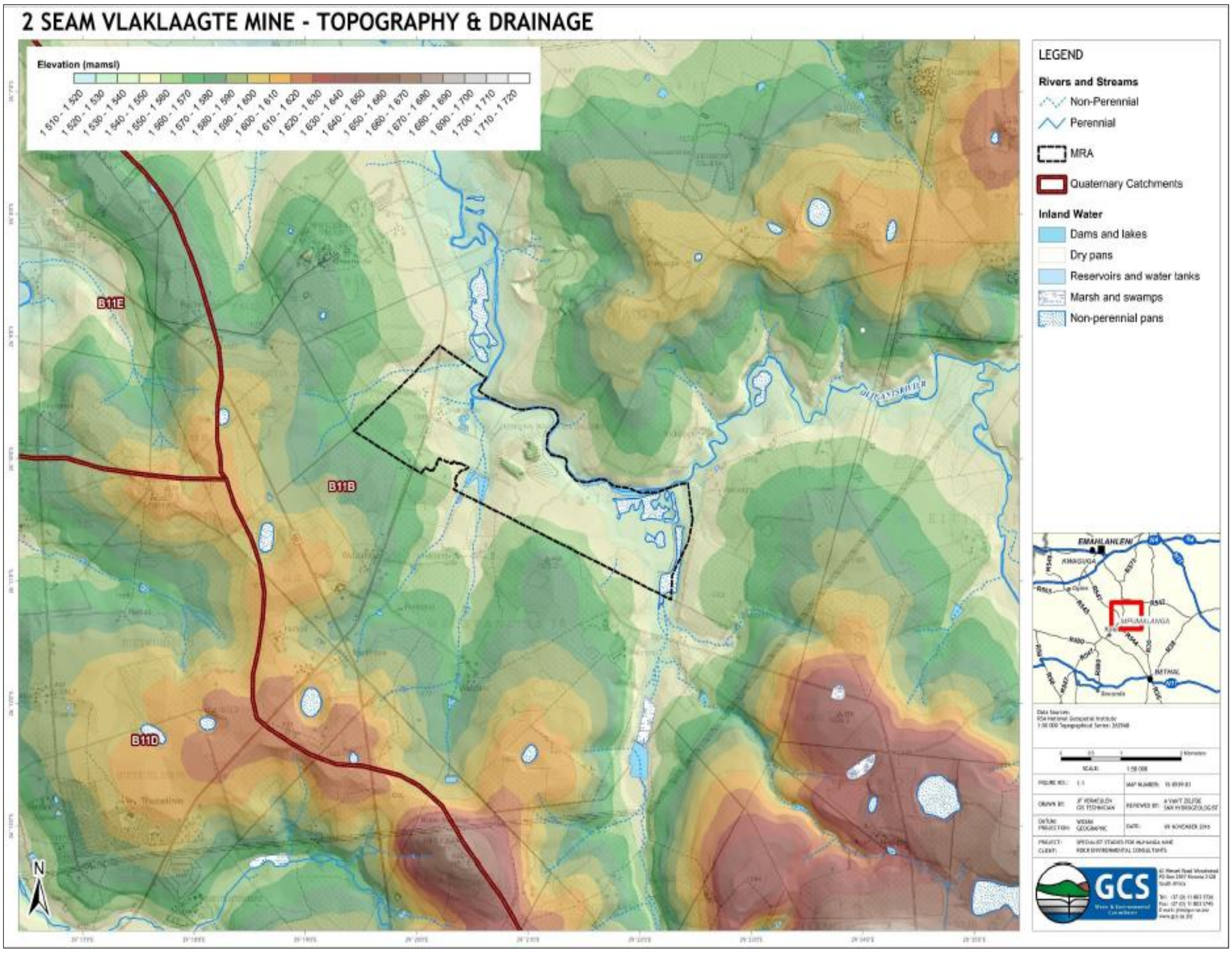

Figure 16: Topography of the 2 Seam Mine

10.3 CLIMATE

The project area is situated in the summer rainfall region of southern Africa. The climate is temperate with hot summers and dry cold winters. Summer precipitation occurs in the form of mist, drizzle, hail and thunderstorms.

10.2.1 TEMPERATURE

At Bethal, the mean daily maximum exceeds 24°C between November and March, the hottest months. Average daily maximum temperatures in the winter months (May-August) range from 16.5°C to 19.9°C. The mean minimum summer temperatures range from 11.8°C (November and March) to 13.8°C (January) with winter mean minima ranging from 0.8°C to 4.4°C. Refer to Table 9 for maximum and minimum temperatures. for maximum and minimum temperatures.

Table 9: Mean monthly temperature

Month	Average daily maximum temperature (ºC)	Average daily minimum temperature (ºC)	Mean daily temperature (ºC)
Jan	25.6	13.8	19.7
Feb	25.2	13.2	19.2
March	24.6	11.8	18.2
Apr	21.8	8.6	15.1
May	19.5	4.4	11.9
Jun	16.5	0.8	8.7
Jul	17.1	1.0	9.0
Aug	19.9	3.8	11.9
Sept	23.2	7.5	15.3
Oct	23.9	9.9	17.0
Nov	24	11.8	17.9
Dec	25.3	13.1	19.2

10.2.2 PRECIPITATION AND EVAPORATION

Thunderstorms occur often during the summer (rainy season), usually accompanied by lightning, heavy rain, strong winds and occasionally hail. Storms are localized and rainfall can vary markedly over short distances. Rainfall for the site is based on 90 years of record obtained from the Water Resources of South Africa Report 2012 (WR2012) (WRC, 2015). The WR2012 historical records indicate a long-term average rainfall rate of approximately 688 mm per annum (see Figure 8). The month with the highest average values is that of January (117mm), with the lowest month being July (7mm). Evaporation data used for this site is based on the 1 541 mm per annum S-Pan evaporation and Evaporation Zone 4A (WRC, 2015). Evaporation is likely to be distributed as presented in Figure 8.

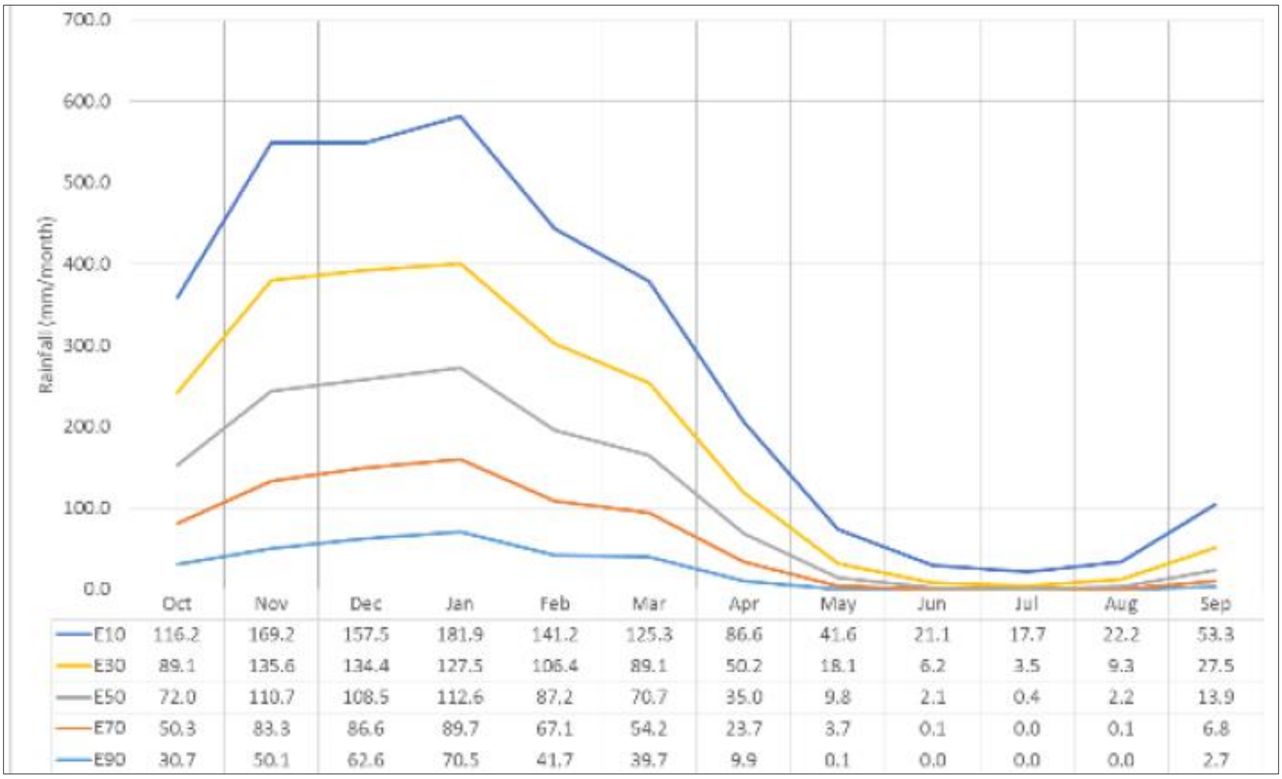

Figure 8: Monthly rainfall distribution at the 2 Seam Pty Ltd Mine (GCS, 2020)

10.2.3 MEAN MONTHLY WIND DIRECTION AND SPEED

The prevailing wind direction at Bethal throughout the year is from the north-west. The storm winds, however, usually blow from the south-east, with the strongest winds in the late winter and early spring.

Average wind speeds have not been recorded greater than 5.7 m/s with only about 8% to 12% of the monthly average frequency exceeding the 3.4 - 5.4 speed intervals. This increases to 15 - 25% during spring and early summer (August to December). Refer to Table 10.

Table 10: Mean monthly wind direction and speed

Month	N		NE		E		SE		S		SW		W		NW	
	n	v	n	v	n	v	n	v	n	v	n	v	n	v	n	v
Jan	67	4.3	124	4.0	119	4.5	92	5.1	40	4.6	47	4.3	45	3.8	149	3.8
Feb	48	4.1	108	3.8	139	4.1	135	4.9	61	4.5	48	3.9	41	3.5	91	3.7
March	53	3.9	99	3.7	126	3.7	99	4.5	50	4.1	56	4.1	43	3.5	111	3.9
Apr	50	4.0	88	3.5	94	4.0	55	4.2	45	4.3	71	4.4	71	4.5	129	4.0
May	54	4.4	66	3.7	61	3.9	62	4.5	47	4.2	79	4.5	67	4.7	116	4.1
Jun	48	4.1	47	3.7	59	4.1	42	4.8	46	4.7	99	4.5	76	4.3	115	4.3
Jul	43	4.1	66	3.7	64	4.1	62	4.9	54	4.6	84	4.5	57	4.2	121	4.1
Aug	80	4.9	96	4.4	97	4.3	33	5.6	35	4.9	75	4.9	65	4.9	192	4.7
Sept	115	4.8	134	4.8	101	5.0	48	5.7	32	4.1	53	5.1	59	5.0	203	4.8
Oct	115	4.5	139	4.7	116	5.4	58	5.6	41	4.9	54	4.7	47	4.8	223	4.8

Month	N		NE		E		SE		S		SW		W		NW	
	n	v	n	v	n	v	n	v	n	v	n	v	n	v	n	v
Nov	105	4.4	135	4.4	110	5.0	56	5.3	37	4.9	45	4.6	55	4.3	229	4.7
Dec	91	4.2	138	4.1	102	4.8	55	4.9	35	4.5	47	4.9	55	4.2	194	4.2
Average	72	4.4	103	4.1	98	4.4	66	4.9	44	4.5	64	4.5	57	4.4	156	4.4

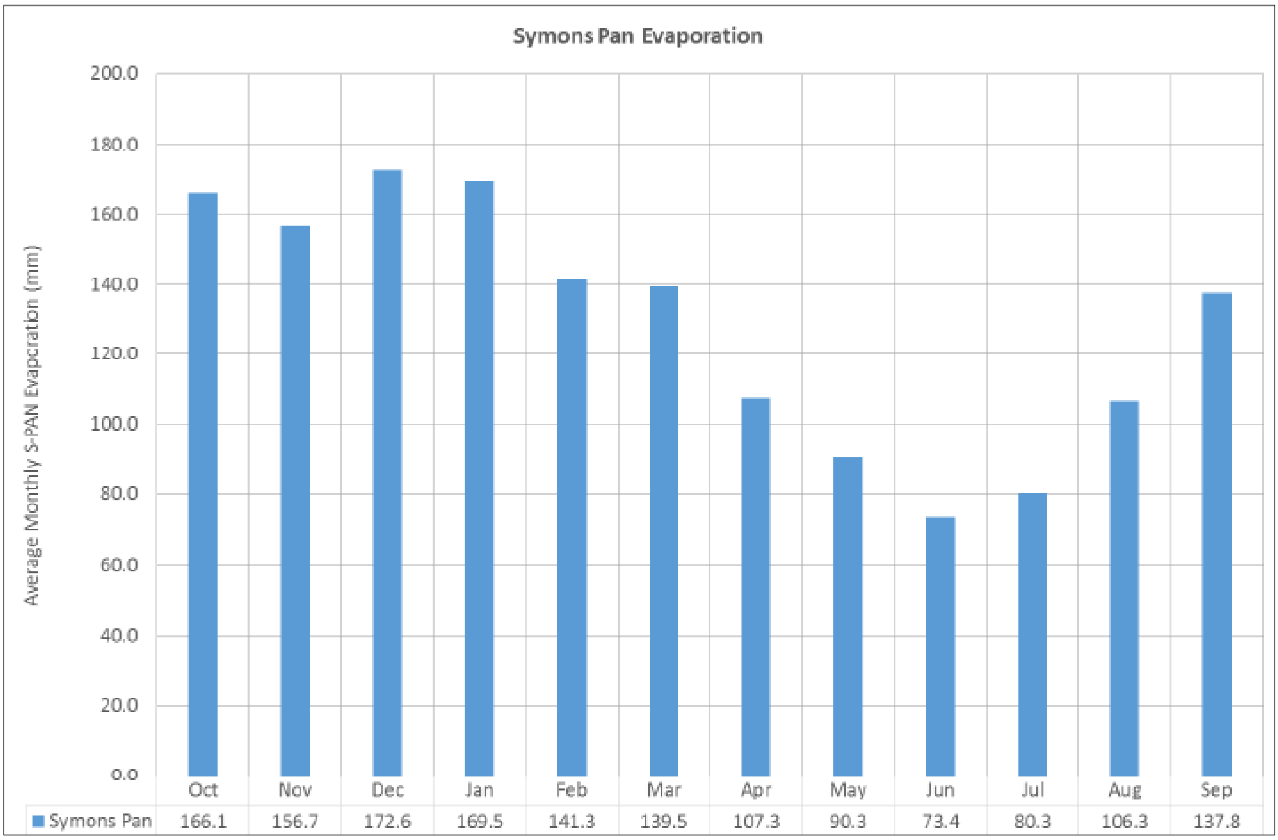

Figure 17: S-Pan Evaporation for 2 Seam Pty Ltd mine (WRC, 2015)

Based on data obtained by Eco Elementum (2019b) from the Witbank Weather Station at the Witbank Dam (closest weather station), the mean annual precipitation is reported as 702.7 mm per annum (refer to Table 11).

Table 11: Summary of Rainfall and S-Pan Evaporation Data (EcoElementum, 2019b)

Month [-]	Mean Annual Precipitation [mm]	Evaporation [mm]
January	131.5	164.5
February	91.8	138.4
March	73.8	129.8
April	39.3	97.4
May	13.4	79.8
June	7	65.3
July	2.9	72.5
August	7.9	98.8
September	20.7	137.3
October	78.3	163.7
November	123.8	158.5
December	116.7	163.6
Mean Annual Total (mm)	702.7	**10.2**

10.4 AGRICULTURE AND LAND CAPABILITY ASSESSMENT

Index (Pty) Ltd. was appointment by Elemental Sustainability to undertake the agricultural impact assessment for the proposed additional activities. A copy of the report is included in Appendix 5.

10.4.1 METHODOLOGY

The specialist assessed the five areas that form part of this application, namely:

- Contractor's yard: 3.5 ha
- Opencast Mine: 11 ha
- Coal Wash Plant: 1.25 ha
- 2 PCDs: 2 ha
- Tailings Facility: 37 ha (no longer part of the application)

The total area assessed was 54 ha.

The current land uses and the environmental sensitivity of the site are available in the screening tool report and were used in assessing the site's sensitivity. The differences between the screening tool and the actual status as found by the site visit on 27 July 2022 are indicated in the below sections.

10.4.2 PRESENT LAND USES

10.4.2.1 SITE LAND USES

The mining right land is mostly under mining activities. There are small portions that are used for farming. Approximately 1,2 hectares is planted to summer grains. Refer to Figure 18 below.

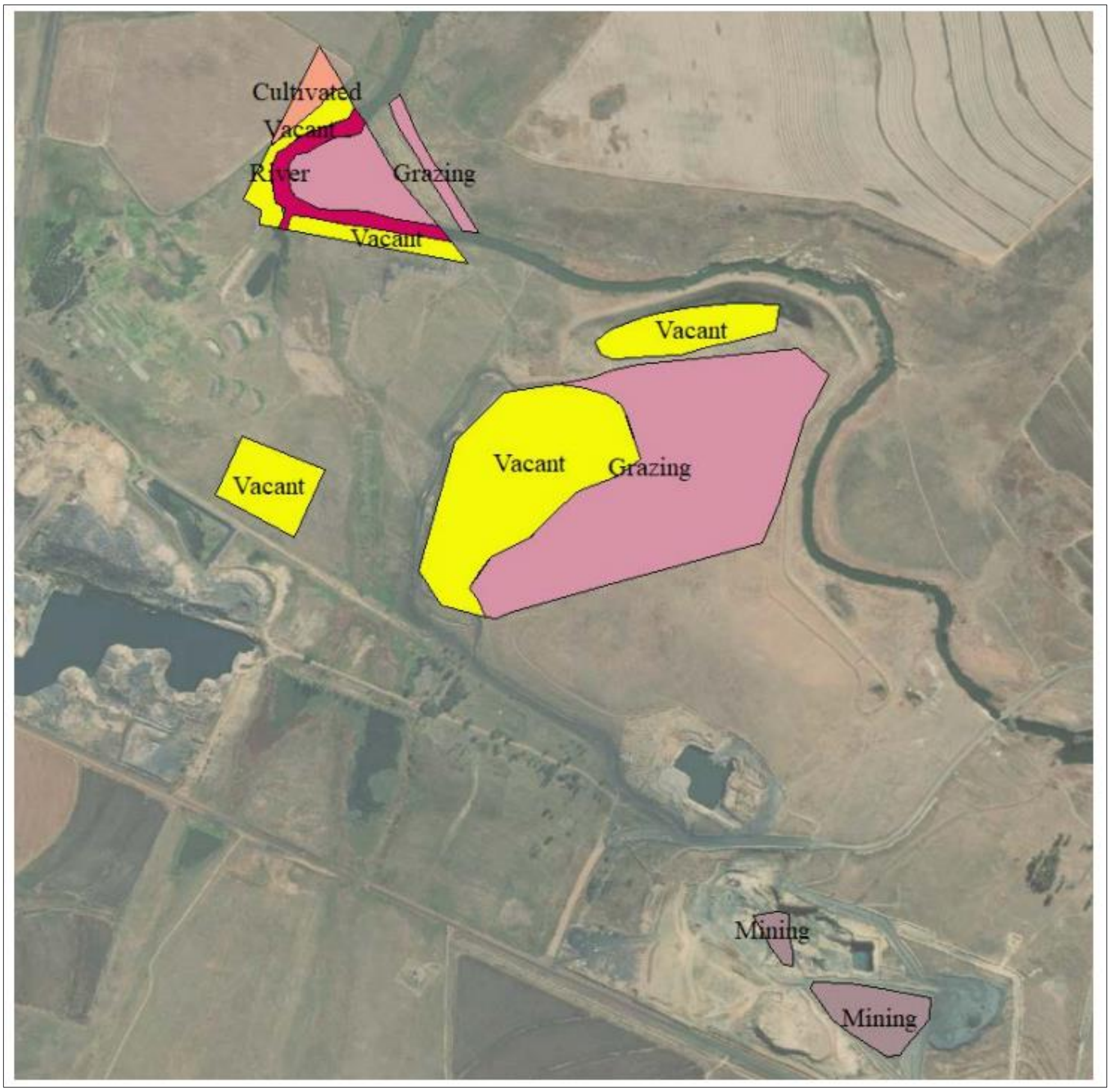

Figure 18: Present Land Uses

10.4.2.2 REGIONAL LAND USES

General uses within 5km of the site include mining, grazing and cultivated land. The regional land uses are indicated in Figure 19. The area in green is mining land, grey is cultivated and that in rose is used as grazing.

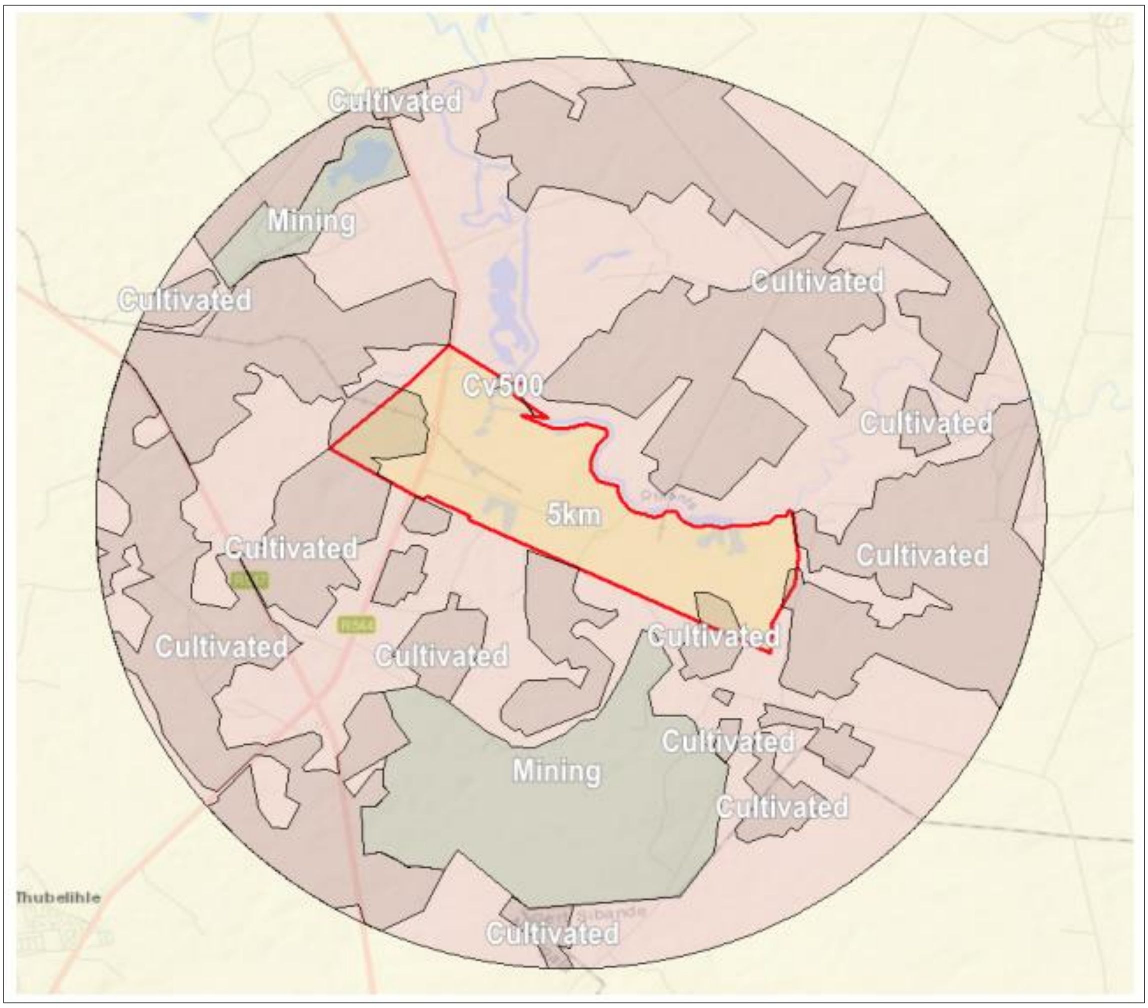

Figure 19: Regional Land Uses

10.4.3 SOIL

The land has been used for mining for some time. The only portion that has not been affected by mining is in the far north-western part of the survey site. This was classified as Clovelly soils. The rest of the surveyed land consists of shallow derelict land and rehabilitated mined land. Refer to Figure 20 and Table 12 below.

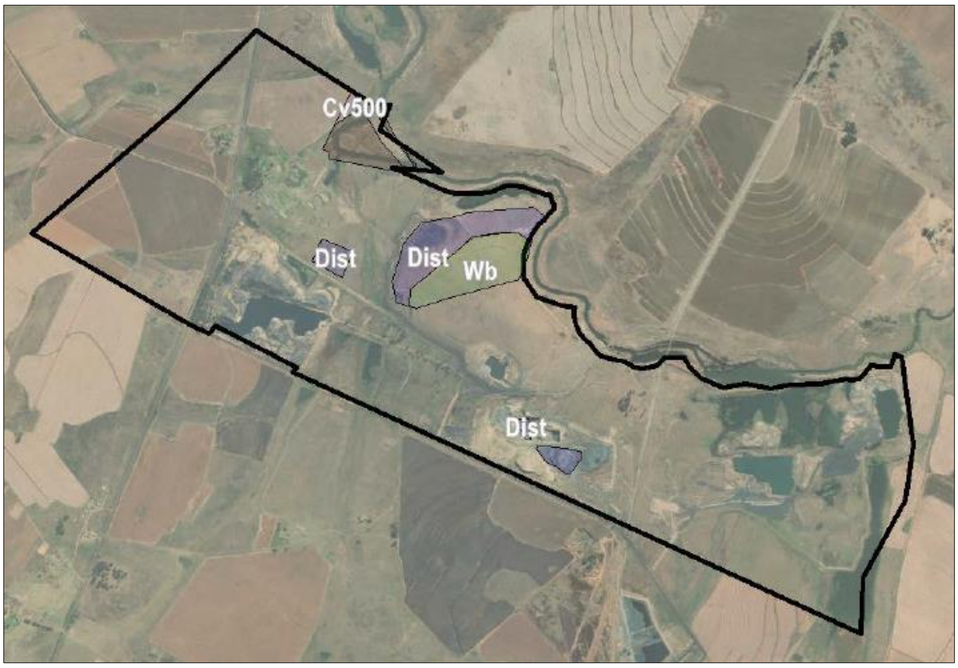

Figure 20: Soil Types on the Development Areas

Table 12: Soil Descriptions

Map unit	Description
Cv800	Sandy soil with a clay content of 18 - 28%. The soil depth that is normally more than 600 mm. The topsoil is light brown with a grain structure. The topsoil is free of stones or nodules. The subsoil is yellowish brown course sandy loam with poorly developed blocky or grain structure. The deeper subsoil can be ferricrete or have hard ferricrete nodules. The dominant soil forms identified are Clovelly and Glencoe.
Wb	Rehabilitated land that is still in process of development. The soil type is Witbank.
Wetland	Moderately deep and shallow black and dark grey clay soils and waterlogged areas. These soils have strongly developed expansive properties with prismacutanic structures. The subsoil is gleyed. This soil should not be cultivated but be left as natural grazing.
Dist	This unit is disturbed land where mining is taking place.

10.4.4 VEGETATION

Veld condition is moderate to poor. It is currently in its pioneer state. The veld's grazing capacity is estimated by the Department as 5 ha per LSU. Due to mining activities on site, the land is not considered to be suitable for grazing purposes.

10.4.3 SENSITIVITY ANALYSIS

10.4.3.1 ECOLOGICAL SENSITIVITY– SCREENINGTOOL

According to the screening tool (Figure 21), the site has medium sensitivity. There are isolated pockets within the proposed additional mining area that are indicated as high sensitivity. These have recently been mined and as such, are not sensitive in terms of agriculture.

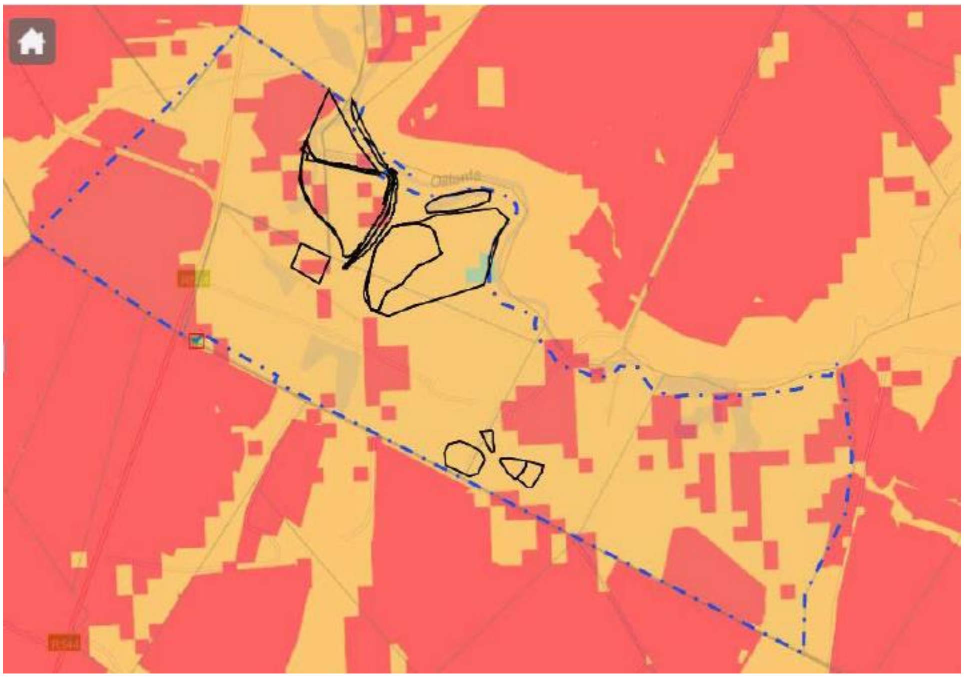

Figure 21: Results of the Screening Tool

10.4.3.2 SPECIALIST SITE ANALYSIS

According to the guidelines of the protocol, for the assessment and minimum report content for EIA impacts on agricultural resources, the following applies:

"A detailed assessment found that the sensitivity is low or medium which is a variation to the findings of the screening tool. Provision 1.1.3 in the Protocol applies, which requires the specialist to submit an *Agricultural Compliance Statement*." This statement is provided in Section 10.4.5.

10.4.4 LAND USE CAPABILITY

The soil on the property is arable but no water is available for irrigation (Department of Agriculture, 2019). Land capability classes are interpretive groupings of land with similar potential and limitations or similar hazards. The classic eight-class land capability system (Klingebiel & Montgomery, 1961) was adapted for use by the South African Department of Agriculture in their Agriculture Geographic Information System (AGIS).

Land capability is classified according to guidelines published by the National Department of Agriculture in AGIS. It is determined by the collective effects of soil, terrain and climate features and shows the most intensive long-term use of land. It indicates the permanent limitations associated with the different land-use classes (Figure 22).

- Order A: Arable land – high potential land with few limitations (Classes i and ii);
- Order B: Arable land – moderate to severe limitations (Classes iii and iv);
- Order C: Grazing and forestry land (Classes v, vi and vii);
- Order D: Land not suitable for agriculture (Class viii).

LAND CAPABILITY				Grazing and Forestry			Crop production			
Order		Class	Wildlife	Forestry	Veld	Pastures	Limited	Moderate	Intensive	Very intensive
Arable	A	i								
		ii								
	B	iii								
		iv								
Non arable	C	v								
		vi								
		vii								
	D	viii								

Note: the shaded area indicates the suitable land use.

Figure 22: Land Capability Classes –Intensity of Land Uses

The following was found for the sites within the 2 Seam Mine:

- Medium capability cropping land (Class iii) occurs in the northern western portion of the land. The size is approximately 1,2 ha;
- The balance is low capability (Classes iv and lower); and
- The land capability was then used as input to determine agricultural sensitivity.

The screening tool did not consider watercourses, infrastructure, excavations and mines land. Having taken these into consideration makes the site *low sensitive* to farming.

10.4.5 AGRICULTURAL COMPLIANCE STATEMENT

The specialist declaration includes the following in terms of Agricultural Compliance on site:

- The site used to place the infrastructure has *low* or *medium* sensitivity.
- The proposed development will, therefore, have negligible impact on the agricultural production capability;
- Small, isolated pockets will be developed. The only land that is still used for farming purposes is the cultivated land in the north-western part of the site. The size is 1,2 hectares, which is so small that it will not influence the adjacent land;
- The site is not located on any high potential land. The site survey also found that the grazing land is fragmented portions that is and vacant because it falls into the larger mining land. Therefore, no reason can be found not to allow the development. It is our recommendation that the project be approved for implemented;
- There are no conditions to which the statement is subjected; and
- No gaps in knowledge or data were found that would influence the findings or recommendations.

10.5 ECOLOGICAL BIODIVERSITY

An Ecological Biodiversity Assessment was undertaken by Enviridi Environmental Consultants (Pty) Ltd. A copy of the report is included in Appendix 6.

10.5.1 METHODOLOGY

A desktop assessment was conducted to establish whether any potentially sensitive species/receptors might occur on site. The South African National Biodiversity Institute's online biodiversity tool, ADU (Animal Demography Unit) Virtual Museum was used to query a species list for the Quaternary Degree Square (QDS) within which the study area is situated. Information regarding species of conservation concern was obtained prior to the field investigation.

A field investigation has been undertaken on the 3rd of August 2022 to supplement and confirm several findings from the desktop study. This mainly served as a fatal flaw analysis to determine whether any major ecological concerns exist with regards to the study area surface infrastructure establishment.

A plotless sampling method was used to record data. Fauna and flora species observed in the study area (development footprint and 100 m extended project area) during the time of the study were recorded and included in the species lists. Plant species identification was done following the checklist of Germishuizen & Meyer (2003).

10.5.2 BIOME

According to the National Vegetation Map (SANBI 2006 – 2018) the project area is in the Grassland biome, which is the second largest biome in South Africa, covering 28.4% of the country. Grasslands are dominated by a single layer of grasses. Trees are absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. The Grassland Biome is considered to have an extremely high biodiversity, with nearly 3800 plant species recorded, second only to the Fynbos Biome.

10.5.3 BROAD VEGETATION DESCRIPTION (VEGETATION MAP 2018)

One vegetation type, according to the National Vegetation Map (SANBI, 2006 – 2018), occurs in the project area, namely Eastern Highveld Grassland (Gm12) (Figure 23).

The Eastern Highveld Grassland vegetation type is located in the Mpumalanga and Gauteng Provinces. The vegetation type is distributed on lightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Senegalia caffra*, *Celtis africana*, *Diospyros lycioides* subsp. *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Searsia magalismontanum*).

Figure 23: Vegetation Group within the 2 Seam Mine

10.5.4 VEGETATION CONSERVATION STATUS

The National List of Ecosystems that are threatened and in need of protection (GN1002 of 2011), published under NEMBA (Section 3.1.1), lists national vegetation types that are afforded protection on the basis of rates of transformation. Eastern Highveld Grassland is shown as Vulnerable and in the "National List of Ecosystems that are Threatened and need of protection", which is also reflected by the 2018 National Biodiversity Assessment.

10.5.5 SITE SURVEY RESULTS

A site survey was undertaken on the 2nd of August 2022. The surface topography of the project area is slightly undulating. The Olifants River flows along the northern border of the Mining Right area. Current and historical opencast mine workings and rehabilitated waste rock dumps affect the project site relief.

10.5.5.1 FLORAL ASSESSMENT RESULTS

The state of the vegetation of the proposed project area varies from being moderately impacted to completely transformed. The following broad classification of Vegetation Units (VU) (Figure 24) were found to occur on the proposed project footprint and 100 m extended project area:

1. Impacted grassland (VU1);

2. Transformed land (VU2); and
3. Riparian and wetland (VU3).

Figure 24: Vegetation Units Delineated

Vegetation Unit 1 (VU1)

Vegetation Unit 1 (VU1) is associated with grassland habitat and is 73 ha in extent. The grassland habitat is heavily modified by large-scale edge effects from mining activities, crop farming and grazing, which has resulted in an altered grassland habitat. Some areas of VU1 are likely to be old lands previously used for crop cultivation. 47.7 ha of VU1 is located on a rehabilitated waste rock dump (VU1a). VU1 is also impacted by exotic plant proliferation.

Most of VU1 has patches of wetland associated flora which is likely due to water runoff from roads and mining areas that has created moist conditions for obligate and facultative wetland species, such as *Cyperus denudatus* (Winged sedge), *Gomphocarpus rivularis, Helichrysum mundtii* (Strooiblom), *Imperata cylindrica* (Cottonwool grass) and *Scirpoides burkei* (Biesie).

Fourty-six (46) plant species were identified in VU1, of which 23 were grass species. The VU is dominated by grass species, with few trees and shrubs and low forb diversity. The dominant grass species include: *Cynodon dactylon* (Couch grass), *Eragrostis chloromelas* (Curly leaf), *E. curvula* (Weeping love grass), *E. rigidior* (Curly leaf), *E. trichophora* (Hairy love grass) and *Imperata cylindrica* (Cottonwool grass).

Eight exotic species were identified to occur within VU1, especially along road verges and moist grassland patches, of these eight species, three are classified as Alien and Invasive Plant (AIP) species in terms of the NEMBA, i.e. *Datura ferox* (Large thorn apple), *Solanum sisymbriifolium* (Dense-thorned bitter apple) and *Verbena bonariensis* (Purple top).

VU1 is considered to be heavily to moderately disturbed and the plant species composition of this VU is no longer considered representative of the Eastern Highveld Grassland vegetation type.

VU1 is located in areas categorised in the MBSP as Transformed and Other Natural Areas. However, some of the areas categorised as ONA, would be more accurately designated as Modified, due to existing mining activities and crop cultivation.

Vegetation Unit 2 (VU2)

Vegetation Unit 2 occurs on the areas which have been totally transformed, i.e. current mining and associated activities and crop cultivation. This habitat is considered to have very low ecosystem service provision capabilities. 56 ha of the mining footprint and 100 m extended project area is located in VU2.

The vegetation unit is classified as having a low sensitivity due to the transformed state of the vegetation composition of the vegetation unit or lack of vegetation.

Vegetation Unit 3 (VU3)

VU3 is characterised by riparian and wetland vegetation associated with artificial impoundments, watercourses and the Olifants River. Twenty-three (23) ha of the project footprint and 100 m extended project buffer is located in VU3. It should be noted that VU3 is delineated only on the presence of obligate and facultative flora species. VU3 is moderately to heavily modified by large-scale edge effects from mining activities, crop farming and grazing, which has resulted in an altered habitat. The VU was found to be highly fragmented by adjacent transformed vegetation and infrastructure. Vegetative cover in VU3 was found to be good with moderate species diversity.

Twenty-three (23) flora species were identified in VU3, most of which are obligate and facultative wetland species, such as *Cyperus articulatus* (Jointed flatsedge), *Cyperus fastigiatus*, *Gomphostigma virgatum* (River star), *Helichrysum mundtii* (Strooiblom), Imperata cylindrica (Cottonwool grass), Juncus articulatus, Phragmites australis (Common reed), *Pycreus polystachyos* and *Typha capensis* (Bulrush).

Six exotic species were identified to occur in within VU3, of these six species, three are classified as Alien and Invasive Plant (AIP) species in terms of the NEMBA, i.e. *Verbena bonariensis* (Purple top), *Cirsium vulgare* (Spear thistle) and *Datura stramonium* (Common thorn apple).

VU3 is located in areas categorised in the MBSP as Transformed and Other Natural Areas. However, some of the areas categorised as ONA, would be more accurately designated as Modified, due to existing mining activities and crop cultivation.

Although this VU is considered to be moderately to heavily disturbed, watercourses and wetlands are considered high sensitivity and are capable of providing suitable habitat for wetland species and flora SCC. No SCC were identified to occur on the project footprint during the site survey. However, two flora SCC are considered to be moderately likely to occur on the project footprint, specifically in the riparian and wetland habitats.

10.5.5.2 FAUNAL ASSESSMENT RESULTS

Species were recorded as sighted, and occurrence verified based on signs and dung. The areas surveyed focussed mainly on the areas where surface impacts would occur, specifically the opencast, TSF and river diversion footprints and the sensitive ecological features identified during the desktop and based on arial footage.

Large sections of the area proposed is currently subjected to agricultural practices. The site proposed for OC6, OC6A and OC4B are all currently transformed habitat utilised as agricultural lands. Scattered wetlands have been noted. Natural habitat has been severely impacted within this footprint; however, a pristine natural area is found adjacent, across the fence. OC5 and OC4 footprints showed some mining disturbances which will be extended to include these proposed footprints completely and the river diversion will be implemented to continue mining across the banks of the Olifants River.

Thirty-seven (37) species were sighted and one (1) national SCC species confirmed within the footprints. Mammals protected or regulated under MNCA have been found to occur as well, and these species should not be interfered with, nor relocated. Generally, the area was found to be visibly impacted, with predominant mining and agricultural activities prevalent in the surrounding area. Remaining natural footprint areas were mostly still fenced off from the current mining activities and once the project implementation begins, it could impact on sensitive habitat such as the various wetlands found to scattered over the landscape.

Table 13: Species observed within and around the Project Area

Family	Species	Common Name	Sighting/Finding	Status and IUCN
Invertebrates				
Termitidae	*Termitaria species*	Mound building termites	Mounds	Least Concern
Pyrgomorphidae	*Dictophorus spumans*	Koppie Foam Grasshopper	Sightings	Least Concern
Pyrgomorphidae	*Zonocerus elegans*	Elegant Grasshopper	Sightings	Least Concern
Agelenidae	*Species unknown*	Funnel-web spiders	Sightings	Least Concern
Sparassidae	*Pseudomicrommata longipes*	Grass huntsman/ groot-dwaal krap spinnekop	Sightings	Least Concern
Danainae	*Amauris niavius*	Friar	Sightings	Least Concern
Pieridae	*Eurema brigitta*	Broad-Bordered Grass Yellow	Sighting	Least Concern
Butterflies				
Noctuidae	*Grammodes exclusiva*	Black and White Lines	Sighting – previously sighted	Least Concern
Nymphalidae	*Danaus chrysippus*	African Monarch	Sightings - General	Least Concern
Mammals				
Hystricidae	*Hystrix africaeaustralis*	Porcupine	Droppings and quills – Den found on the bank of pan	Least Concern
Herpestidae	*Atilax paludinosus*	Water Mongoose	Droppings	Least Concern MNCA Schedule 5
Herpestidae	*Cynictis penicillata*	Yellow Mongoose	Sighted	Least Concern MNCA Schedule 5
Canidae	*Canis mesomelas*	Jackal, Black-backed	Droppings	Least Concern

Family	Species	Common Name	Sighting/Finding	Status and IUCN
				MNCA Schedule 8 (Problem animals)
Pedetidae	*Pedetes capensis*	Spring hare	Droppings	Least Concern MNCA Schedule 5
Viverridae	*Genetta tigrina*	Large-spotted Genet	Droppings and signs	Least Concern MNCA Schedule 5
Bovidae	*Bos taurus*	Cattle	Sightings and Dung	Domestic
Mustelidae	*Anonyx or Hydrictis maculicollis sp.*	Otter	Scat found. Spraints found to occur at Olifants river itself along banks	*Aonyx capensis* Near Threatened (2016) *Hydrictis maculicollis* Vulnerable (2016), ToPs Protected
Avifauna				
Threskiornithidae	*Threskiornis aethiopicus*	Ibis, African Sacred	Sightings	Least Concern, ToPs Protected
Anatidae	*Alopochen aegyptiaca*	Egyptian goose	Sighted	Least Concern
Ardeidae	*Ardea cinerea*	Grey Heron	Sighted	Least Concern
Muscicapidae	*Oenanthe pileata*	Capped Wheatear	Sightings	Least Concern
Charadriidae	*Vanellus armatus*	Lapwing, Blacksmith	Sightings	Least Concern
Laridae	*Larus fuscus*	Lesser Black-backed Gull, presumably *L.f. fuscus*	Sightings	LC (Regional), LC (Global)
Locustellidae	*Bradypterus baboecala*	Little Rush Warbler	Sightings	Least Concern
Order: Strigiformes	*Species unknown since not sighted – presumed to be the Marsh owl*	Owl	Owl pellets, presumed to be Marsh owl	Least Concern
Ploceidae	*Plocepasser mahali*	White-browed sparrow-weaver	Sightings	Least Concern
Ploceidae	*Euplectes orix*	Southern Red Bishop	Sightings in Reed/Riverine Areas	Least Concern
Alaudidae	*Eremopterix leucotis*	Chestnut-backed sparrow-lark	Sightings	Least Concern
Ploceidae	*Euplectes ardens*	Red-Collared Widowbird	Sightings in Grasslands	Least Concern
Viduidae	*Vidua chalybeata*	Village Indigobird	Sightings in Grasslands	Least Concern
Hirundinidae	*Hirundo spilodera*	Cliff-swallow, South African	Sightings	Least Concern
Ploceidae	*Ploceus velatus*	Masked-weaver, Southern	Sightings	Least Concern
Ardeidae	*Bubulcus ibis*	Egret, Cattle	Sightings associated with Cattle	Least Concern
Pycnonotidae	*Pycnonotus barbatus*	Black-eyed Bulbul	Sightings	Least Concern
Numididae	*Numida meleagris*	Guineafowl, Helmeted	Sightings	Least Concern
Upupidae	*Upupa africana*	Hoopoe, African	Sightings	Least Concern
Turnicidae	*Turnix sylvaticus*	Buttonquail	Sightings	Least Concern
Amphibians				
None sighted during field assessment				
Reptilian species				
None sighted during field assessment				

10.5.6 SENSITIVITY DATA

The objective of a sensitivity mapping exercise is to determine the location and extent of all sensitive areas that must be protected from transforming land uses. The site has been found to have medium sensitivity in general based on current condition and impacts already present.

The majority of the proposed project footprint (and extended 100 m project buffer) is located on land transformed for mining activities, with the remainder of the study site located on moderately to highly impacted grassland. The grassland habitat is heavily modified by large-scale edge effects from mining activities, crop farming and grazing, which has resulted in an altered grassland habitat.

No SCC were identified to occur on the project footprint during the site survey. However, two (2) flora SCC were considered to be moderately likely to occur on the project footprint, specifically in the riparian and wetland habitats (VU3).

All footprints considered for the development are considered to be a combination of High-Low sensitivity based on the field assessment findings. The areas chosen are considered appropriate for the development since largest sections of the footprints proposed are located on already disturbed footprints.

The National Web Based Environmental Screening Tool indicated that the project footprint is of moderate and low sensitivity in terms of plant species, very high sensitivity in terms of terrestrial biodiversity and medium sensitivity in terms of animal species.

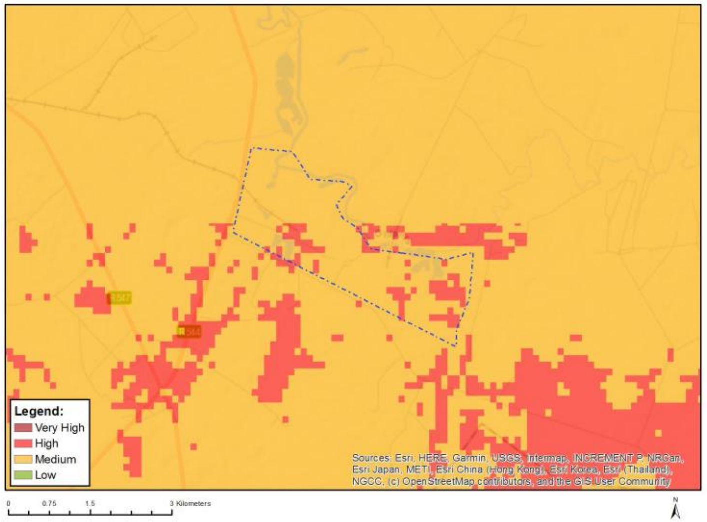

Figure 25: Animal Species Sensitivity – National Screening Tool – Categorised as High Sensitivity

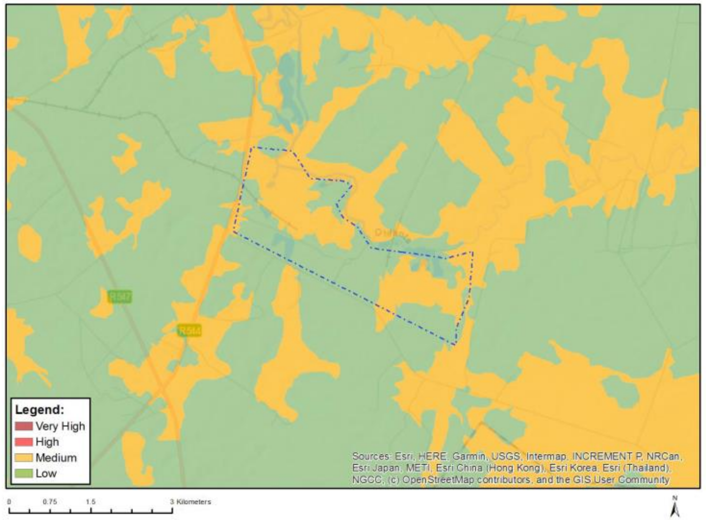

Figure 26: Plant Species Sensitivity – National Screening Tool – Categorised as Medium Sensitivity

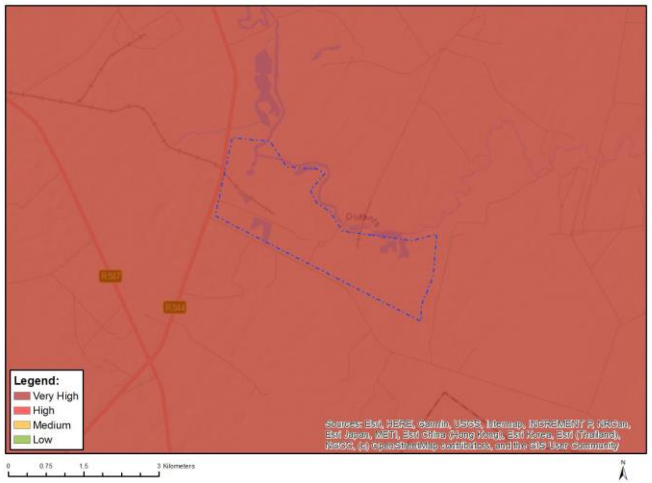

Figure 27: Terrestrial Biodiversity Sensitivity – National Screening Tool – Categorised as Very High Sensitivity

10.5.7 PROJECT AREAS OF INFLUENCE (PAOI)

The following is prescribed to be included in the Sensitivity determinations:

a) Where the nature of the activity is not expected to have an impact on species of conservation concern (SCC) beyond the boundary of the preferred site, the study area means the proposed development footprint within the preferred site.

b) Where the nature of the activity is expected to have an impact on SCC beyond the boundary of the preferred site, the project areas of influence (PAOI) must be determined by the specialist in accordance with Species Environmental Assessment Guideline, and the study area must include the PAOI, as determined.

The site verification in terms of plant, animal and terrestrial biodiversity themes found that the majority of the project footprint is of low sensitivity (VU1 and VU2), with riparian zones rated as high sensitivity (VU3).

The figure below illustrates the sensitivity of the project footprint, based on the findings of the desktop assessment and site survey.

It is important to note that sensitivity buffers as calculated and determined in the Wetland Assessment have not been considered for the Terrestrial Ecology Sensitivity. It is none-the-less important the buffer areas indicated in the Wetland Assessment are taken into account in the project planning and implementation. However, no substantial impacts to SCC are expected <u>beyond the boundary</u> of the preferred sites.

10.5.7 PROTECTED AREAS, NPAES, IBAS AND OTHER

No protected areas, in terms of NEMPAA, are located within 10 km of the project area. No conservation areas (areas responsibly managed for biodiversity conservation but not legally declared as Protected Areas), as per the South African Conservation Area Database (SACAD), are located within 10 km.

No NPAES areas are situated within 10 km of the project footprint. The project footprint is not located in a SWSA or a FEPA.

Figure 28: Protected areas located around the proposed opencast mine

The Mpumalanga Conservation Plan provides classification of the Terrestrial Biodiversity into various classification categories:

- Protected areas - already protected and managed for conservation;
- Irreplaceable areas - no other options available to meet targets—protection crucial;
- Highly Significant areas - protection needed, very limited choice for meeting targets;
- Important and Necessary areas - protection needed, greater choice in meeting targets;
- Ecological Corridors – mixed natural and transformed areas, identified for long term connectivity and biological movement;
- Areas of Least Concern – natural areas with most choices, including for development; and
- Areas with No Natural Habitat Remaining – transformed areas that make no contribution to meeting targets.

10.6 SURFACE WATER

The information from this section was obtained from the Aquatic Ecosystem Impact Assessment Report undertaken from Limnology (Appendix 7), the previous IWWMP (Elemental, 2020), and the latest Water Quality Monitoring Report done by Zyntha Consulting (Appendix 8).

10.6.1 WATER MANAGEMENT AREA

The mine is located in Quaternary Catchment B11B, upper Olifants River Catchment within the Olifants Water Management Area.

10.6.2 HYDROLOGY OF PROJECT AREA

The tributary to the Olifants River flows on the northwestern boundary of the proposed opencast operations at Lourens 472 IS. The confluence of the tributary and the Olifants River is on RE of the farm Clydesdale 483 IS northeast of the mining area. The effective catchment in terms of surface runoff is approximately 490 km^2.

10.6.3 ARTIFICIAL IMPOUNDMENTS

Many artificial impoundments were observed on site (Figure 29). Many of these are associated with old mining and farming activities. The impoundments to the west of the site are of low concern. The eastern impoundment is difficult to assess, as this was a channelled valley bottom system. Mining activities have completely transformed the system and the functions and composition of the old valley bottom wetland have been lost. A diversion channel moves water entering the system from the south (an unchannelled valley bottom system) around the impacted area. The impoundment area is also very high in salts - as associated with mining activities and acid mine drainage (AMD). The main ecological function of this system is the attenuation of water and the provision of open standing water habitat (for especially the Marsh sylph butterfly).

Figure 29: Artificial Impoundments

10.6.4 SURFACE WATER QUALITY

2 Seam Mine is an existing mine and surface water monitoring is undertaken by Zyntha Consulting (Pty) Ltd. as per the WUL requirements. A copy of the last quarterly monitoring report is attached as Appendix 8.

The current monitoring points are indicated in Figure 30. The surface water quality results for March 2022 are provided in Table 14 below.

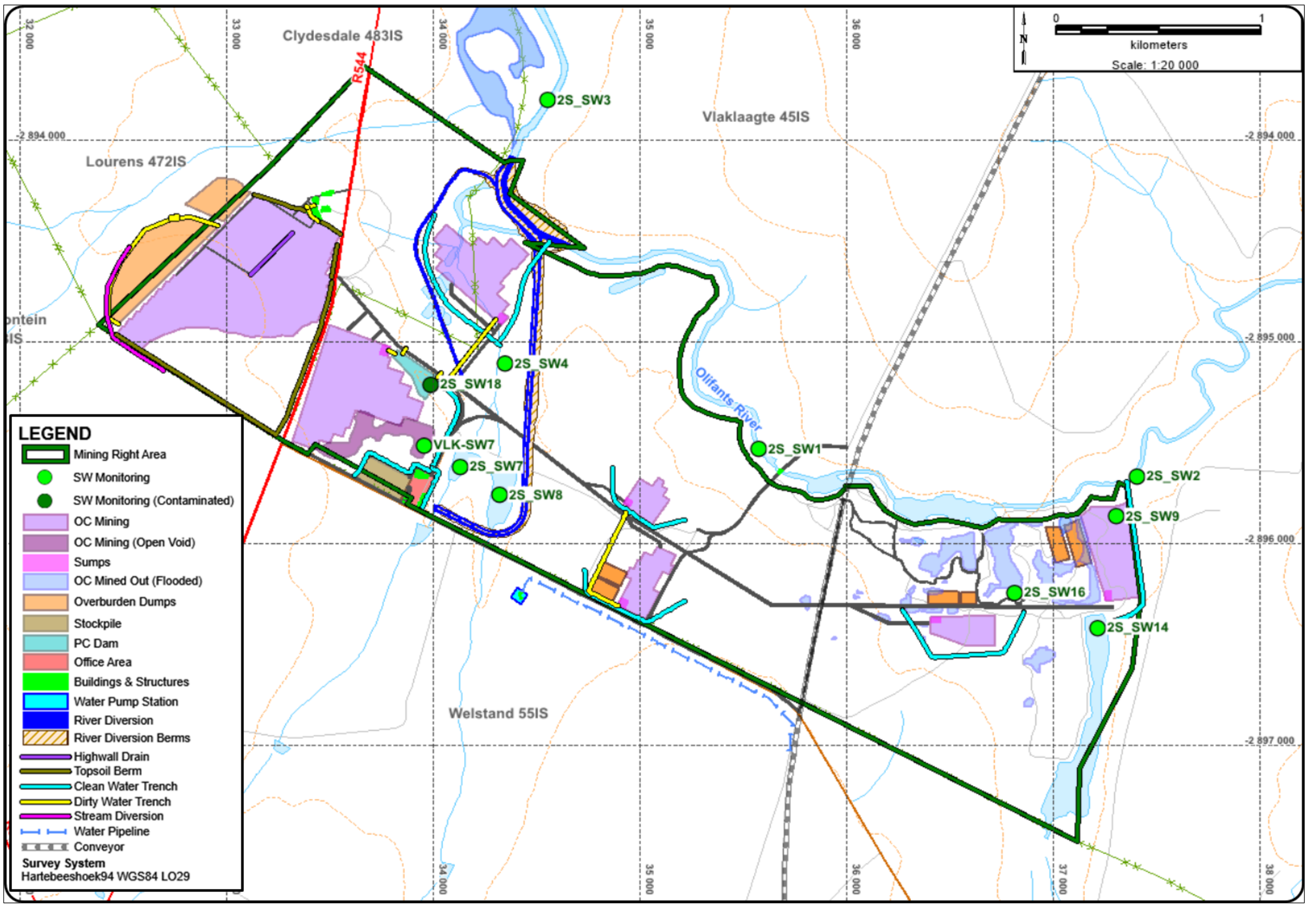

Figure 30: Surface Water Monitoring Points

Table 14: Surface Water Quality Results for March 2022

Sample Point	Sample Date	Parameters														
		pH	EC (mS/m)	TDS (mg/l)	Alk (mg/l)	N (mg/l)	Cl (mg/l)	SO_4 (mg/l)	F (mg/l)	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
	Non-Compliance	**<6,5**	**>90**	**>350**	**>120**	**>0,5**	**>40**	**>150**	**>0,75**	**>50**	**>25**	**>50**	**>30**	**>0,02**	**>0,3**	**>0,05**
2S_SW 1	Mar-22	7.86	76.00	530.00	191.00	0.10	16.80	242.00	0.76	31.70	6.19	67.80	42.60	0.03	0.04	0.02
2S_SW 2	Mar-22	7.87	53.30	420.00	140.00	0.10	18.80	126.00	0.79	27.00	4.85	46.20	23.80	0.10	0.08	0.01
2S_SW 3	Mar-22	7.88	71.80	638.00	177.00	0.10	16.90	218.00	0.76	30.20	5.95	62.00	39.40	0.06	0.06	0.20
2S_SW 4	Mar-22	7.44	149.00	1 394.00	151.00	0.10	18.80	724.00	0.46	45.40	16.30	160.00	93.70	0.04	0.05	6.10
2S_SW 7	Mar-22	5.60	34.20	294.00	66.00	0.10	5.98	155.00	0.84	9.89	7.60	29.70	12.90	0.23	4.72	2.05
2S_SW 8	Mar-22	7.40	29.30	194.00	132.00	0.10	1.00	30.60	0.44	9.68	1.78	28.20	13.20	0.02	0.02	0.01
2S_SW 9	Mar-22	7.68	37.30	248.00	134.00	0.10	16.10	42.00	0.82	20.80	3.97	26.40	15.70	0.13	0.21	0.01
2S_SW 14	Mar-22	7.93	34.20	234.00	123.00	0.10	12.80	42.70	0.65	17.70	3.52	26.30	13.60	0.09	0.14	0.01
2S_SW 16	Mar-22	8.24	93.40	864.00	160.00	0.10	16.60	360.00	0.76	38.20	7.78	68.60	58.20	0.04	0.06	0.01
2S_SW 18	Mar-22	7.92	259.00	2 574.00	198.00	24.40	23.20	1 328.00	1.28	138.00	13.60	225.00	172.00	0.05	0.05	0.01
VLK SW 7	Mar-22	6.90	19.20	158.00	60.00	0.10	18.50	9.97	0.64	15.80	9.08	9.17	4.42	0.07	0.51	0.13

10.6.5 MEAN ANNUAL RUN-OFF

The Mean Annual Runoff (MAR) of the B11B catchment is 13.8 million m^3 per year based on average rainfall.

10.6.6 RESOURCE CLASS

On 22 April 2016, the Minister of Water and Sanitation, published the Classes and Resource Quality Objectives of water resources for catchments of the Olifants WMA, as GN No. 466 in Government Gazette No. 39943. This notice provides a summary of the water resource classes and ecological categories for Integrated Units of Analyses (IUAs).

IUAs are classified in terms of their extent of permissible utilisation and protection as either Class I: indicating high environmental protection and minimal utilisation; or Class II: indicating moderate protection and moderate utilisation; and Class III: indicating sustainable minimal protection and high utilisation. The table below indicates the Resource Class set for the relevant Quaternary Catchments, within which the project area is situated. The resource class and ecological category applicable to the 2 Seam Mine are indicated in Table 15.

Table 15: Water Resource Classes per IUA and Ecological Categories per Biophysical Node

Integrated Unit of Analysis (IUA)	Water Resource Class for IUA	Biophysical Node Name	Quaternary Catchment	River Name	Ecological Category to be maintained	Natural MAR (million m^3/a)	EWR as % of natural MAR
Upper Olifants River catchment	III	HN1	B11A, B11B	Olifants (confluence with Steenkoolspruit)	C	61.3	10.25

10.6.7 SURFACE WATER USER SURVEY

The greater Olifants River Catchment falls within the Limpopo and Mpumalanga provinces with an estimated population of 5 million people, about 70% of whom live in rural areas. There are about 30 major dams in the Olifants River Catchment, excluding farm and unlawful dams. There are approximately 800 registered mines in the area, including closed and prospective mines. There are around 120 wastewater treatment works that process domestic and industrial wastewater on a daily basis. A large portion of the catchment is under agricultural production and is home to the second largest irrigation scheme in South Africa.

Focussing more on the region surrounding the project area, the primary surface water users and impacts are mining, agricultural, industrial and domestic.

The surrounding area consists of:

- Mainly agricultural land with many farm dams, and
- Coal mining operation in close proximity to the river.

10.7 AQUATIC ECOLOGY

Limnology (Pty) Ltd. was appointed for the aquatic ecosystems condition and impact ratings for the proposed diversion of the Olifants River, new processing plant and run of mine stockpile, tailings facility(no longer part of the application), contractor yard and the two pollution control dams for the 2 Seam Coal mine, Mpumalanga. A copy of the report is included in Appendix 7.

10.7.1 METHODOLOGY

10.7.1.1 RIVER DIVERSION ASSESSMENT METHODOLOGY

To assess the *in-situ* conditions, before the diversion, firstly the drivers of the aquatic ecosystem were measured. This includes basic aspects, such as stream morphology, water quality assessment and physical structures. This information is then used to describe the habitat created by the system, where the diversion is planned.

The reagent to the drivers is basically the fauna and flora occurring in the specific area where the diversion is planned. To assess the reagents, basic EcoStatus models were applied (Louw and Kleynhans, 2007). This includes SASS 5 and fish population assessments. The detailed methodology is included in the full report.

10.7.1.2 SASS 5 METHOD

In South Africa, the River Health Programme (under the Department of Water Affairs) has developed a suite of different programs to rapidly assess the quality of aquatic systems. One of the most popular and robust indicators of aquatic ecology health is the South African Scoring System or SASS currently in version 5 (SASS5). The South African Scoring System is a biotic index initially developed by Chutter (1998). It has been tested and refined over several years and the current version is SASS 5 (Dickens and Graham, 2002). This technique is based on a British biotic index called the Biological Monitoring Working Party (BMWP) scoring system and has been modified to suit South African aquatic micro-invertebrate fauna and conditions. SASS 5 is a rapid biological assessment method developed to evaluate the impact of changes in water quality using aquatic macro-invertebrates as indicator organisms.

The biotopes sampled include vegetation both in and out of current (VG- aquatic and marginal), stones (S- both stones in current and out of current) and gravel, sand, and mud (GSM) (Dickens & Graham, 2002). The standardised sampling methods allow comparisons between studies and sites. Macroinvertebrate sampling is done using a standard SASS net (mesh size 1000 mm, and a frame of 30 cm x 30 cm). There are nineteen (19) possible macro-invertebrates from each biotope that are tipped into a SASS tray half filled with water and families are identified for not more than 15 minutes/biotype at the streamside.

10.7.2 RIVER DIVERSION ASSESSMENT

10.7.2.1 BATHOMETRIC ANALYSIS RESULTS

Near the bend of the diversion area in the system a section of the water is as deep as 8 meters. This was verified using a Secchi disk depth gauge (Chapman, 1996) (Department of Water and Sanitation, 2016). There is a proposed inlet section of the diversion. This section is very uniform without any major depth variations. This is possibly due to the water hydrology not being turbulent, due to bends in the systems or other water sources (wetlands etc) entering the section here.

It is important to note that bathometric deviations form habitat for ichthyofauna. The Deeper sonar is commercially sold as a fish finder, and the application thereof as a bathometric analysis device is secondary. During the assessment, it was noted that after depth deviations, large fish was observed by the sonar. This shows increased habitat suitability by the deviations in the system for fish. It is important to note that two sections of weirs or artificial impoundments is located at -26.153888° 29.344718° and -26.156995° 29.341676°. This alters the hydrology habitat of the system by slowing water flow, settling sediments, and increasing unnatural species composition of fauna and flora.

10.7.2.2 BANK MORPHOLOGY

In 2018 the assessment of the banks of the Olifants River system was undertaken to assess the shape and form of the banks of the area before the diversion. The morphology of the banks was assessed at 15 points, located throughout the bend (Figure 31). In 2022, the southern samples points of Launch1, 001, 002, 003 and 007 has been altered by the berm. Historical data is retained in terms of the value of historical data.

Figure 31: Bank Morphology sample sites

These points were chosen as they varied from the norm. This was specifically done to assess varying habitat. Due to the difficulty of assessing varying slope and access issues, the vertical height (from water level to upper base) was calculated. The distance from the upper marginal end was measured to the edge of the water. This was used to calculate the slope of the bank in degrees.

10.7.2.3 BIOTIC REAGENTS ASSESSMENT

Biotic assessments were completed for the project based on the methods described above. As the diversion will have a permanent impact, the main aim of the assessments was to provide baseline information and provide measurable goals for monitoring. The results will also be used to infer information of the rehabilitation of the diversion channel in terms of habitat creation.

10.7.3 SASS 5 RESULTS

Five sample sites for SASS 5 protocol were used for the project in 2018 and 2022. It clearly states in the methodology of the SASS 5 method that SASS can realistically only be applied in a water column of 1.5 meters or less (Dickens and Graham, 2002). This was emulated in Barbour *et al.*, (1998). In the case of the study site, the depth of the water exceeds this. Care must be taken when applying SASS 5 to deep systems, as the required habitats is not present. It was for this reason that a full SASS 5 assessment could not be completed for the study site.

Figure 32: Sass 5 Sample Site Location

A total of 21 taxa was observed in the five sample sites. These include: Hirundea, Atyidae, Hydracarina, Baetiedae (>2 sp), Tricorythidae, Coegnagrionidae, Lestidae, Belostomatidae, Gerridae, Naucoridae, Nepidae, Notonectidae, Pleidae, Vellidae, Hydropsychidae (sp1), Hydroptilidae, Dytisicidae, Ceratopogonidae, Chironomidae, Physidae, Unionidae, and notably Daphnia. Daphnia occurs in deep water that is slow moving and is usually an indicator that SASS 5 protocol must be attempted with care, due to habitat requirements outside the scope of the protocol.

The average score per taxon (ASPT) of the samples sites was 5.2 in 2018 and in 2022 this was 5.0. This indicates the sample sites to be very similar in composition, but a slight decrease has occurred in the four years. This is suspected to be more seasonal driven than impact or degradation of water habitat. Daphnia was encountered at three of the five sites, showing the water movement to be very slow throughout the sites. See Figure 33 for a graph of the ASPT results of 2018 and 2022 over the various sample sites.

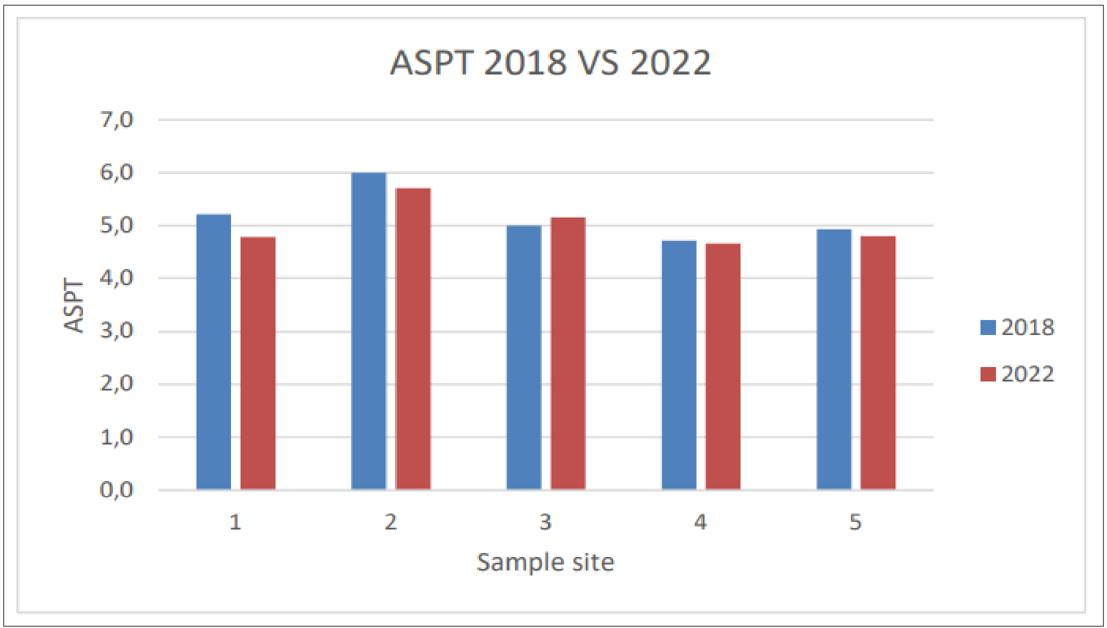

Figure 33: Graph of the 2018 vs 2022 ASPT Results

10.7.4 FISH POPULATION ASSESSMENT

Fish habitat abundance assessment was completed for the study site and is presented in Table 16. Due to the depth of the water on site, standard methods (electrofishing) did not produce fish in the water column. This immediately removes many of the *Barbus* species or *Enteromius* sp. (Skelton, 2016) as they prefer shallow/deep fast-moving water (Kleynhans and Mackenzie, 2007). Cast-netting using a 5-meter diameter net from the inflatable boat also did not produce any fish. Sampling of the banks for the aquatic macroinvertebrates did however produce some fish. These were limited to *Gambusia affinis* and *Tilapia sparrmanii. Clarias gariepinus* was observed feeding in the marginal vegetation. *Cyprinus carpio* is known to be actively caught in the system. All these species can move and adapt to new habitat and impacts to these species by the diversion is expected to be minimal.

Table 16: Fish Habitat Assessment Results

(0- absent, 1- rare, 2- sparse, 3- common, 4 – abundant, 5- very abundant)

	Slow deep	Slow shallow	Fast deep	Fast shallow
Overhanging vegetation	2	2	0	0
Undercut banks and root wads	4	2	0	0
Substrate	3	2	0	0
Aquatic macrophytes Water column	3	2	0	0
Mean	3	2	0	0

10.7.5 VEGETATION COMMUNITY COMPOSITION

In 2018 during the assessment of the riverbank morphology, vegetation species composition was included to indicate varying habitat provided by the bank morphology (Figure 34). The 2022 sample was completed during the winter month and most of the vegetation aspects were either dormant or difficult to identify. The 2018 results are presented below for reference in terms of the impact assessment of the proposed diversion. Lauch01, 001, 002, 003 and 007 does not have the same relevance as in 2018 and is included for rehabilitation reference.

To assess the vegetation community structure in the system, the identification of the species was included in the bank morphology. To illustrate the vegetation communities, simple side view drawings was created for the sample sites. Species encountered in the marginal zones include: *Cynodon dactylon, Cyperus articulatus, Eragrostis curvula, Gomphostigma virgatum, Hyparrhenia hirta, Juncus articulatus, Juncus effesus, Leersia hexandra, Panicum natalensis, Paspalum scrobiculatum, Phragmites australis, Phragmites capensis, Persicaria lapathifolia, Pycreus polystachyos, Rorippa nudiuscula, Salix babylonica, Themeda triandra, Typha capensis* and *Verbena bonariensis*.

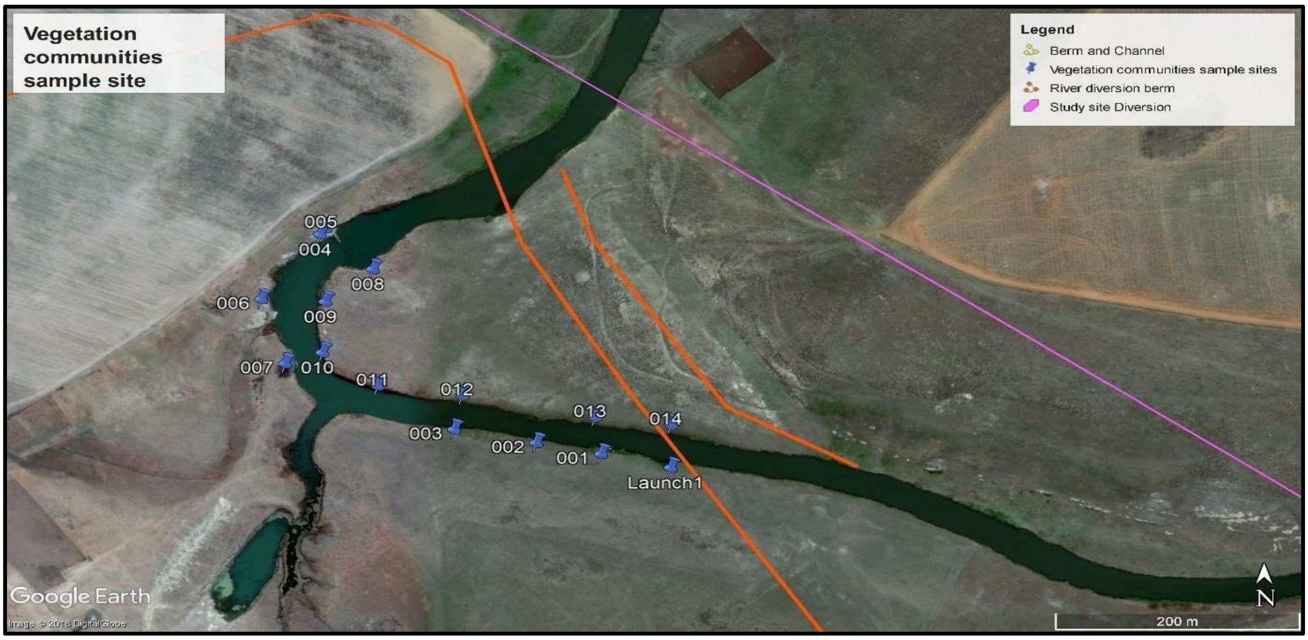

Figure 34: Locations for Vegetation Community Sample Sites

10.7.6 SASS SPECIES PER PLANT PRESENCE

To assess the habitat provision of the plant species, the assessment of the presence of specific aquatic macroinvertebrates to plant species was completed. This includes population numbers to provide more accurate habitat use information. This information is used to infer the vegetation type with the best habitat for aquatic diversity. A combined pie graph of the vegetation type with the best habitat is given in Figure 35. This shows that Sedges has the largest species use (31%) and Phragmites second (21%). In Figure 36 it shows the number of total individuals per plant types. Sedges and Phragmites were very similar in this regard and made up almost 50% of the habitat provision.

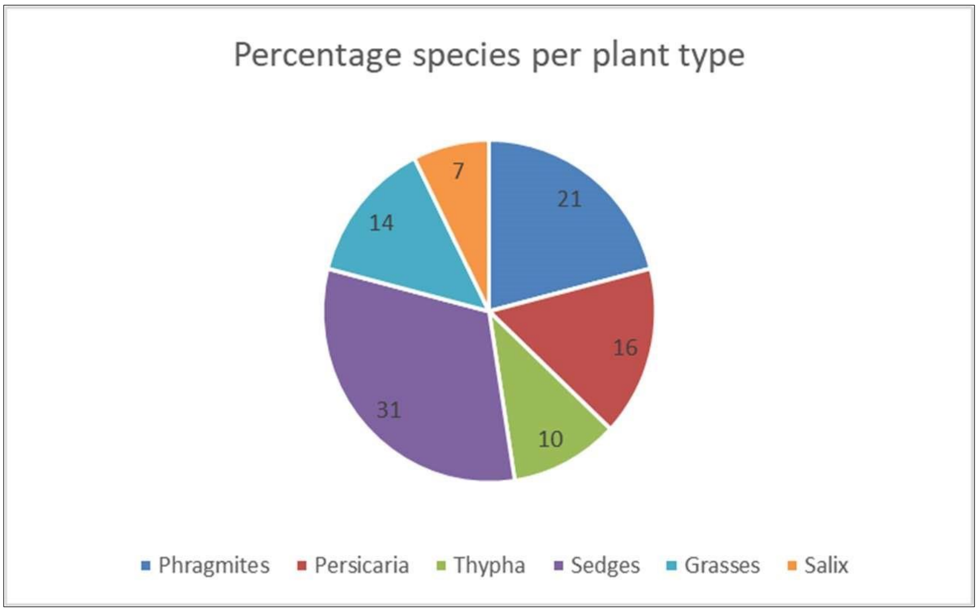

Figure 35: Pie Graph of total taxa per plant type

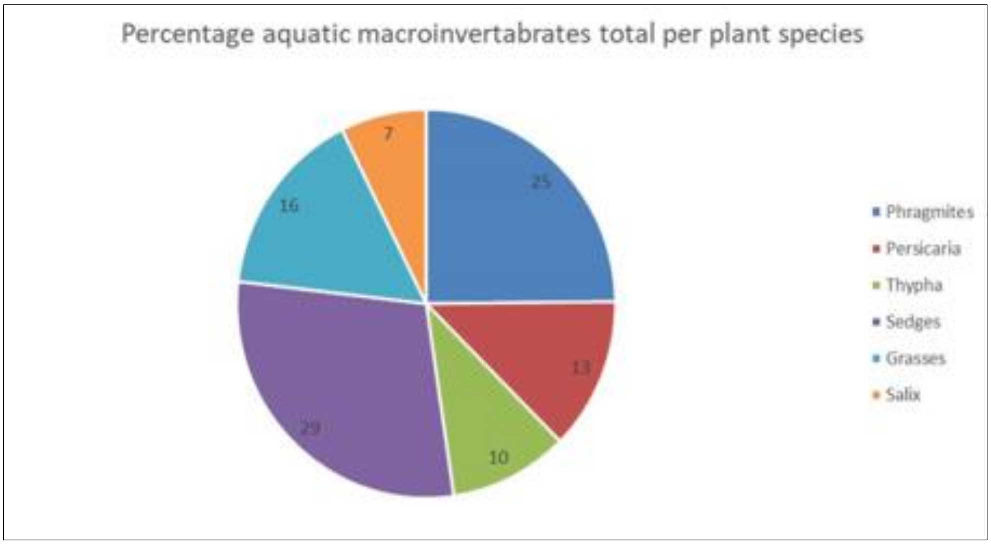

Figure 36: The Percentage Aquatic Macroinvertebrate Individuals Per Plant Type

10.7.7 AQUATIC ALIEN VEGETATION

Dense mats of the aquatic alien vegetation, parrots feather (*Myriophyllum aquaticum*), was observed in the wetland sample site (Figure 37). This is of concern as these plants can reproduce using vegetative methods and create an excellent seed bank in mud. Specific management is required in this regard to prevent the spread of the species.

Figure 37: Parrots Feather (*Myriophyllum Aquaticum*) in the Wetland Sample Site

10.7.8 CONCLUSION AND RECOMMENDATIONS

The diversion of any aquatic ecosystem must not be taken lightly and is the most detrimental activity that can be undertaken by a developer. The exact location and magnitude of impacts are very difficult to assess- especially considering the dissolving effect of impacts in water and the transportation of the impact from the impact area to a secondary location.

The monitoring of the rehabilitation process is of paramount importance to ensure the efficiency thereof. If rehabilitation does not occur as recommended, then corrective measures must be enforced through the audit findings and reports. Communication between the rehabilitation implementer, the author of the rehabilitation plan, the developer, and the construction contractor is of principal importance to ensure execution of the rehabilitation plan. If any areas of concern are found, then they must be explored to determine the extent of and solution to the problem.

Due to the complexity of the rehabilitation process, it is proposed that a specialist Aquatic Environmental Control Officer (AECO) be on site for the duration of the process. This is advised as the possible impacts on the aquatic ecosystem are of such a concern that a trained person be instated for the full length of the diversion process and pre and post phases.

10.8 WETLANDS

A wetland delineation assessment was undertaken by Limnology along with the aquatic ecosystem impact assessment. A copy of the report is included in Appendix 7.

10.8.1 METHODOLOGY

The delineation guideline, Department of Water Affair's: Practical field procedure for identification and delineation of wetlands and riparian areas, Edition 1 September 2005, and revision 2 of 1998 was used. The site visit was conducted on various dates in 2019, 2020, 2021 and 2022. All field work was completed by the author and the data is assimilated into this report. This identification and delineation of possible wetlands and riparian habitat is also done to mitigate any possible future contraventions of the National Water Act, Act no 36 of 1998. Although the term wetland describes the main functions provided by the wetland, there are many different hydrogeomorphic types of wetlands in South Africa.

10.8.2 OLIFANTS RIVER SYSTEM OF THE STUDY SITE

The Olifants River is deep (>1.5 meters) with steep banks and a narrow marginal zone on site. The active channel in the system is wide, with *Salix mucronata* in places on the edge of the banks.

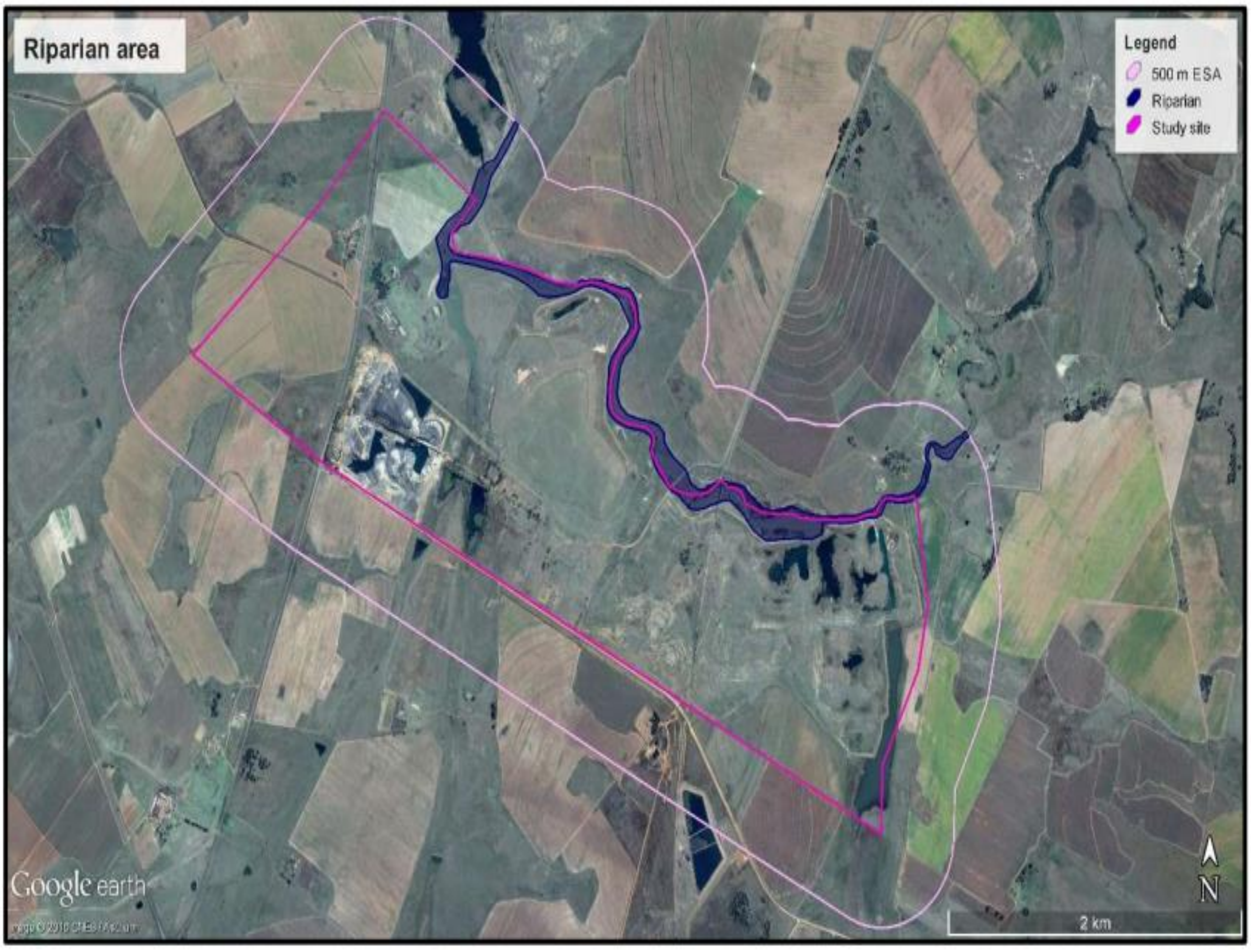

Figure 38: The Olifants river riparian area of the larger study site

10.8.2.1 AQUATIC ECOSYSTEM CLASSIFICATION

The classification of the aquatic system was done using the dichotomous key in Ollis et al. (2013) (Figure 39) with the services provided by the aquatic ecosystems found on site.

Watercourse	Level 3		Level 4: HGM Unit			Level 5				
	Key 1 Landscape Unit		Key 2			Key 3a River Flow types		Key 3b Hydroperiod		
	Level 3a	Level 3b	Level 4a HGM Type	Level 4b	Level 4c	Level 5a	Level 5b	Level 5 a Inundation period	Level 5b Saturation period	Level 5 c Inundation depth class
Riparian area	Valley floor (no 5)	N/A	River			Perennial	Seasonal	Permanent	Permanently saturated	Limnetic

Figure 39: Summary of the application of levels 1 to 5 of the aquatic ecosystem classification in accordance with the dichotomous key from Ollis *et al.* 2013

10.8.2.2 PES OF THE SYSTEMS

Using the method described above, the following calculations were completed to determine the Present Ecological Score (PES) of the aquatic ecosystem found on site. See Figure 40 for the PES calculation.

OVERALL PRESENT ECOLOGICAL STATE (PES) SCORE					
	Ranking	Weighting	Score	*Confidence Rating*	PES Category
DRIVING PROCESSES:		**100**	**1,9**		
Hydrology	1	80	2,4	*4,0*	**D**
Geomorphology	2	100	1,6	*4,0*	**C**
Water Quality	3	30	2,1	*4,2*	**D**
WETLAND LANDUSE ACTIVITIES:		**100**	**1,5**	***4,0***	
Vegetation Alteration Score	1	100	1,5	*4,0*	**C**
Weighting needs to consider the sensitivity of the type of wetland *e.g.: nutrient poor wetlands are sensitive to nutrient loading (Water Quality rated higher)*					
OVERALL SCORE:			**1,7**	***Confidence Rating***	
	PES %		**65,6**		
	PES Category:		**C**	***2,0***	

Figure 40: The Wetland IHI PES result of the wetland system

The PES score of the system indicated the system to be Moderately modified “A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact”.

10.8.2.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY

EIS was calculated in Table 17. The REMC was calculated to be in High condition "Aquatic ecosystems that are ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers."

Table 17: The EIS score of the seepage wetlands and REMC classification (0 indicates no importance and 4 indicates very high importance)

Determinant	Score	Confidence	Discussion
PRIMARY DETERMINANTS			
Rare & Endangered Species	3	3	Possibility of Marsh Sylph (*Metisella meninx*) in the system. Other endangered species of fauna are also possible in the system.
Populations of Unique Species	3	4	The system has varied habitat in the main channel as well as in the marginal zones of the system for unique species.
Species/taxon Richness	2	3	Diverse
Diversity of Habitat Types or Features	3	2	Diverse fauna and flora
Migration route/breeding and feeding site for wetland species	3	2	Highly important water sources and movement corridor
Sensitivity to Changes in the Natural Hydrological Regime	1	3	The system is a high-volume low velocity river system, of second stream order. The system can buffer many of the impacts, but overall accumulation will show in the system over time.
Sensitivity to Water Quality Changes	1	3	
Flood Storage, Energy Dissipation & Particulate/Element Removal	3	2	
MODIFYING DETERMINANTS			
Protected Status	3	3	Although not formally protected, the risk of flooding is high in the system and thus the system is protected.
Ecological Integrity	2	3	The system is ecologically intact although many impacts have occurred on the system.
TOTAL	24		
MEAN (Total / 10)	2.4		
Recommended Ecological Management class (REMC)	**High**		

10.8.3 CHANNELLED VALLEY BOTTOM WETLAND

Figure 41 below indicates a single channelled valley bottom wetland that was observed on site. The system feeds directly into the Olifants River and is fed from an unchannelled valley bottom wetland. The system is relatively flat, and it was observed that the Olifants River pushes back into the system to create a floodplain area. There is an impact on the system through grazing. The unchannelled valley bottom wetland feeding into the system is impacted by impoundments. This directly influences the hydrology of the channelled valley bottom wetland.

Figure 41: The location of the Channelled Valley Bottom Wetland on site

10.8.3.1 AQUATIC ECOSYSTEM CLASSIFICATION (OLLIS ET AL 2013)

The classification of the system was done using the dichotomous key in Ollis et al. (2013). Refer to Figure 42.

	Level 3		Level 4: HGM Unit			Level 5				
	Key 1 Landscape Unit		Key 2			Key 3a River Flow types		Key 3b Hydroperiod		
Watercourse	**Level 3a**	**Level 3b**	**Level 4a** HGM Type	**Level 4b** River zonation	**Level 4c** River Flow type	**Level 5a**	**Level 5b**	**Level 5 a** Inundation period	**Level 5b** Saturation period	**Level 5 c** Inundation depth class
Channelled valley bottom wetland	Valley floor (no 5)		Channelled valley bottom					Intermittently inundated	**Seasonal saturated**	Limnetic

Figure 42: Summary of the application of levels 1 to 5 of the Aquatic Ecosystem Classification in accordance with the dichotomous key from Ollis et al. 2013

10.8.3.2 PES OF THE SYSTEMS

Using the method described above, the following calculations were completed to determine the Present Ecological Score (PES) of the aquatic ecosystem found on site. See Figure 43 for the PES calculation.

OVERALL PRESENT ECOLOGICAL STATE (PES) SCORE					
	Ranking	Weighting	Score	Confidence Rating	PES Category
DRIVING PROCESSES:		**100**	**2,2**		
Hydrology	1	80	3,1	*3,8*	**D/E**
Geomorphology	2	100	1,6	*4,0*	**C**
Water Quality	3	30	1,9	*4,4*	**C**
WETLAND LANDUSE ACTIVITIES:		**100**	**2,4**	***4,0***	
Vegetation Alteration Score	1	100	2,4	*4,0*	**D**
Weighting needs to consider the sensitivity of the type of wetland *e.g.: nutrient poor wetlands are sensitive to nutrient loading (Water Quality rated higher)*					
OVERALL SCORE:			**2,3**	***Confidence Rating***	
	PES %		**54,6**		
	PES Category:		**D**	***2,0***	

Figure 43: The wetland IHI PES result of the wetland system

The PES score of the system indicated the system to be largely modified "A large change in ecosystem processes and loss of natural habitat and biota and has occurred". The PES score is primarily driven by the large artificial impoundment found on site. The hydrology of the system is highly impacted by the impoundment. Of concern is the release of water from the dam back into the wetland, with channelization forming below the dam wall. The geomorphology is also impacted by the impoundment.

10.8.3.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY

EIS was calculated in Table 18. The REMC was calculated to be in Moderate condition "Aquatic ecosystems that are ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains 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".

Table 18: The EIS score of the seepage wetlands and REMC classification (0 indicates no importance and 4 indicates very high importance)

Determinant **PRIMARY DETERMINANTS**	**Score**	**Confidence**	**Discussion**
Rare & Endangered Species	2	3	Possible but highly unlikely due to the lack of cover in the system. If water is present in the channel of the wetland, the EIS score will improve. The vegetation in the system was also very short during the site visit, reducing functional habitat. There is however a possibility of the Marsh Sylph (Metisella meninx) butterfly in the system.
Populations of Unique Species	1	4	
Species/taxon Richness	2	3	
Diversity of Habitat Types or Features	2	2	

Migration route/breeding and feeding site for wetland species	2	2	The wetland provides a corridor for movement from the wetlands to the Olifants River.
Sensitivity to Changes in the Natural Hydrological Regime	2	3	Highly important as the wetland is a buffer between the wetland and the Olifants River.
Sensitivity to Water Quality Changes	2	3	
Flood Storage, Energy Dissipation & Particulate/Element Removal	3	2	
MODIFYING DETERMINANTS			
Protected Status	1	3	Not protected and highly affected and utilised.
Ecological Integrity	2	3	Remains intact although the wetland is highly impacted and degraded
TOTAL	19		
MEAN (Total / 10)	1.9		
Recommended Ecological Management class (REMC)	**Moderate**		

10.8.4 SEEPAGE WETLANDS

The seepage wetlands of the study site are located adjacent to and feeding directly into the Olifants River (Figure 44). The system to the south seems to have been created by the old mine tailings, but details on the 1954 image shows some indications of the system being present pre mining activities.

Figure 44: The Seepage Wetlands of the study site

10.8.4.1 AQUATIC ECOSYSTEM CLASSIFICATION (OLLIS ET AL 2013)

The classification of the system was done using the dichotomous key in Ollis *et al*. (2013) (Figure 45) with the services provided by the aquatic ecosystems found on site.

Watercourse	Level 3		Level 4: HGM Unit			Level 5				
	Key 1 Landscape Unit		Key 2			Key 3a River Flow types		Key 3b Hydroperiod		
	Level 3a	Level 3b	Level 4a HGM Type	Level 4b River zonation/	Level 4c River Flow type	Level 5a	Level 5b	Level 5 a Inundation period	Level 5b Saturation period	Level 5 c Inundation depth class
Seepage wetland	Hilltop (No 1)	Saddle	Seep	Without channeled outflow				Never/ Rarely inundated	Permanently saturated	Limnetic

Figure 45: Summary of the application of levels 1 to 5 of the aquatic ecosystem classification in accordance with the dichotomous key from Ollis *et al.* 2013

10.8.4.2 PES OF THE SYSTEMS

Using the method described above, the following calculations were completed to determine the Present Ecological Score (PES) of the aquatic ecosystem found on site. See Table 19 for the PES calculation.

Table 19: The wethealth PES result of the wetland system

	Northern Seepage wetland		Southern seepage wetland	
Geomorphology	**C**	Impacted by cultivation in the catchment of the system.	**E**	Highly impacted by the mine tailings on top of the wetland
Hydrology	**B**	Natural, somewhat reduced function by the cultivation of the system	**E**	
Vegetation	**B**	More natural, with varying species of hydrophytes.	**C**	Degraded and reduced to homogenous stands of *Imperata cylindrica* and *Typha capensis.*
PES	**B** Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.		**E** The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable	

10.8.4.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY

A combined EIS was calculated in Table 21. The REMC was calculated to be in Moderate condition "Aquatic ecosystems that are ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains 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".

Table 21: The EIS score of the seepage wetlands and REMC classification

Determinant	**Score**	**Confidence**	**Discussion**
PRIMARY DETERMINANTS			
Rare & Endangered Species	2	3	Possibility of Marsh Sylph (Metisella meninx) butterfly in the system.
Populations of Unique Species	2	4	
Species/taxon Richness	1	3	Low, limited to flora
Diversity of Habitat Types or Features	1	2	Limited due to low variation of habitat
Migration route/breeding and feeding site for wetland species	1	2	Low due to type of system and limited links to other aquatic systems outside that of the Olifants River system
Sensitivity to Changes in the Natural Hydrological Regime	3	3	See Table 2 above
Sensitivity to Water Quality Changes	2	3	
Flood Storage, Energy Dissipation & Particulate/Element Removal	1	2	
MODIFYING DETERMINANTS			
Protected Status	0	3	Not protected and highly impacted
Ecological Integrity	2	3	Somewhat still functional but ecology is fragmented
TOTAL	15		
MEAN (Total / 10)	1.5		
Recommended Ecological Management class (REMC)	**Moderate**		

10.8.5 UNCHANNELLED VALLEY BOTTOM WETLAND

Unchannelled valley bottom wetlands in different areas were observed on site (Figure 46). All these feed into the Olifants River, either directly or through another aquatic ecosystem. Most of the system is degraded due to historical mining and cultivation in the catchment of the system. Almost all the systems are impounded (Figure 47).

Figure 46: Unchannelled Valley Bottom Wetlands of the study area

Figure 47: Impoundments of the Unchannelled Valley Bottom Wetlands

10.8.5.1 AQUATIC ECOSYSTEM CLASSIFICATION (OLLIS ET AL 2013)

The classification of the system was done using the dichotomous key in Ollis et al. (2013) (Table 20: The WetHealth PES result of the wetland system) with the services provided by the aquatic ecosystems found on site.

10.8.5.2 PES OF THE SYSTEMS

Using the method described above, the following calculations were completed to determine the Present Ecological Score (PES) of the aquatic ecosystems found on site. See Table 20 for the PES calculation.

Watercourse	**Level 3**		**Level 4:** HGM Unit			**Level 5**				
	Key 1 Landscape Unit		**Key 2**			**Key 3a** River Flow types		**Key 3b** Hydroperiod		
	Level 3a	**Level 3b**	**Level 4a** HGM Type	**Level 4b** River zonation	**Level 4c** River Flow type	**Level 5a**	**Level 5b**	**Level 5 a** Inundation period	**Level 5b** Saturation period	**Level 5 c** Inundation depth class
Unchannelled valley bottom wetland	Valley floor		Unchannelled valley bottom					**Never/ Rarely inundated**	**Seasonal saturated**	Limnetic

Figure 48: Summary of the application of levels 1 to 5 of the aquatic ecosystem classification in accordance with the dichotomous key from Ollis *et al.* 2013

Table 20: The WetHealth PES result of the wetland system

	GEOMORPHOLOGY	HYDROLOGY	VEGETATION	PES
A	C	B	A	B
	Impacted by road crossing and mining in the upper reaches of the system	Mostly intact with only a road crossing of the system impacting the hydrology	Diverse and natural	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.
B	C	C	B	C
	Affected by cultivation in the catchment as well as mining. The system is also impounded. Various branches of wetland feeds into the system, creating an ever larger wetland	Impounded with signs of abstraction	Affected by grazing and grass cutting. Vegetation was short during the site visit.	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact
C	D	E	B	D
	The system ends abruptly in the current mining activity on site.		Low diversity, cut/grazed short	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred
D	D	D	A	C
	Impacted by the road crossing of the system as well as various small impoundments		Diverse vegetation with good coverage	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact
E	C	C	C	C
	Some impoundments and road crossings reduce the geomorphology of the system	Road crossings and impoundments in small scale reduces the hydrological connectivity of the system	Affected by grazing and grass harvesting. Low diversity	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact

10.8.5.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY

The EIS results for the unchannelled valley bottom wetlands are given in Table 21. The calculations were not included in the report to save printing volumes. The possibility of Marsh Sylph (*Metisella meninx*) in the system increases the rare and endangered species probability in all these systems.

Table 21: Summary of the EIS and REMC for the unchannelled valley bottom wetlands

	EIS Score	REMC	
A	2.3	High	Aquatic ecosystems that are ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.
B	2.1	High	
C	1.2	Moderate	Aquatic ecosystems that are ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains 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.
D	1.5	Moderate	
E	2.4	High	Aquatic ecosystems that are ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.

10.9 HYDROGEOLOGY

GCS (Pty) Ltd. (GCS) was appointed to conduct the groundwater assessment. A copy of the report is attached in Appendix 9.

10.9.1 METHODOLOGY

The study followed a logical and holistic approach, whereby all existing and new hydrogeological data for the site were assessed (limited to accessible public, GCS internal reports and reports shared with GCS by the client). A systematic phased approach was followed to adhere to the objectives and agreed-upon scope of work for the assessment.

A logical and holistic approach was adopted to assess the study area. The Best Practice Guidelines for Impact Prediction (G4) (DWAF, 2008), were considered to define and understand the three basic components of the hydrogeological risk (also referred to as “SPR”):

Subsequently, a groundwater model was developed to illustrate the conceptual understanding of the groundwater flow system. Groundwater modelling is an efficient tool for groundwater management and remediation. Furthermore, a literature review and desktop study were done.

10.9.2 AQUIFER CLASSIFICATION

The weathered/fractured aquifer that underlies the site may be classified as a minor aquifer (Parsons, 1995) due to the general yields of less than 2.0 l/s. The Minor Aquifer System is defined as “fractured or potentially fractured rocks which do not have high primary permeability or other formations of variable permeability. Aquifer extent may be limited and water quality variable. Although these aquifers seldom produce large quantities of water, they are important both for local supplies and in supplying base flow to rivers.”

Eco Elementum (2019a) evaluated the groundwater vulnerability of the 2 Seam Mine by assessing the Aquifer Vulnerability Map of South Africa (DWA, 2013) and conducting a Groundwater Vulnerability Assessment. Based on the Aquifer Vulnerability map the 2 Seam Mine is in the least to moderate vulnerability rating area. A vulnerability rating of 7 was determined for the area, indicative of medium vulnerability.

Eco Elementum (2019a) combined the Aquifer System Management Classification and the Vulnerability Classification Rating to determine the Groundwater Quality Management (GQM) Classification, which provides the level of aquifer protection. The GQM Index for the Vlaklaagte Mining area is 4, which indicates a medium level of protection. Based on the Aquifer Susceptibility Map of South Africa (DWA, 2013), the 2 Seam Mining Area is classified as having a low to moderate susceptibility to contamination. It is, therefore, essential that a monitoring protocol is in place and followed at the mine.

10.9.4 HYDROCENSUS

10.9.4.1 DESKTOP HYDROCENSUS

A review of SADC GIP (2022) data for the study area indicates that there are fifteen (15) boreholes within a 5km radius of the site. The groundwater users identified are listed in Figure 49 below. The boreholes are concentrated towards the north of the site, with a few falling in the existing mining right area and south of the mine. Only water level data is available for the boreholes identified.

ID	Source	Latitude (WGS84) Decimal Degrees	Longitude (WGS84) Decimal Degrees	Elevation (mamsl)	Water Level (mbgl)
712910	SADAC GIP	-26.14606	29.33912	1537.744	3.5
712911	SADAC GIP	-26.14246	29.34413	1532	3.1
712912	SADAC GIP	-26.14826	29.34413	1531.174	3.8
712913	SADAC GIP	-26.14736	29.34673	1536.472	4
712914	SADAC GIP	-26.14246	29.34573	1534.383	0
712915	SADAC GIP	-26.14016	29.33862	1532.008	7.9
712916	SADAC GIP	-26.17666	29.36333	1535.612	6.5
712917	SADAC GIP	-26.17716	29.36133	1538.272	17.3
712930	SADAC GIP	-26.24222	29.42473	1679.941	9.1
712934	SADAC GIP	-26.21726	29.43306	1617.111	9.1
712941	SADAC GIP	-26.15056	29.30805	1581.983	7.6
712954	SADAC GIP	-26.17554	29.41971	1544.143	6.1
712964	SADAC GIP	-26.12579	29.42191	1621.955	5.2
713511	SADAC GIP	-26.26728	29.34972	1639	8.8
679093	SADAC GIP	-26.16723	29.4714	1598.218	10.4

Figure 49: Boreholes identified within a 10km radius of the site

10.9.4.2 FIELD HYDROCENSUS

GCS conducted a field hydrocensus exercise from the 11th and the 12th of July 2022 within 2.5 kilometres of the opencast mine to identify preferential groundwater flow paths in the area; with the objective of:

- Obtain up-to-date hydrogeological data, i.e. groundwater levels and hydrochemistry data;
- Identify boreholes that had not been previously recorded; and
- Assess the status and adequacy of the existing boreholes and confirm any information gaps in the field.

During the hydrocensus field investigation, the following borehole information was recorded/confirmed:

- Identify/update all water users within the surrounding area;
- Borehole locality (coordinates using a hand-held global positioning system – GPS);
- Borehole status (incl. equipment) and construction details;
- Static water level; and
- Obtain groundwater samples from five (5) boreholes (hydrochemistry data).

The results of the hydrocensus boreholes are in Figure 50. Due to the expansion of the mining activities, previously identified hydrocensus boreholes (BH-EM14, BH-EM16, BHX3, BH-09, BHX-1, BH2, and BH-EM22) have been destroyed. The areas where the boreholes were located are currently being mined. GCS did however manage to visit a total of fourteen (14) boreholes around and on the site. Ten (10) of the 14 boreholes were accessible for groundwater level measurements, with one of the boreholes (NBH02) fitted with a locked borehole cap, and borehole DFBH was located behind a locked gate therefore, the static water level could not be measured. The measured static water levels ranged between 1.12 to 30.56 mbgl.

BH ID	Coordinates (WGS84 DD)		Property	Elevation	SWL	Borehole depth	Uses		Equipment	Comments
	Latitude	Longitude		(mamsl)	(mbgl)	(mbgl)	Irrigation	Monitoring	(Pumps)	
NBH3	-29.34359	30.13344	Mine	1534	14.01	33.36		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
BH-2M	-26.15645	29.34175	Mine	1533	2.89	32.85		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
NBH5	-26.15807	29.34465	Mine	1536	17.16	33.25		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
NBH4	-26.16935	29.33416	Private	1564	30.56	57.40		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
DFBH	-26.17492	29.34407	Private	1547	--	--		X	None	Borehole locked behind a locked gate
BH4	-26.16235	29.33874	Mine	1543	4.51	12.91		X	None	Monitoring borehole with a borehole cap
EUB-1	-26.15842	29.33632	Mine	1545	1.62	35.67		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
NBH5A	-26.17028	29.35657	Mine	1537	4.32	19.43		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
NBH1	-26.15688	29.34527	Private	1540	7.4	33.1		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
NBH2	-26.15685	29.34528	Private	1541	7.69	33.22		X	None	Old, abandoned Borehole is fitted with steel casing only and had no borehole cap
NBH02	-26.16933	29.33361	Private	1565	--	64		X	None	The borehole cap was locked; therefore, water level measurements could not be obtained
BH-5M	-26.15705	29.34382	Mine	1534	14.2	29.02		X	None	Old, abandoned Borehole is fitted with steel casing only and had a borehole cap
BH-1M	-26.1588	29.33255	Mine	1548	1.12	11.90		X	None	Monitoring borehole the mine use for water level measurements
BH5	-26.17065	29.35382	Mine	1543	10.15	32.74		X	None	Monitoring borehole the mine use for water level measurements

Figure 50: Results of the hydrocensus boreholes

10.9.4.3 GROUNDWATER QUALITY

GCS collected five (5) hydrochemistry samples as part of the hydrocensus for this project. The samples were submitted to X-lab earth (Accreditation No. T0775) for sample analysis.

Table 22 summarises the catchment scale groundwater quality for the study area. The results are compared with (DWAF, 1996e) Ideal Target Water Quality Ranges (TWQR) for Domestic Water Use to contextualise the water quality data.

From the hydrochemistry data obtained, the following can be said:

- All samples exhibit neutral pH conditions;
- Electrical conductivity (EC) for the samples is well within DWAF target values for potable use, except for borehole BH-2M with an above average EC > 120 mS/m.
    - Borehole BH-2M shows high Na, F, and SO_4 concentrations, compared to DWAF's ideal target water quality ranges.
- Borehole NBH1 exhibits a high NO_3 concentration, above DWAF ideal water quality ranges, and is possibly related to the use of nitrate-rich explosives at 2-Seams. Nitrate leachate from the opencast workings and overburden is likely the cause of the high NO_3 concentration.
- Fe and Mn are high in borehole BH4, compared to DWAF's ideal water quality limits for potable water use.
- Figure 51 shows a piper plot of the hydrocensus borehole samples. From the piper-plot, the following is noted: All samples, except NBH5A, plot towards the middle of the left ternary diagram. The sample spread suggests that Ca, Mg, and Na ions are present in molar equivalent concentrations, but that in sample NBH5A Na ions are more dominant.
    - The samples plot towards the left-middle of the right ternary diagram, except NBH1 which plots towards the right corner of the right ternary diagram. The majority of the samples appear to be dominated by bicarbonate (HCO3-). NBH1 is affected by NO_3 as a result of the mining.
    - The sample spread in the centre rhombus varies and suggests that water from borehole BH-5M and NBH5A can be classified as Ca-HCO_3 type groundwater (typical of shallow or fresh groundwater), water from borehole BH4 and BH-2M exists in a mixed state (i.e. undergoing chemical weathering or active ion exchange) and water from NBH1 can be classified as Ca-SO_4 type groundwater (typical of mine drainage affected water).

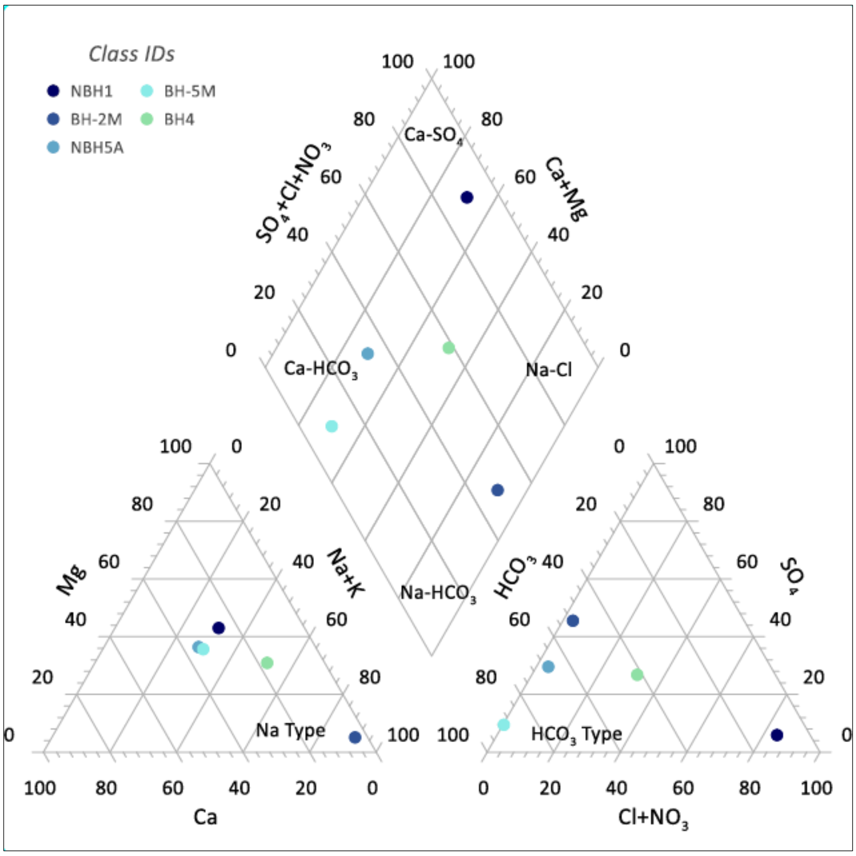

Figure 51: Field hydrocensus hydrochemistry – Piper plot

Table 22: Summary of field hydrocensus water quality data

Determinant	Unit	NBH1	BH-2M	NBH5A	BH-5M	BH4	DWAF 1996 Domestic Use – TWQR
pH at 25°C	pH units	5.3	8.8	7.3	8.6	6.3	4 - 9
Electrical Conductivity at 25°C	mS/m	22	124	56	17	25	0 - 70
Bicarbonate Alkalinity*	mg HCO_3^-/ℓ	12	415	244	104	61	ns
Total Alkalinity	mg $CaCO_3$/ℓ	<12	340	200	85	50	ns
Dissolved Calcium	mg Ca/ℓ	9.9	9.9	43	12	7.2	0 - 32
Dissolved Magnesium	mg Mg/ℓ	10	8.1	27	7.6	7.8	0 - 30
Sodium	mg Na/ℓ	10	271	37	10	23	0 - 100
Potassium	mg K/ℓ	6.3	3.3	4.9	3.7	2.9	0 - 50
Chloride	mg Cl/ℓ	28	14	7.2	0.08	27	0 - 100
Fluoride	mg F/ℓ	<0.05	1.7	0.23	0.2	0.17	0 - 1
Nitrate	mg N/ℓ	54	<0.1	0.7	0.2	<0.1	0 - 6
Sulphate	mg SO_4/ℓ	5.6	289	85	8.6	31	0 - 200
Aluminium	mg Al/ℓ	<0.02	<0.02	<0.02	<0.02	<0.02	0.15
Iron	mg Fe/ℓ	<0.05	<0.05	<0.05	<0.05	5.2	0.1
Manganese	mg Mn/ℓ	0.03	0.01	<0.01	<0.01	0.74	0.05
ns = No Quality Range in Reference Guideline, Orange = Above DWAF (1996) Ideal Water Quality Ranges							

10.9.4.4 MONITORING NETWORK WATER QUALITY

Groundwater quality monitoring data was provided by the client from January 2022 to July 2022 (Zyntha Consulting, 2022). The data is captured here to provide an overview of the existing hydrochemistry of the site with a focus on pH, EC, TDS, Fe, SO_4 and Mn, which are typically associated with pollution from Coal Mines (INAP, 2018). The criteria used in the latest water monitoring report provided are as follows:

Surface water contextualisation

No guidelines were published in the WUL for surface water analysis and no RQO were set for the biophysical node in which the site is located. Based on this, the water quality standards that will be used to measure compliance at 2 Seams are the Water Quality Planning Limits (WQPL) for the Upper Olifants. The WQPL for the Upper Olifants Catchment was published by the Department of Water and Sanitation (DWS, 2016) and Quaternary Catchment B11B, in which the 2-Seams Mine is located, falls under Management Unit 8 – refer to Figure 52.

pH	EC (mS/m)	TDS (mg/l)	Alk (mg/l)	N (mg/l)	Cl (mg/l)	SO_4 (mg/l)	F (mg/l)	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
<6,5 >8,4	>90	>350	>120	>0,5	>40	>150	>0,75	>50	>25	>50	>30	>0,02	>0,3	>0,05

Figure 52: Surface water compliance screening criteria

Groundwater chemistry contextualisation

No guidelines were published in the WUL for groundwater analysis and no RQO were set for the biophysical node in which the 2 Seams Mine is located. Based on this, the water quality standard that will be used to measure compliance at 2 Seams Mine is SANS 241:2015 – refer to Figure 53.

pH	EC (mS/m)	TDS (mg/l)	Alk (mg/l)	N (mg/l)	Cl (mg/l)	SO_4 (mg/l)	F (mg/l)	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	Al (mg/l)	Fe (mg/l)	Mn (mg/l)
<5 >9,7	>170	>1 200	>300	>11	>300	>250	>1,5	>200	>50	>32	>30	>0,3	>0,3	>0,1

Figure 53: Groundwater compliance screening criteria

There are seven (7) groundwater monitoring boreholes at 2-Seams, and their spatial positions are shown in Figure 54 (Zyntha Consulting, 2022). It is noted that BH2, BH4 and ODW are no longer operational. Hence, only four (4) boreholes are being monitored. Sampling is undertaken monthly and quarterly. Based on a review of the hydrochemistry data provided, the following is noted:

- BH1 exhibits neutral pH conditions, and TDS, SO_4, Fe and Al are well within the target water quality ranges. No mining impact is noted.
- BH4 exhibits neutral pH conditions, and TDS, SO_4, Fe and Al are well within the target water quality ranges. Only Mn occasionally exceeds the No mining impact is noted.
- BH5 generally exceeds five of the tested parameters namely; EC, TDS, SO_4, Na, and Mg, and the concentrations are still high as of July 2022 (EC > 300 mS/m, TDS> 2500 mg/l, SO_4 > 2500 mg/l) compared to the target water quality limit. This borehole shows a definite mining impact.

- BH-1 generally exhibit neutral pH conditions, with only NO3 (> 12 mg/l in March 2022, and >14 mg/l in July 2022) observed. The borehole was also sampled by GCS, and high nitrate is confirmed. Nitrate leachate from the opencast workings and overburden is likely the cause of the high NO_3 concentration.

Table 23: Summary of groundwater sampling points (Zyntha Consulting, 2022)

Site Label	Description	Latitude	Longitude
BH1	Monitoring borehole located West of Block 5, just below 4 seam floor	26°09'21.2" S	29°19'57.1" E
BH2	Monitoring borehole located Block 2 / Block 3A, Just below 2 seam floors.	26°10'31.50"S	29°21'3.79"E
BH3	Monitoring borehole below 2 seam floor	26°10'15.17"S	29°22'19.77"E
BH4	Monitoring borehole located Block 5, Just below 4 seam floor	26° 9'44.45"S	29°20'19.69"E
BH5	Monitoring borehole located Mined Out Block 1, Just below 2 seam floor / historical mining depth	26°10'14.16"S	29°21'13.54"E
NEW	Monitoring point for purpose of portable water uses – office drinking water *(not included in this section as water is pristine)*	26°10'42.2" S	29°21'34.0" E
BH-1	Mining monitoring borehole located close to the OC void	26°10'10.37"S	29°20'10.49"E

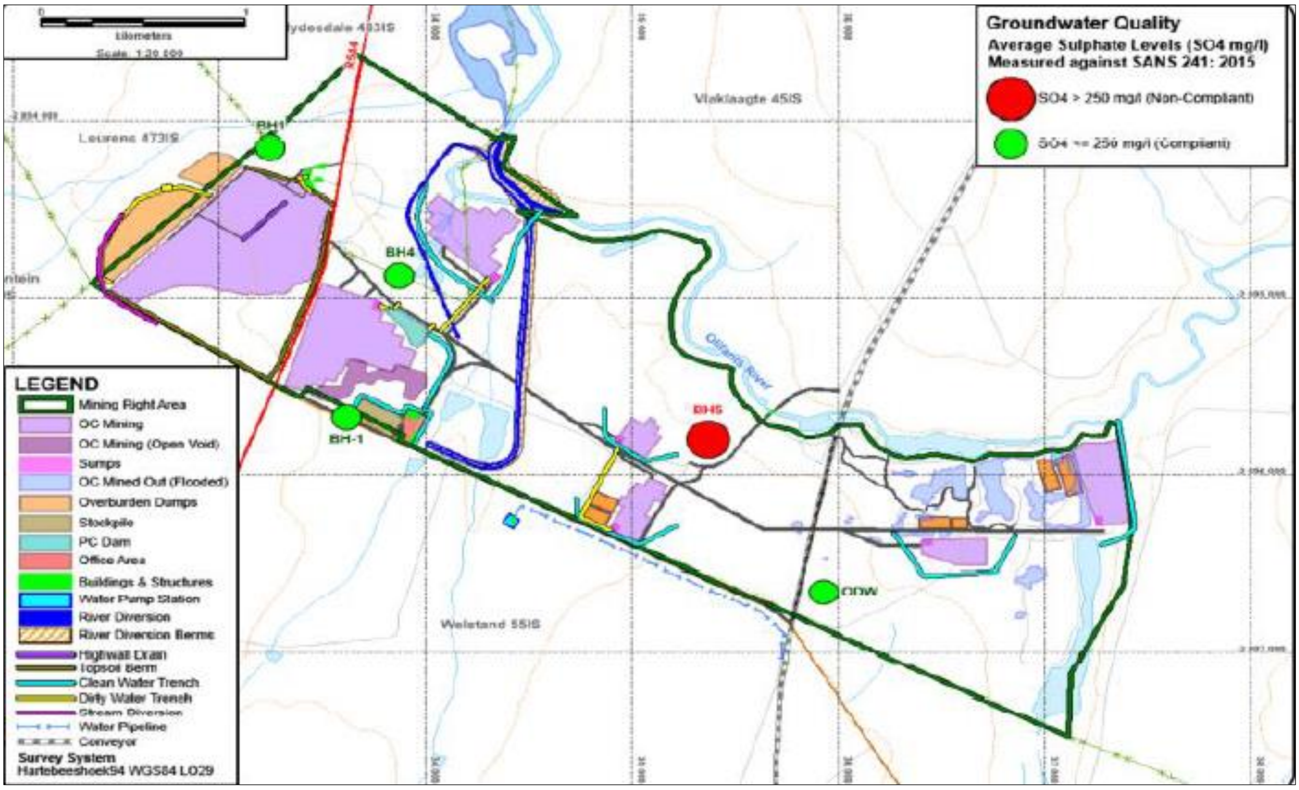

Figure 54: Groundwater monitoring points (Zyntha Consulting, 2022) – SO4 compliance March 2022

10.9.4.5 GROUNDWATER LEVELS

The groundwater levels for boreholes identified in the project area are summarised as follows:

- Groundwater levels for the site range from 1.12 to 30.56 mbgl; and
- Groundwater levels for the catchment range from 3 to 50 mbgl.

Figure 55 plots the groundwater elevation vs topographic elevation for groundwater monitoring boreholes situated at the site. There is a good linear relationship (R ≈ 97%) between topographic and groundwater elevations. The data suggest that the groundwater table mimics the topography.

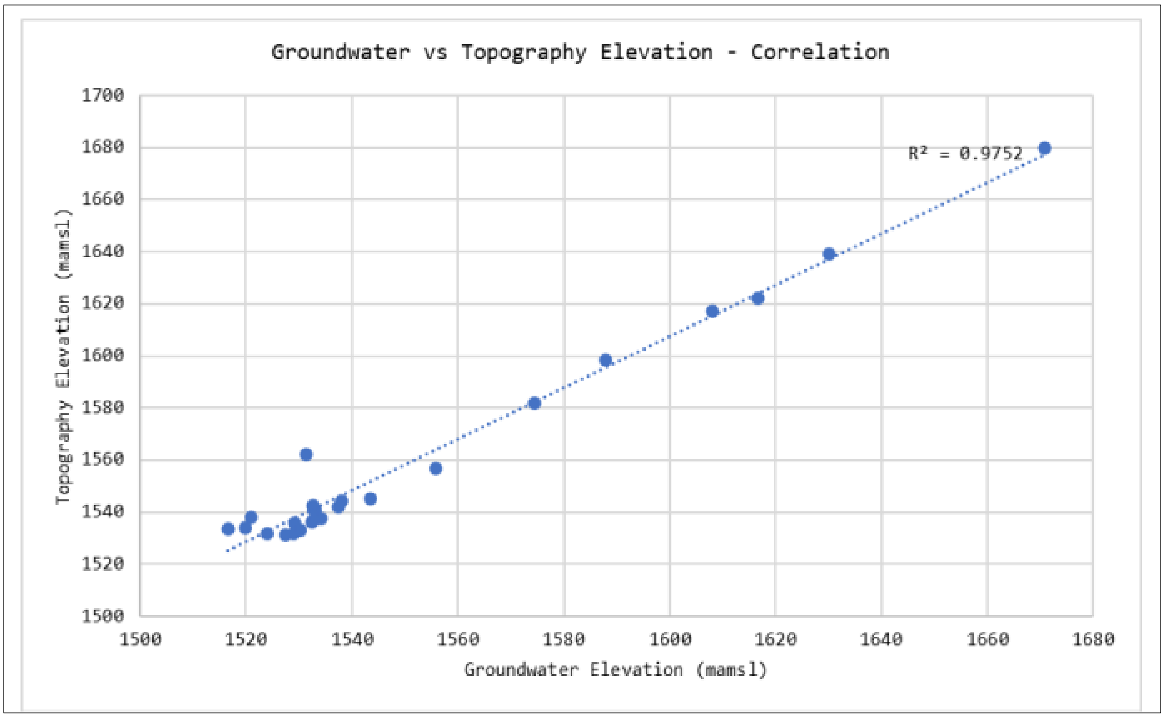

Figure 55: Groundwater elevation vs topographic elevation – correlation

10.9.4.6 GROUNDWATER QUANTITY ASSESSMENT

Data from relevant hydrogeological databases was obtained from the Water Resources of South Africa Report 2012 (WR2012, 2015) and Groundwater Resource Assessment Ver. 2 datasets (DWAF, GRAII, 2006). As stated previously, the site falls within quaternary catchment B11B as tabulated in Table 24.

Table 24: Summarised Quaternary Catchment Information

Quaternary Catchment	Total Area (km^2)	Recharge (mm/a)	Rainfall (mm/a)	Baseflow (mm/a)	Population
B11B	435.3628	7%	691.2	3.58 [PITMAN Model]	>8255

10.9.4.6.1 Sub-catchment Delineation

The combined extent of the sub-catchment areas is approximately 106.35 km^2.

10.9.4.6.2 Existing groundwater usage (EU)

No existing groundwater users were identified via the desktop and field hydrocensus. Hence, no EU is reserved for the water balance.

10.9.4.6.3 Basic Human Needs (BHN)

The population in B11B is > 8255 people. As a result of the population not being known, and the limited water supply boreholes in the area, no BHN is reserved (i.e. available data suggest that the aquifer units in the area are poorly exploited for groundwater use).

10.9.4.6.4 Proposed Groundwater Usage (PU)

No PU is reserved for the 2-Seams mine. The only groundwater that will be removed is groundwater ingress into opencast operations. Hence, no fixed PU is reserved. The

10.9.4.6.5 Existing Land Use (LU)

Based on 2018 South African National Land Cover data for the sub-catchment, the sub-catchment consists predominantly of mine dumps, mine operations, thickets, bushels and natural grassland (DEA, 2019). The project area is also extensively mined, and hence, there may be both decreases/increases in groundwater recharge. To be conservative, these anthropogenic activities are not accounted for, to present a base case groundwater reserve.

10.9.4.6.6 Groundwater Balance

Figure 56 presents the groundwater reserve calculations for the delineated sub-catchments. Based on available information and the water balance undertaken, there is a surplus amount of groundwater available for all sub-catchments delineated. All groundwater dewatering as a result of opencast and underground expansions should be evaluated in context to the surplus reserve calculated.

HRU1			HRU2			HRU3		
Area	78.22	km^2	Area	19.97	km^2	Area	8.15	km^2
Rainfall	691.23	mm/yr	Rainfall	691.23	mm/yr	Rainfall	691.23	mm/yr
BF	13.63	mm/yr	BF	13.63	mm/yr	BF	13.63	mm/yr
Aquifer Recharge			Aquifer Recharge			Aquifer Recharge		
Re	48.39	mm/yr	Re	48.39	mm/yr	Re	48.39	mm/yr
Re to Aquifer	3784868.85	m^3/yr	Re to Aquifer	966461.33	m^3/yr	Re to Aquifer	394566.44	m^3/yr
Existing Use (EU)			Existing Use (EU)			Existing Use (EU)		
	None	m^3/day		None	m^3/day	None		m^3/day
Total EU Day	0.00	m^3/day	Total EU Day	0.00	m^3/day	Total EU Day	0.00	m^3/day
Total EU Year	0.00	m^3/yr	Total EU Year	0.00	m^3/yr	Total EU Year	0.00	m^3/yr
Basic Human Needs			Basic Human Needs			Basic Human Needs		
BHN	0.00	m^3/day	BHN	0.00	m^3/day	BHN	0.00	m^3/day
BHN	0.00	m^3/yr	BHN	0.00	m^3/yr		0.00	m^3/yr
Base Flow			Base Flow			Base Flow		
BF	1066176.76	m^3/yr	BF	272246.85	m^3/yr	BF	111147.20	m^3/yr
Available	2718692.08	m^3/yr	Available	694214.48	m^3/yr	Available	283419.24	m^3/yr
Proposed Use (PU)			Proposed Use (PU)			Proposed Use (PU)		
	None	m^3/day		None			None	
		m^3/day		147.17				
Total PU Day	0.00	m^3/day	Total PU Day	147.17	m^3/day	Total PU Day	0.00	m^3/day
Total PU Year	0.00	m^3/yr	Total PU Year	53716.32	m^3/yr	Total PU Year	0.00	m^3/yr
Nett Balance	2718692.08	m^3/yr	Nett Balance	640498.16	m^3/yr	Nett Balance	283419.24	m^3/yr

Figure 56: Estimated groundwater reserves for delineated sub-catchments

10.9.4.7 GROUNDWATER POTENTIAL CONTAMINANTS

The potential sources of contamination at 2 Seam Mine include the opencast workings, old, backfilled opencast workings, overburden and waste rock dumps, ROM stockpiles and PCDs. The underground mine workings could pose a risk of groundwater contamination.

10.9.5 GEOCHEMICAL OVERVIEW

A total of 19 rock samples were collected by GC in 2016 as part of a geohydrological assessment, from the 2 Seam Pty Ltd Mine. The following rock samples were collected:

- Carbonaceous mudstones and shales samples;
- Coal samples;
- Sandstone and mudstone samples; and

- Weathered sandstone and clay sample.

The samples were subjected to acid-base accounting (ABA) and net acid generation (NAG) testing, as well as sulphur speciation (S-Spec), distilled water leach and peroxide leach tests and mineralogical testing such as X-ray diffraction and X-ray-florescence (XRD & XRF). The test work data is deemed still valid, as the same resource is being mined and the same wastes are being generated. The test results were used to quantify the source terms associated with the 2-Seams Mine, and are summarized as follows (GCS, 2016):

Mineralogy (XRD & XRF):

- The hanging-and-footwall carbonaceous clastic rocks comprised mostly of kaolinite with lesser amounts of coal compared to the coal samples. The sandstone is comprised predominantly of kaolinite with lesser quartz.
- Carbonaceous mudstone - sample comprises mainly kaolinite and coal as dominant and major minerals with lesser muscovite and quartz.
- Carbonaceous shale with subordinate coal - sample comprises mainly kaolinite and coal as dominant and major minerals with lesser muscovite and siderite.
- Coal with subordinate carbonaceous mudstone - samples comprise mainly coal and kaolinite as dominant and major minerals with lesser muscovite and quartz.
- Fine sandstone with subordinate mudstone - sample comprises mainly kaolinite as the dominant mineral with lesser coal, microcline, muscovite, and quartz.
- Coal with subordinate fine sandstone): The sample comprises mainly coal and kaolinite as dominant and major minerals with lesser quartz.

ABA & NAG:

- 33.3% (2 out of 6 samples) of the carbonaceous mudstone/shale samples collected have a high potential to generate acidic drainage (and will generate a high salt load), and 17% (1 out of 6) have a low potential to generate acidic drainage (and will generate a low to medium salt load), 17% (1 out of 6) has a very low potential to generate acidic drainage (and will generate a very low to medium salt load), 33.3% (2 out of 6 samples) of the carbonaceous mudstone/shale samples collected has no potential to generate acidic drainage (and will generate no salt load);
- 100% (4 out of 4 samples) of the coal samples collected have a high potential to generate acidic drainage (and will generate a high salt load);
- 50% (2 out of 4) of the shale samples collected have a very high potential to generate acidic drainage (and will generate a very high salt load), and 50% (2 out of 4) have a very low potential to generate acidic drainage (and will generate a very low salt load)
- 25% (2 out of 8) of the sandstone/mudstone samples collected have a high potential to generate acidic drainage (and will generate a high salt load), and 38% (3 out of 8) have a low to medium potential to generate acidic drainage (and will generate a medium to high salt load), 17% (1 out of 8) has a low potential to generate acidic drainage (and will generate a low to medium salt load), 17% (1 out of 8) has a very low potential to generate acidic drainage (and will generate a very low to medium salt load) 13,

13% (13 out of 8 samples) of the sandstone/ mudstone samples collected has no potential to generate acidic drainage (and will generate no salt load); and

- 100% (1 out of 1) of the soil and clay samples collected have low potential to generate acidic drainage (and will generate a low to medium salt load);
- The carbonaceous mudstone samples generally have a variable %S content at an average of 0.274%. There is, however, an average neutralisation potential of 30.3 kg/t CaCO3, thus the initial leachate from these rocks will not be acidic as confirmed by the NAG testing but it is suspected that 66% of the samples have sufficient sulphide content and will acidify over the long-term because of the high sulphide content;
- The coal samples all have a high %S content and a lower neutralisation content thus if subjected to oxidisation then leached acidic drainage will occur as confirmed by NAG testing;
- The sandstone and mudstone samples have variable %S content with a relatively high neutralisation potential, but about 38-76% of the samples have the potential to generate acidic drainage if oxidised and subsequently leached as confirmed by NAG testing;
- The weathered sandstone and clay sample have a relatively low %S content with a low neutralisation potential thus there is a low potential to generate acidic drainage.
- Overall, it could be concluded that about 50% of the hanging wall/waste rock material (sandstone, mudstones, shales) has the potential to generate acidic drainage if the material is oxidised and leaching occurs subsequently. The coal samples have a high potential to generate acidic drainage if subjected to oxidisation. Usually, the coal is mined before significant oxidation occurs and only coal remaining in the mine will potentially be of concern over the long term.

Reagent water leach:

The static leach test performed at a 1:20 ratio is a relatively diluted extraction and did not leach the chemicals at significant concentrations. It is expected that metals like Fe, Mn, Co, Ni and Pb will only be significantly present in acidic leachate if the rocks are subjected to atmospheric conditions (oxidation).

10.9.6 AQUIFER CHARACTERISATION

10.9.6.1 AQUIFER YIELD & HYDRAULIC CONDUCTIVITY

The aquifer is considered a low-yielding aquifer and has a reported yield in the order of 0.1 l/s to 0.5 l/s (King, 1998). Table 25 provides a summary of aquifer test data (transmissivity and hydraulic conductivity) for existing and new aquifer test data collected for the 2-Seams Mine Data indicate that aquifer transmissivity (T) values range from 0.25 to 50.25 m²/day. Assuming a uniform saturated aquifer thickness of ± 10 m, yields an aquifer hydraulic conductivity (K-value) ranging from 0.03 to 5.03 m/day. T values for the alluvium sediments associated with the Olifants River are estimated in the order of 100 m²/d (Botha, 1998).

Table 25: Summary of aquifer test data

BH ID	Source	Test Type	K (m/day)	T (m²/day)
BH1	GCS (2016)	Falling Head Test	0.03	0.25
BH2	GCS (2016)	Falling Head Test	3.50	35.00
BH2	GCS (2016)	Pump Test	2.80	28.00

BH ID	Source	Test Type	K (m/day)	T (m²/day)
BH3	GCS (2016)	Falling Head Test	0.03	0.31
BH3	GCS (2016)	Pump Test	0.70	7.00
BH4	GCS (2016)	Falling Head Test	0.06	0.56
BH5	GCS (2016)	Falling Head Test	0.10	0.97
BH5	GCS (2016)	Pump Test	1.20	12.00
BH-5M	GCS (2022)	Falling Head Test	0.06	0.59
BH-2M	GCS (2022)	Falling Head Test	5.03	50.25
BH4	GCS (2022)	Falling Head Test	2.06	20.56
NBH4	GCS (2022)	Falling Head Test	0.07	0.68

10.9.6.2 AQUIFER STORAGE/STORATIVITY

According to King *et al.* (1998) and DWAF (2006), the aquifer storage/storage coefficient is in the order of magnitude of < 3.1 x 10-3 (unitless) – supported by available pump test data. The porosity of the aquifer is expected to range from 15 to 20 %. Literature data suggest that aquifer storage coefficients range from 5 to 10%.

10.9.6.3 GROUNDWATER VELOCITIES AND FLOW RATES

The calculation of the groundwater flow rate is important when determining the rate at which a pollutant will migrate into an aquifer. The average flow velocity can be calculated, using Darcy's Flow Velocity equation, as given below in Equation 3.

$$v = \frac{Ki}{\theta} \quad \text{..........Equation 3}$$

Where: *v=flow velocity*

K=hydraulic conductivity

θ=porosity (a standard porosity of 20% for sandstones will be used)

i =probable average hydraulic gradient (Equation 4)

$$i = \frac{h1-h2}{l} \quad \text{..........Equation 4}$$

The hydraulic gradient is calculated in Table 26. Table 27 shows the results of the flow velocity equation, which indicates that groundwater will flow through the weathered aquifer at an approximate average rate of 0.113 m/day or 41.5 m/year. This flow rate is considered slow. However, the flow rate will increase in areas adjacent to dykes, which act as preferential pathways. A porosity of 15-20% was applied, based on the typical porosity for shale and sandstone from the literature (Freeze and Cherry, 1979).

Table 26: Hydraulic gradient calculation

	OC4 (NE section of Diversion) - NBH1 to BH-5M	OC6 to OC4 - EUB-1 to BH-1M	OC4 to Olifants River (BH4 to BH-5M)
h1 (mamsl)	1533.168	1543.503	1537.526
h2 (mamsl)	1519.846	1519.846	1519.846
h1-h2 (m)	13.322	23.657	17.68
L (m)	139	379	776
i	0.096	0.062	0.023
K (m/day) - GeoMean	0.33	0.33	0.33
n	0.2	0.15	0.15

Table 27: Flow velocity calculation

	OC4 (NE section of Diversion) - NBH1 to BH-5M	OC6 to OC4 - EUB-1 to BH-1M	OC4 to Olifants River (BH4 to BH-5M)	Average
m/day	0.1563	0.1357	0.0495	0.1138
m/year	57.0401	49.5318	18.0794	41.5504

Groundwater flow generally follows the topographical characteristics of the area and local streams, and rivers act as groundwater boundaries for the shallow weathered aquifer. The site is bound to the northeast by the Olifants which can be regarded as the local weathered aquifer's boundary. Considering the stream diversion of the Olifants river would mean that the boundary will be shifted. It is, therefore, important to consider the existing groundwater flow field and post-stream diversion groundwater flow field. The local sphere of groundwater influence is indicated in Figure 57. The focus of the groundwater impact assessment is within this area.

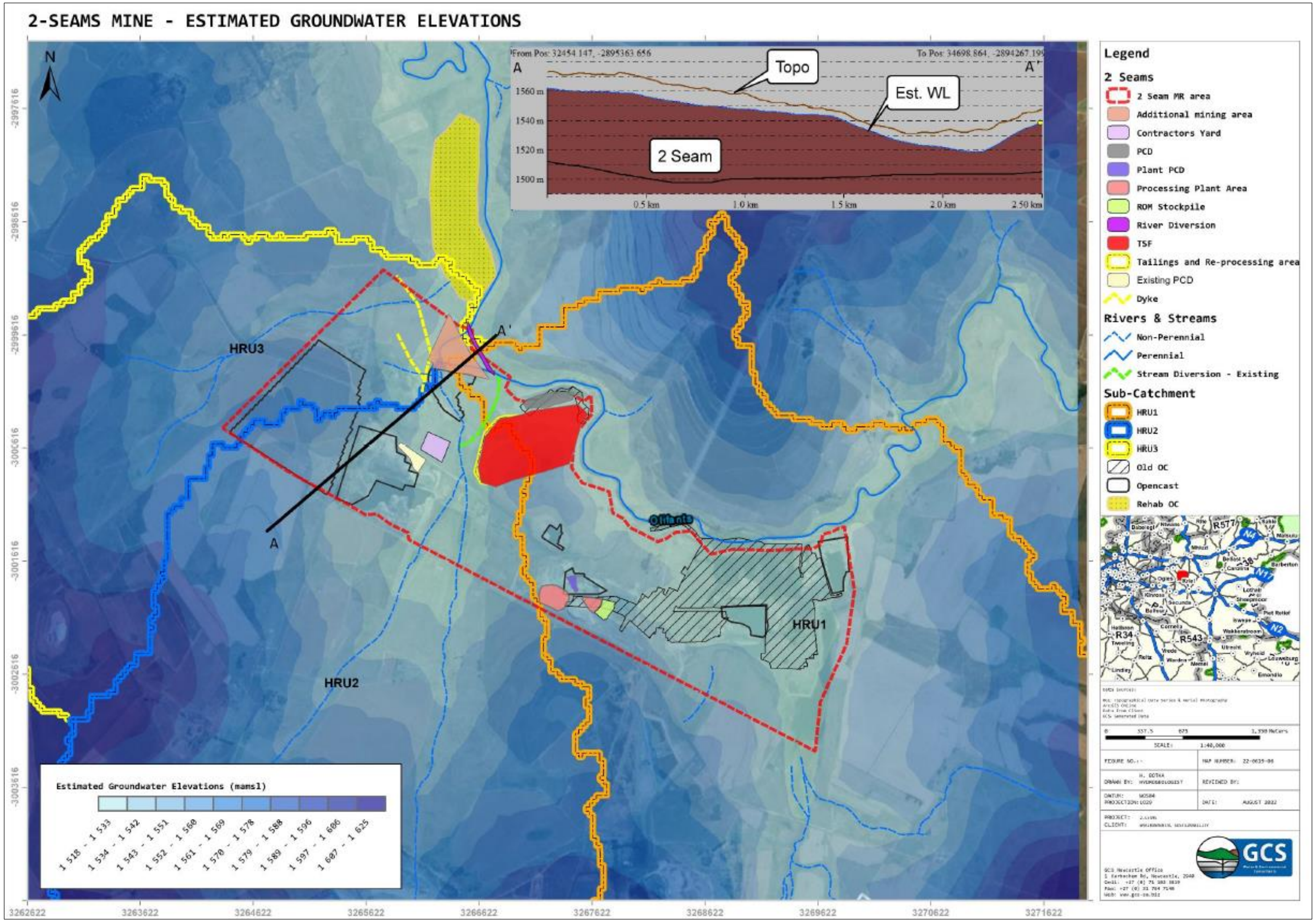

Figure 57: Bayesian estimation of groundwater table at the site and sphere of groundwater influence

10.9.7 GROUNDWATER MODELLING

10.9.7.1 CONCEPTUAL GEOHYDROLOGICAL MODEL

Based on the information for the site a conceptual model was developed. The conceptual model illustrates the existing flow system and aims to evaluate potential groundwater pollution sources (i.e. opencast workings, PCDs, TSF etc.), potential activities that could impact the groundwater flow regime (i.e. opencast mine dewatering, underground mine dewatering, river diversion), as well as the end-receivers that will be exposed to the risk (Olifants river, vadose zone and aquifer units).

Figure 58 shows the current site layout, planned mining pits (OC4 and OC4A) and the proposed Olifants River diversion portion. Based on the conceptual model developed, the following is noted:

- The 2 Seam Mine is located in the Highveld Region of Mpumalanga. Summer rainfall is experienced in the study area, with a MAP rate of approximately 691 mm/year. Evaporation is estimated to be 1385 mm/annum.
- Regional drainage features flow towards the North, but locally the Olifants River flows towards the northwest. The topography across the study area is slightly undulating with a general gradient of 3° to 10° towards the north-northeast where the Olifants River borders the site.
- The study area is underlain by stratigraphy of the Vryheid Formation, Ecca Group of the Karoo Supergroup. The coal-bearing Vryheid Formation consists predominantly of fine-grained sandstone, platy shale and coal (No. 4, No. 2 and No. 1 seams). the No. 2 and No.4 seams are the major mining targets at 2 Seam Vlaklaagte Mine.
- Three (3) aquifers occur within the study area: alluvium zone (unconfined) along the Olifants River flood plan, an upper weathered Ecca aquifer (shallow aquifer formed in the weathered zone of the Karoo sediments), fractured aquifers within the unweathered but fractured Ecca stratigraphy and fractured aquifer underlying the Ecca sediments consisting of low yielding Dwyka and/or basement rocks. An additional hydrogeological unit is present within the study area, attributed to the disturbance of in-situ hydrogeological conditions by historical mining activities.
- The latest groundwater level measurements at 2 Seam Mine range between 1.12 to 30.56 mbgl and indicate subdued groundwater levels in some areas due to historical mining activities.
- Groundwater contamination within the vicinity of the historical underground mining areas has historically been exhibited by BH2, BH3 and prominently BH5 (EC > 300 mS/m, TDS> 2500 mg/l, SO4 > 2500 mg/l).
- TDS concentrations within old, rehabilitated pits that have become flooded range between 500 mg/l and 2400 mg/l. Sulphate varies between 200 mg/l and 1400 mg/l. Neutral pH conditions are observed (GCS, 2016).
- Acid-base accounting analyses conducted on material sampled for the 2 Seam Mine indicate that 33.3% of the carbonaceous mudstone/shale samples have a high potential to generate acidic drainage; 100% (4 out of 4 samples) of the coal samples collected have a high potential to generate acidic drainage; 50% (2 out of 4) of the shale samples collected has a very high potential to generate acidic drainage, 25% (2 out of 8) of the sandstone/mudstone samples collected has a high potential to generate acidic

drainage and 100% (1 out of 1) of the soil and clay samples collected has low potential to generate acidic drainage (and will generate a low to medium salt load.

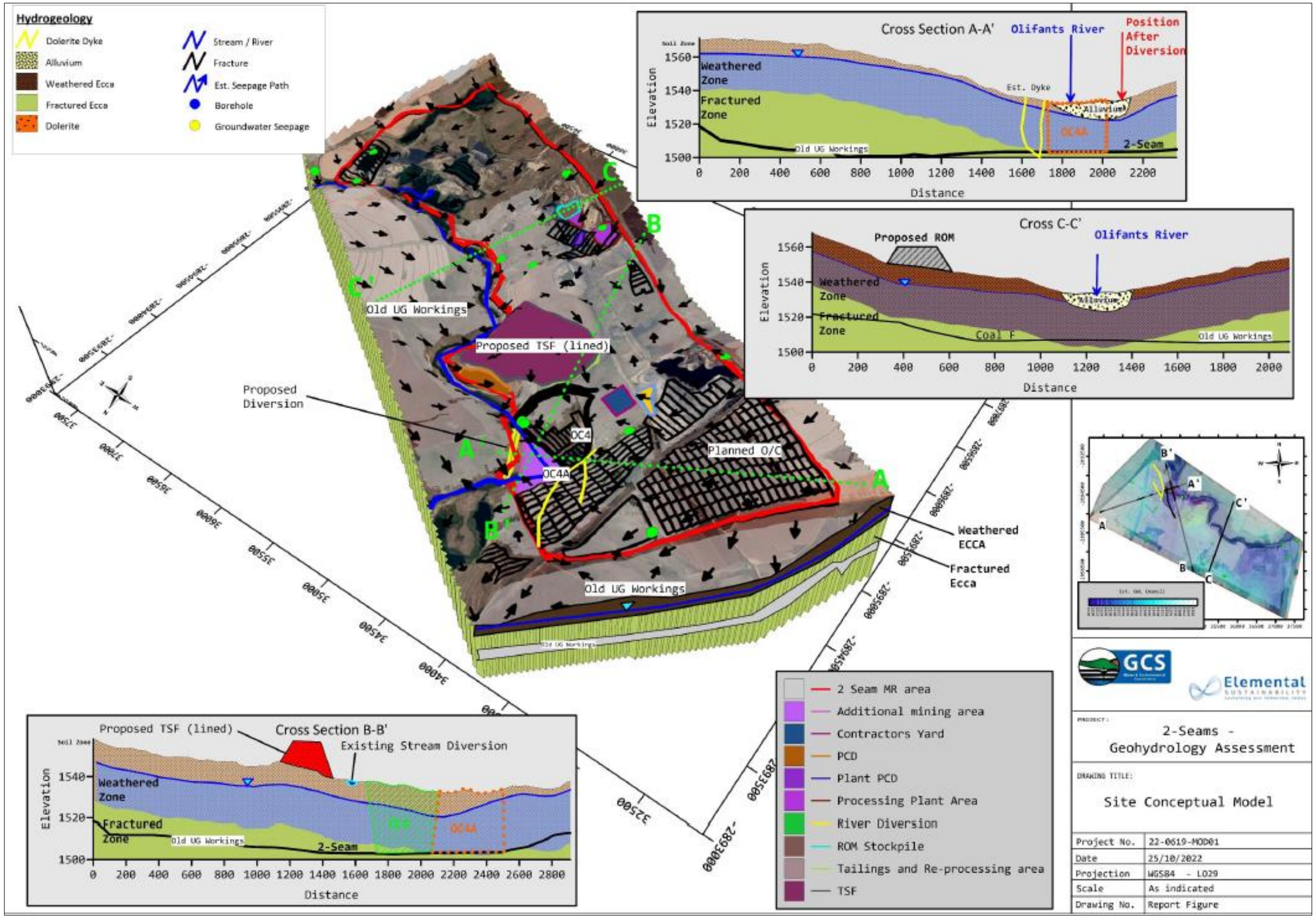

Figure 58: Conceptual geohydrological model

10.9.7.2 SOURCES-PATHWAYS AND RECEPTORS

The source-pathway-receptor principle should be addressed by the conceptual hydrogeological model, and is presented as follows:

- Groundwater Sources
  - Recharge: Natural recharge to the weathered aquifer is estimated to be within 1 and 3% of MAP (Grobbelaar et al, 2004). Recharge could also potentially occur from surface water bodies Artificial sources of recharge include leakage from pollution control dams (PCD) if the structural integrity of their foundations is compromised, waste rock dumps, ROM stockpiles and backfilled opencast workings. Recharge to dumps, stockpiles and old rehabilitated opencast could range between 8 and 80% of MAP, depending on the degree to which the dumps/backfill have been levelled and rehabilitated (Hodgson and Krantz, 1998), but a general recharge value of 20% can be expected for these features within the study area.
  - Contamination: The potential sources of contamination at 2 Seam Mine include the opencast workings, old, backfilled opencast workings, overburden and waste rock dumps, ROM stockpiles and PCDs. The underground mine workings could pose a risk of groundwater contamination, as is likely evident at BH5.

- Groundwater Pathways
  - Contaminants may migrate from potential sources of contamination to sensitive receptors through the weathered aquifer. Groundwater flow towards rivers and streams could lead to the contamination of surface water bodies if baseflow contribution occurs.
  - Contaminated recharge may permeate through the vadose zone to the shallow weathered aquifer, and depending on aquifer interconnectivity, migrate to the fractured aquifer.
  - Decant and consequent overland flow towards depressions can contaminate downstream receptors. Infiltration of contaminated decant may also occur.
  - Fault zones and dykes represent preferential pathways of groundwater movement and contaminant migration. Although no site-specific data is available to detect these structures, the Karoo Supergroup does exhibit brittle deformation and has been intruded by dolerite dykes.

- Groundwater Receptors
  - Dewatering of the opencast pits will result in groundwater flow towards the mines, thereby, creating artificial groundwater receptors.
  - Drainage systems: contaminated baseflow contribution may occur to surface water bodies and ecosystems such as wetlands if a groundwater contaminant plume has migrated to the drainage systems. Decant and overland flow may lead to the contamination of surface water bodies. The reduced baseflow contribution due to the development of a dewatering cone of depression during mining may also occur.
  - Potential groundwater users within the dewatering cone of depression and contaminant plume impact area. The impact area may become larger if geological structures are intercepted.

- The groundwater flow system along the Olifants River that will be diverted is predicted to change significantly. Groundwater baseflow and groundwater recharge resulting from the presence of the Olifants River will decrease along OC4 & OC4A, and a long-term dewatering zone is predicted as a result of the natural hydraulic boundary conditions changes if the Olifants River is diverted. The zone of influence (ZOIp) was further assessed by numerical groundwater modelling.

10.9.7.3 DECANT ELEVATIONS, WATER ACCUMULATION IN THE FINAL VOID AND DECANTING AREAS

Decant may occur if (refer to Figure 59 and Figure 60):

- Excess rainwater ingress or rainfall runoff is allowed to accumulate in unrehabilitated and rehabilitated opencast and access adits (box cuts), as well as hydraulically connected boreholes. The aim should be to reduce runoff into the mine workings, and compact and slope rehabilitated workings to reduce infiltration.
- Areas that are topographically lower than the highest flooded underground working sections, may be at risk of decanting. The likely decant will be driven by the following factors:
  - The water in the flooded / partially flooded workings will form a positive piezometric head. Hence, water under pressure will tend to reach this piezometric level either through the underground workings or escaping through fractures, fissures, adits, contact zones, fault zones or higher conductive areas.
  - Exploration boreholes, opencast box cuts, and ventilation shafts into underground workings with an elevation below the piezometric pressure level are at risk of becoming decant points (flow conduits).

Decant may not be a point source discharge (i.e. seen on the surface as a running stream of water such as a spring) but can also occur via the weathered aquifer or vadose zone (i.e. as baseflow seepage).

Based on existing information for the site, and factoring in the drivers of decant mentioned above, decant at 2-Seams is given a probability in the probability range of moderate to high. It is important to update the decant risk and management strategies as mining progresses and as more geohydrological data becomes available. The interconnectivity of the underground workings with that of the opencast workings needs to also be carefully monitored, as mine interflow can subject connected mine works areas in lower laying areas to decant.

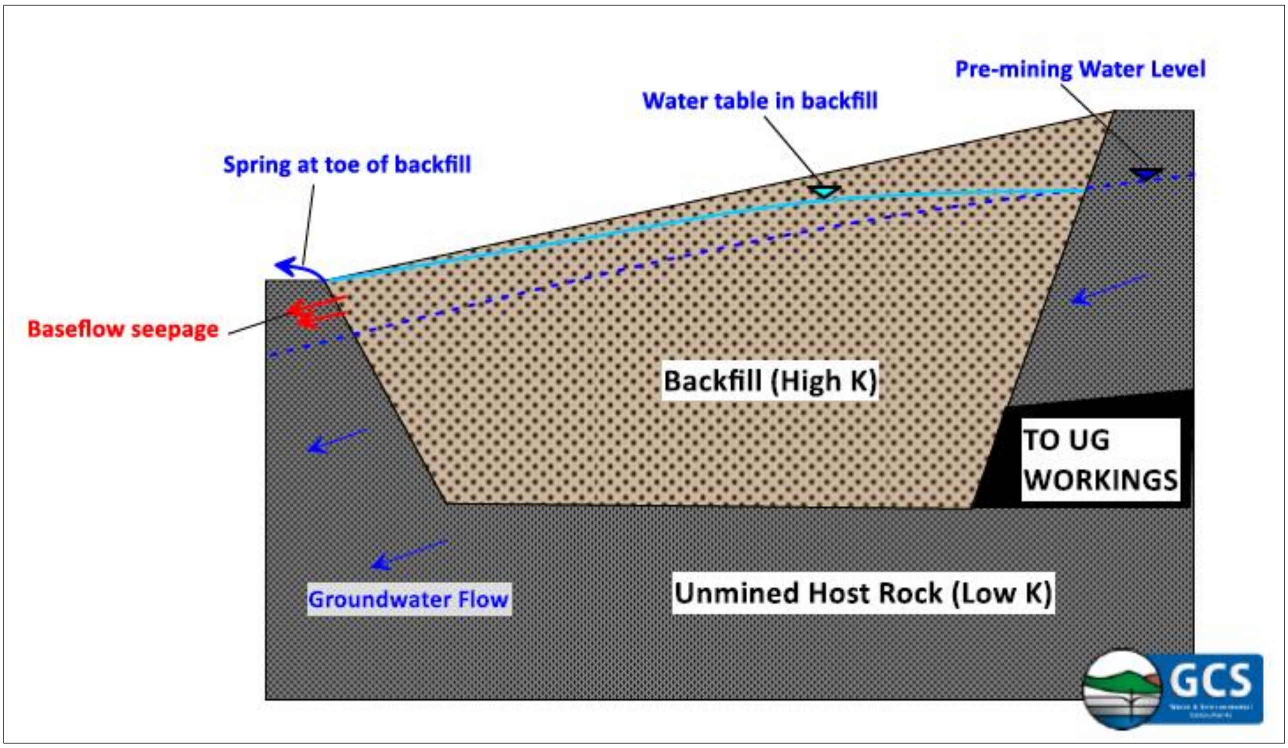

Figure 59: Concept of decanting from backfilled adits

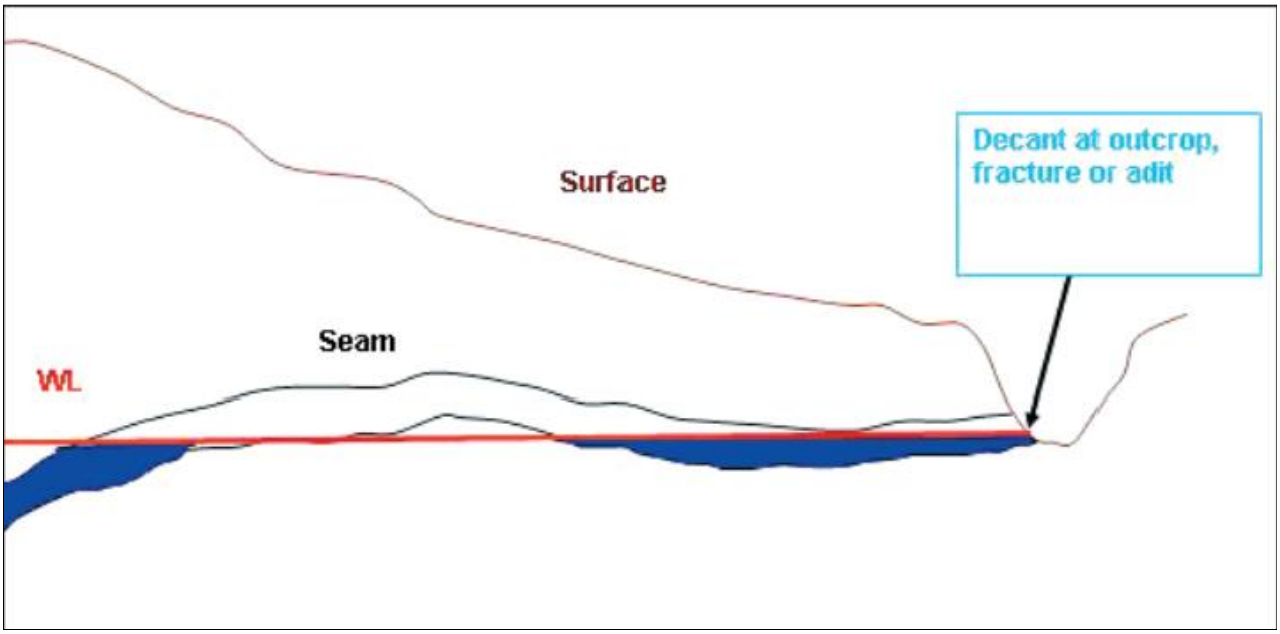

Figure 60: Decant illustration of an unflooded mine, with one seam mined (after Vermeulen and Usher, 2017)

The decant location, elevation and decant probability are captured in Table 28 and shown in Figure 61. Based on the coal floor elevations, the existing mine plan and proposed mine plan for OC4 and OC4A, one (1) decant area previously identified for OC4 will fall away, and 2 new potentials decant areas associated with OC4A will likely occur (along the north and east side of the pit). Decant volumes are estimated to be between 26 to 66.5 m³/day for the backfilled OC4 and OC4A areas.

Table 28: Potential decant locations and probability

Block	OC1	OC2	OC2A	OC3	OC4A -1	OC4A -2	OC5	OC6
X	37148.823	35444.883	35081.537	36377.502	34235.2	34458.6	33899.743	33529.017
Y	-2895873.6	-2896215.9	-2895713	-2896357.6	-2894151	-2894151	-2895234.8	-2894458
Lowest Topography or Decant Elevation (mamsl)	1534	1549	1549	1534	1532.804	1532.059	1547	1551
Average WL Depth (mbgl)	5	16	14	12.5	5	5	13	9
Duration of Mining (months)	9	10	6	6	12	12	16	24
Approximate Average Depth Below Decant Point (m3/day)	27	24	38	15	31	31	22	29
Pit Surface Area (m2)	75300	42100	17300	61700	175859	175859	222500	697100
Minimum Time to Decant (years) (15% void ratio, 20% recharge)	7	18	16	14	18	18	17	18
Maximum Time to Decant (years) (25% void ratio, 8% recharge)	26	75	66	59	47	47	65	58
Minimum Decant Volume (m3/day)	11	6	3	9	26	26	33	102
Maximum Decant Volume (m3/day)	28	15	6	23	66.5	66.5	81	255
Comment	Likely to decant. Need to verify historical inflows.	Unlikely to decant.	Unlikely to decant.	Uncertainty regarding decant potential. Need to verify historical inflows.	Likely to decant.	Likely to decant.	Unlikely to decant.	Unlikely to decant.

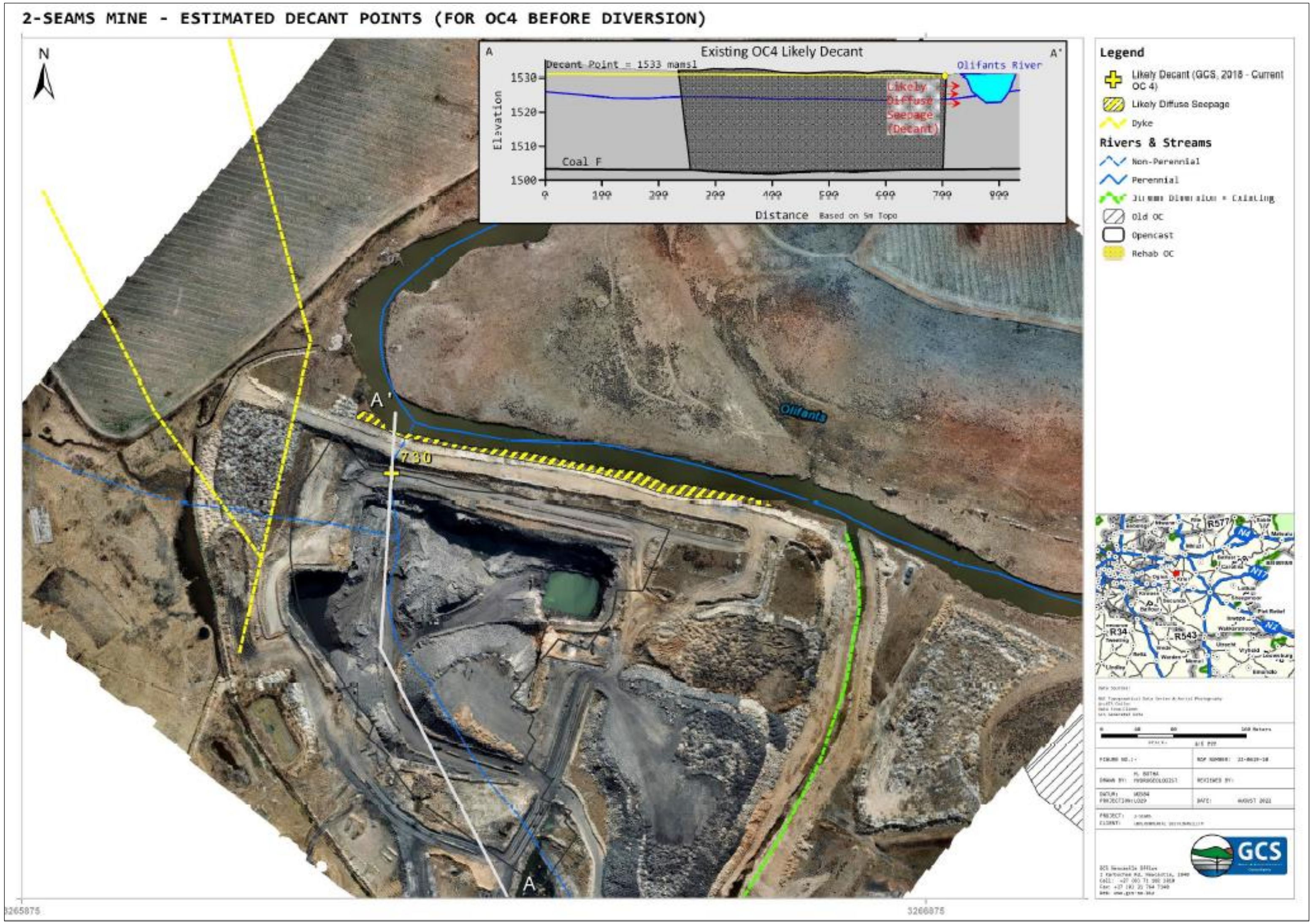

Figure 61: Estimated diffuse decant area

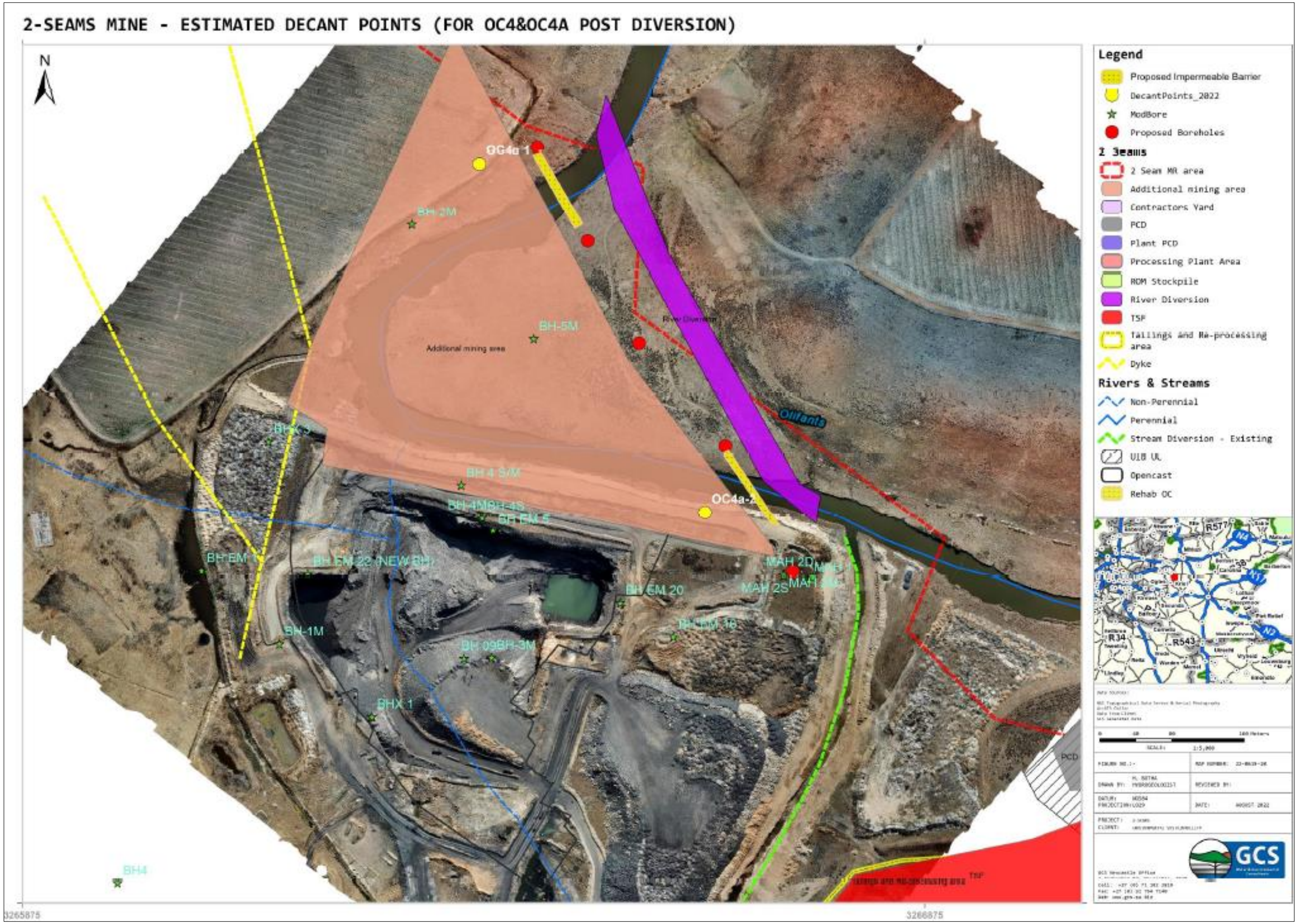

Figure 62: Identified decant points

10.9.7.4 NUMERICAL GROUNDWATER MODEL AND TRANSPORT MODEL

The numerical groundwater model developed describes the existing Zone of Influence (ZOIf) and Zone of Impact (ZOIp) of the activities associated with the proposed OC4, OC4a and Olifants River diversion activities.

The objective of the model

As stated previously, the groundwater flow and transport models were developed to:

- Simulate the operational and assumed post-closure groundwater flow system (particularly for OC4 and OC4a); and
- Evaluate the flow system and impact on the receiving environment and decant potential if the stream diversion is implemented (50 and 100Y).

Model assumptions and limitations

The following model assumptions and limitations are recognised:

- Groundwater-specific yield and specific storage values were derived from literature ranges for the rock encountered in the study area. It is assumed that specific yield and specific storage values in the model domain are like literature values.
- SO_4 was used to illustrate the predicated zone of impact due to the physical and chemical attributes of SO_4. SO_4 is typically associated with mine drainage from coal mines and is, therefore, a good tracer to predict impacts (INAP, 2018).
- Conductance for river and stream drainage cells was derived from the literature and built-in stream conductance models in Visual Modflow. It is assumed that conductance in the model domain is like literature values.
- The model does not consider kinetic mineral reactions (i.e. oxidation of minerals within the waste storage facilities or seepage thereof).
- Source terms were defined based on available data for the site and were traced based on available borehole SO_4 data and google imagery of the site.
- No capping of the opencast workings (OC4 and OC4A) is simulated. It is therefore assumed that the workings will be backfilled and seeded. In the numerical simulation, a recharge range of 10 to 15% is applied to the backfilled pit areas.

Model time

The model runs from 2010 to 2210 and has a total simulation time of 73 000 days. The mining of OC4 and OC4a will take place from November 2022 to October 2023, with the river diversion planned for Feb 2023. The model simulation time was derived from available mine sequences and mine plans.

10.9.7.4.1 MODEL CONCEPTUALISATION

The groundwater model grid and boundary condition visualisation are shown in Figure 63 and Figure 64. The model describes the groundwater flow field within the sphere of influence mentioned earlier in the report. Both hydrocensus, monitoring and SADAC GIP data for the model domain were applied to calibrate and illustrate the groundwater flow system for the project area.

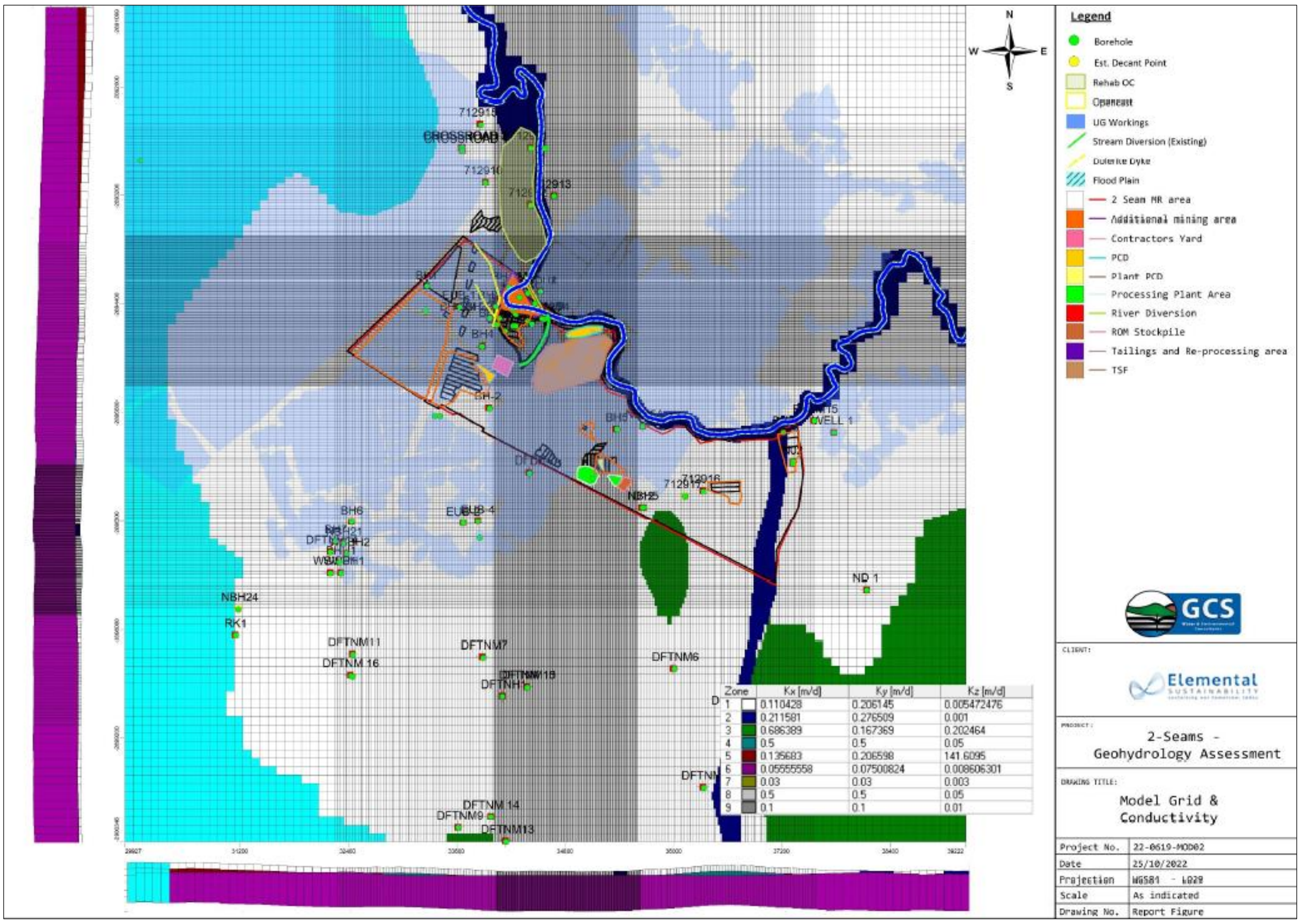

Figure 63: Model grid

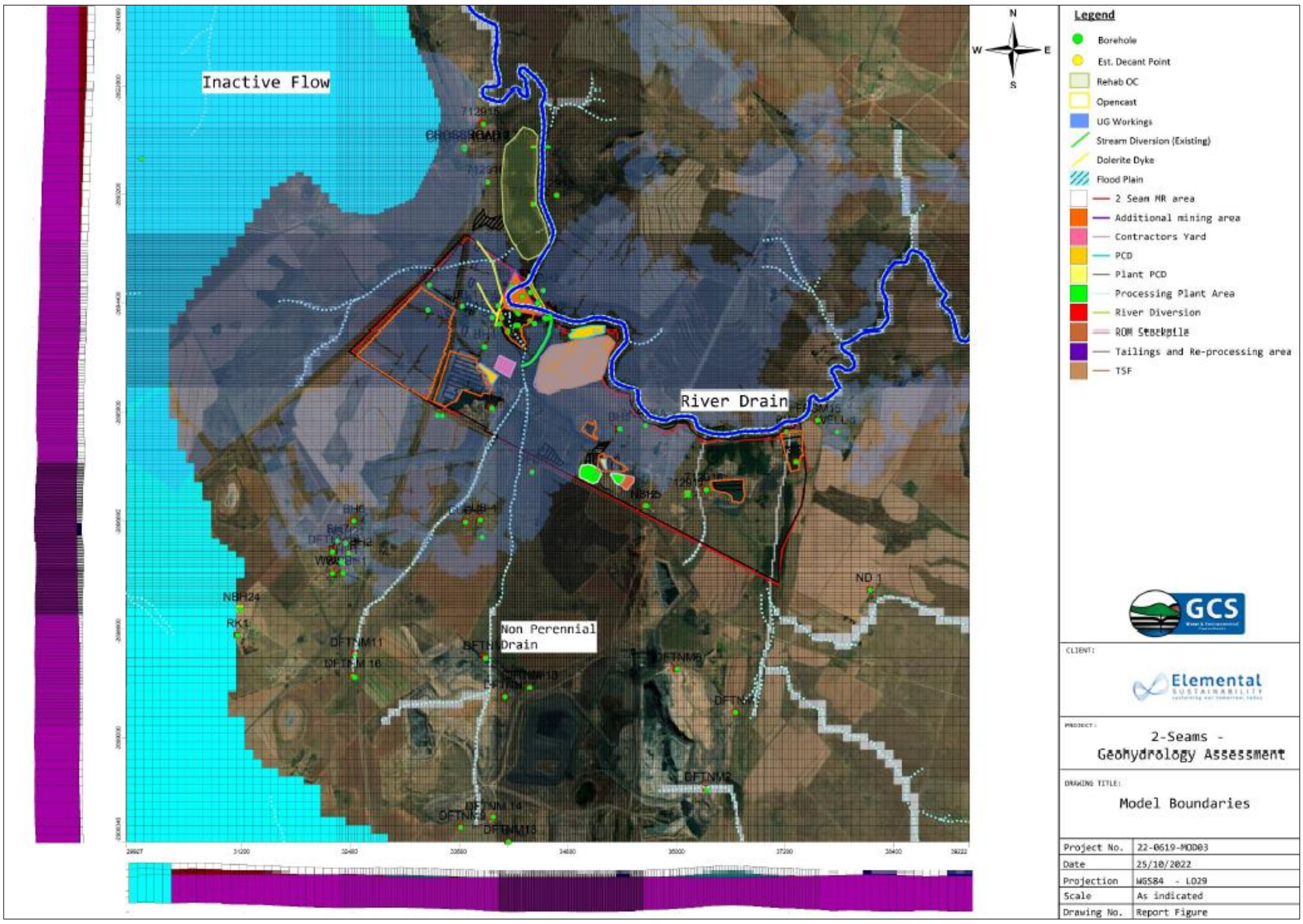

Figure 64: Model boundary conditions

10.9.7.4.2 MODEL CALIBRATION AND OUTPUT VISUALIZATION PROCESS

The ZOI presentations from the model calibration process are as follows:

- Based on the monitoring data for the site, SO_4 was used to calibrate the transport model. It was observed that SO_4 is generally high in boreholes surrounding known diffuse and point sources at the site and that SO_4 is typically associated with poor-quality leachate from these facilities. Geochemical testing has also confirmed that SO4 is typically associated with mine drainage at the site.
  - The plume presentation indicates 250 mg/l and 500 mg/l sulphate plume contour lines. The above-mentioned was applied to demarcate potentially contaminated groundwater zones, based on model calibration. The 250 mg/l and 500 mg/l zones represent the SANS 241-1:2015 water quality ranges. o These guidelines are not intended to be used for environmental compliance and are used only as a benchmark value, to contextualise the results.
  - Figure 65 supplies the target water quality range for sulphate as per the DWAF 1996 and SANS 241-1 guideline documents.
- Conductance for river and stream drainage cells was derived from the literature and T values of weathered zone rock.
- The dewatering presentation indicates 0.5 m drawdown contours. The contours aim to illustrate and demarcate the maximum radius of influence and rebound time due to the likely aquifer dewatering activity.

System	Aquatic Ecosystems	Domestic / Potable Use		Recreation		Industry		Agriculture	
DWAF 1996	N/A	Human Consumption	0-200 mg/l	Full Contact	NA	Category 1	0-30 mg/l	Livestock Watering	0-1000 mg/l
						Category 2	0-80 mg/l	Irrigation	N/A
				Intermediate Contact	NA	Category 3	0-200 mg/l	Agriculture	N/A
						Category 4	0-500 mg/l		
SANS 241-1: 2015	N/A	Aesthetic	>250 mg/l	N/A		N/A		N/A	
		Acute Health	>500 mg/l						

Figure 65: Summary of the target water quality range as per the DWAF 1996 and SANS 241-1: 2015 guideline documents for SO_4 (mg/l)

10.9.7.4.3 MODEL CALIBRATION

Aquifer parameters used in the model were obtained from field measurements and model calibration, using measured groundwater levels. Figure 66 illustrates the calibration graph for the calculated versus observed heads for the steady-state model. A scaled absolute mean value of below 10-15 % (RMS < 15 %) is generally regarded as acceptable for a local/regional model (Hill & Tiedeman, 2005).

The initial calibration was done under steady-state conditions. An RMS in the order of 12 % was achieved for the steady-state flow model (refer to Figure 66). When calibrated, the model can be used as an input to a transient state model, to predict future scenarios.

Adopting this approach, the flow model was calibrated with data for the year 2022, and an RMS in the order of 12.2% was achieved.

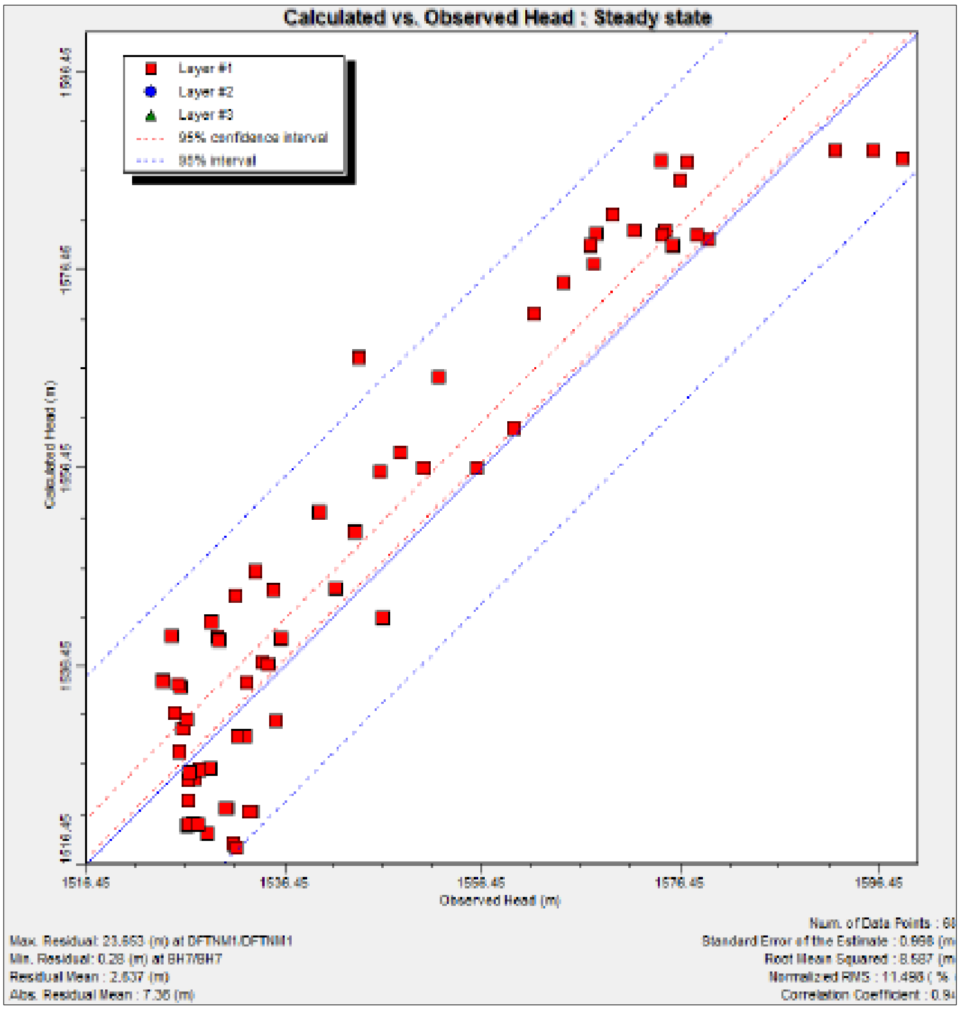

Figure 66: Calibrated steady-state model

10.9.7.4.4 MODEL SENSITIVITY

A sensitivity analysis was carried out on the calibrated steady-state model using zones to assess the influence on groundwater level and flow dimensions by running the model in the PEST and sensitivity mode.

It can be seen from Figure 67 and Figure 68 that the calibrated residuals (calculated heads vs observed heads) are slightly skewed towards the left. However, most of the data plots are within 5-10% of the normalised distribution of the dataset used for calibration.

The following summarises the sensitivity analyses:

- The flow model is very sensitive to changes in aquifer recharge (Par001);
- The flow model is sensitive to changes in horizontal hydraulic conductivity (Kx and Ky) in the 1st layer (top weathered aquifer) and 2nd layer (transition to fractured zone); and
- The flow model is less sensitive to changes in storage and vertical hydraulic conductivity (Ss, Sy and Kz).

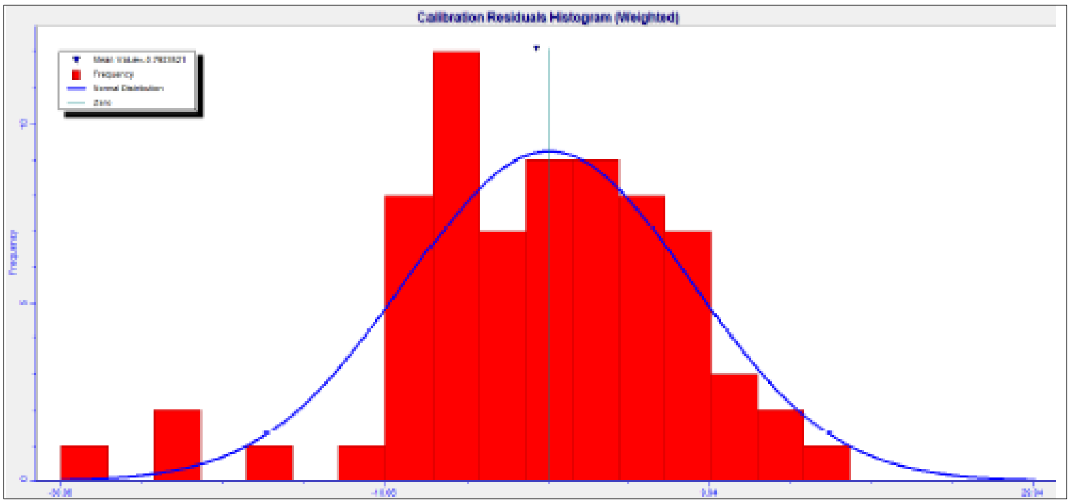

Figure 67: PEST run simulation histogram

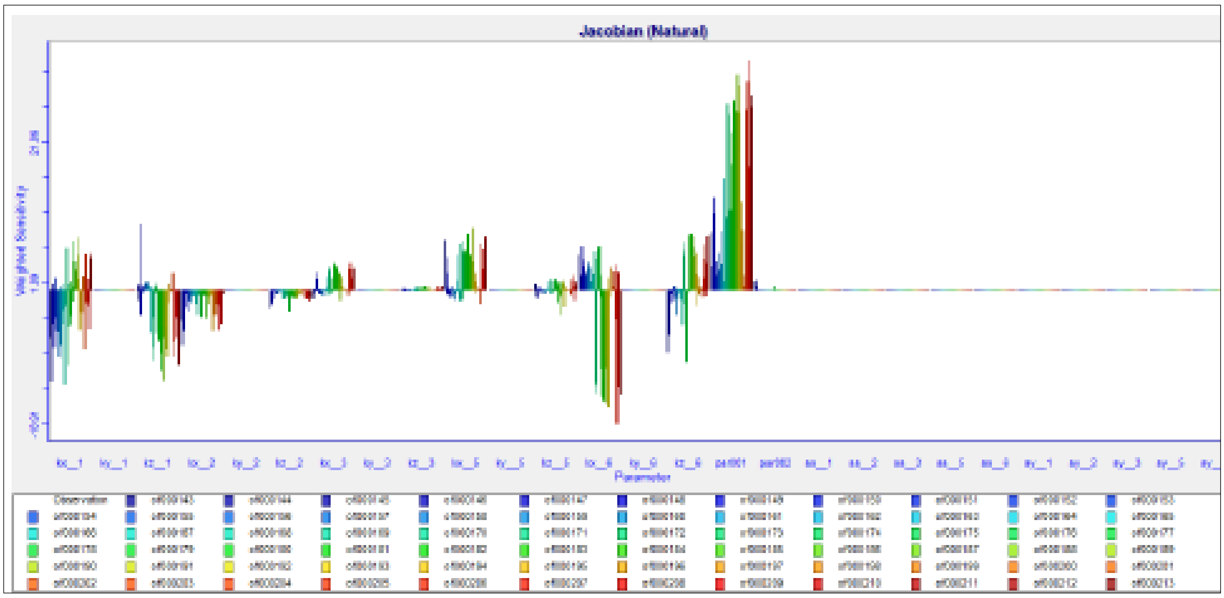

Figure 68: Model sensitivity

10.9.7.5 Model Results

The numerical modelling outcome is discussed in the sub-sections below.

10.9.7.5.1 CALIBRATED FLOW MODEL (2022)

The calibrated flow model is shown in Figure 69. The following observations are made from the calibrated flow model:

- Groundwater flow is towards the various rivers in the area and follows the topography (further supported by measured correlation data for groundwater elevations and topography elevations for the study area).
- Preferential flow from the OC4 and proposed OC4A areas is towards the Olifants River.
- The flow model indicates flow velocities ranging from 0.001 to 0.2 m/day, with greater velocities achieved for the alluvium aquifer zones. Hence, groundwater flow through the aquifer is slow.

10.9.7.5.2 SIMULATED DRAWDOWN AS A RESULT OF PIT EXPANSION AND RIVER DIVERSION

The simulated aquifer drawdown for the development of OC4 and subsequently OC4A is shown in Figure 70. From the simulation, the following is noted:

- At the end of OC4 pit development, before the diversion of the Olifants River, it is noted that greater drawdown occurs in the southern portions of the opencast workings and gradually extends towards the fringe of the proposed OC4A that will mine out the existing portion of the Olifants River.
- The mining of OC4 is predicted to affect the Olifants River and subsequent aquifer, by inducing a 0.5 to 1m drawdown of the subsequent aquifer zone. Therefore, just before the stream diversion takes place, there may be baseflow loss from the Olifants River segment.
- After the diversion takes place, a drawdown ranging from 32 to 20 mbgl, with a greater drawdown towards the south of OC4, is predicted. Because the Olifants River is diverted, a new flow regime is established. The predicted impact on the diverted flow area is < 2 m, and the stream diversion area appears to be safe from the majority of the dewatering associated with the OC4A expansion.
- 50Y after LOM of the OC4 and OC4A pits, it is observed that groundwater levels have not yet recovered to pre-mining levels (with regards to OC4 & OC4A) and that a lingering cone of depression occurs in the area. The lingering cone of depression in the simulation is caused by the new flow system that has been established, and the groundwater system will take several years to establish a new equilibrium (about 100 years based on the current simulation data and model assumptions made in the simulation).

It is important to calibrate the numerical model during the opencast expansion, and if the diversion is approved, more boreholes should be drilled in the area to refine and calibrate the groundwater flow fields. Based on the analytical estimates a rebound of the opencast working is expected between 18 to 47 years, however, the numerical model that considers aquifer flow and baseflow suggests a longer rebound due to the stream diversion.

10.9.7.5.3 SIMULATED SOLUTE TRANSPORT / SO_4 PLUME FROM OC4 & OC4A

The simulated sulphate transport from OC4 and OC4A, operational and after LOM for the workings, is shown in Figure 71. From the simulation, the following is noted:

- The 250 mg/l SO_4 contour remains isolated along the mined-out opencast workings, with greater concentrations (>1000 mg/l) predicted for the access box/cut and initial OC4 mine blocks.
  - If the Olifants River segment is not diverted, the preferential movement towards the Olifants River is observed, with the 1000 mg/l plume reaching the river in < 10 years.
- At LOM of OC4A, it is observed that the 250 mg/l SO_4 contour remains on the fringe of the mine works, with increases in concentrations towards older sections of the workings.
- The 50Y SO_4 plume shows preferential movement towards the Olifants River stream diversion, with the 250 mg/l contours infringing the southern portion of the diversion. SO_4 loads to the river are estimated in the order of 150 mg/l.
- The 100Y SO_4 plume presents a similar picture to that of the 50Y plume migration. Preferential movement is towards the Olifants River stream diversion, and the SO_4 load is estimated to increase to approximately 200 mg/l.

It is predicted that if the opencast workings are to be capped to decrease recharge by <3%, the plume movement to the surrounding environment will be reduced by several orders.

10.9.7.5.4 SIMULATED SOLUTE TRANSPORT / SO4 PLUME FROM

The simulated 50Y and 100Y sulphate transport from the ROM stockpile area, TSF(no longer part of the application), processing areas & contractor yard, are shown in Figure 72. From the simulation, it is noted that the predicted 250 mg/l SO_4 contour remains in already impacted areas, with preferential movement towards the northeast towards the Olifants River. The prediction is the worst case, as the facilities will likely be decommissioned before the 50Y plume can migrate towards the receivers identified in the area. The ROM and processing plant areas are predicted to have a greater cumulative impact on the surroundings, as these areas will be unlined.

As per the proposed design criteria of the PCDs and TSF, these facilities will be fitted with impermeable barriers. As such potential pollution from these structures will only occur if the liner is compromised or if stormwater capturing systems fail. The lining of these facilities pre-determines that there will be a very low groundwater pollution risk, if the proposed liners are installed correctly and if the facilities' stormwater systems operate as per the design criteria. As the TSF and TSF PCD are situated on the bank of the Olifants River, it is predicted that any seepage will report directly to the surface water environment via groundwater baseflow or overland runoff.

The emphasis in these areas should be:

- Operation of the PCDs to a level that accommodates 1:50 and 1:100 year storm events; and
- Stormwater runoff interception and diversion to the PCDs.

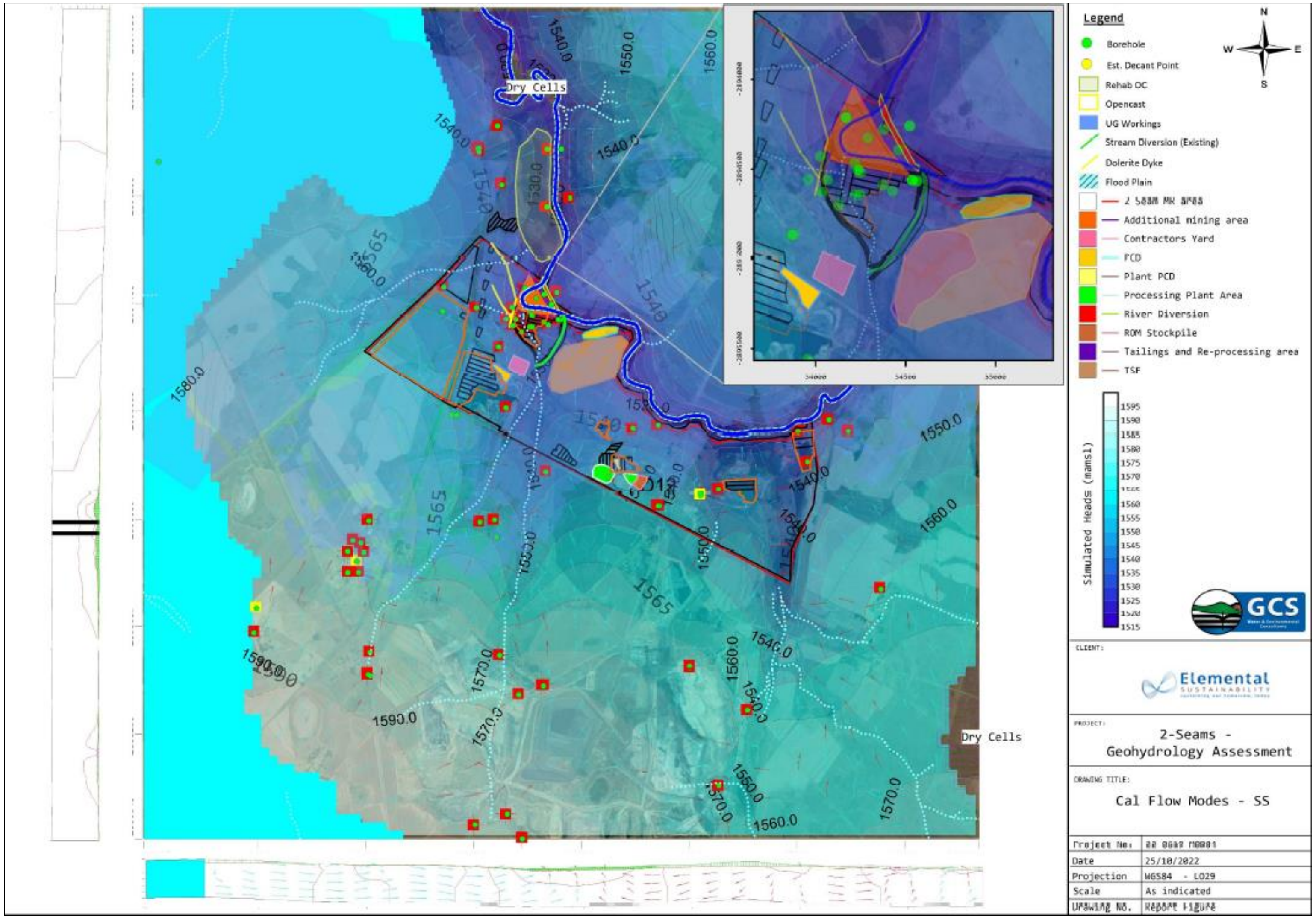

Figure 69: Calibrated flow model (2022)

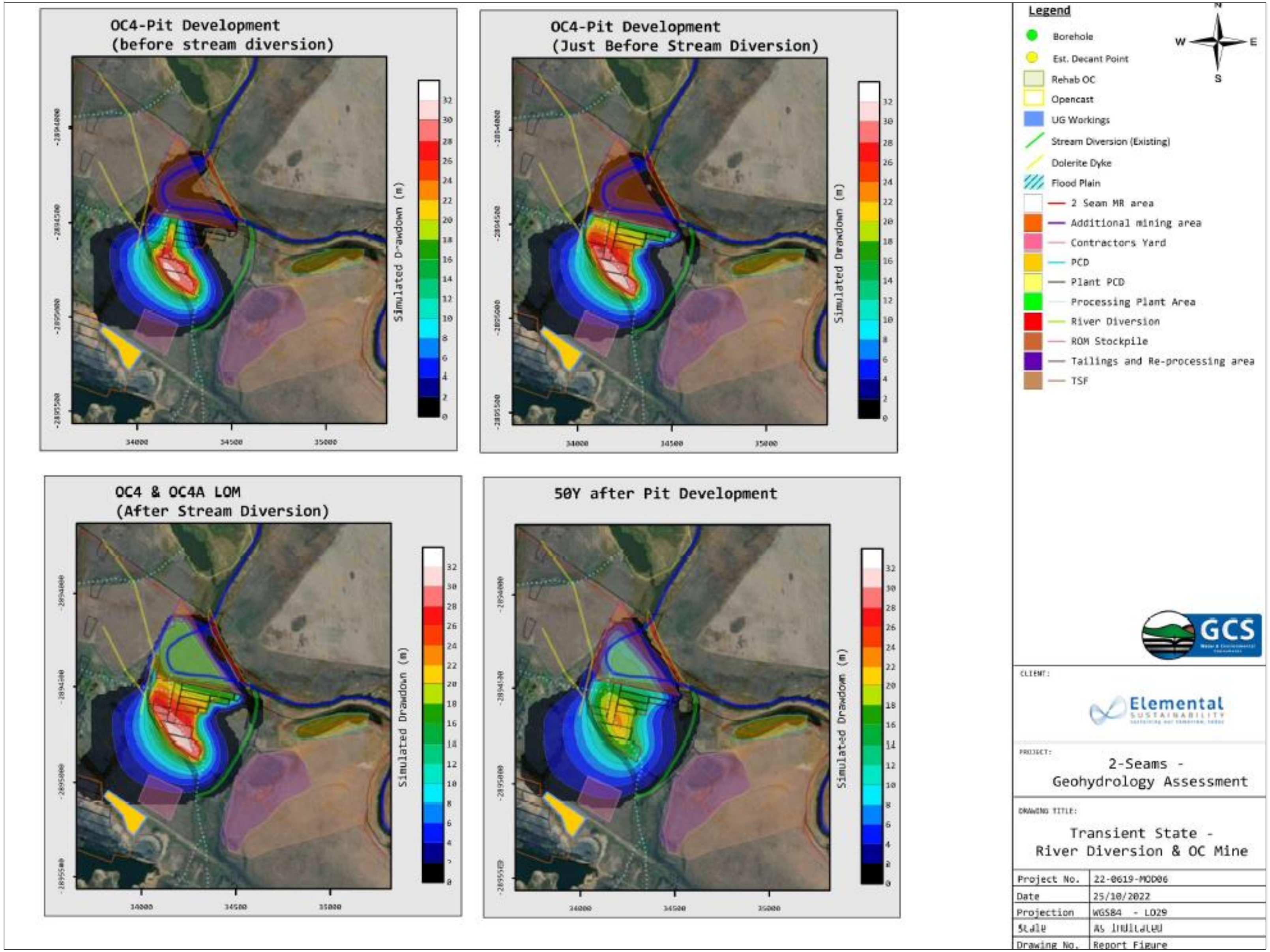

Figure 70: Simulated drawdown - OC4 & OC4A

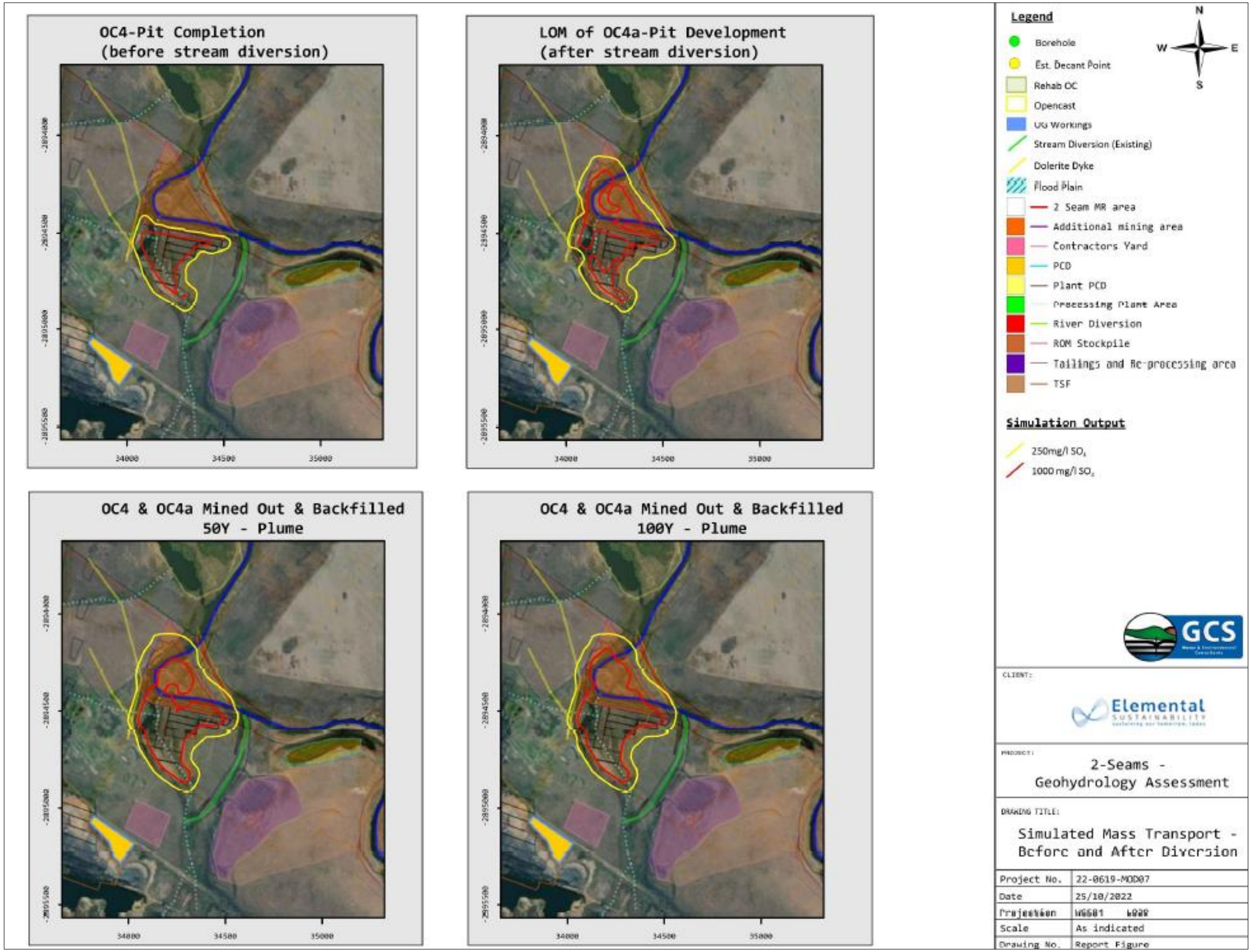

Figure 71: Simulated Soluble Transport - OC4 & OC4A

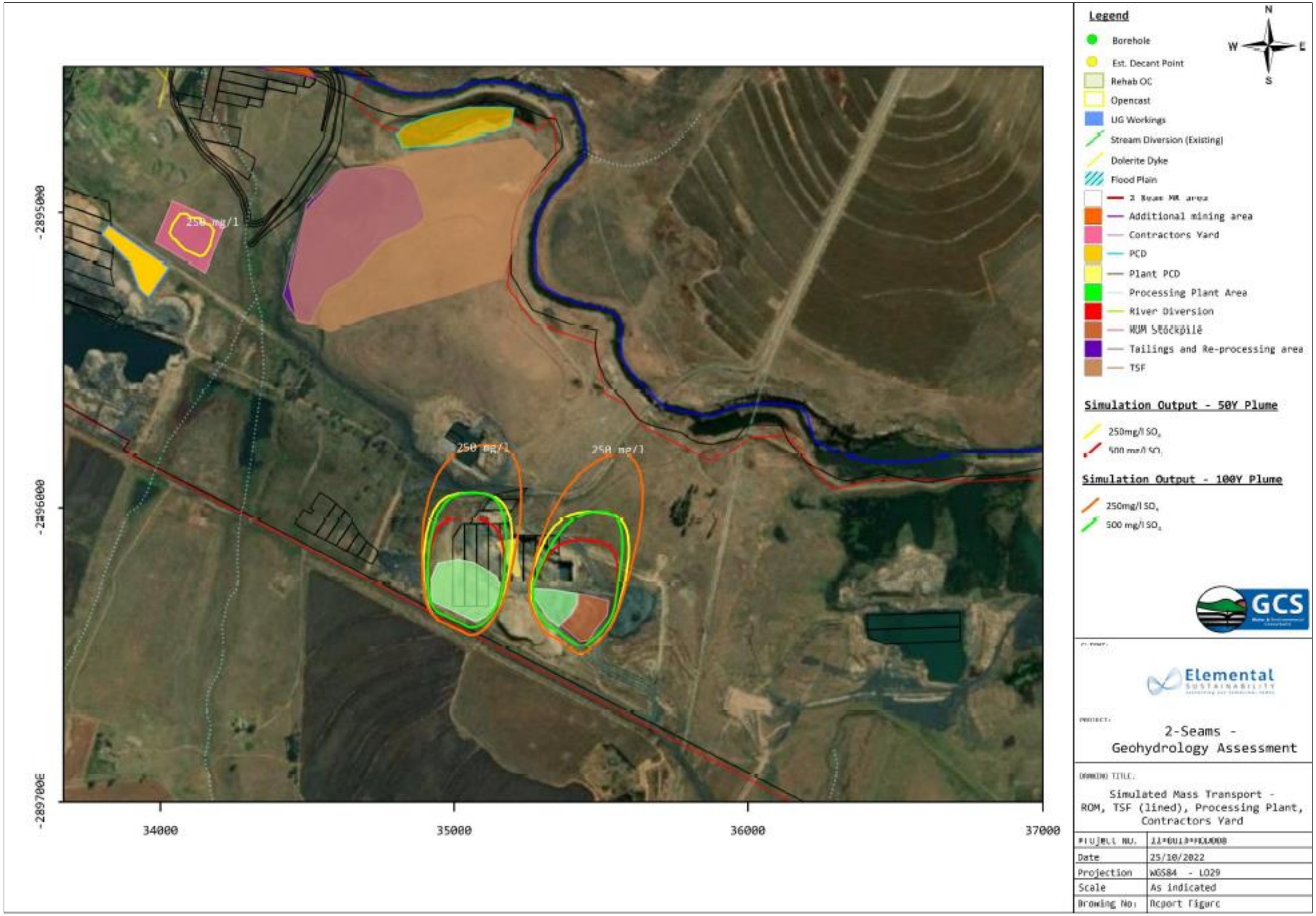

Figure 72: Simulated Soluble Drawdown - ROM stockpile area, TSF, processing areas & contractor yard

10.10 Hydropedology

Geo Pollution Technologies (Pty) Ltd. (GPT) undertook a wetland flow driver (hydropedological assessment) for opencast mining on the farm Vlaklaagte known as OC4 (existing opencast) and the proposed river diversion of the Olifants river to accommodate further opencast mining (OC4A). A site visit was done on 5 October 2022 with land use surrounding the wetlands mostly cultivated land (maize), grazing and mining. The detailed report is attached as Appendix 10.

10.10.1 Identification of Dominant Hillslopes

The wetlands within the 2 Seam Mining area are dominated by extensive hillslope seepage and unchanneled valley bottom wetlands that feed into the valley bottom wetlands associated with the Olifants river. Precipitation first strikes vegetative surfaces before hitting the soil.

The amount of water is the ratio of vegetative surface area to the underlying ground surface area. Leaf area indices range from as little as 1.0 for short grasses and desert scrub, around 3.0– 4.0 for grasslands and savannahs.

Although infiltration rates in wetlands themselves are typically low, infiltration rates across the landscapes surrounding wetlands can have a strong effect on the routing of water to the wetlands. Water infiltrates into the soil and enters the vegetative root system to be used in evapotranspiration, travels by subsurface pathways to surface waters (streams, wetlands) found at the base of slopes, or percolates to groundwater. Human land-use activities that compact or denude soils reduce infiltration rates, often reducing them so much they are exceeded by commonly experienced rainfall. When rainfall rates exceed infiltration rates, the excess water runs off the soil surface, rapidly carrying sediment and contaminants to surface waters and increasing storm flows. For given soil conditions, the potential infiltration rate decreases asymptotically over time during a wetting event thus only indicative modelling can be done.

10.10.2 SURFACE RUNOFF

Runoff from natural (unmodified) catchments in this area is simulated in WR2012 as being equivalent to 48.57 millimetres per year over the surface area and is equal to approximately 7.07% of the Mean Annual Precipitation (MAP). Runoff within the Blocks was simulated considerably higher at~64% of MAP. It is expected that runoff from the mine site (TSF, office, etc) will be similar to the runoff expected within Blocks. For the TSF within the area, a different runoff pattern is likely to occur at ~69% MAP. Water will seep into surfaces more easily and will be held in temporary storage before being released at a more constant rate.

Water drains from the area in a northernly direction towards the Olifants river. There are two water courses flowing through the site (see Figure 73 below). The first is the Olifants river on the northern border of the site and the second a minor flow area creating the channelled valley bottom flowing into the Olifants river. The wetland catchment drains mainly from the south in a northernly direction until it reaches the Olifants river. The highest point of the wetland catchment is in the north with an approximate level of 1,600 mamsl and the lowest point at the site is 1,535 mamsl.

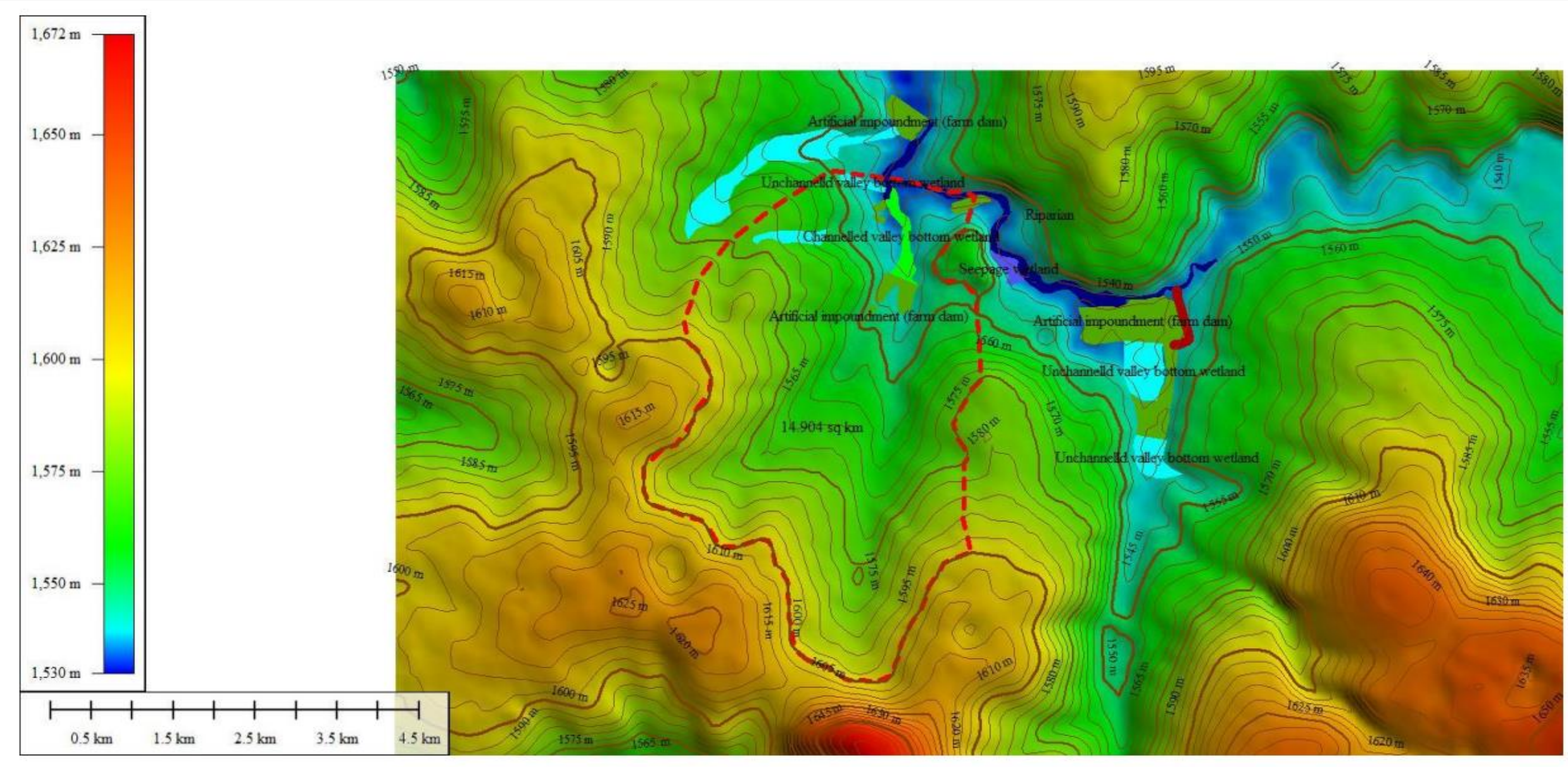

Figure 73: Site drainage and topography

10.10.3 CONCEPTUALIZE HILLSLOPE HYDRO-PEDOLOGICAL RESPONSES

Auger holes and test pits were done to delineate the soils and are described below. Bucket augers were done at selected points the area of OC4A only. A summary of the soil types is discussed below. In Figure 74 an attempt to delineate the soils hydro-pedologically was made using available desktop information, site visits and transect information. Note that the responsive and interflow soils were grouped together as it was difficult to accurately delineate this transition zone.

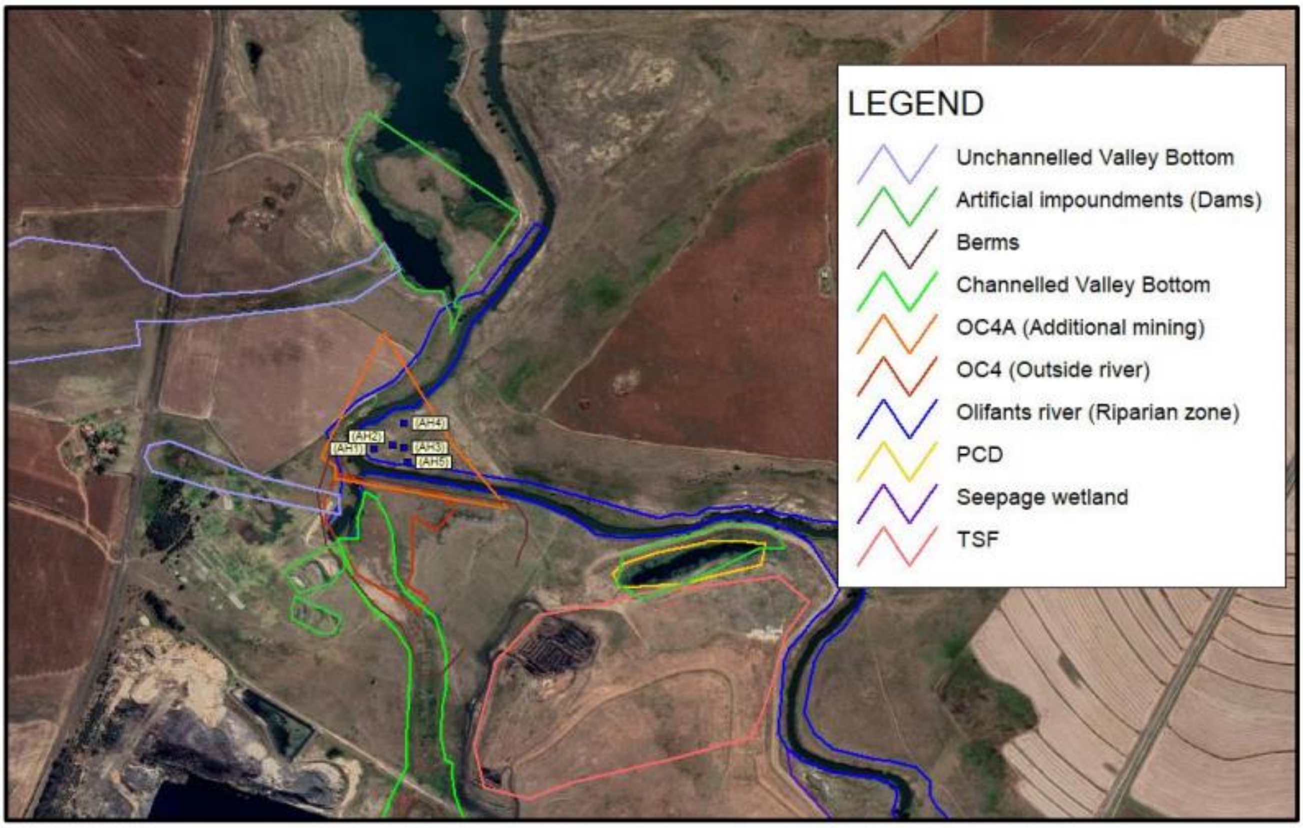

Figure 74: Auger hole positions

10.10.3.1 RECHARGE SOILS

The sandy soils are generally shallow and overlie an impeding sandstone layer. The main soil forms found in rocky soils were Mispah. These soils were the dominant soil type at OC4A north of the Olifants river.

10.10.3.2 INTERFLOW OR TRANSITIONAL SOILS

The transitional soil unit comprises the soils found between clay soils and the agricultural soils. These soils often have signs of clay accumulation or water movement in the lower horizons. These soils are usually indicative of seasonal or temporary wetland conditions. No interflow soils were found at the at OC4A north of the Olifants river.

10.10.3.3 RESPONSIVE SOIL

This soil form is mostly found in areas of semi-permanent wetness. No responsive soils were found at OC4A north of the Olifants river.

10.10.4 QUANTIFICATION OF HYDRAULIC PROPERTIES AND FLOWRATES.

Quantification of hydraulic properties was done through the following:

- In situ field infiltration tests;
- Falling head permeability tests;
- Wetland delineation; and,
- Site observations.

An interpolated map of the hydro pedological soil types based on the above is detailed Figure 75 below.

10.10.4.1 IN SITU INFILTRATION TESTS

In situ infiltration tests (falling head permeability test) to estimate the rate at which runoff will infiltrate, or pass through the soil profile were done as follows:

Step 1: Test hole with the following dimensions Depth 50 cm, Diameter 10 cm
Step 2: Determine soil texture through a ribbon test
Step 3: Fill the hole with water and measure time to drain the hole completely
Step 4: Calculate the infiltration rate using the following formula

$$k = \frac{2.3A}{F(t_2 - t_1)} \log \frac{h_1}{h_2}$$

A summary of the soil results from the auger holes are shown in Table 29 below. The following observations can be made regarding the permeabilities:

- The majority of the samples are typical recharge soils without any morphological indication of saturation. Vertical flow through and out of the profile into the underlying bedrock is the dominant flow direction.

Table 29: Auger hole infiltration rates

Label	m/s	%Clay	% Silt	% Sand	% Gravel		Material Description
AH1	1.19-06	2	12	78	8	100	Sandy Gravel
AH2	1.22-06	1	15	75	9	100	Sandy Gravel
AH3	1.21-06	2	14	76	8	100	Sandy Gravel
AH4	1.17-06	3	15	73	9	100	Sandy Gravel
AH5	1.29-06	3	12	75	10	100	Sandy Gravel

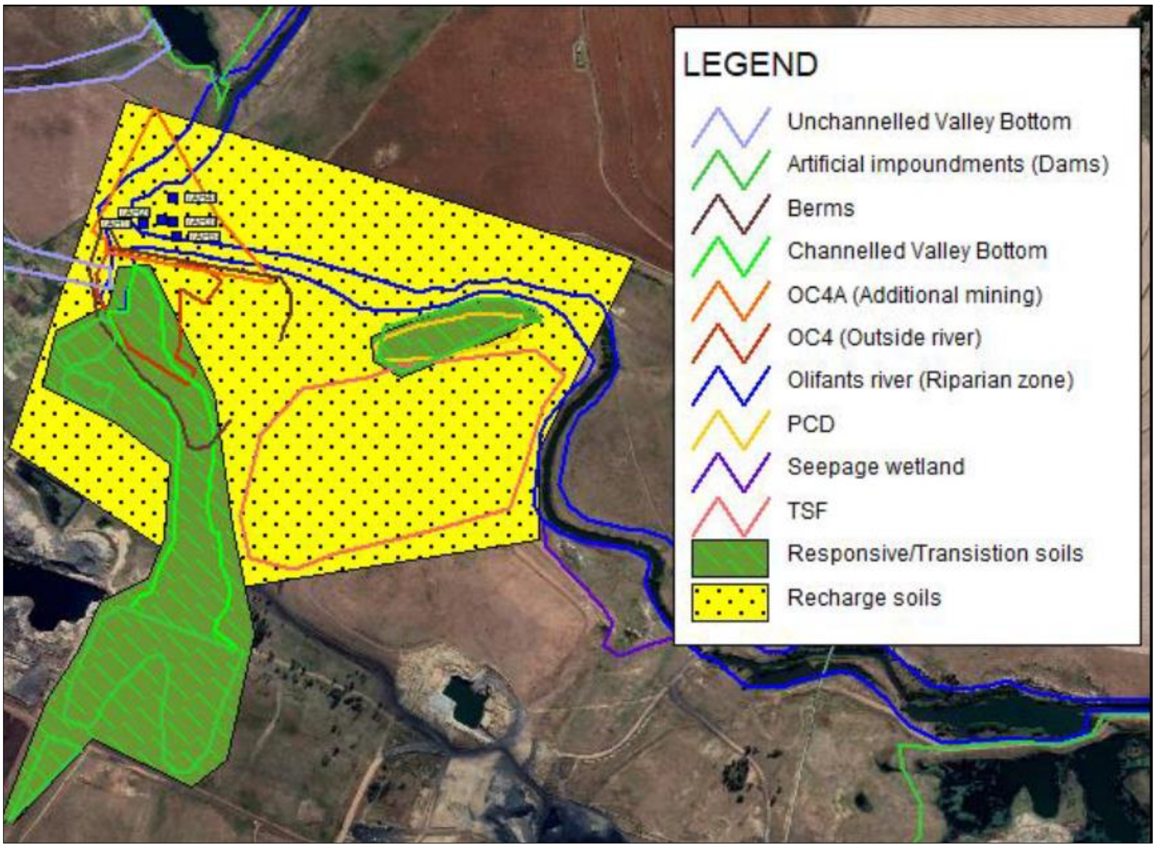

Figure 75: Interpolated hydropedological soil types

10.10.5 WETLAND FLOW DRIVER IMPACT

OC4 and OC4A (river diversion extension) could impact on the flow drivers of the wetland systems through interception systems such as drainage systems, berms, increased recharge and water quality changes. The test pits indicated different hydropedological soil types comprising of alluvial, colluvial, residual material and weathered sandstone rock.

10.10.5.1 WETLAND CATCHMENT FLOW REDUCTION

The SANBI Biodiversity Series 22, (2013) Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems was consulted in determining the estimated flow losses to the specific wetland catchment systems due to mining.

Many wetlands are hydrologically and ecologically linked to adjacent groundwater bodies, but the degree of interaction can vary greatly. Some wetlands may be completely dependent on groundwater discharge under all climatic conditions, whilst others may have very limited dependence such as only under very dry conditions – and some may have no connection with groundwater at all. Some aquifers are dependent almost entirely on recharge. Based on the SANBI Biodiversity Series 22, the following to water systems is present on the proposed area:

- Unchanneled valley bottom – Valley bottom area with no clearly defined stream channel gently sloped and characterized by alluvial sediment deposition. Water inputs mainly from channel entering the wetland and also from adjacent slopes
- Channelled valley bottom – The valley bottom had a well-defined stream channel but lacked characteristic floodplain features. It is gently sloped and characterized by the net accumulation of alluvial deposits. Water inputs is expected from the main channel (when channel banks overspill)

and from adjacent slopes.

10.10.5.2 ASSUMPTIONS

Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment. Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment.
The wetland's catchment determines the relative extent of different hydrological response types in the catchment and within specific hillslopes contained within the catchment. The impact on flow drivers of the wetland catchment is detailed below and is based on the following assumptions (status quo). A water balance2 on the wetland catchment is represented by:

- Rainfall 100% of flow input
- Evapotranspiration is 50 – 70% of rainfall (outflow)
- Runoff is 10% (outflow)[3]
- Groundwater recharge is 5%[4] (outflow)
- 20 -30 % of the water being left in or stored the unsaturated zone or interflow zone feeding the wetland

10.10.5.3 FLOW DRIVERS

The following episodic flow drivers are relevant to the wetland system:

- Groundwater recharge = 569500 m^3/a
- Direct rainfall on wetland soils = 300160 m^3/a
- Run off = 797300 m^3/a

Water stored in the interflow or responsive soils:

- 300160 m^3/a

The above information indicates that surface run off water, followed by direct rainfall and then water stored in the wetland soils are the main water components of the wetland system south of the Olifants River. In contrast the largest impact on the wetland system is the disruption of water stored in the interflow and responsive wetland soils as shown in Figure 76.

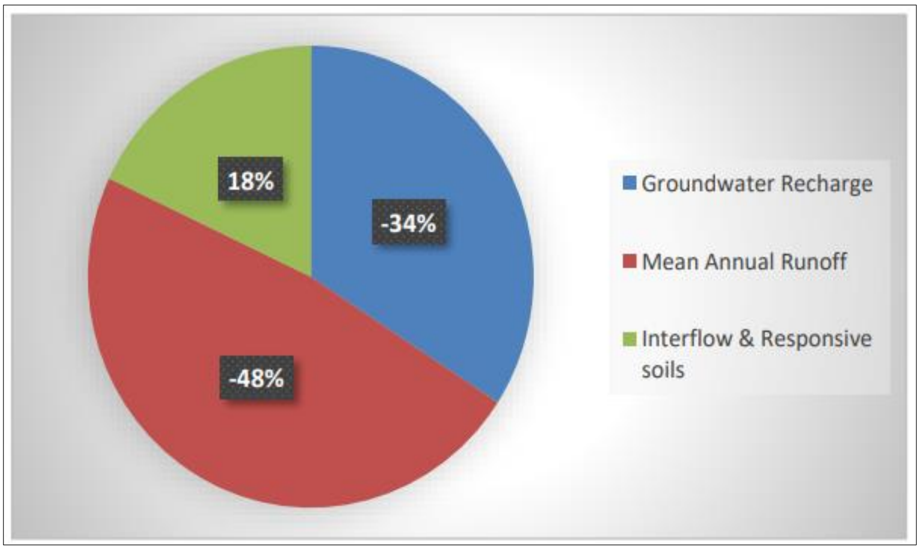

Figure 76: Contribution in terms of flow driver percentages (pre mining)

10.10.5.4 OC4 AND OC4A

The impact percentages in terms of flow drivers are detailed in Figure 77 and Figure 78 below. The largest impact is on the wetland soil storage potential, followed by run-off and then groundwater.

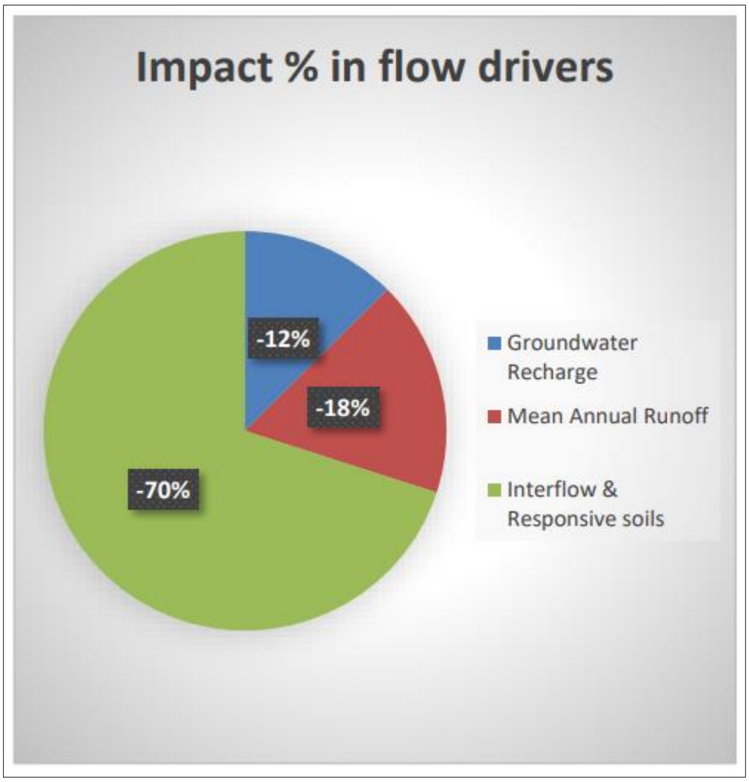

Figure 77: Contribution in terms of flow driver impact percentages (during mining OC4 & OC4A)

Description	Volume pre development (m3/a)	Volume during mining (m3/a)	Volume loss (m3/a)	% Loss
Groundwater Recharge	-569500	-567268.9670	-2231.03	1-3
Mean Annual Runoff	-797300	-794176.5538	-3123.45	1-2
Interflow & Responsive soils	300160	287666.2152	-12493.78	2 -5%

Figure 78: Wetland flow driver impact losses (OC4 & OC4A)

10.11 AIR QUALITY

Mining operations such as drilling, blasting, hauling, and transportation are major sources of emissions and air pollution. Emissions of particulate matter and nuisance dust will result from mineral plant operations such as crushing, screening and processing for final transportation. Fugitive emissions are also possible from roads and open stockpiles.

Nuisance dust can reduce visibility; soil or damage buildings and other materials; and increase costs due to the need for washing, cleaning and repainting. Plants can be affected by dust fallout through reduced light transmission which affects photosynthesis and can result in decreased growth. Fallout dust can also collect in watercourse causing sedimentation and a reduction in the water quality and can also affect aquatic life through the smothering of riverine habitat and fish gill clogging. Coarse dust particles are produced during mining operations which can lead to an increase in fallout dust.

Potential sources of pollutants which may be of importance in terms of impact potentials include:

- Existing surrounding mines;
- Cultivation of agricultural for annual crop production (economic);
- Coal mining on the eastern boundary of the project site;
- Fugitive emissions from industrial, mining commercial and miscellaneous operations (wind erosion of open areas, vehicle-movement of dust along paved and unpaved) roads; and
- Vehicle Exhaust emissions.

Dust fall-out at 2 Seam Mine is monitored on a monthly basis via dust buckets. Refer to Figure 79 for the March to April 2022 dust monitoring results. Figure 80 shows the location of the monitoring sites.

ATT: Mr Jaco Kleynhans	Period: 9 March 2022 - 7 April 2022					
Quantity Analyzed: 6 LAB NO:-	Z 47	Z 48	Z 49	Z 50	Z 51	Z 52
LAB REF NO: ZYN / 47 - 52 / Z / 04 / 22						
SAMPLE DESCRIPTION	Vlak D 1	Vlak D 2	Vlak D 4	Vlak D 5	Vlak D 6	Vlak D 7
CO-ORDINATES SOUTH	26°10'03.4	26°10'18.9	26°09'24.2	26°10'5.61"	26°10'15.2"	26°11'7.28"
CO-ORDINATES EAST	29°21'31.7	29°21'10,5	29°20'10.3	29°20'0.70"	29°22'14.6"	29°22'15.22"
Date Sampling Commenced	9-Mar-22	9-Mar-22	9-Mar-22	9-Mar-22	9-Mar-22	9-Mar-22
Date Samples Collected:	7-Apr-22	7-Apr-22	7-Apr-22	7-Apr-22	7-Apr-22	7-Apr-22
Date Samples Reported:	12-Apr-22	12-Apr-22	12-Apr-22	12-Apr-22	12-Apr-22	12-Apr-22
Date Analysed:	11-Apr-22	11-Apr-22	11-Apr-22	11-Apr-22	11-Apr-22	11-Apr-22
Time:	12:35	10:16	13:30	12:54	12:05	12:20
Mass Collected mg	122	336	117	1293	Contaminated (Algae)	60.9
Sampling Period days	29	29	29	29		29
Settleable Particulates (LPM 42) mg/m2/day	185	510	178	1964		92.5
Classification (Dept Env. & Tourism)	Residential area	Action	Residential area	Alert		Residential area
Restriction Areas	Residential area	Residential area	Residential area	Action		Residential area

SANS 1929:2011 Ambient Air Quality Limits for Dust Deposition

CLASSIFICATION	
Residential	Less than 600 mg/m2/day, 30 day average
Non Residential area	600 to 1200 mg/m2/day, 30 day average
Action	1200 to 2400 mg/m2/day, 30 day average
Alert	Greater than 2400 mg/m2/day, 30 day average

Method Based on ASTM D1739:1970 Air Quality Act NO. 39 of 2004

Restriction Areas	Dustfall rate (mg/m2/day, 30 - days average)	Permitted frequency of exceeding dust fall rate
Residential	<600 mg/m2/day	Two within a year, not sequential months.
Non Residential area	600 to 1200 mg/m2/day	Two within a year, not sequential months.

Figure 79: Dust Monitoring Results March to April 2022

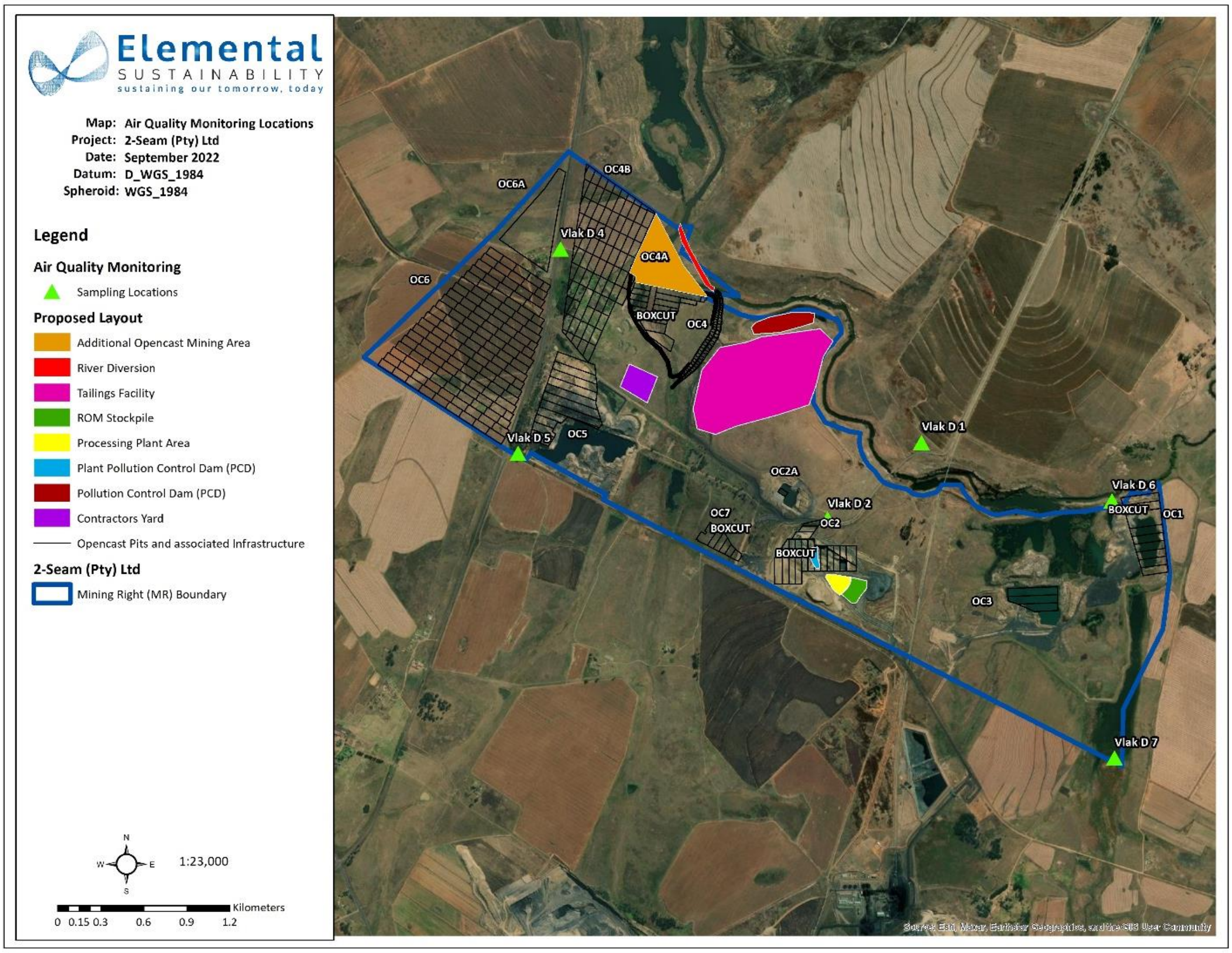

Figure 80: Air Quality Monitoring Locations

The monitoring plan will be adjusted to include monitoring points at the new project area when activities commence. Monitoring will continue during the Life of Mine (LOM). No dust sensitive environments were identified that might be impacted by the proposed activities.

10.12 NOISE

Mining and mining activities often emit significant noise levels which can become a nuisance or health risk when not properly managed. Not only to the mining area, but also to the surrounding land users and occupiers. The most sensitive receptors identified for the project area is the surrounding communities including land users, mine workers, mining communities and permanent farm homesteads and settlements. The region is predominantly occupied by mining and agricultural land uses.

In general, the only receptors that will be affected by the noise generated from the mining activities are the communities to the west, the farm infrastructure and communities living on the Farm Lourens 472 IS. According to the SABS (1983), the ambient daytime sound level for rural residential areas (outdoors) is approximately 45 dBA. The expected outdoor ambient sound level is approximately 40 dBA during the evenings or on weekends, and 35 dBA during the night

The main noise generation activities of the proposed development during all phases are:

- Construction phase:
  - Excavations;
  - Transportation of materials; and
  - Construction of water handling infrastructure.
- Operation phase:
  - Transportation of materials; and
  - Offloading of materials.
- Closure or care and maintenance phase:
  - Limited number of vehicles moving around the site.

Noise generation can therefore be expected on the proposed site due to various activities and actions as indicated above. Noise levels may possibly exceed allowed limits for noise as indicated in SANS 10103: 2008. It is, however, important to implement a noise monitoring programme to monitor noise levels and implement mitigation measures should the set limits be exceeded.

10.13 SITES OF ARCHAEOLOGICAL AND CULTURAL INTEREST

Elemental Sustainability (Pty) Ltd appointed Agri Civils Geo-Tech and Heritage to undertake a Phase 1 Archaeological Impact Assessment for the proposed amendment to the existing 2-Seam Mine. A copy of the report is included in Appendix 11.

10.13.1 METHODOLOGY

Archaeological reconnaissance of the demarcated areas was conducted during September 2022 through unsystematic pedestrian and vehicular surveys and general site conditions were recorded via photographic record. The demarcated areas were inspected on Google Earth, historical topographical maps, and historical aerial imagery in order to identify potential heritage remains. The historical topographical maps dating to 1962, 1984, 1996, and 2009, as well as the historical aerial images dating to 1954, 1956, 1967, 1975, 1978, 1991, and 2005, proved useful in terms of providing an indication of potential heritage sites and past land uses associated with the demarcated areas.

10.13.3 ARCHAEOLOGICAL AND HISTORICAL REMAINS

10.13.3.1 STONE AGE REMAINS

No Stone Age archaeological remains were located within the demarcated areas. These artefacts are often associated with rocky outcrops or water sources. Archaeological studies conducted in the surrounding areas also did not locate Stone Age artefacts.

10.13.3.2 IRON AGE FARMER REMAINS

No Iron Age Farmer remains were located within the demarcated areas. Archaeological studies conducted in the surrounding areas also did not locate Iron Age material.

10.13.3.3 HISTORICAL REMAINS

No sites dating to the Historic Period were located within the demarcated areas. Heritage studies conducted in the surrounding areas recorded historical buildings and homesteads. See PGS (2010) and Du Piesanie (2014).

10.13.3.4 CONTEMPORARY REMAINS

No contemporary sites were identified within the demarcated areas. The heritage study conducted by Pelser (2019) noted the presence of a farmstead. However, the site is not discussed and the age is therefore unknown.

10.13.3.5 GRAVES/BURIAL SITES

No graves or cemeteries were identified within the demarcated areas. The heritage studies conducted in the area, PGS (2010), Du Piesanie (2014) and Pelser (2019), recorded the presence of several graves and cemeteries.

10.13.4 STATEMENT OF SIGNFICANCE

The following proposed areas are partially located within 500 m of rivers/streams, a zone that is generally associated with a higher heritage site probability: Additional Opencast Mining Area, River Diversion, Tailings Facility (no longer part of the environmental authorisation process), PCD and Contractors Yard. However, all the areas associated with the proposed amendment to the existing 2-Seam Mine have been disturbed by previous/current mining/agricultural activities and are therefore not considered to be significant or sensitive from a heritage perspective. Also, the 2-Seam Mine Manager, Mr Tim Erskine, confirmed that to his knowledge, no potential heritage resources are located within the proposed boundaries: Additional Opencast Mining Area, River Diversion, Tailings Facility (no longer part of this application), ROM Stockpile, Processing Plant Area, Plant PCD, PCD, Contractors Yard.

10.14 PALEONTOLOGICAL ASSESSMENT

Dr. Marion Bamford from the University of Witwatersrand undertook a paleontological assessment. A copy of the report is included in Appendix 12.

Consultation of geological maps, literature, palaeontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas was undertaken. Due to the project area being an active mining area, no site visit was undertaken by the specialist.

10.14.1 PALEONTOLOGICAL SENSITIVITY

The paleontological sensitivity of the area under consideration is presented in Figure 81. The site for development is in the very highly sensitive Vryheid Formation (red) with an east marginal section of moderately sensitive Quaternary sands and alluvium (green).

The Vryheid Formation contains the main coal reserves of South Africa. Coals are the product of the alteration of buried peats by heat and pressure to form amorphous organic matter. No fossil plants are visible in the coal itself but can sometimes be found in the carbonaceous lenses between and adjacent to the coal seams. Here the original plants can be seen, the *Glossopteris* flora. This flora is dominated by the extinct seed fern, *Glossopteris*, but other plants were also present such as lycopods, sphenophytes, ferns, cordaitaleans and early gymnosperms (Plumstead, 1969; Anderson and Anderson, 1985; Bamford, 2004). Vertebrate fossils are seldom found with plant fossils because they require different environments for preservation. Plants require a more reducing environment while bones need a more oxidizing environment (Cowan, 1995).

Coal itself does not preserve any recognisable plant material because the peats have been greatly altered by compression and heat from burial. Fossils may occur in shales and carbonaceous shales associated with the coal seams. This mine is in the Witbank Coal Field where there are five coal seams at various depths below the surface. The uppermost seam, no 5, occurs at depths varying between 12 to 50m below the surface (Snyman, 1998)

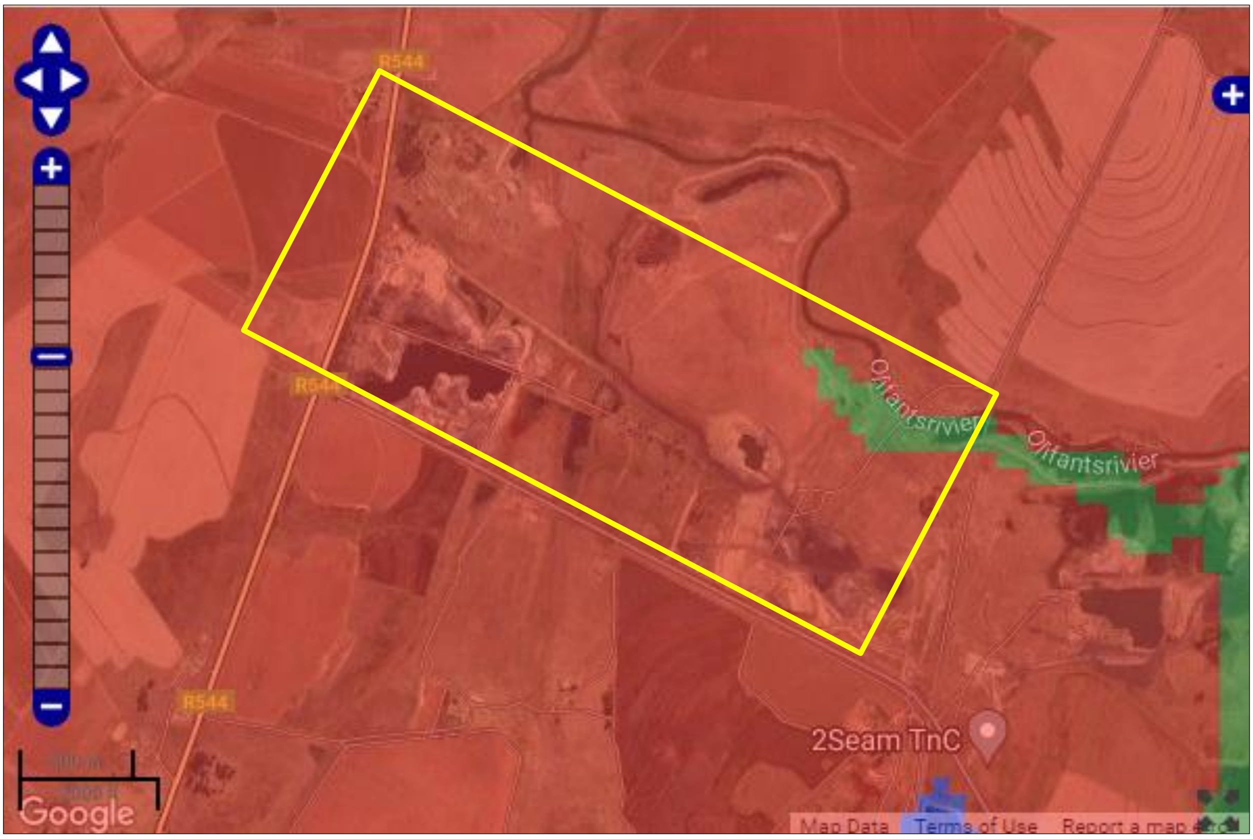

Figure 81: SAHRIS palaeosensitivity map for the site for the proposed expansion on 2 Seam Coal Mine shown within the yellow rectangle. Background colours indicate the following degrees of sensitivity: red = very highly sensitive; orange/yellow = high; green = mod

The geohydrology report (GCS, 2020) confirms that the coal (and shales) is far below the land surface: "Drilling conducted at OC4 in 2020, intersected Ecca stratigraphy to depths between 30 and 36 mbgl (Siyaphambili Geoservices, 2020)." This confirms that there would be no Ecca strata, and no fossils, visible on the surface. It should be noted that the general geological interpretation of the area is based on drill core data, not on surface observations unless there is outcrop. With a gently undulating topography of the Ecca Group described in the same geohydrology report, there is no chance of any outcrop in the project site.

From the SAHRIS map above the area is indicated as very highly sensitive (red) for the Vryheid Formation but as discussed above, the Vryheid Formation is covered by 30-36m of soils, sandstones and sediments of younger strata that are most unlikely to preserve any fossils.

Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying sols and sands of the Quaternary. There is a small chance that fossils may occur in the shales of the early Permian Vryheid Formation that occur 30-36m below the surface, but nothing will be visible until new ground is broken when the mining commences. Therefore, so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the miners, environmental officer, or other responsible person once mining has commenced, then they should be rescued and a paleontologist called to assess and collect a representative sample. The impact on the paleontological heritage would be low until mining has commenced. No site visit is required until fossils are found by the responsible person.

10.15 TRAFFIC

The 2 Seam Mine is an existing mine and like most mining operations contributes to increased traffic and mine-related trucks on public road networks which can result in an inconvenience to current road users, higher accidents (for people and animals) decreased road service levels and/or increased road damage. This in turn can put pressure on the relevant roads authority to increase the maintenance programmes and/or upgrade the roads.

In the absence of active mining activities, traffic volumes along the secondary road and the N4 are generally high and mostly limited to light vehicles (rather than heavy vehicles that would be generated by the mining operation). Regardless of the alternatives that are selected, the project would contribute to traffic volumes on public roads. Traffic impacts are expected from construction through to the end of the decommissioning phase.

In the absence of mitigation measures that consider other road uses and users, project-related use of public roads could result in a high severity impact. Any serious injury or death is a long-term impact that would extend to the communities to which injured people/animals belong. The related unmitigated significance is high. With mitigation that focuses on ensuring adequate capacity on the road network and safety measures for other road users, the significance could reduce to medium as the severity, duration and frequency of potential accidents is expected to reduce.

10.16 VISUAL

The assessment of visual impacts takes the following issues into account: the pre-mining visual resource and the visibility, visual intrusion, sensitivity of viewing receptors, and visual exposure, associated with the mine. The following have been identified as sensitive receptors in terms of visual impacts and impacts on the 'Sense of Place' of the study area and surrounding area:

- Travelers on the R544 provincial road; and
- Surrounding land users within 2 km from the study area.

The visual resource of the mine area is determined by considering landscape character, sense of place, and landscape quality. The pre-mining visual resource was considered to be of moderate to low value because the predominantly rural agricultural setting of the broader area is compromised by power lines, roads, telephone lines and mining activities neighbouring the project area.

Visibility refers to the extent to which people in the surrounding areas will see the project. The mine can be seen from all directions.

Visual intrusion refers to the magnitude of the intrusion that the mine has on existing views. The visual intrusion of the mine is high during the operational phase, which can be reduced to a low intrusion with successful implementation of the requirements for rehabilitation and closure.

Sensitivity of visual receptors refers to the fact that the visual impact varies according to the sensitivity of the receptors in the project area. Although various third parties currently remain within a relatively close proximity to the area no issues regarding visual impacts have been raised. It must therefore be concluded that the visual impact is not a sensitive issue.

Visual exposure is the extent to which infrastructure and activities will appear in various views. It follows that the closer the infrastructure and activities, the greater the visual exposure.

10.17 SOCIO ECONOMIC CHARACTERISTICS

The 2 Seam Mine falls within the Nkangala District Municipality and the eMalahleni Local Municipality.

10.17.1 NKANGALA DISTRICT MUNICIPALITY

The Nkangala District Municipality is a Category C municipality in the Mpumalanga Province. It is the smallest district of the three in the province, making up 22% of its geographical area. It is comprised of six local municipalities: Victor Khanye, Emalahleni, Steve Tshwete, Emakhazeni, Thembisile Hani, and Dr JS Moroka. The district's headquarters are located in Middelburg.Nkangala is at the economic hub of Mpumalanga and is rich in minerals and natural resources. A strength of the district is the Maputo Corridor, which brings increased potential for economic growth and tourism development. The proximity to Gauteng opens up opportunities to a larger market, which is of benefit to the district's agricultural and manufacturing sectors. The further potential inherent in exporting goods provides opportunities that need to be investigated. The main economic sectors of the Nkangala District are mining, manufacturing, energy, tourism and agriculture. The key demographic statistics for the Nkangala District Municipality are provided in Table 30.

Table 30: Demographic Statistics for the Nkangala District Municipality

	2016	**2011**
Population	1 445 624	1 308 129
Age Structure		
Population uner 15	27.3%	28.5%
Population 15 to 64	68.6%	66.5%
Population over 65	4.1%	5.0%
Sex Ratio		
Males per 100 females	102.2	100.7
Population Growth		
Per annum	2.27%	n/a
Labour Market		
Unemployment rate (official)	n/a	30.0%
Youth Unemployment rate (official) 15-34	n/a	39.6%
Education (aged 20+)		
No schooling	9.0%	11.5%
Matric	35.0%	29.4%
Higher Education	8.7%	10.2%
Household Dynamics		
Households	421 144	356 911
Average Housegold Size	3.4	3.5
Formal Dwellings	81.6%	82.8%
Housing Owned	62.8%	58.9%
Household Services		

Flush toilet connected to sewerage	51.5%	48.7%
Weekly refuse removal	47.9%	48.3%
Piped water inside dwelling	39.3%	40.6%
Electricity for lighting	85.4%	85.7%

10.17.2 EMALAHLENI LOCAL MUNICIPALITY

eMalahleni Local Municipality is one of the six local municipalities in the Nkangala District Municipality. It forms part of the western regions of the province and borders Gauteng province. The southern parts of eMalahleni Local Municipality form part of the precinct referred to as the Energy Mecca of South Africa, due to its rich deposits of coal reserves and power stations such as Kendal, Matla, Duvha and Ga-Nala. The southward road and rail network connect the Emalahleni area to the Richards Bay and Maputo harbours, offering export opportunities for coal reserves. It comprises of eMalahleni City as the main urban centre in the municipality, with the other activity nodes/towns in the municipal area represented by Ogies, Phola, Ga-Nala, Thubelihle, Rietspruit, Van Dyksdrift andWilge. (www.emalahleni.gov.za).

The key statistics for the eMalahleni Local Municipality are provided below:

Total population	395,466
Young (0-14)	25,2%
Working Age (15-64)	71,2%
Elderly (65+)	3,6%
Dependency ratio	40,4
Sex ratio	111,8
Growth rate	3,58% (2001-2011)
Population density	148 persons/km2
Unemployment rate	27,3%
Youth unemployment rate	36%
No schooling aged 20+	5,8%
Higher education aged 20+	13,9%
Matric aged 20+	31,4%
Number of households	119,874

Number of Agricultural households	10,947
Average household size	3,2
Female headed households	27,9%
Formal dwellings	77,2%
Housing owned/paying off	45,3%
Flush toilet connected to sewerage	68,8%
Weekly refuse removal	67,2%
Piped water inside dwelling	54,9%
Electricity for lighting	73,4%

11 DESCRIPTION OF SPECEFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

11.1 ENVIRONMENTAL FEATURES

Most of the study site consists of old cultivated lands and remaining opencast and underground mining areas or diggings from historic mining. The Olifants River borders the northern section of the mining right boundary. Various wetlands, natural and man-made due to previous mining, can be found on site. Other areas within close proximity to the mining right boundary, include grazing areas, roads and homesteads.

11.2 EXISTING INFRASTRUCTURE ON THE STUDY AREA AND IN CLOSE PROXIMITY

There is existing mining infrastructure for the 2 Seam Mine in the project area, as described in Section 3. Other existing infrastructure in close proximity includes mining infrastructure, farmhouses and agricultural infrastructure. No railway line occurs close to the mine. The R547 borders the mining right area.

12 DESCRIPTION OF THE CURRENT LAND USES

(Show all environmental and current land use features)

The mining right land for 2 Seam is mostly under mining activities since this application involves an existing mine. There are small portions that are vacant and used for farming. Approximately 1,2 hectares is planted to summer grains. On a regional scale, general uses within 5km of the site include mining, grazing and cultivated land.

12.1 SENSITIVE LANDSCAPES

The occurrence of possible sensitive landscapes at the project site is outlined in the table below.

Table 31: Sensitive Landscapes within the Mining Site

Types of sensitive landscapes	Occurrence at the Mining Site
Nature conservation or ecologically sensitive areas - indigenous plant communities (particularly rare communities and forests), wetlands, rivers, riverbanks, lakes, islands, lagoons, estuaries, reefs, inter-tidal zones, beaches and habitats of rare animal species.	Ecological assessments have been conducted on the Mining Right area. Refer to Sections 10.5, 10.7, 10.8, 10.9 and 10.10 above for the assessment and baseline findings regarding the ecological assessment, aquatic ecology, wetlands found on site, hydrogeological and hydropedological l updates found and assessed on-site (and within 500 m of the project area).
Sensitive physical environments - such as unstable soils and geo-technically unstable areas.	None known. A Hydropedological assessment has been undertaken as required for the WUL process and this will aim to connect the wetlands found and Hydrogeological assessment and describe the movement between the two water environments. Geotechnical assessment has also been undertaken.
Important natural resources - river systems, groundwater systems, high potential agricultural land.	All of these aspects have been assessed by specialists and is described in the baseline environment section (Section 10).
Sites of special scientific interest	None known.
Sites of social significance - including sites of archaeological, historic, cultural, spiritual or religious importance and burial sites.	Refer to Section 10.13 and 10.14.
Sites of outstanding natural beauty, panoramic views and scenic drives	The area has already been impacted by mining activities, roads and agricultural activities.
Green belts or public open space in municipal areas	Not applicable.

13 LIMITATIONS AND ASSUMPTIONS

Limitations as per each specialist study has been provided within each specialist investigation as to comply with Appendix 6 of the Impact Regulations and may be viewed there.

13.1 GROUNDWATER ASSESSMENT

The following limitations are recognised:

- No exploration drilling was undertaken for this study. Available borehole log data, specialist reports for the study area and literature data for the lithological occurrences in the area were used to supplement the geohydrological conceptual model for the site. The literature review filled the drilling gap. Moreover, the gaps in lithostratigraphy and geohydrological information would be further addressed during the establishment of the proposed monitoring boreholes at the site.
- Groundwater-specific yield and specific storage values were derived from literature ranges for the rock encountered in the study area. It is assumed that specific yield and specific storage values in the model domain are like literature values.
- SO_4 was used to illustrate the predicated zone of impact due to the physical and chemical attributes of SO_4. SO_4 is typically associated with mine drainage from coal mines and is, therefore, a good tracer to predict impacts (INAP, 2018).
- Conductance for river and stream drainage cells was derived from the literature and built-in stream

conductance models in Visual Modflow. It is assumed that conductance in the model domain is like literature values.

- The model does not consider kinetic mineral reactions (i.e. oxidation of minerals within the waste storage facilities or seepage thereof).
- Source terms were defined based on available data for the site and were traced based on available borehole SO_4 data and google imagery of the site.
- No capping of the opencast workings (OC4 and OC4A) is simulated. It is therefore assumed that the workings will be backfilled and seeded. In the numerical simulation, a recharge range of 10 to 15% is applied to the backfilled pit areas.
- The TSF(no longer part of this application) and PCDs will be lined, hence, no mass transport or contamination is anticipated for these facilities (best case).

13.2 SURFACE, AQUATIC AND WETLAND WATER ASSESSMENT

To determine the riparian or wetland boundary, indicators (as discussed above) are used. If these are not present during the site visit, it can be assumed that they were dormant or absent and thus if any further indicators are found during any future phases of the project, the author cannot be held responsible due to the indicator's variability. Even though every care was taken to ensure the accuracy of this report, environmental assessment studies are limited in scope, time, and budget. Discussions and proposed mitigations are to some extent made on reasonable and informed assumptions built on bona fide information sources, as well as deductive reasoning. No biomonitoring or physical chemical aspects of water found on the study were done. The safety of the delineator is of priority and thus in areas deemed, as unsafe limited time was spent. If the location of the study site is on and near underlying granitic geology the possible presence of cryptic wetlands must be investigated by a suitably qualified soil scientist with field experience.

Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions and migrations. Since environmental impact studies deal with dynamic natural systems additional information may come to light at a later stage. As aquatic systems are directly linked to the frequency and quantity of rain it will influence the systems drastically. If during dry months or dry seasons studies are done, the accuracy of the report's findings could be affected.

13.3 AGRICULTURAL ASSESSMENT

No gaps in knowledge or data were found by the specialist that would influence the findings or recommendations.

13.4 HERITAGE ASSESSMENT

The general visibility was good during the time of the site visit and no access constraints were encountered.

13.5 PALEONTOLOGICAL ASSESSMENT

Based on the geology of the area and the paleontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and do contain fossil plant, insect, invertebrate and vertebrate material. The sands of the Quaternary period would not preserve fossils. From drill core data for geohydrology in the mining area it is certain that the uppermost coal seam and associated shales of the Vryheid Formation are 30-36m below ground surface.

13.6 HYDROPEDOLOGICAL ASSESSMENT

- It should be noted from the outset that hydropedology focuses on wetland impacts feeding the Olifants river and does not address direct groundwater and surface water impacts related to diverting the Olifants river which requires specialist studies.
- Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment. Wetlands are dependent on rainfall infiltrating the upslope soil, being partitioned by the subsoil and fractured rock, before flowing down slope to return to the soil surface and wetland, sometimes via a river system. A wetland may thus be considered a signature of the hydrological dynamics of its surrounding catchment.
- The wetland's catchment determines the relative extent of different hydrological response types in the catchment and within specific hillslopes contained within the catchment. The impact on flow drivers of the wetland catchment is detailed below and is based on the following assumptions (*status quo*). A water balance on the wetland catchment is represented by:
    - Rainfall 100% of flow input
    - Evapotranspiration is 50 – 70% of rainfall (outflow)
    - Runoff is 10% (outflow)3
    - Groundwater recharge is 5%4 (outflow)
    - 20 -30 % of the water being left in or stored the unsaturated zone or interflow zone feeding the wetland
- The impact assessment is only valid for OC4 and OC4A, based on the site visit historic activity and agricultural activities has impacted on the wetland systems. Current flow driver impacts from existing and neighbouring mines/agricultural activities was not part of the impact assessment.

13.7 BIODIVERSITY

- The layout presented within the ecological report is thought to be the final at the time of the compilation of this report.
- It is assumed that species flowering only during specific times of the year could be confused with a very similar species of the same genus. Some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- The site survey was undertaken on the 2nd of August 2022 which is not within the peak, spring flowering period in a summer rainfall region, but rather the dry, winter season. The timing of the site visits was thus not optimal, and the seasonal constraints on the comprehensiveness of the botanical findings are considered to be moderate to high. However, considering the general condition of vegetation and land-use on the study site, the data gathered during the site visit is considered sufficient for the purposes of this report and the Scope of Work for this study.

- Species flowering only during specific times of the year could be confused with a very similar species of the same genus and some plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- As part of the site survey a Species of Conservation Concern (SSC) scan was undertaken for SCC floral species identified during the desktop assessment. However, the SCC scan does not substitute an in-depth survey specifically for SCC.
- No scientific data was collected or analysed for the calculation of ecological veld condition. Any comments or observations made in this regard are based on observations, the expert knowledge and relevant professional experience of the specialist investigator.
- Riparian and wetland associated vegetation units were delineated on the presence of obligate and facultative flora species only and does not serve as a substitute of a comprehensive wetland delineation. The sensitivity rating provided in this Terrestrial Ecology Assessment does not consider sensitivity buffers that are calculated and determined in a Wetland Assessment. It is none-the-less important the buffer areas indicated in the Wetland Assessment are considered in the project planning and implementation.
- Data collection in this study relied heavily on data from representative, homogenous sections of vegetation units, as well as general observations, analysis of satellite imagery from the past until the present, generic data, and a desktop analysis.
- Riparian areas refer to watercourses, rivers or streams and does not specifically cater for wetland zones. For aspects related to wetlands, the Wetland Delineation Report will need to be referred to.
- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

13.8 CLOSURE REPORT

This report is based on the following assumptions and limitations:

- Current information available to Elemental Sustainability was used in the development of this report.
- The information contained within this report is based on current layout plans available. If there is a significant change or addition of other infrastructure areas, this report will need to be updated to cater for this change.
- Mitigation measures and recommendations provided in this report is based on the specialist studies. All specialist studies have been completed prior to this report being completed; and
- This report must be considered as a living document and will be updated as additional information becomes available, and as monitoring and rehabilitation progresses. The report has to be updated as required by legal requirements.

14 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE (IN RESPECT OF THE FINAL SITE LAYOUT PLAN) THROUGH THE LIFE OF THE ACTIVITY

(Including (i) a description of all environmental issues and risks that where identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

14.1 IMPACTS IDENTIFIED FOR THE PROJECT

The following cultural, environmental and socio-economic impacts associated with the project have been assessed in this document.

Potential impacts that may be caused by the development will be identified using input from the following:

- Views of I&APs;
- Existing information;
- Specialist investigations;
- Site visit with the project team; and
- Legislation.

The following potential major direct, indirect and cumulative impacts were identified:

- Land degradation (where surface impacts are expected);
- Potential to alter the topography (where surface impacts are expected);
- Loss of soil characteristics - erosion and compaction (where surface impacts are expected);
- Potential for alien invasive establishment;
- Reduced flow to downstream water catchment;
- Potential pollution to water resources (surface and groundwater);
- Drawdown cone from dewatering activities (groundwater quantity);
- Increased dust and emissions;
- Increased noise levels;
- Damage to property/infrastructure from blast events (however, blasting will be underground);
- Potential damage to heritage sites (grave and/or archaeological artefacts);
- Influx of job seekers to the area;
- Potential increased traffic – haulage;
- Health and safety impacts;
- Potential injury and loss of health and life of humans; and
- Altered Socio-Economic Environment (Positive or negative).

14.2 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

Minerals can only be mined where identified and verified, therefore it was not practical to select any other sites. This fact will have guided the proposed positioning as well as utilising the transformed/impacted areas, which will limit surface impacts for the project (refer to Section 7 above).

14.3 ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

A Comments and Response Report was compiled for the scoping phase of the project (Appendix 4). This will be updated for EIA phase of the project (refer to Appendix 4).

14.4 SPECIALIST INVESTIGATIONS

Several specialist investigations formed part of the in the EIA Phase of the project.

Table 32: Description of aspects assessed by the specialists

Aspect	Specialist Study	Specialist	Terms of Reference
Surface water and Aquatic Ecology	Surface water and Aquatic Ecology Assessment	Limnology	The main objectives of this study were as follows: • Delineate and classify wetlands within 500m of the development site; • Discusses drivers of wetlands; • Groundtruthed of desktop data; • Assessment of the PES or EIS scores and Recommended Ecological Category; • The Risk Assessment based on the 2016 version of the Risk Matrix Tool presented in Appendix A of the Risk-Based Water Use Authorisation Approach and Delegation Protocol for Section 21(c) and (i); • To identify anticipated impacts of the proposed development on wetlands; and • To provide mitigation measures to limit and/or eliminate the anticipated impacts. The wetland assessment presented further aimed to provide information required for the NEMA as well as Department of Water and Sanitation (DWS), including: • Undertake functional and integrity assessment of wetlands areas within the area assessed as specified in General Notice 267 of 24 March 2017, particularly an assessment of ecosystem services following Kotze et al, 2005, • Undertake an impact assessment as specified in the NEMA 2014 regulations, • Undertake a risk assessment as specified in General Notice 509 in published in the Government Gazette 40713 of 24 March 2017, Recommend suitable buffer zones, both generic (as required in GDARD, 2014) and scientific as specified in General Notice 267 of 24 March 2017, following Macfarlane et al 2015.
Groundwater	Groundwater Impact Assessment	GCS (Pty) Ltd.	The scope of work completed was as follows: 1. Desktop study and Data Review: a. All available groundwater monitoring data, previous studies conducted by GCS, and other site-specific reports made available for this study were assessed. Data were extracted from the reports to establish groundwater quality and quantity conditions. Subsequently, data were assimilated for numerical application. b. A desktop-level hydrocensus was completed for the study area. The latest National Groundwater Archive (NGA, 2021) and groundwater resource information project (GRIP, 2016) data were assessed. 2. Field investigation: a. A site walkover survey was undertaken to identify potential sensitive surface-groundwater areas was completed; b. A hydrocensus (within a 2.5 km radius of the proposed underground and opencast areas – and in the sub-catchment associated with the site) was undertaken in the study area to identify groundwater users.

Aspect	Specialist Study	Specialist	Terms of Reference
			c. Several geophysical profile lines (magnetic methods) were conducted to confirm the presence and orientation of dolerite dykes at the site. The data was used to determine future monitoring of borehole drilling positions and to supplement the numerical model and risk assessment. d. Water sampling of hydrocensus boreholes was conducted to gather groundwater quality data for hydrocensus boreholes identified in the field. e. Several slug tests were conducted on selected boreholes, to confirm aquifer parameters. f. All field data were evaluated and interpreted per best practice guidelines. 3. Hydrogeological and geological conceptual Model development: a. Hydrogeological, geochemical and geological conceptual models were developed for the site – based on the data gathered for the site. b. A site conceptual model was developed in support of the numerical groundwater flow and transport model. 4. Groundwater numerical flow and transport modelling: a. A numerical model grid was developed and the flow model was calibrated to the existing setting (for the year 2022) with available data for the study (transient state); b. Scenario modelling was undertaken to evaluate the flow system and impact on the receiving environment and decant potential if the stream diversion is implemented (50 and 100Y). - a. The source-pathway-receptor (SPR) principle was applied to the site, along with the conceptual site model and numerical model outputs to evaluate hydrogeological risk. The aim was to assess: i. Preferential groundwater flow paths; - ii. Decant areas and decant quantities & qualities; - iii. Impact on groundwater baseflow to the Olifants River; and - iv. Impact on the water quality of the Olifants River. - - a. The existing groundwater monitoring network was reviewed, and a gap assessment was undertaken. - b. Geophysical data gathered during this investigation was also assessed to site future groundwater monitoring boreholes, that can be used to improve the monitoring system. - a. A geohydrological report encompassing all work done as well as a preliminary groundwater risk assessment and monitoring plan were compiled.

Aspect	Specialist Study	Specialist	Terms of Reference
			5. Hydrogeological risk assessment: a. The source-pathway-receptor (SPR) principle was applied to the site, along with the conceptual site model and numerical model outputs to evaluate hydrogeological risk. The aim was to assess: i. Preferential groundwater flow paths; ii. Decant areas and decant quantities & qualities; iii. Impact on groundwater baseflow to the Olifants River; and iv. Impact on the water quality of the Olifants River. 6. Monitoring plan: a. The existing groundwater monitoring network was reviewed, and a gap assessment was undertaken. b. Geophysical data gathered during this investigation was also assessed to site future groundwater monitoring boreholes, that can be used to improve the monitoring system. 7. Reporting: a. A geohydrological report encompassing all work done as well as a preliminary groundwater risk assessment and monitoring plan were compiled.
Heritage	Heritage Impact Assessment	Agri Civils Geo-Tech and Heritage - Tobias Coetzee Heritage Practitioner.	Assessment of the potential impact on any types and ranges of heritage resources that are outlined in Section 3 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999). The objective of the Phase 1 Heritage Impact Assessment (HIA) was to gain an overall understanding of the heritage sensitivities of the area and indicate how they may be impacted. In order to establish heritage significance the following method was followed: • Investigation of primary resources (archival information) • Investigation of secondary resources (literature and maps) • Physical evidence (site investigation) • Determining Heritage Significance.
Terrestrial Ecology	Flora Impact Assessment	Enviridi Environmental Consultants (Pty) Ltd	The terms of reference for the Vegetation Assessment were as follows: • Describe the affected floristic environment from available literature and by means of a desktop study to identify a list of possible floral species that are likely to occur on site. • List and record endangered, red data and protected plant species found on site.

Aspect	Specialist Study	Specialist	Terms of Reference
			• List exotic and invasive plant species found on site. • List plants found on site with medicinal properties • Identification of anticipated impact of the proposed project on the vegetation and ecosystem services. • Provide proposals for mitigation of identified impacts. • Draw up a sensitivity map indicating all sensitive areas, transformed areas and buffers around sensitive features.
	Fauna Habitat Assessment		The main objectives of the Faunal study were as follows: • To provide a description of the potentially affected fauna habitat by making use of available literature resources, and in so compiling a list of fauna species likely to occur on site; • To list and record endangered, red data or protected fauna species found or likely to occur on site; • To assess the condition of suitable habitat on site for sensitive fauna species; • To compile a sensitivity map indicating sensitive or non-sensitive or transformed areas and relevant buffer zones; • To identify anticipated impacts of the proposed development on fauna species; and • To provide mitigation measures to limit and/or eliminate the anticipated impacts. The study included the following data sources: • Bird distribution data of the Southern African Bird Atlas Project 1 (SABAP1) and 2 (SABAP2) (http://sabap2.adu.org.za/). The SABAP1 was conducted in the late 1980s to early 1990s. The SABAP2 data covers the period 2007 to present. • The Important Bird Areas (IBA) project data (Birdlife International data; Barnes 1998). • The national threatened status of all priority species was determined using the Red Data Book of Birds of South Africa (Taylor et al. 2014), and the updated Birdlife South Africa Checklist of Birds 2015 in South Africa. (http://www.birdlife.org.za/publications/checklists). • The global threatened status of all priority species was determined by consulting the latest (2015.1) IUCN Red List of Threatened Species (Http://www.iucnredlist.org/). • Data on biomes, bioregions, vegetation types and rivers in the study area was obtained from the Vegetation Map of South Africa (Mucina & Rutherford 2006). • Google Earth satellite imagery was used to view the broader development areas and to identify specific bird habitats at ground level. • PlanetGIS Explorer online (www.planetgis.co.za) is used to compile and generate maps.
Hydro-pedological Assessment	Hydro-pedological Assessment	Geo Pollutions Technologies – Morne Burger	The main objectives of this study was the following: • Determine the flow drivers for the pan area; • Determine the catchment of the pan area. • Link the wetland assessment, geohydrological assessment and soil assessment to understand soil-water interactions.

Aspect	Specialist Study	Specialist	Terms of Reference
			• To understand the movement of water through the soil.
Agricultural Agro-Ecosystem Assessment	Assessment of the land Capability	Index - Dr Andries Gouws	The overarching purpose of the Agricultural Agro-Ecosystem Specialist Assessment (from here onwards also referred to as the Agricultural Assessment) that will be included in the Environmental Impact Assessment Report, is to ensure that the sensitivity of the site to the proposed land use change (from agriculture to establishment of mining infrastructure) is sufficiently considered. Also, that the information provided in this report, enables the Competent Authority to come to a sound conclusion on the impact of the proposed project on the food production potential of the site. To meet this objective, site sensitivity verification must be conducted of which the results must meet the following objectives: • It must confirm or dispute the current land use and the environmental sensitivity as was indicated by the National Environmental Screening Tool. • It must contain proof of the current land use and environmental sensitivity pertaining to the study field. • All data and conclusions are submitted together with the Environmental Impact Assessment report for the proposed 2 Seam Mine. According to GN320, the Agricultural Agro-Ecosystem Assessment that is submitted must meet the following requirements: • It must identify the extent of the impact of the proposed development on the agricultural resources. • It has to indicate whether or not the proposed development will have an unacceptable impact on the agricultural production capability of the site, and in the event where it does, whether such a negative impact is outweighed by the positive impact of the proposed development on agricultural resources.
Paloentology	Paloentological Assessment	Dr Marion Bamford (Unviersity of Witwatersrand)	The Terms of Reference (ToR) for this study were to undertake a PIA and provide feasible management measures to comply with the requirements of SAHRA. The methods employed to address the ToR included: 1. Consultation of geological maps, literature, paleontological databases, published and unpublished records to determine the likelihood of fossils occurring in the affected areas. Sources included records housed at the Evolutionary Studies Institute at the University of the Witwatersrand and SAHRA databases; 2. Where necessary, site visits by a qualified paleontologist to locate any fossils and assess their importance (*not applicable to this assessment*); 3. Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and 4. Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).
Financial	Financial	Elemental	The financial provision for the proposed project will be determined by Elemental Sustainability and would be determined in

Aspect	Specialist Study	Specialist	Terms of Reference
Provision – Closure Cost Assessment and Plan	Provision	Sustainability (Pty) Ltd	accordance with the NEMA Regulations (1147 of 2015, as amended) pertaining to the financial provision for mining operations.

14.5 THE POSITIVE AND NEGATIVE IMPACTS THAT THE ACTIVITY (IN TERMS OF THE INITIAL SITE LAYOUT) AND ALTERNATIVES WILL HAVE ON THE ENVIRONMENT AND THE COMMUNITY THAT MAY BE AFFECTED

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

General impacts are provided below as per specialist investigations (refer to Appendix 5 – 12). The specialist investigations which included modelling, such as groundwater, noise, visual, air and blasting, included the modelling results below as per relevant heading.

14.5.1 IMPACT ON GEOLOGY

No geological impacts such as sterilisation of mineral resources are expected as the proposed project is being planned in a manner that allows for the maximum extraction of the targeted commodities within the project area.

14.5.2 IMPACTS ON TOPOGRAPHY

The topography of the project area would be altered by project related activities. The topography of the site could be altered through:

- Opencast mining; and
- Alteration of drainage patterns.

14.5.3 IMPACTS ON AGRICULTURE AND SOIL

The screening tool indicates very small portions of *high sensitivity* land. This is now mined. A detailed assessment found that the sensitivity is low and that there is no medium or high sensitivity land as indicated by the tool.

The screening tool did not consider watercourses, infrastructure or mined land. Having taken these into consideration makes the site low sensitive to farming.

- There will be no loss of high potential land. No impact and no mitigation measures are required.
- No grazing land will be lost. The only portion suitable for grazing is the rehabilitated land. The balance is under mining infrastructure and vacant.
- Loss of crop production. There will be a loss of 1,2 ha of cultivated land. The impact is negligible and no mitigation is required.
- Loss of animal production. The land is fragmented and not used for animal grazing. Hence, there will be no loss of animal production or income.
- No farming infrastructure will be lost. No impact.

14.5.4 AQUATIC IMPACTS (INCLUDING AQUATIC ECOLOGY AND WETLANDS)

During construction and operation of the river diversion and opencast pit the following impacts may occur:

- Sediment ingress into the aquatic ecosystems;
- Diversion of the Olifants River

- Sediment releases/ingress into system due to topsoil stockpile;
- Increased flow volumes
- Impact on the ecosystem health
- Reduced functionality of buffer
- Ecotone removal
- Possible hydrocarbon spillage into natural area;
- Transportation from site may impacted by trucks and machinery
- Alien vegetation establishment and spread
- Collection of water in opencast pit.

During decommissioning and closure the following impacts may occur:

- Replaced surface soils are washed away if not stabilised or planted before the first rainfall;
- Altering of beds and banks
- Sediment ingress;
- Alteration of soil chemical properties reducing soil productivity
- Herbicide application may pollute the systems; and
- Spread and establishment of alien vegetation.

14.5.5 IMPACTS ON HYDROGEOLOGY

The identified risks for the pre-mining phase on the groundwater include:

- The destruction of the localised geological units at the opencast development. This impact is permanent and is therefore not included in the impact table as no mitigation measures can be recommended.
- Clearing topsoil from footprint areas will influence the rate of infiltration of water to the shallow groundwater system and/or baseflow component to shallow streams.
- Diversion of the Olifants River to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.
- Handling of waste and transport of material can cause various types of spills (domestic waste, sewage water, hydrocarbons) which can infiltrate and contaminate the groundwater system.
- Poor quality mine drainage from material removed during the opencast development (i.e. from overburdened rock piles) may cause local soil and groundwater contamination.
- Oil and fuel spills and leakages at hard park areas, and in the mining pits, may cause poor-quality seepage and soil contamination.
- Stripping of the topsoil during the channel creation for the Olifants River diversion may cause temporary sedimentation as the river takes to the new flow path. There may be some bank erosion which could also lead to sedimentation and suspended solid transport.
- If vehicles and machines leak hydrocarbons during the diversion trenching, there may be local soil contamination that could impact the surface and groundwater quality.

The identified risks for the operational phase on the groundwater include:

- The destruction of the localised geological units as the opencast workings are developed. This impact is permanent and is therefore not included in the impact table as no mitigation measures can be recommended.
- Opencast mining will result in groundwater inflows into the pits which need to be pumped out for mine safety and will lead to a lowering of groundwater levels in the surrounding aquifers.
- Dewatering activity may impact the shallow baseflow of the Olifants River and its tributaries.
- Diversion of the Olifants River to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.
- Analyses showed that acid mine drainage (AMD) formation is expected and poor-quality leachate can occur based on the leaching potential of the material. This can influence the water quality in the surrounding aquifers. However, groundwater flow directions will be directed towards the opencast and contaminant migration away from the mining areas will be limited during active mining.
- Potentially contaminated groundwater ingress if fracture networks from underground workings are intercepted during opencast mining.
- Seepage from the ROM stockpiles.
- Potential seepage from the TSF into the vadose zone and the subsequent groundwater table. The facility will be lined, and no seepage is likely. Poor-quality runoff is still likely to occur.
- Potential seepage from the PCDs. The facilities will be lined, and no seepage is likely. Poor-quality runoff is still likely to occur; and
- Seepage from the processing plant areas, contractor yard (i.e. oil and fuel spills, coal dust fallout etc.) and processed coal stockpiles.
- Poor quality seepage associated with coal transport via haulage roads, concurrent backfilling of opencast pits, overburdened rock, coal and ROM stockpiles, and the plant could lead to spillages, and workshop areas (hydrocarbons, sewage, domestic waste) and pollution Control Dams (existing and proposed).

The identified risks for the closure and decommissioning phases on the groundwater include:

- Rebounding water levels.
- Migration of groundwater contaminant plume and contaminated groundwater seepage to streams and Olifants River (salt load).
- Depending on the pit water balance, the pit can decant at the lowest topographical area and negatively impact groundwater and stream quality. This is particularly probable for OC4A.
- Migration of groundwater contaminant plumes and contaminated groundwater seepage from the TSF (even though predicted to be limited) and rehabilitated ROM and plant areas
- Potentially contaminated groundwater ingress if fracture networks from underground workings were intercepted during mining.

14.5.6 IMPACTS ON ECOLOGICAL BIODIVERSITY

- The site has sections which have been modified, and habitat has been transformed to an extent based on mining activities in the area, however, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area.
- Development related activities will specifically lead to damage or degradation of highly sensitive habitats (VU3) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction of these additional activities further fragmentation, degradation or compression may occur.
- The project area has sections which are slightly/moderately degraded, and habitat has been transformed to an extent due to farming activities in the area. However, the onset of additional activities might result in impacts to the natural environment due to increased movement, traffic and large machinery to the area. Heavy machinery and vehicles might result in compaction of the soil and destruction of vegetation habitat which in turn will also impact on the animals that use the area as habitat. Construction (or additional construction activities) will result in increase of potentially destructive movement within the compromised area.
- Development related activities may lead to the loss of faunal and floral species of conservation concern. Avifaunal red listed species was confirmed during the field assessment for the water related environments. Three (3) species listed by POSA for the area are classified as species of conservation concern (SCC), two of which may potentially occur on the project footprint. Also, the MNCA protected species, *Cyrtanthus tuckii* (Pempempie), was confirmed to occur on areas outside the footprint (but within the Mining Right) but could potentially spread to occur within the footprint site as well before mining commences. Development and related activities could impact on the sensitive habitats, such as riparian and wetland areas (VU2), situated in and around the development footprint.
- Impacts may occur on the water resources located in close proximity where the development will take place. This may be due to pollutants entering the water resource, during construction or during operational phase from sources associated with the mine.
- Rehabilitation could be ineffective if measures are not appropriately complied to. Without the necessary mitigation measures, rehabilitation will be unsuccessful, and the environment will not be self-sustaining. The possibility of subsidence for underground mining should be managed and stability of pillars ensured. If subsidence occurs, it should be rehabilitated properly to prevent impacts to faunal species that might fall into these depressions, leading to serious injury, entrapment, and death. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture.

14.4.7 IMPACTS ON HYDROPEDOLOGY

Flow drivers

The following episodic flow drivers are relevant to the wetland system:

- Groundwater recharge = 569500 m^3/a
- Direct rainfall on wetland soils = 300160 m3/a

- Run off = 797300 m^3/a

Water stored in the interflow or responsive soils:

- 300160 m^3/a

It is clear from the above that surface run off water, followed by direct rainfall and then water stored in the wetland soils are the main water components of the wetland system south of the Olifants river. In contrast the largest impact on the wetland system is the disruption of water stored in the interflow and responsive wetland soils as shown in Figure 82 and Figure 78**.**

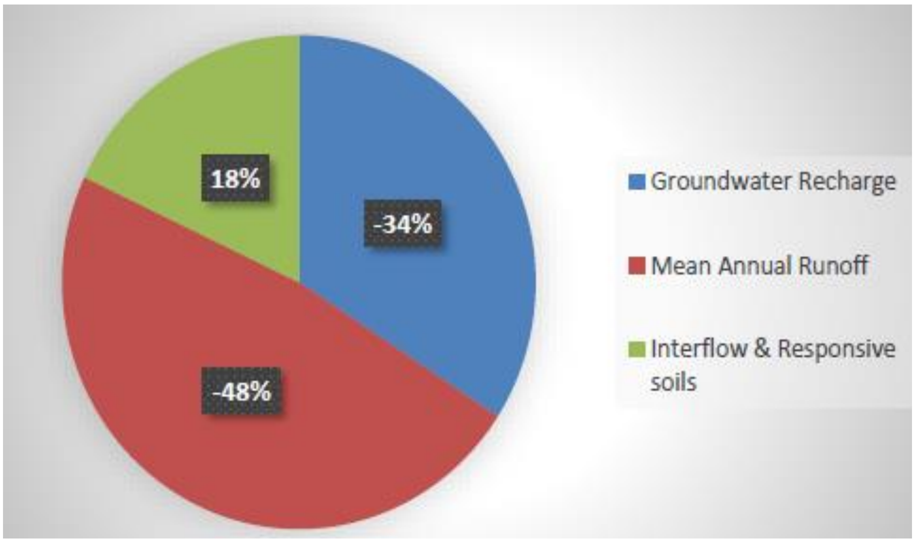

Figure 82: Contribution in terms of flow driver percentages (pre mining)

OC4 and OC4A

The impact percentages in terms of flow drivers are detailed in Figure 83 and Figure 78 below. The largest impact is on the wetland soil storage potential, followed by run-off and then groundwater.

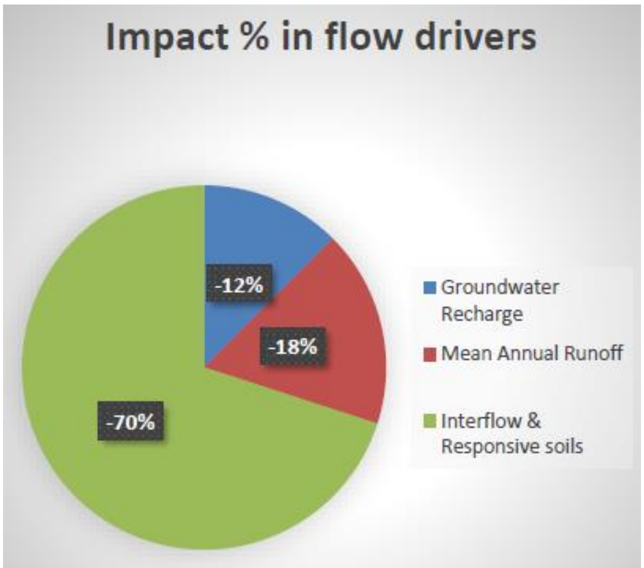

Figure 83: Contribution in terms of flow driver impact percentages (during mining OC4 & OC4A)

Description	Volume pre development (m3/a)	Volume during mining (m3/a)	Volume loss (m3/a)	% Loss
Groundwater Recharge	-569500	-567268.9670	-2231.03	1-3
Mean Annual Runoff	-797300	-794176.5538	-3123.45	1-2
Interflow & Responsive soils	300160	287666.2152	-12493.78	2 -5%

Figure 84: Wetland flow driver impact losses (OC4 & OC4A)

The wetlands on site reflect the behaviour of water, predominantly rainfall, and its behaviour following interception and infiltration into the soils. Thus, activities that affect the movement of water as well as its quality in the catchment areas supporting wetlands, translate into changes in the pans to which they are invariably linked. Expected impacts include:

- Change in hydrology.
- Change in water quality, and
- Loss of wetlands and the biodiversity supported by these wetlands.

Impacts that lead to a change in hydrology include all impacts that influence the quantity (e.g., increased or decreased run-off) and velocity (e.g., concentration of flows) of flows leaving the site.

Increased flows and increased velocity of flows could result in increased erosion within the receiving environment, while decreased flows could result in a decreased wetland functionality.

Impacts that lead to deteriorating water quality, together with the impacts that change the hydrology, are expected to be the most significant impacts on site. From a wetland perspective, mitigation measures and management plans should focus on these impacts and it will need to be clearly shown in the EIA and EMP how these impacts will be ameliorated to prevent significant deterioration of the quality and quantity of water discharged to downstream areas. The impact assessment is discussed in the heading below.

The impact quantification was done using the procedures for the assessment and minimum criteria for reporting aquatic biodiversity in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998. In terms of groundwater the proposed development impact on the functioning of the aquatic feature in terms of:

- Baseflow.
- Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem.
- Quality of water.

- The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.
- Additional environmental impacts expected from the proposed development
- The degree to which impacts, and risks can be mitigated.
- The degree to which the impacts and risks can be reversed.
- The degree to which the impacts and risks can cause loss of irreplaceable resources.
- A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.

Two impact scenarios were done:

- Scenario 1 – No diversion
- Scenario 2 – With a diversion

Should the river diversion not occur, there will be no change on the hydropedology, as OC4A is situated on recharge no wetland impacts (not river impacts) are foreseen except for some decrease in direct rainfall on the footprint area. With the diversion (Scenario 2) the impact on hydropedology will be medium without mitigation measures and low with mitigation.

Mining is at the low point of the wetland and only intersects a small portion of the wetland with lower impacts than expected was obtained during the impact assessment. However, as the wetland system directly feeds into the Olifants river the impacts if not mitigated is expected on the river and therefore should mining be conducted should only be done with a diversion or similar offset strategy. As the planned OC4A is on recharge soils the impacts from dewatering of groundwater (lowering of the groundwater level) could lead to a decrease in baseflow to the Olifants River which is beyond the scope of hydropedology.

14.5.8 VISUAL IMPACT

Visual Absorption Capacity (VAC) can be described as the ability of an area to absorb physical modifications. Factors affecting VAC include inter alia, vegetation, the built environment, existing infrastructure and topography. In terms of these factors the receiving environment is perceived to have a low to medium VAC. The following have been identified as sensitive receptors in terms of visual impacts and impacts on the ‘Sense of Place’ of the study area and surrounding area:

- Travelers on the R544 provincial road
- Surrounding land users within 2 km from the study area; and

However, as the mine is existing and additional infrastructure will be within the existing operation, no further Visual impacts are expected.

14.5.9 IMPACTS FROM BLASTING AND VIBRATION

The mining method involves drill and blasting. Blasting activities have the potential to impact on people, animals and structures located in the vicinity of the proposed project area. The potential impact could have a medium severity in the unmitigated scenario. In the mitigated scenario, this severity will remain medium. A number of measures can be taken to control blasts and associated impacts.

14.5.10 TRAFFIC IMPACTS

Mining projects contribute to increased traffic and introduce mine-related trucks on public road networks which can result in an inconvenience to current road users, higher accidents (for people and animals) decreased road service levels and/or increased road damage. This in turn can put pressure on the relevant roads authority to increase the maintenance programmes and/or upgrade the roads.

As 2 Seam is an existing mine, no additional traffic impacts are expected.

14.5.11 NOISE IMPACTS

2 Seam is an existing mine, therefore, the proposed activities are not expected to create additional noise impacts.

14.5.12 IMPACTS ON AIR QUALITY

2 Seam Mine is an existing mine and dust monitoring is undertaken. No additional impacts on air quality are expected due to the proposed activities.

14.5.13 HERITAGE IMPACTS

The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences. A fundamental aspect in the conservation of a heritage resource relates to whether the sustainable social and economic benefits of a proposed development outweigh the conservation issues at stake. There are many aspects that must be taken into consideration when determining significance, such as rarity, national significance, scientific importance, cultural and religious significance, and not least, community preferences. When, for whatever reason the protection of a heritage site is not deemed necessary or practical, its research potential must be assessed and if appropriate mitigated in order to gain data / information which would otherwise be lost. Such sites must be adequately recorded and sampled before being destroyed.

All sites should include a field rating in order to comply with section 38 of the National Heritage Resources Act (Act No. 25 of 1999). The field rating and classification in this report are prescribed by SAHRA.

Table 33: Field Ratings

Rating	Field Rating/Grade	Significance	Recommendation
National	Grade 1		National site
Provincial	Grade 2		Provincial site
Local	Grade 3A	High	Mitigation not advised
Local	Grade 3B	High	Part of site should be retained

General Protection A	4A	High/Medium	Mitigate site
General Protection B	4B	Medium	Record site
General Protection C	4C	Low	No recording necessary

14.5.14 PALEONTOLOGICAL IMPACTS

Based on the nature of the project, surface activities may impact upon the fossil heritage if preserved in the development footprint. The geological structures suggest that the rocks are the right type to contain fossils of the Glossopteris flora BUT these shales occur 30m plus below the land surface. Since there is a small chance that fossils from the below ground Vryheid Formation may be disturbed a Fossil Chance Find Protocol has been added to this report. Taking account of the defined criteria, the potential impact to fossil heritage resources is extremely low.

14.5.15 SOCIO-ECONOMIC IMPACTS

Mining projects have the potential to have positive and/or negative impacts on the following, regardless of the alternatives that are selected:

- Continued employment for current workers;
- The local and national economy;
- Social structures within communities;
- Increased pressure on basic services;
- Quality of life and health related issues; and
- Livelihoods of businesses.

Socio-economic impacts would occur during all project phases. In the absence of mitigation that focuses on enhancing positive impacts and reducing negative impacts, the severity of unmitigated impacts would be medium for negative impacts and medium (positive) for positive impacts. The related unmitigated significance could be medium. Where the project planning takes into account and applies the necessary mitigation to avoid, minimises or remedy impacts in line with the mitigation hierarchy, the significance of potential negative impacts can be reduced and potential positive impacts can be increased.

14.6 CUMULATIVE IMPACTS

A cumulative impact may result from an additive impact i.e. where it adds to the impact which is caused by other similar impacts or an interactive impact i.e. where a cumulative impact is caused by different impacts that combine to form a new kind of impact. Interactive impacts may either be countervailing (net adverse cumulative impact is less than the sum of the individual impacts) or synergistic (net adverse cumulative impact is greater than the sum of the individual impacts).

The assessment of cumulative impacts on a study area is complex; especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated. It is often difficult to determine at which point the accumulation of many small impacts reaches the point of an undesired or unintended cumulative impact that should be avoided or mitigated. There are often factors which are uncertain when potential cumulative impacts are identified.

The anticipated impacts resulting from the additional activities at 2 Seam Mine could potentially result in cumulative effects such as:

- Increase in impacts to the environment already present from the existing land uses;
- Additional risk of soil, air and water pollution due to all the combined coal mining activities of the region.

Regarding the hydrological environment, cumulative impacts in association with adjacent mines in the region will be mitigated by the implementation of appropriate management measures to ensure sensitive downstream water users are not detrimentally impacted.

Table 34: Cummulative Impacts due to additional 2 Seam activities

Impact	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation		Management and Mitigation Measures
Impact on groundwater quantity	Local	3	Long term	4	Low	2	Completely reversible	1	10	Medium	3	Low	30	Medium to high	0,6	Very Low	18	Develop and maintain a surface and groundwater monitoring program in line with the WUL requirements.
The deterioration of groundwater quality due to pollution from ROM stockpile, plant area and PCD	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28, 8	Develop and maintain a surface and groundwater monitoring program in line with the WUL requirements;
Reduction in land capability after rehabilitation	Footprint	1	Long term	4	Medium	3	Nearly irreversible	4	12	Possible	2	Low	24	Medium	0,6	Very Low	14, 4	Optimise the limited topsoil resources available on site; Utilize the stored topsoil for the sole purpose of rehabilitation, no topsoil should be used for landscaping or construction purposes such as roads or embankments; Analysis of topsoil for fatality and apply require amelioration where required; Apply agricultural lime and fertiliser to soil profile

Incremental losses and fragmentation of habitat	Site	2	Short term	2	Low	2	Nearly completely	2	8	Medium	3	Low	24	Medium	0,6	Very Low	14, 4	Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled with the use of a specialist and the correct seeding techniques and mixtures should be applied. Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified specialist deems the monitoring to no longer be necessary
Increase in Air Quality due to additional pollution	Region	4	Long term	4	Medium	3	Nearly completely	2	13	Medium	3	Low	39	Medium	0,6	Very Low	23, 4	Ensure implementation of dust monitoring plan. Continuous dust suppression on site.

Loss and fragmentation of wetland habitat are two of the more serious impacts, as this may result in the loss of broad-scale ecological processes, cumulative habitat loss, connectivity, or potential for the area to meet long-term conservation objectives (such as CBAs, ESAs, IBAs and NPAES areas).	Local	3	Long term	4	Medium	3	Partly reversible	4	14	High	4	Medium	56	Medium	0,6	Low	33, 6	Buffer zones should be maintained, in order to minimise sedimentation of the downstream areas. Ensure that erosion management and sediment controls are strictly implemented from the beginning of site clearing activities. Alien and invasive vegetation control should take place throughout all phases. Monitor the occurrence of erosion during the rainy season and take immediate corrective action where needed
Deterioration of downstream surface water resources quality.	Region	4	Long term	4	Medium	3	Partly reversible	4	15	Medium	3	Medium	45	Medium	0,6	Low	27	Develop and maintain a surface water monitoring program in line with the WUL requirements; Ensure stormwater management plan is implemented and stormwater infrastructure is maintained and functioning correctly. Implement soil erosion management plan

Contamination of the surrounding environment.	Region	4	Long term	4	Medium	3	Nearly completely	2	13	High	3	Low	39	Medium	0,6	Low	23, 4	Adequate monitoring to detect changed in the surface and groundwater environment must be initiated by the applicant, with special focus on contaminants associated with coal and the possibility of formation of Acid Mine Drainage in the area.
Disturbing noise levels: The project has the potential to increase noise pollution through the operation of the plant.	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28, 8	Implementation of berms and operation of plant during daylight hours

Loss of heritage/cultural and palaeontological resources: The project has the potential to damage heritage/cultural and palaeontological resources.	Site	2	Short term	2	Low	2	Nearly completely	2	8	Low	2	Very Low	16	Medium	0,6	Very Low	9,6	Monitoring of any heritage or palaeontological features on site

14.7 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The Environmental Impact Assessment (EIA) 2014 Regulations [as amended] promulgated in terms of Sections 24 (5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) [as amended] (NEMA), requires that all identified potential impacts associated with the project be assessed in terms of their overall potential significance on the natural, social and economic environments. The criteria identified in the EIA Regulations (2014) include the following:

- Nature of the impact;
- Extent of the impact;
- Duration of the impact
- Probability of the impact occurring;
- Degree to which impact can be reversed;
- Degree to which impact may cause irreplaceable loss of resources;
- Degree to which the impact can be mitigated; and
- Cumulative impacts.

The impact assessment methodology used to determine the significance of impacts prior and after mitigation is presented below.

Extent of the impact

The EXTENT of an impact is the physical extent/area of impact or influence.

Score	Extent	Description
1	Footprint	The impacted area extends only as far as the actual footprint of the activity.
2	Site	The impact will affect the entire or substantial portion of the site/property.
3	Local	The impact could affect the area including neighbouring properties and transport routes.
4	Region	Impact could be widespread with regional implication.
5	National	Impact could have a widespread national level implication.

Duration of the impact

The DURATION of an impact is the expected period of time the impact will have an effect.

Score	Duration	Description
1	Short term	The impact is quickly reversible within a period of less than 2 years, limited to the construction phase, or immediate upon the commencem of floods.
2	Short to medium term	The impact will have a short term lifespan (2–5 years).
3	Medium term	The impact will have a medium term lifespan (6 – 10 years)
4	Long term	The impact will have a medium term lifespan (10 – 25 years)
5	Permanent	The impact will be permanent beyond the lifespan of the development

Intensity of the impact

The INTENSITY of an impact is the expected amplitude of the impact.

Score	Intensity	Description
1	Minor	The activity will only have a minor impact on the affected environment in suc a way that the natural processes or functions are not affected.
2	Low	The activity will have a low impact on the affected environment.
3	Medium	The activity will have a medium impact on the affected environment, bu function and process continue, albeit in a modified way.
4	High	The activity will have a high impact on the affected environment which ma be disturbed to the extent where it temporarily or permanently ceases.
5	Very High	The activity will have a very high impact on the affected environment whic may be disturbed to the extent where it temporarily or permanently ceases

Reversibility of the impact

The REVERSIBILITY of an impact is the severity of the impact on the ecosystem structure

Score	Reversibility	Description
1	Completely reversible	The impact is reversible without any mitigation measures and manageme measures
2	Nearly completely reversible	The impact is reversible without any significant mitigation an management measures. Some time and resources required.
3	Partly reversible	The impact is only reversible with the implantation of mitigation an management measures. Substantial time and resources required.
4	Nearly irreversible	The impact is can only marginally be reversed with the implantation o significant mitigation and management measures. Significant time ar resources required to ensure impact is on a controllable level.
5	Irreversible	The impact is irreversible.

Probability of the impact

The PROBABILITY of an impact is the severity of the impact on the ecosystem structure

Score	Probability	Description
1	Improbable	The possibility of the impact occurring is highly improbable (less than 5% of impact occurring).
2	Low	The possibility of the impact occurring is very low, due either to the circumstances, design or experience (5% to 30% of impact occurring).
3	Medium	There is a possibility that the impact will occur to the extent that provision must be made therefore (30% to 60% of impact occurring).
4	High	There is a high possibility that the impact will occur to the extent that provision must be made therefore (60% to 90% of impact occurring).
5	Definite	The impact will definitely take place regardless of any prevention plans, and there can only be relied on migratory actions or contingency plans to contain the effect (90% to 100% of impact occurring).

Calculation of Impacts – Significance Rating of Impact

Significance is determined through a synthesis of the various impact characteristics and represents the combined effect of the Irreplaceability (Magnitude, Extent, Duration, and Intensity) multiplied by the Probability of the impact. The significance of an impact is rated according the scores a presented below:

Equation 1:

Significance = Irreplaceability (Reversibility + Intensity + Duration + Extent) X Probability

Significance Rating		
Score	**Significance**	**Colour Code**
1 to 20	Very low	
21 to 40	Low	
41 to 60	Medium	
61 to 80	High	
81 to 100	Very high	
Mitigation Efficiency		
Degree to which the impact can be mitigated: *The effect of mitigation measures on the impact and its degree of effectiveness:* *Equation 2:* *Significance Rating = Significance x Mitigation Efficiency*		
High		0,2
Medium to High		0,4
Medium		0,6
Low to Medium		0,8
Low		1,0

Confidence rating: *Level of certainty of the impact occurring*.

- **Certain**
- **Sure**
- **Unsure**

Cumulative impacts: *The effect the combination of past, present and "reasonably foreseeable" future actions have on aspects.*

- Very Low cumulative impact
- Low cumulative impact
- Medium cumulative impact
- High cumulative impact

15 IMPACTS AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION AND PROBABILITY OF THE IMPACTS, INCLUDING THE DEGREE TO WHICH THESE IMPACTS

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated)

15.1 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

Please refer to discussions on identified impacts as well as to Table 35 and relevant Management Objectives and Mitigation types for each aspect is provided within Table 37. Mitigation measures are prescribed within the Environmental Management Programme (EMPR). The cumulative impact assessment is provided in Table 36.

The supporting impact assessment conducted by the EAP must be attached as an appendix. **(Considerations used to inform the impact assessment was included in the section above Section 14).**

Refer to Appendix 13.

Table 35: Impact Assessment Table (Complete with Ratings used to obtain Significance)

ACTIVITY	**POTENTIAL IMPACT**	**PHASE**	**Extent**		**Duration**		**Intensity**		**Reversibility**		**Irreplaceability (Extent + Duration +**	**Probability**		**Significance without mitigation**		**Mitigation Efficiently**		**Significance with mitigation**	
Socio Economic																			
No-go option	Reduced period of development and upliftment of the surrounding communities and infrastructure.	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Medium	45	N/A	1	Medium	45
No-Go Option	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Medium	45	N/A	1	Medium	45
No-Go Option	**<u>Positive:</u>** No additional negative impacts on I&APs or surrounding land users	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Positive Medium	45	N/A	1	Positive Medium	45
Natural Environment and Wetlands																			
No-Go Option	**<u>Positive:</u>** No additional negative impacts on the environment	N/A	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Positive Medium	45	N/A	1	Positive Medium	45

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Wetlands and Aquatics																			
Stripping of topsoil for river diversion	Sediment ingress into the aquatic ecosystem, clearing of vegetation	Construction	Site	2	Short term	2	High	4	Partly reversible	3	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
River diversion	Diversion of the Olifants River	Construction	Local	3	Permanent	5	Very High	5	Partly reversible	3	16	Definite	5	Very High	80	Medium	0,6	Medium	48
Stockpiling of topsoil for river diversion	Sediment releases, impact of area disturbed by stockpile	Construction	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Excavation of river diversion	Area impacted by placement of soils on surface next to excavation	Operational	Site	2	Medium term	3	High	4	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Excavation of river diversion	Sediment ingress	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	High	4	Medium	52	Medium	0,6	Low	31,2
Excavation of river diversion	Increased flow volumes	Operational	Local	3	Long term	4	Medium	3	Partly reversible	3	13	High	4	Medium	52	Medium	0,6	Low	31,2
Excavation of river diversion	Impact on long term ecosystem health	Operational	Local	3	Permanent	5	Medium	3	Partly reversible	3	14	High	4	Medium	56	Medium	0,6	Low	33,6
Excavation of river diversion	Reduced functionality of buffer	Operational	Local	3	Permanent	5	High	4	Partly reversible	3	15	Definite	5	High	75	Medium	0,6	Medium	45
Excavation of river diversion	Ecotone removal	Operational	Local	3	Permanent	5	High	4	Partly reversible	3	15	Definite	5	High	75	Medium	0,6	Very Low	45
Excavation of river diversion	Possible spillage into natural area	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Excavation of river diversion	Refilling of machinery with hydrocarbons	Operational	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Excavation of river diversion	Stockpiling of soils	Operational	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Mediu m	0,6	Low	26,4
Excavation of river diversion	Physical excavation in soil	Operational	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Mediu m	0,6	Low	26,4
Transportation from site due to river diversion	Area impacted by waiting trucks and machinery	Operational	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Mediu m	0,6	Low	26,4
Transportation from site due to river diversion	Crossing of aquatic ecosystem on existing roads and bridges	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Mediu m	0,6	Low	28,8
Hydrocarbon spill (river diversion)	Possible spillage into natural area	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	High	4	Medium	52	Mediu m	0,6	Low	31,2
Hydrocarbon spill (river diversion)	Refilling of machinery	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	High	4	Medium	52	Mediu m	0,6	Low	31,2
Access Road for river diversion	Crossing of aquatic ecosystem with machinery	Operational	Site	2	Medium term	3	Medium	3	Nearly completely reversible	2	10	Medium	3	Low	30	Mediu m	0,6	Very Low	18
Impoundment of water in excavation pit (river diversion)	During rainfall events the excavation pit can fill with water (unlikely but included)	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	High	4	Medium	52	Mediu m	0,6	Low	31,2
Alien vegetation spreading and establishment (river diversion)	Alien vegetation establishment and spread	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	Definite	5	High	65	Mediu m	0,6	Low	39
Post development/ rehabilitation (river diversion)	Decompaction of soil	Decommission ing and rehabilitation	Footprint	1	Medium term	3	Medium	3	Completely	1	8	High	4	Low	32	Mediu m	0,6	Very Low	19,2
Post development/ rehabilitation (river diversion)	Removal of crossings over aquatic ecosystem	Decommission ing and rehabilitation	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	High	4	Low	40	Mediu m	0,6	Low	24

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Removal of crossings over aquatic ecosystem (river diversion)	Altering of beds and banks	Decommissioning and rehabilitation	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
Removal of crossings over aquatic ecosystem (river diversion)	Sediment ingress	Decommissioning and rehabilitation	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Replacement of soil into excavated area (unlikely)	Decommissioning and rehabilitation	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Levelling of topsoil's	Decommissioning and rehabilitation	Site	2	Medium term	3	Medium	3	Partly reversible	3	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
Erosion of replaced soils (river diversion)	Replaced surface soils are washed away if not stabilised or planted before the first rainfall	Decommissioning and rehabilitation	Site	2	Medium term	3	Low	2	Nearly completely reversible	2	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2
Alteration of soil chemical properties (river diversion)	Alteration of soil chemical properties reducing soil productivity	Decommissioning and rehabilitation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium to low	0,8	Low	38,4
Alien vegetating eradication (river diversion)	Application of herbicides	Decommissioning and rehabilitation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
New processing plant	Flood attenuation	Operational	Footprint	1	Short term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Streamflow regulation	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Sediment trapping	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Phosphate assimilation	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Nitrate assimilation	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Toxicant assimilation	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Erosion control	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Carbon storage	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
New processing plant	Alien vegetation establishment and spread	Operational	Footprint	1	Medium term	3	Medium	3	Partly reversible	3	10	High	4	Medium	40	Medium	0,6	Low	24
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Footprint	1	Medium term	3	Medium	3	Nearly completely reversible	2	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Replacement of soil	Decommissioning and rehabilitation	Footprint	1	Medium term	3	Medium	3	Nearly completely reversible	2	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2
Decompaction, infilling of soil and or placement of	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Footprint	1	Medium term	3	Medium	3	Nearly completely reversible	2	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
topsoil due to processing plant																			
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Levelling of topsoil	Decommissioning and rehabilitation	Footprint	1	Medium term	3	Medium	3	Nearly completely reversible	2	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Decompaction, infilling of soil and or placement of topsoil	Replacement of soil	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Decompaction, infilling of soil and or placement of topsoil	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Decompaction, infilling of soil and or placement of topsoil	Levelling of topsoil	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Decompaction, infilling of soil and or placement of topsoil	Alien vegetation establishment and spread	Decommissioning and rehabilitation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Very Low	48	Medium	0,6	Low	28,8
Contractor's yard	Flood attenuation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Streamflow regulation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Contractor's yard	Sediment trapping	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Phosphate assimilation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Nitrate assimilation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Toxicant assimilation	Operational	Site	2	Long term	4	Medium	3	Completely	1	10	High	4	Medium	40	Medium	0,6	Low	24
Contractor's yard	Erosion control	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Carbon storage	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Alien vegetation establishment and spread	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Replacement of soil	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Levelling of topsoil	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Alien vegetation establishment and spread	Decommissioning and rehabilitation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Flood attenuation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Pollution Control Dams	Streamflow regulation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Sediment trapping	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Phosphate assimilation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Nitrate assimilation	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Toxicant assimilation	Operational	Site	2	Long term	4	Medium	3	Completely	1	10	High	4	Medium	40	Medium	0,6	Low	24
Pollution Control Dams	Erosion control	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Carbon storage	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Alien vegetation establishment and spread	Operational	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	High	48	Low to medium	0,8	Medium	38,4
Pollution Control Dams	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Replacement of soil	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Levelling of topsoil	Decommissioning and rehabilitation	Footprint	1	Long term	4	Medium	3	Partly reversible	3	11	High	4	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Alien vegetation establishment and spread	Decommissioning and rehabilitation	Site	2	Long term	4	Medium	3	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8
Groundwater																			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Clearing topsoil from footprint areas will influence the rate of infiltration of water to the shallow groundwater system and/or baseflow component to shallow streams.	Water Quantity > Groundwater > Olifants River	Construction	Site	2	Short to medium term	2	Medium	3	Partly reversible	3	10	Medium	3	Low	30	Medium	0,6	Very Low	18
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Water Quantity > Groundwater > Olifants River	Construction	Site	2	Permanent	5	Very High	5	Irreversible	5	17	Definite	5	Very High	85	No mitigation possible			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + ...)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Handling of waste and transport of material can cause various types of spills (domestic waste, sewage water, hydrocarbons) which can infiltrate and contaminate the groundwater system. Poor quality mine drainage from material removed during the opencast development (i.e. from overburdened rock piles) may cause local soil and groundwater contamination. Oil and fuel spills and leakages at hard park areas, and in the mining pits, may cause poor quality seepage and soil contamination.	Water Quantity > Groundwater > Olifants River	Construction	Site	2	Medium term	3	High	4	Partly reversible	3	12	High	4	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Stripping of the topsoil during the channel creation for the Olifants River diversion may cause temporary sedimentation as the river takes to the new flow path. There may be some bank erosion which could also lead to sedimentation and suspended solid transport. If vehicles and machines leak hydrocarbons during the diversion trenching, there may be local soil contamination that could impact the surface and groundwater quality.	Water Quantity > Groundwater > Olifants River	Construction	Site	2	Medium term	3	High	4	Partly reversible	3	12	High	4	Medium	48	Mediu m	0,6	Low	28,8
Opencast mining will result in groundwater inflows into the pits which need to be pumped out for mine safety and will lead to a lowering of groundwater levels in the	Water Quantity > Groundwater Level	Operational	Site	2	Medium term	3	Very High	5	Partly reversible	3	13	Definite	5	Medium	65	Low to mediu m	0,8	Medium	52

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
surrounding aquifers.																			
Dewatering activity may impact shallow baseflow to Olifants River and tributaries.	Water Quantity > Baseflow	Operational	Site	2	Medium term	3	High	4	Partly reversible	3	12	Definite	5	Medium	60	Medium	0,6	Low	36
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Water Quantity > Olifants River	Operational	Local	3	Permanent	5	Very High	5	Irreversible	5	18	Definite	5	Very High	90	No mitigation possible			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Analyses showed that acid mine drainage (AMD) formation is expected and poor-quality leachate can occur based on the leaching potential of the material. This can influence the water quality in the surrounding aquifers. However, groundwater flow directions will be directed towards the opencast workings and contaminant migration away from the mining areas will be limited during active mining.	Water Quality > Soil water > Aquifer zones (water table)	Operational	Site	2	Long term	4	Very High	5	Partly reversible	3	14	High	4	Medium	56	Low to medium	0,8	Medium	44,8
Potentially contaminated groundwater ingress if fracture networks from underground workings are intercepted during opencast mining.	Water Quality > Aquifer zones (water table)	Operational	Site	2	Long term	4	Very High	5	Partly reversible	3	14	Medium	3		42	Medium	0,6	Low	25,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Coal transport via haulage roads.	Water Quality > Soil water > Aquifer zones (water table) > Dust fallout along the rivers and streams in the project area	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	Medium	3	Low	39	Medium	0,6	Low	23,4
Concurrent backfilling of opencast pits - poor quality seepages.	Water Quality > Aquifer zones (water table)	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	High	4	Medium	52	Medium	0,6	Low	31,2
Waste disposal on surface - poor quality seepages.	Water Quality > Aquifer zones (water table)	Operational	Site	2	Permanent	5	High	4	Partly reversible	3	14	High	4	Medium	56	Low to medium	0,8	Medium	44,8
Coal and ROM Stockpiles.	Water Quality > Soil water > Aquifer zones (water table)	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	High	4	Medium	52	Low to medium	0,8	Medium	41,6
Operation of the plant could lead to spillages/seepage	Water Quality > Soil water > Aquifer zones (water table)	Operational	Site	2	Medium term	3	High	4	Partly reversible	3	12	High	4	Medium	48	Low to medium	0,8	Medium	38,4
Workshops and spillages (hydrocarbons, sewage, domestic waste).	Water Quality > Soil water > Aquifer zones (water table)	Operational	Site	2	Medium term	3	High	4	Nearly completely reversible	2	11	High	4	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams (existing and proposed)- poor quality seepages.	Water Quality > > Soil water > Aquifer zones (water table)	Operational	Site	2	Long term	4	High	4	Partly reversible	3	13	Definite	5	High	65	Medium	0,6	Low	39

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Infrastructure	Seepage that makes it from the plant areas PCD and ROM area and contractors' yard via the vadose and aquifer zones, and enters streams as baseflow.	Operational	Site	1	Short term	2	Medium	3	Completely	1	7	Medium	3	Low	21	Medium	0,6	Very Low	12,6
Infrastructure	Dewatering may impact groundwater table and groundwater uses	Operational	Site	1	Short term	2	Low	2	Completely	1	6	Low	2	Very Low	12	High	1	Very Low	12
Rehabilitated mining areas - rebounding water levels.	Groundwater Quantity > Groundwater Levels	Decommissioning and rehabilitation	Site	2	Short to medium term	2	Low	2	Partly reversible	3	9	Definite	5	Medium	45	Medium	0,6	Low	27
Rehabilitated mining areas - Migration of groundwater contaminant plume and contaminated groundwater seepage to streams and Olifants river (salt load).	Water Quality > Olifants River > Groundwater table	Decommissioning and rehabilitation	Local	3	Long term	4	High	4	Partly reversible	3	14	Definite	5	High	70	Medium	0,6	Medium	42
Rehabilitated mining areas - depending on the pit water balance, the pit can decant at the lowest topographical area and negatively impact groundwater and stream quality.	Water Quality > Olifants River > Groundwater table	Decommissioning and rehabilitation	Site	2	Long term	4	High	4	Partly reversible	3	13	Definite	5	High	65	Medium	0,6	Medium	39

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
This is particularly probable for OC4A.																			
Potentially contaminated groundwater ingress if fracture networks from underground workings were intercepted during mining.	Water Quality > Olifants River > Groundwater table	Decommissioning and rehabilitation	Site	2	Permanent	5	High	4	Partly reversible	3	14	Medium	3	Medium	42	Medium	0,6	Low	25,2
Seepage from plant area, ROM area, contractor's yard and PCD	Vadose zone soils and subsequent aquifer (groundwater table)	Decommissioning and rehabilitation	Site	2	Short term	2	Low	2	Completely	2	8	Medium	3	Low	24	Medium	0,6	Very low	14,4
Hydropedology																			
No River diversion	No change in flow is expected	Construction and operational	Project area	1	Medium term	3	Medium	3	Partly reversible	3	10	High	4	Medium	40	High	1	Medium	40
River diversion	OC4 could impact on the flow drivers of the wetland systems through interception systems such as dewatering, diversions, drainage systems and water quality changes.	Construction and operational	Project area	1	Medium term	3	Medium	3	Partly reversible	3	10	High	4	Medium	40	Low to medium	0,8	Low	32
Ecological																			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Development related activities will specifically lead to damage or degradation of highly sensitive habitats (VU3) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction of these additional activities further fragmentation, degradation or compression may occur.	Construction	Regional	3	Permanent	5	Medium high	4	Nearly irreversible	4	16	High	4	Medium to high	64	Low to medium	0,8	Medium	51,2
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Development and related activities could impact on the sensitive habitats (VU3) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	Construction	Regional	3	Permanent	5	High	5	Nearly irreversible	4	17	High	4	High	68	Low to medium	0,8	Medium	54,4

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Fragmentation of habitat areas due to possible fencing or the placement of boundary structures could lead to increased edge effects. Habitat that is not to be cleared, needs to be protected.	Construction	Regional	3	Permanent	5	Medium	4	Partly reversible	3	15	Medium	3	Medium	45	Medium	0,6	Low	27
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	Construction and operational	Regional	3	Permanent	5	Medium	4	Partly reversible	3	15	Medium	3	Medium	45	Medium	0,6	Low	27

ACTIVITY	**POTENTIAL IMPACT**	**PHASE**	**Extent**		**Duration**		**Intensity**		**Reversibility**		**Irreplaceability (Extent + Duration +**	**Probability**		**Significance without mitigation**		**Mitigation Efficiently**		**Significance with mitigation**	
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Anthropogenic influence stemming from employees, visitors and contractors that infiltrate the natural veld areas will damage and impact on species communities within certain areas. Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU3).	Construction and operational	Regional	3	Permanent	5	Medium	3	Partly reversible	3	14	High	4	Medium	56	Medium	0,6	Low	33,6

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Closure of opencast mine, plant and related infrastructure	Rehabilitation could be ineffective if measures are not appropriately complied to. Without the necessary mitigation measures, rehabilitation will be unsuccessful, and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture	Closure	Regional	3	Long term	4	Medium	3	Partly reversible	3	13	High	4	Medium	52	Mediu m	0,6	Low	31,2
Heritage and Palaeontological																			
Construction of infrastructure and opencast mine	No heritage features were found within the proposed amendment areas of the mining boundary	Construction and operational	Footprint	1	Short term	1	Minor	1	Nearly completely reversible	2	5	Improbable	1	Very low	5	High	0,2	Very Low	1
Construction of infrastructure and opencast mine	No fossils were found within the proposed amendment areas of the mining boundary	Construction and operational	Footprint	1	Short term	1	Minor	1	Nearly completely reversible	2	5	Improbable	1	Very low	5	High	0,2	Very Low	1
Closure and Rehabilitation	Graves to be protected in-situ	Closure Phase	Site	2	Short term	1	Low	2	Nearly completely	2	7	Medium	3	Low	21	Low	0,8	Very Low	16,8
Soil and Agricultural																			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of infrastructure and opencast mine	Loss of agricultural land for grazing and planting	Construction and operational	Footprint	1	Short term	2	Minor	1	Nearly completely reversible	2	6	Improbable	1	Very low	6	High	0,2	Very Low	1,2
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of overburden stockpiles and backfilling of opencast with waste rock and tailings; Waste rock stockpiling, Tailings backfill into Carbonaceous layer, ROM Stockpiles - Waste Residue Deposits; Hauling and Transporting on new roads; Dust suppression; Removal of indigenous vegetation.	Soil compaction by heavy duty vehicles.	Construction & Operational Phase	Site	2	Long term	4	Low	2	Partly reversible	3	11	Medium	3	Low	33	High	0,2	Very Low	6,6

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of overburden stockpiles and backfilling of opencast with waste rock and tailings; Waste rock stockpiling, Tailings backfill into Carbonaceous layer, ROM Stockpiles - NEW Waste Residue Deposits; Hauling and Transporting on new roads; Dust suppression; Removal of indigenous vegetation.	Contamination of soils through:	Construction & Operational Phase	Site	2	Long term	4	Low	2	Partly reversible	3	11	Medium	3	Low	33	High	0,2	Very Low	6,6
Closure and Rehabilitation of infrastructure areas	Soil compaction by heavy duty vehicles.	Closure Phase	Site	2	Short term	1	Low	2	Nearly completely	2	7	Medium	3	Low	21	High	0,2	Very Low	4,2
Closure and Rehabilitation of infrastructure area	Contamination of soils through: - Indiscriminate disposal of waste; and	Closure Phase	Site	2	Short term	1	Low	2	Nearly completely	2	7	Medium	3	Low	21	High	0,2	Very Low	4,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
	- Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints.																		
Visual																			
Construction of additional mining infrastructure and opencast mine and diversion of river	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the waste management facilities and mining activities.	Construction and operational	Footprint	1	Medium term	3	Minor	1	Partly reversible	3	8	Low	2	Very low	16	Medium to high	0,4	Very Low	6,4
Closure and Rehabilitation	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	Closure Phase	Local	3	Short term	1	Low	2	Nearly completely	2	8	High	4	Low	32	Low	0,8	Low	25,6
Closure and Rehabilitation	Visibility of solid domestic and operational waste.	Closure Phase	Local	3	Short term	1	Low	2	Nearly completely	2	8	High	4	Low	32	Low	0,8	Low	25,6
Traffic																			

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceabilit y (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
All	Continued change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	Construction & Operational Phase	Regional	3	Long term	4	Low	2	Nearly completely	2	11	High	4	Medium	44	Low	0,8	Low	35,2
Construction of additional infrastructure and opencast mining	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	Construction and operational	Local	3	Long term	4	Medium	3	Partly reversible	3	13	High	4	Medium	52	Mediu m	0,6	Low	31,2
Air Quality																			
Construction of surface infrastructure	Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust).	Construction	Site	2	Medium term	3	High	4	Nearly Irreversible	4	13	Definite	5	Medium	65	Low	0,8	Medium	52

ACTIVITY	**POTENTIAL IMPACT**	**PHASE**	**Extent**		**Duration**		**Intensity**		**Reversibility**		**Irreplaceabilit y (Extent + Duration +**	**Probability**		**Significance without mitigation**		**Mitigation Efficiently**		**Significance with mitigation**	
General transportation, hauling and vehicle movement on site	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.	Construction	Local	3	Long term	4	High	4	Partly reversible	3	14	Definite	5	High	70	Medium	0,6	Medium	42

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles.	Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles may result in increased fugitive emission sources and may impact on the ambient air quality specifically an increase in daily PM10 concentrations and TSP concentrations	Operational	Regional	4	Long term	4	High	4	Nearly irreversible	4	16	Definite	5	Very high	80	Low to medium	0,8	Medium	64
Closure and Rehabilitation	Dust (soil and ore fines) pollution due to rehabilitation activities and heavy-duty vehicles.	Closure Phase	Site	2	Long term	4	Low	2	Nearly completely	2	10	Medium	3	Low	30	Medium	0,6	Very Low	18
Closure and Rehabilitation	Windborne dust (soil and ore fines) and vehicle fumes and particulate matter PM10, altering air quality.	Closure Phase	Site	2	Long term	4	Low	2	Nearly completely	2	10	Medium	3	Low	30	Medium	0,6	Very Low	18
Noise and Lighting																			
Closure and Rehabilitation	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy-duty vehicles and equipment.	Closure Phase	Site	2	Short term	1	Medium	3	Nearly completely	2	8	Medium	3	Low	24	Low	0,8	Very Low	19,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Closure and Rehabilitation	Disturbance due to vibrations caused by heavy duty vehicles.	Closure Phase	Site	2	Short term	1	Low	2	Nearly completely	2	7	Medium	3	Low	21	Low	0,8	Very Low	16,8
Closure and Rehabilitation	Impact of security lighting on surrounding landowners and animals.	Closure Phase	Site	2	Short term	1	Low	2	Nearly completely	2	7	Medium	3	Low	21	Low	0,8	Very Low	16,8
Blasting																			
Opencast Mining, Drilling and Blasting	Blasting hazard, specifically - Ground vibration	Construction & Operational Phase	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Medium-High	4	Medium	52	Medium	0,6	Low	31,2
Opencast Mining, Drilling and Blasting	Blasting hazard, specifically - Air Blasting	Construction & Operational Phase	Local	3	Long term	4	Medium	3	Partly reversible	3	13	Medium-High	4	Medium	52	Medium	0,6	Low	31,2
Opencast Mining, Drilling and Blasting	Blasting hazard, specifically - Fly Rock	Construction & Operational Phase	Local	3	Long term	4	Medium	3	Nearly completely	2	12	Medium	3	Low	36	Medium	0,6	Low	21,6
Opencast Mining, Drilling and Blasting	Blasting hazard, specifically on sensitive close by receptors	Construction & Operational Phase	Local	3	Long term	4	Medium	3	Partly reversible	3	13	High	4	Medium	52	Medium	0,6	Low	31,2
Socio-Economic																			
All	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers.	Construction & Operational Phase	Regional	3	Long term	4	Medium	3	Nearly completely	2	12	Medium	3	Low	36	Medium	0,6	Low	21,6

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
All	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	Construction & Operational Phase	Site	2	Long term	4	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
All	Increased risk to public and worker health and safety	Construction & Operational Phase	Site	2	Long term	4	Medium	3	Partly reversible	3	12	Medium	3	Low	36	Medium	0,6	Low	21,6
All	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Construction & Operational Phase	Regional	4	Long term	4	Low	2	Nearly irreversible	4	14	Medium	3	Medium	42	Medium	0,6	Low	25,2
All	Socio-economic impact on farmers, labourers and surrounding landowners specifically the close-by receptors such as Mr Swanepoel, the Gogo identified by the community and the Potgieter farmers	Construction & Operational Phase	Regional	4	Long term	4	Medium	3	Nearly irreversible	4	15	Definite	5	High	75	Medium	0,6	Medium	45

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
All	Extended employment provision due to the implementation of the mining activities, allowing mining activities to commence.	Construction & Operational Phase	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Medium	45	N/A	1	Medium	45
All	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Construction & Operational Phase	Regional	4	Long term	4	High	4	Nearly irreversible	4	16	Medium	3	Medium	48	N/A	1	Medium	48
Closure and Rehabilitation	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	Closure Phase	Site	2	Short term	1	Medium	3	Partly reversible	3	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and possible loss of life to mine workers and visitors to the site.	Closure Phase	Site	2	Short term	1	Medium	3	Partly reversible	3	9	Medium	3	Low	27	Medium	0,6	Very Low	16,2

ACTIVITY	POTENTIAL IMPACT	PHASE	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration +	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Closure Phase	Regional	4	Short term	1	Low	2	Nearly irreversible	4	11	Medium	3	Low	33	Medium	0,6	Very Low	19,8
Closure and Rehabilitation	Economic impact should there be an incident of public health and safety.	Closure Phase	Regional	4	Long term	4	High	4	Partly reversible	3	15	Medium	3	Medium	45	Low	0,8	Low	36
Closure and Rehabilitation	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Closure Phase	Regional	4	Short term	1	High	4	Nearly irreversible	4	13	Medium	3	Low	39	Low	0,8	Low	31,2
Closure and Rehabilitation	Reduced period of providing employment for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	Closure Phase	Regional	4	Short term	1	Medium	3	Nearly completely	2	10	Medium	3	Low	30	Medium	0,6	Very Low	18

Table 36: Cumulative Impacts

POTENTIAL IMPACT	**Extent**		**Duration**		**Intensity**		**Reversibility**		**Irreplaceability (Extent + Duration + Intensity + Reversibility)**	**Probability**		**Significance without mitigation**		**Mitigation Efficiently**		**Significance with mitigation**		**Management and Mitigation Measures**
Impact on groundwater quantity because of dewatering	Region	4	Long term	4	Medium	3	Irreversible	5	16	Definite	5	Very high	80	Low	0,8	Medium	64	Develop and maintain a surface and groundwater monitoring program in line with the WUL requirements. Seal off individual high yielding inflow zones intercepted during mining. Total extraction should not occur at any stage of mining.
The deterioration of groundwater quality down gradient of the mining operations due to plume movement	Local	3	Medium term	3	Medium	3	Partly reversible	3	12	Definite	5	Medium	60	Medium	0,6	Low	36	Develop and maintain a surface and groundwater monitoring program in line with the WUL requirements; Drilling of monitoring boreholes into rehabilitated area after rehabilitation; Seal off individual high yielding inflow zones intercepted during mining. Sealing of underground areas to minimise interflow
The deterioration of groundwater and surface water quality because of Decant	Site	2	Permanent	5	Low	2	Irreversible	5	14	Definite	5	High	70	Medium	0,6	Medium	42	Sealing of underground areas to minimise interflow. Institute water level and water quality monitoring programmes to confirm rate of water rise and water quality as the mine floods. The mine should plan for post closure water treatment based on available monitoring data to be implemented during mining

POTENTIAL IMPACT	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation		Management and Mitigation Measures
Deterioration of surface water quality because of runoff or decant	Region	4	Long term	4	Medium	3	Nearly irreversible	4	15	Definite	5	High	75	Medium	0,6	Medium	45	Appropriate monitoring of the pollution source areas; Develop and maintain a surface and groundwater monitoring program in line with the WUL requirements; Contain any runoff on the rehabilitated area to prevent siltation and contamination of surface water; and The mine should plan for post closure water treatment based on available monitoring data to be implemented during mining.
Reduction in land capability after rehabilitation	Footprint	1	Long term	4	Medium	3	Nearly irreversible	4	12	Possible	2	Low	24	Medium	0,6	Very Low	14,4	Optimise the limited topsoil resources available on site; Utilize the stored topsoil for the sole purpose of rehabilitation, no topsoil should be used for landscaping or construction purposes such as roads or embankments; Analysis of topsoil for fatality and apply require amelioration where required; Apply agricultural lime and fertiliser to soil profile

POTENTIAL IMPACT	Extent		Duration		Intensity		Reversibility		Irreplaceability (Extent + Duration + Intensity + Reversibility)	Probability		Significance without mitigation		Mitigation Efficiently		Significance with mitigation		Management and Mitigation Measures
Incremental losses and fragmentation of habitat	Site	2	Short term	2	Low	2	Nearly completely	2	8	Medium	3	Low	24	Medium	0,6	Very Low	14,4	Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled with the use of a specialist and the correct seeding techniques and mixtures should be applied. Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified specialist deems the monitoring to no longer be necessary
Increase in Air Quality due to additional pollution	Region	4	Long term	4	Medium	3	Nearly completely	2	13	Medium	3	Low	39	Medium	0,6	Very Low	23,4	Ensure implementation of dust monitoring plan. Continuous dust suppression on any access roads.
Changes in surface hydrology because of underground mining - Subsidence	Local	3	Medium term	3	Low	2	Nearly completely reversible	2	10	Highly likely	4	Medium	40	High	0,2	Very Low	8	Implement final landform design; Safety factors of pillar to be maintained at 2. No stooping to take place within mining area Safety factor to be increased in high-risk areas

15.2 THE POSSIBLE MITIGATION MEASURES THAT COULD BE APPLIED AND THE LEVEL OF RISK

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Management Objectives and Mitigation types for each aspect is provided here. Mitigation measures are prescribed within the Environmental Management Programme (EMPR).

Table 37: Summary of the key environmental impacts and Management Objectives and Mitigation Type

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
No-go option	Socio-Economic	Reduced period of development and upliftment of the surrounding communities and infrastructure.	No Additional Management Objectives if Project does not proceed	N/A	Medium	45
No-Go Option	Socio-Economic	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	No Additional Management Objectives if Project does not proceed	N/A	Medium	45
No-Go Option	Socio-Economic	**<u>Positive:</u>** No additional negative impacts on I&APs or surrounding land users	No Additional Management Objectives if Project does not proceed	N/A	Positive Medium	45
No-Go Option	Natural Environment and Wetlands	**<u>Positive:</u>** No additional negative impacts on the environment	No Additional Management Objectives if Project does not proceed	N/A	Positive Medium	45
Stripping of topsoil for river diversion	Wetlands and Aquatics	Sediment ingress into the aquatic ecosystem, clearing of vegetation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Initiate removal at highest level working downward. Only remove sections of topsoil in relation to removal work. Diversion of river with implementation of rehabilitation plan attached in Appendix 14.	Very Low	19,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
River diversion	Wetlands and Aquatics	Diversion of the Olifants River	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Medium	48
Stockpiling of topsoil for river diversion	Wetlands and Aquatics	Sediment releases, impact of area disturbed by stockpile	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Berming of stockpile, slope 1:3 and revegetation of stockpile Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	28,8
Excavation of river diversion	Wetlands and Aquatics	Area impacted by placement of soils on surface next to excavation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Small volumes to be stockpiled. Ensure stockpile is within stormwater management areas. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	28,8
Excavation of river diversion	Wetlands and Aquatics	Sediment ingress	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Monitor points of release, ensure bunding of stockpiles. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	31,2
Excavation of river diversion	Wetlands and Aquatics	Increased flow volumes	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Monitor points of release, ensure bunding of stockpiles. Installation of windrows to ensure water movement does not concentrate and lead to erosion. Diversion of river with implementation of rehabilitation plan attached in Appendix	Low	31,2
Excavation of river diversion	Wetlands and Aquatics	Impact on long term ecosystem health	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Monitor the systems with emphasis on water quality and preventative measure to ensure any degradation is observed and mitigated. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	33,6
Excavation of river diversion	Wetlands and Aquatics	Reduced functionality of buffer	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of water flows downstream of activity with monitoring and feedback. Emergency reaction plan to be compiled for stochastic events. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Medium	45
Excavation of river diversion	Wetlands and Aquatics	Ecotone removal	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Ensure activities adjacent to the aquatic ecosystems are managed/limited to ensure impact is mitigated.	Very Low	45

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
			To protect wetlands and ensure their ecological function continues.	Diversion of river with implementation of rehabilitation plan attached in Appendix 14		
Excavation of river diversion	Wetlands and Aquatics	Possible spillage into natural area	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Bunding of stockpiles. Placement of berms along natural areas to prevent ingress. Defined works areas demarcated. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	28,8
Excavation of river diversion	Wetlands and Aquatics	Refilling of machinery with hydrocarbons	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Refill outside the confines of the aquatic ecosystems and setback buffers. Spill kits present. Refilling over bunded area. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	26,4
Excavation of river diversion	Wetlands and Aquatics	Stockpiling of soils	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Bunding of stockpiles. Placement of berms along natural areas to prevent ingress. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	26,4
Excavation of river diversion	Wetlands and Aquatics	Physical excavation in soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Sequential nature of soils are kept. Stockpiling done outside setback area, bunding of stockpiles. Diversion of river with implementation of rehabilitation plan attached in Appendix 14	Low	26,4
Transportation from site due to river diversion	Wetlands and Aquatics	Area impacted by waiting trucks and machinery	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Minimise area of impact. Create sloped and controlled waiting area. Ensure adequate toilet facilities are available.	Low	26,4
Transportation from site due to river diversion	Wetlands and Aquatics	Crossing of aquatic ecosystem on existing roads and bridges	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Manage hydrology avoiding impounding by crossing structure. Sloping of banks 1:3. Reseed after construction.	Low	28,8
Hydrocarbon spill (river diversion)	Wetlands and Aquatics	Possible spillage into natural area	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Do not refill near aquatic ecosystems and or setbacks. Placement of spill kits near all activities and vehicles.	Low	31,2
Hydrocarbon spill (river diversion)	Wetlands and Aquatics	Refilling of machinery	To prevent the loss of aquatic biodiversity and ecological function	Refilling over hydrocarbon spill remediation blankets. No refilling near aquatic ecosystems.	Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
			within the ecosystem. To protect wetlands and ensure their ecological function continues.	Ensure spill kits are on standby close to refilling point.		
Access Road for river diversion	Wetlands and Aquatics	Crossing of aquatic ecosystem with machinery	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Long-term crossing structure must be constructed to prevent repeated impacts. Ensure hydrological connections remain. Reduce sediment ingress into the aquatic ecosystem using sediment barriers.	Very Low	18
Impoundment of water in excavation pit (river diversion)	Wetlands and Aquatics	During rainfall events the excavation pit can fill with water (unlikely but included)	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Pumping and clearing sediment control structures. Diffused flows must be achieved using sediment barriers. Compilation of Standard Operating Procedures to manage impact.	Low	31,2
Alien vegetation spreading and establishment (river diversion)	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of alien vegetation throughout the activities on site. Must be compiled through alien vegetation management plan. Removal throughout activities on site and not as once off.	Low	39
Post development/ rehabilitation (river diversion)	Wetlands and Aquatics	Decompaction of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Ripping must follow contour of landscape creating windows.	Very Low	19,2
Post development/ rehabilitation (river diversion)	Wetlands and Aquatics	Removal of crossings over aquatic ecosystem	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Sediment reducing barriers must be installed downstream of the crossing. Working from upstream structures must ne removed as quickly as possible.	Low	24
Removal of crossings over aquatic ecosystem (river diversion)	Wetlands and Aquatics	Altering of beds and banks	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Sediment reducing barriers must be installed downstream of the crossing. Working from upstream structures must ne removed as quickly as possible.	Very Low	18

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Removal of crossings over aquatic ecosystem (river diversion)	Wetlands and Aquatics	Sediment ingress	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Installation of sediment reducing structures – sand bags.	Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Replacement of soil into excavated area (unlikely)	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Infilling of lowest point or closest to the aquatic ecosystems must be completed first. Temporary berm must be placed adjacent to the aquatic ecosystem until all filling has been completed. Work must follow contours of area creating windrows.	Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Levelling of topsoil's	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Very Low	19,8
Erosion of replaced soils (river diversion)	Wetlands and Aquatics	Replaced surface soils are washed away if not stabilised or planted before the first rainfall	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Refilling of eroded areas with coarser topsoil to prevent erosion. Management of reseeding in area to prevent erosion.	Very Low	16,2
Alteration of soil chemical properties (river diversion)	Wetlands and Aquatics	Alteration of soil chemical properties reducing soil productivity	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Application of fertilisers to manage altered soil chemical properties.	Low	38,4
Alien vegetating eradication (river diversion)	Wetlands and Aquatics	Application of herbicides	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of alien vegetation through the activities on site.	Low	28,8
New processing plant	Wetlands and Aquatics	Flood attenuation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	Use of PCD and storm water systems to manage attenuation of storm water.	Very Low	18

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
			To protect wetlands and ensure their ecological function continues.			
New processing plant	Wetlands and Aquatics	Streamflow regulation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Very Low	18
New processing plant	Wetlands and Aquatics	Sediment trapping	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Installation of sediment traps before storm water systems.	Very Low	18
New processing plant	Wetlands and Aquatics	Phosphate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Inclusion of phytoremediation aspects in all PCD and storm water systems.	Very Low	18
New processing plant	Wetlands and Aquatics	Nitrate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Very Low	18
New processing plant	Wetlands and Aquatics	Toxicant assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Very Low	18
New processing plant	Wetlands and Aquatics	Erosion control	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of storm water to prevent concentrated flow.	Very Low	18
New processing plant	Wetlands and Aquatics	Carbon storage	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Inclusion of phytoremediation aspects in all PCD and storm water systems.	Very Low	18
New processing plant	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function	Management of alien vegetation through the activities on site.	Low	24

ACTIVITY	**ASPECTS AFFECTED**	**POTENTIAL IMPACT**	**MANAGEMENT OBJECTIVES**	**MITIGATION MEASURES**	**Significance with mitigation**	
			within the ecosystem. To protect wetlands and ensure their ecological function continues.	Must be completed through alien vegetation management plan. Removal throughout activities on site and not as once off.		
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Ripping must follow contours of landscape creating windrows.	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Replacement of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Infilling of lowest point or closest to the aquatic ecosystem must be completed first. Temporary berm must be placed adjacent to the aquatic ecosystem until all filling has been completed. Work must follow contours of area creating windrows.	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Levelling of topsoil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of alien vegetation through the activities on site. Must be completed through alien vegetation management plan. Removal throughout activities on site and not as once off.	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Use of PCD and storm water systems to manage attenuation of storm water.	Low	26,4
Contractor's yard	Wetlands and Aquatics	Flood attenuation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Use of PCD and storm water systems to manage attenuation of storm water.	Low	28,8
Contractor's yard	Wetlands and Aquatics	Streamflow regulation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Low	28,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Contractor's yard	Wetlands and Aquatics	Sediment trapping	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Installation of sediment traps before storm water systems.	Low	28,8
Contractor's yard	Wetlands and Aquatics	Phosphate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Inclusion of phytoremediation aspects in all PCD and storm water systems	Low	28,8
Contractor's yard	Wetlands and Aquatics	Nitrate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Low	28,8
Contractor's yard	Wetlands and Aquatics	Toxicant assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Inclusion of phytoremediation aspects in all PCD and storm water systems	Low	24
Contractor's yard	Wetlands and Aquatics	Erosion control	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of storm water to prevent concentrated flows.	Low	28,8
Contractor's yard	Wetlands and Aquatics	Carbon storage	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Inclusion of phytoremediation aspects in all PCD and storm water systems	Low	28,8
Contractor's yard	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of alien vegetation through the activities on site. Must be completed through alien vegetation management plan. Removal throughout activities on site and not as once off.	Low	28,8
Contractor's yard	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Ripping must follow contours of landscape creating windrows.	Low	26,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Contractor's yard	Wetlands and Aquatics	Replacement of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Infilling of lowest point or closest to the aquatic ecosystem must be completed first. Temporary berm must be placed adjacent to the aquatic ecosystem until all filling has been completed. Work must follow contours of area creating windrows.	Low	26,4
Contractor's yard	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Infilling of lowest point or closest to the aquatic ecosystem must be completed first. Temporary berm must be placed adjacent to the aquatic ecosystem until all filling has been completed. Work must follow contours of area creating windrows.	Low	26,4
Contractor's yard	Wetlands and Aquatics	Levelling of topsoil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Low	26,4
Contractor's yard	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of alien vegetation through the activities on site. Must be completed through alien vegetation management plan. Removal throughout activities on site and not as once off.	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Flood attenuation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Use of PCD and storm water systems to manage attenuation of storm water.	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Streamflow regulation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Sediment trapping	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Installation of sediment traps before storm water systems.	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Phosphate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure	Inclusion of phytoremediation aspects in all PCD and storm water systems	Low	28,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
			their ecological function continues.			
Pollution Control Dams	Wetlands and Aquatics	Nitrate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Inclusion of phytoremediation aspects in all PCD and storm water systems	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Toxicant assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.		Low	24
Pollution Control Dams	Wetlands and Aquatics	Erosion control	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of storm water to prevent concentrated flows. Regulation of erosion preventing devices is needed.	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Carbon storage	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Inclusion of phytoremediation aspects in all PCD and storm water systems	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of alien vegetation through the activities on site. Must be completed through alien vegetation management plan. Removal throughout activities on site and not as once off.	Medium	38,4
Pollution Control Dams	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Ripping must follow contours of landscape creating windrows.	Low	26,4
Pollution Control Dams	Wetlands and Aquatics	Replacement of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Infilling of lowest point or closest to the aquatic ecosystem must be completed first. Temporary berm must be placed adjacent to the aquatic ecosystem until all filling has been completed. Work must follow contours of area creating windrows.	Low	26,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Pollution Control Dams	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Management of alien vegetation through the activities on site. Must be completed through alien vegetation management plan. Removal throughout activities on site and not as once off.	Low	28,8
Clearing topsoil from footprint areas will influence the rate of infiltration of water to the shallow groundwater system and/or baseflow component to shallow streams.	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	Groundwater level monitoring should be conducted down the gradient of these facilities, in terms of the groundwater flow direction. Footprint areas should be minimised and compacted to reduce infiltration.	Very Low	18
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	No mitigation measures possible as the river will be mined. A new flow equilibrium will take place along the diversion path. Peak flows in the river are not anticipated to change, only recharge and baseflow characteristics are associated with the riverbed sediments.		
Handling of waste and transport of material can cause various types of spills (domestic waste, sewage water, hydrocarbons) which can infiltrate and contaminate the groundwater system. Poor quality mine drainage from material removed during the opencast development (i.e. from overburdened rock piles) may cause local soil and groundwater contamination. Oil and fuel spills and leakages at hard park areas, and in the mining	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	Waste should be discarded in the allocated waste area. The waste area should be bunded. Spills should be cleaned up immediately according to the WULA conditions. DWS should be notified in the event of a significant spill. Solid waste must similarly either be stored at the site in an approved waste disposal area or removed by credible contractors. Groundwater quality monitoring (quarterly) to identify problem areas. Have fuel & oil spill clean-up kits on site. Park vehicles in designated areas. Ensure route geochemical monitoring (quarterly ABA, NAG, static leach test) of material excavated and placed during mining to confirm AMD potential.	Low	28,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
pits, may cause poor quality seepage and soil contamination.						

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Stripping of the topsoil during the channel creation for the Olifants River diversion may cause temporary sedimentation as the river takes to the new flow path. There may be some bank erosion which could also lead to sedimentation and suspended solid transport. If vehicles and machines leak hydrocarbons during the diversion trenching, there may be local soil contamination that could impact the surface and groundwater quality.	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	Mitigation will likely have a minimum effect, as stream diversion will be required to mine OC4A. The only mitigation measures that can be considered are: • Have fuel and oil spill clean-up kits on-site during stream division trenching. • Park vehicles in designated areas. • Ensure re-vegetation of eroded areas.	Low	28,8
Opencast mining will result in groundwater inflows into the pits which need to be pumped out for mine safety and will lead to a lowering of groundwater levels in the surrounding aquifers.	Groundwater	Water Quantity > Groundwater Level	Prevent hydrogeological impacts and prevent contamination of water resources	Dewatering should be conducted over as short a period as possible. Groundwater ingress rates should be monitored. Water supply should be compensated if any community supply boreholes are influenced. Groundwater level and quality monitoring should be conducted.	Medium	52
Dewatering activity may impact shallow baseflow to Olifants River and tributaries.	Groundwater	Water Quantity > Baseflow	Prevent hydrogeological impacts and prevent contamination of water resources	Dewatering should be conducted over as short a period as possible. Impacts on the surface water bodies should be monitored. Groundwater level monitoring should be conducted close to the Olifants River, and additional boreholes should be drilled to monitor the water table and fluctuations.	Low	36

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Groundwater	Water Quantity > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	No mitigation is possible, as the river will be mined. A new flow equilibrium will take place along the diversion path. Peak flows in the river are not anticipated to change, only recharge and baseflow characteristics are associated with the riverbed sediments.		
Analyses showed that acid mine drainage (AMD) formation is expected and poor-quality leachate can occur based on the leaching potential of the material. This can influence the water quality in the surrounding aquifers. However, groundwater flow directions will be directed towards the opencast workings and contaminant migration away from the mining areas will be limited during active mining.	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	Loose coal should be removed continuously within pits to reduce the exposure period. The operational term of the opencast pit should be kept to a minimum. Groundwater quality monitoring should be conducted in the surrounding area. Ensure route geochemical monitoring (quarterly ABA, NAG, static leach test) of material excavated and placed during mining to confirm AMD potential.	Medium	44,8
Potentially contaminated groundwater ingress if fracture networks from underground workings are intercepted during opencast mining.	Groundwater	Water Quality > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	Fracture networks and flow paths should be sealed to prevent the ingress of fresh or contaminated groundwater during mining. Blasting should be conducted in such a manner as to reduce impacts on the stability of barrier pillars between opencast workings and old underground workings.	Low	25,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Coal transport via haulage roads.	Groundwater	Water Quality > Soil water > Aquifer zones (water table) > Dust fallout along the rivers and streams in the project area	Prevent hydrogeological impacts and prevent contamination of water resources	Spillages should be cleaned regularly.	Low	23,4
Concurrent backfilling of opencast pits - poor quality seepages.	Groundwater	Water Quality > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	Backfill of the opencast pits with overburden should be conducted correctly - geology with the highest acid leach potential must be backfilled at the base of the pit and compacted. Waste rock should be backfilled to at least 5 m below the static groundwater level, well compacted and lime added. Ensure that pollution control dams are lined and their structural integrity maintained. Groundwater level and quality monitoring are necessary.	Low	31,2
Waste disposal on surface - poor quality seepages.	Groundwater	Water Quality > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	The footprint areas of waste rock dumps should be kept to a minimum. The footprint areas should be compacted before disposal and prepared per the results of the waste classification. Dumps should be constructed to facilitate runoff into trenches. Dumps should be separated from any surface water bodies by a berm. Groundwater level and quality monitoring are necessary.	Medium	44,8
Coal and ROM Stockpiles.	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	The footprint areas of stockpiles should be kept to a minimum. The footprint areas should be compacted before disposal. Stockpiles should be constructed to facilitate runoff into trenches. Stockpiles should be separated from any surface water bodies by a berm. Groundwater level and quality monitoring are necessary.	Medium	41,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Operation of the plant could lead to spillages/seepage	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	Spillages should be cleaned regularly and prevented. Trenches should be constructed around the plant area to divert contaminated runoff/interflow to the PCD.	Medium	38,4
Workshops and spillages (hydrocarbons, sewage, domestic waste).	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	Waste should be discarded in the allocated waste area, The waste area should be bunded. Spills should be cleaned up immediately according to the WULA conditions. DWS should be notified in the event of a significant spill. Solid waste must similarly either be stored at the site in an approved waste disposal area or removed by credible contractors. Have fuel & oil spill clean-up kits on site.	Low	26,4
Pollution Control Dams (existing and proposed)- poor quality seepages.	Groundwater	Water Quality > > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	The liner of the existing PCD is not adequate to contain dirty water and may result in groundwater contamination. The liner needs to be maintained or replaced to ensure functionality. Groundwater level and quality monitoring are necessary. Ensure that the new PCD is lined with an impermeable barrier.	Low	39
Infrastructure	Groundwater	Seepage that makes it from the plant areas PCD and ROM area and contractors' yard via the vadose and aquifer zones, and enters streams as baseflow.	Prevent hydrogeological impacts and prevent contamination of water resources	Only excavate areas applicable to the project area. Backfill the material in the same order it was excavated to reduce contamination of deeper soils with shallow oxidised soils. Cover excavated soils with a temporary liner to prevent contamination. Retain as much indigenous vegetation as possible. Exposed soils are to be protected using a suitable covering or revegetating. Park heavy machinery in lined areas and place drip trays under vehicles at the site. Visual soil assessments for signs of contamination during construction (monthly)	Very Low	12,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Infrastructure	Groundwater	Dewatering may impact groundwater table and groundwater uses	Prevent hydrogeological impacts and prevent contamination of water resources	No mitigation proposed. The risk is very low.	Very Low	12
Rehabilitated mining areas - rebounding water levels.	Groundwater	Groundwater Quantity > Groundwater Levels	Prevent hydrogeological impacts and prevent contamination of water resources	Groundwater levels in the backfilled pits will recover. Pollution plumes may migrate to surface water bodies such as the Olifants River, its tributaries and wetlands. The final backfilled opencast topography should be engineered such that runoff is directed away from the opencast areas to reduce recharge. The final layer (just below the topsoil cover) should be as clayey as possible and compacted if feasible, to reduce recharge into the opencast workings. Material with the highest acid leach potential must be backfilled at the base of the pit, below the regional groundwater level and compacted. Surface water monitoring of the streams will be essential. Quarterly groundwater sampling should be done to establish a database of plume movement trends, to aid eventual mine closure. If it is established that contaminated baseflow seepage occurs to surface water bodies, suitable remediation measures should be evaluated and implemented as soon as possible. It should also be considered only backfilling OC4 and OC4A with non-acid generating material (if possible). This will reduce long-term liability. If it is determined that private groundwater users are affected by the potential contaminant plumes, their water supply can be compensated. Groundwater level and quality monitoring post-closure is crucial, particularly between the opencast pits and surface water bodies.	Low	27

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Rehabilitated mining areas - Migration of groundwater contaminant plume and contaminated groundwater seepage to streams and Olifants river (salt load).	Groundwater	Water Quality > Olifants River > Groundwater table	Prevent hydrogeological impacts and prevent contamination of water resources	To manage AMD, a detailed water balance should be calculated for the mine. Pit groundwater inflows should be recorded and used to update the decant calculations. Decant calculations should be updated for the final pit topography. Water influx into the mining areas should be kept to the absolute minimum possible. In this regard, the fracturing of the overlying strata due to blasting or surface subsidence should be avoided at all costs, to prevent increased infiltration of surface water into the mine workings. Berms should be constructed and maintained between pit and downstream surface water bodies and depressions to reduce the flow of decanting to surface water bodies. Backfilling should be conducted to limit recharge to the opencast pits and free drainage to trenches should be facilitated. Diverted water should be managed. Treating decanting mine water to acceptable water quality levels can be achieved by the installation of a treatment plant. The level to which the water is treated depends on the use of the water after treatment. As a minimum, treated water should meet the standards for use for livestock watering and irrigation. Groundwater level and quality monitoring post-closure is crucial, particularly between the opencast pits and surface water bodies.	Medium	42
Rehabilitated mining areas - depending on the pit water balance, the pit can decant at the lowest topographical area and negatively impact groundwater and stream quality. This is particularly probable for OC4A.	Groundwater	Water Quality > Olifants River > Groundwater table	Prevent hydrogeological impacts and prevent contamination of water resources		Medium	39
Potentially contaminated groundwater ingress if fracture networks from underground workings were intercepted during mining.	Groundwater	Water Quality > Olifants River > Groundwater table	Prevent hydrogeological impacts and prevent contamination of water resources	Fracture networks and flow paths should be sealed to prevent the ingress of fresh or contaminated groundwater during mining. Blasting should be conducted in such a manner as to reduce impacts on the stability of barrier pillars between opencast workings and old underground workings.	Low	25,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Seepage from plant area, ROM area, contractors' yard and PCD	Groundwater	Vadose zone soils and subsequent aquifer (groundwater table)	Prevent hydrogeological impacts and prevent contamination of water resources	Install a monitoring scavenger well system to contain any potential seepage (if required - to be determined by monitoring). Ensure a stormwater system is in place to capture any runoff from the site.	Very low	14,4
No River diversion	Hydropedology	No change in flow is expected	Prevent hydropedological impacts on the wetlands.	Mitigation measures recommended in the Aquatic ecosystem mitigation plan for the Seam 2 Mine North block 2 done by Galago Environmental in November 2020 should be done. In summary these mitigation measures are: o Installation of a berm to prevent ingress of the Olifants River into the mining area. ***Based on the site visit of October 2022 this berm is already in place.*** o Stripping of topsoil from the wetland, o Removal and storage of hydrophytes, o Stockpiling of the stripped topsoil, o Diversion of the wetland flows from the catchment to the Olifants River system, ***based on the site visit of October 2022 this berm is already in place.*** o Emulating wetland functionality brought by the interaction of the riparian area on the wetland. The largest expected function is the attenuation of the river especially during flooding events, o Reshaping of the mined area post mining, o Reinstatement of the wetland functionality into the mined area • Confine any unpolluted water to a clean water system, away from any dirty area through upstream diversions as follows: o Groundwater - 2200 to 2300 m3/a, through installing shallow	Medium	40
River diversion	Hydropedology	OC4 could impact on the flow drivers of the wetland systems through interception systems such as dewatering, diversions, drainage systems and water quality changes.	Prevent hydropedological impacts on the wetlands.		Low	32

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
				boreholes (50 m) and abstracting clean water. This groundwater should then be released into the diversion through seasonal disperse flow, as designed by the wetland rehabilitation specialist. o Surface water 3100 to 3200 m3/a, through a system of clean water cut-off trenches and diversion berms o Interflow 1300 to 1400 m3/a. In contrast to the above the diversion should allow rehabilitation/reinstatement of disturbed wetland soils to be replaced at the diversion section. A total area of 66598 m2 of responsive wetland soils will be required to simulate the losses from OC4. The replacement of these soils should be overseen by a wetland rehabilitation specialist. The thickness of the soils should be determined by the wetland rehabilitation specialist. Collect the water arising within any dirty area, including water seeping from mining operations, outcrops or any other activity into a dirty water system; and Design, construct, maintain and operate any dirty water system at the mine or activity so that it is not likely to spill into any clean water system more than once in 50 years. Please note that the above mitigation measures are only applicable to the impacts on the wetland system and not impacts on the Olifants river.		
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Development related activities will specifically lead to damage or degradation of highly sensitive habitats (VU3) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction of these additional activities further fragmentation, degradation or compression may occur.	Early detection of impacts and remediation thereof.	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Adhere to all management and mitigation measures as prescribed within other specialist reports and Environmental Management Programme (EMPr). To minimize potential impacts to animal species,	Medium	51,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
				animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees. Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater systems and drains to prevent contaminated water entering the natural environment.		
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Development and related activities could impact on the sensitive habitats (VU3) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	Early detection of impacts and remediation thereof.	• All footprint areas should remain as small as possible. This can be achieved by fencing footprint areas to contain all activities within designated areas. If any SCC are encountered within the subject property in the future, the following should be ensured: ○ If any threatened species will be disturbed, ensure effective relocation of individuals to suitable offset areas or within designated open space on the subject property. ○ All rescue and relocation plans should be overseen by a suitably qualified specialist. ○ Obtain relevant permits/consent, if applicable, for each protected or endangered floral species identified within	Medium	54,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
				the proposed development area that will be destroyed. Human and vehicle movement should be restricted from taking place in sensitive habitats. Areas to be fenced if necessary.		
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Fragmentation of habitat areas due to possible fencing or the placement of boundary structures could lead to increased edge effects. Habitat that is not to be cleared, needs to be protected.	Early detection of impacts and remediation thereof.	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Adhere to all management and mitigation measures as prescribed within other specialist reports and Environmental Management Programme (EMPr). Keep the footprints as small as possible and clear only the designated approved areas. During the construction phase control of access should be implemented for all remaining natural areas to prevent unnecessary destruction of habitats or disturbance of species. It is also important that no additional fragmentation occurs and that all roads are clearly demarcated and kept to. No vehicles or personnel should be permitted outside of these demarcated roads.	Low	27

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	Early detection of impacts and remediation thereof.	Implement an Alien and Invasive Management Programme, which will aim to remove and manage the plants recorded during the field survey, since most of these species are already listed on the Alien and Invasive Species list as published in 2020. Ensure awareness amongst all staff, contractors and visitors to site to not needlessly damage flora. To minimize potential impacts to animal species, animals (wildlife and domestic animals) may under no circumstances be handled, removed, killed or interfered with by the Contractor, his employees, his Sub-Contractors or his Sub-Contractors' employees	Low	27
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and Tailings Facility)	Ecological	Anthropogenic influence stemming from employees, visitors and contractors that infiltrate the natural veld areas will damage and impact on species communities within certain areas. Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU3).	Early detection of impacts and remediation thereof.	Demarcate specific areas to be developed and remain clear of other areas where activities are not necessary. Prevent impacts from reaching downstream water resources by ensuring installation and proper functioning of stormwater management systems.	Low	33,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Closure of opencast mine, plant and related infrastructure	Ecological	Rehabilitation could be ineffective if measures are not appropriately complied to. Without the necessary mitigation measures, rehabilitation will be unsuccessful, and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture	Early detection of impacts and remediation thereof.	A management plan for control of invasive/exotic plant species needs to be implemented for all footprint and surrounding areas. This will be ongoing until the end of the mining closure phase. Rehabilitation plans should be planned long before the closure phase is due. Continuous rehabilitation should also take place during the operational phase. Rehabilitation plan should be implemented. This includes the process of replanting the vegetation. Rehabilitation plans should be compiled with the use of a specialist and the correct seeding techniques and mixtures should be applied. Close monitoring of plant communities to ensure that ecology is restored and self-sustaining. The monitoring of the flora should be conducted annually by the environmental practitioner, until a suitably qualified specialist deems the monitoring to no longer be necessary. A report should be written and stored and should be available at all times.	Low	31,2
Construction of infrastructure and opencast mine	Heritage	No heritage features were found within the proposed amendment areas of the mining boundary	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	Should uncertainty regarding the presence of heritage remains exist, or if heritage resources are discovered by chance, it is advised that the potential site be avoided and that a qualified archaeologist be contacted as soon as possible. Since archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage Resources Act, 25 of 1999 section 36	Very Low	1

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
				(6)).		
Construction of infrastructure and opencast mine	Palaeontological	No fossils were found within the proposed amendment areas of the mining boundary	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	Implementation of Chance Procedure on site.	Very Low	1
Closure and Rehabilitation	Sites of archaeological and cultural interests	Graves to be protected in-situ	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	If the grave site and graves on it cannot be avoided by the proposed mining development then they can be exhumed and relocated after all due processes have been followed. This will include detailed social consultation to try and contact any living descendants of the deceased in order to obtain their consent for the exhumations & relocations and obtaining permits from SAHRA, local, provincial and national authorities before the exhumation and relocation work can be conducted.	Very Low	16,8
Construction of infrastructure and opencast mine	Agriculture, Soil and Land Capability	Loss of agricultural land for grazing and planting	Limit impacts on agricultural activities.	No mitigation measures are recommended by the specialist as the impacts are considered to be negligible.	Very Low	1,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of n stockpiles and backfilling of opencast with waste rock and tailings; Hauling and Transporting on roads; Dust suppression; Removal of indigenous vegetation.	Soils	Soil compaction by heavy duty vehicles.	Limit impacts on agricultural activities.	Visual inspection/confirmation that no surface impacts are occurring. Management and Rehabilitation (If required)	Very Low	6,6
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of overburden stockpiles and backfilling of opencast with tailings;, backfill into Carbonaceous layer, ROM Stockpiles - Hauling and Transporting on roads; Dust suppression; Removal of indigenous vegetation.	Soils	Contamination of soils:	Limit impacts on agricultural activities.	Remedy through rehabilitation, proper removal and disposal if soils have become contaminated	Very Low	6,6
Closure and Rehabilitation	Geology and Soils	Soil compaction by heavy duty vehicles.	Limit impacts on agricultural activities.	Rehabilitation and Monitoring	Very Low	4,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Closure and Rehabilitation	Geology and Soils	Contamination of soils through: Indiscriminate disposal of waste; and Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints.	Limit impacts on agricultural activities.	Remedy through rehabilitation, proper removal and disposal if soils have become contaminated	Very Low	4,2
Construction of additional mining infrastructure and opencast mine and diversion of river	Visual aspects	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the waste management facilities and mining activities.	Early detection of impacts and remediation thereof.	Minimise disturbance to natural areas. Rehabilitate to resemble pre-mining conditions as close as possible.	Very Low	6,4
Closure and Rehabilitation	Visual aspects	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	Early detection of impacts and remediation thereof.		Low	25,6
Closure and Rehabilitation	Visual aspects	Visibility of solid domestic and operational waste.	Early detection of impacts and remediation thereof.	Limit footprint of waste area	Low	25,6
All	Traffic	Continued change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	To limit impacts on traffic as a result of the project.	Infrastructure designs; Management; Monitoring	Low	35,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Construction of additional infrastructure and opencast mining	Traffic	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	To limit impacts on traffic as a result of the project.		Low	31,2
Construction of surface infrastructure	Air Quality	The construction of infrastructure. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust).	To decrease impacts on air quality	Undertake dust monitoring. Implement dust suppression on site. Minimise extent of disturbed area and rehabilitate un-utilised area as soon as possible. Conduct dust suppression. Keep vehicles in a good condition. Do regular medical inspections on employees and contractors.	Medium	52

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
General transportation, hauling and vehicle movement on site	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator's visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.	To decrease impacts on air quality	Undertake dust monitoring. Implement dust suppression on site. Minimise extent of disturbed area and rehabilitate un-utilised area as soon as possible. Conduct dust suppression. Keep vehicles in a good condition. Do regular medical inspections on employees and contractors	Medium	42

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles.	Air Quality	Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles may result in increased fugitive emission sources and may impact on the ambient air quality specifically an increase in daily PM10 concentrations and TSP concentrations	To decrease impacts on air quality	Undertake dust monitoring.	Medium	64
Closure and Rehabilitation	Air Quality	Dust (soil and ore fines) pollution due to rehabilitation activities and heavy-duty vehicles.	To decrease impacts on air quality	Implement dust suppression on site.	Very Low	18
Closure and Rehabilitation	Air Quality	Windborne dust (soil and ore fines) and vehicle fumes and particulate matter PM10, altering air quality.	To decrease impacts on air quality	Ensure site is restored to pre-mining conditions.	Very Low	18
Closure and Rehabilitation	Noise and Lighting	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy-duty vehicles and equipment.	To prevent impact of noise and lighting nuisance.	Limit blasting. Limit lighting	Very Low	19,2
Closure and Rehabilitation	Noise and Lighting	Disturbance due to vibrations caused by heavy duty vehicles.	To prevent impact of noise and lighting nuisance.		Very Low	16,8
Closure and Rehabilitation	Noise and Lighting	Impact of security lighting on surrounding landowners and animals.	To prevent impact of noise and lighting nuisance.		Very Low	16,8
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Ground vibration	To prevent impacts on people and animals and to avoid damage to structures.	Air blast and fly rock can be controlled using proper charging methodology irrespective of the blast hole diameter and patterns used. The only way to mitigate air blast is the design of the stemming length and stemming material. This will require changed blast design to ensure energy levels remain as expected but with increased	Low	31,2
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Air Blasting	To prevent impacts on people and animals and to avoid damage to structures.		Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Fly Rock	To prevent impacts on people and animals and to avoid damage to structures.	stemming lengths and the use of proper stemming material. The used of a crushed product with size of 10 % of the blasthole diameter is the recommended material. Do blast design that considers the actual blasting, and the ground vibration levels to be adhered too. Change the initiating system to facilitate less blast holes detonating simultaneously making using of electronic initiation that allow for single hole firing. The single blast hole charge mass showed no concerns. Do design for smaller diameter blast holes that will use less explosives per blasthole.	Low	21,6
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically on sensitive close by receptors	To prevent impacts on people and animals and to avoid damage to structures.		Low	31,2
All	Health and Safety	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers.	Minimise impacts on socio-economic environment.	Environmental Awareness, Reporting structures; Monitoring	Low	21,6
All	Health and Safety	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	Minimise impacts on health and safety environment.		Low	21,6
All	Health and Safety	Increased risk to public and worker health and safety	Minimise impacts on health and safety environment.		Low	21,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
All	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Minimise impacts on socio-economic environment.	Management; Communication; Strategy implementation	Low	25,2
All	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners specifically the close-by receptors such as Mr Swanepoel, the Gogo identified by the community and the Potgieter farmers	Minimise impacts on socio-economic environment.		Medium	45
All	Socio-Economic: **Positive Impacts**	Extended employment provision due to the implementation of the mining activities, allowing mining activities to commence.	Minimise impacts on socio-economic environment.		Medium	45
All	Socio-Economic: **Positive Impacts**	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Minimise impacts on socio-economic environment.		Medium	48
Closure and Rehabilitation	Health and Safety	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	Minimise impacts on socio-economic environment.		Very Low	16,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MITIGATION MEASURES	Significance with mitigation	
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Health and Safety	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and possible loss of life to mine workers and visitors to the site.	Minimise impacts on socio-economic environment.	Management; Communication; Strategy implementation	Very Low	16,2
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Minimise impacts on socio-economic environment.	Environmental Awareness, Monitoring and Rehabilitation if required	Very Low	19,8
Closure and Rehabilitation	Socio-Economic	Economic impact should there be an incident of public health and safety.	Minimise impacts on socio-economic environment.	Management; Communication; Strategy implementation	Low	36
Closure and Rehabilitation	Socio-Economic	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Minimise impacts on socio-economic environment.		Low	31,2
Closure and Rehabilitation	Socio-Economic	Reduced period of providing employment for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	Minimise impacts on socio-economic environment.		Very Low	18

15.3 SUMMARY OF SPECIALIST REPORTS

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):

Table 38: Specialist Recommendations Summarised

List of Studies Undertaken	**Recommendations of Specialist Reports**	**Specialist Recommendations included**	**Reference to Section in Report Included**
Agricultural Impact Assessment	The screening tool indicates very small portions of high sensitivity land. This is now mined. A detailed assessment found that the sensitivity is low and that there is no medium or high sensitivity land as indicated by the tool. The screening tool did not consider watercourses, infrastructure or mined land. Having taken these into consideration makes the site low sensitive to farming. • There will be no loss of high potential land. No impact and no mitigation is required. • No grazing land will be lost. The only portion suitable for grazing is the rehabilitated land. The balance is under mining infrastructure and vacant. • Loss of crop production. There will be a loss of 1,2 ha of cultivated land. The impact is negligible and no mitigation is required. • Loss of animal production. The land is fragmented and not used for animal grazing. Hence, there will be no loss of animal production or income. • No farming infrastructure will be lost. No impact. **Recommendation** • The development is not located on any high potential land. • The site survey also found that the grazing land is too small or inaccessible. Therefore, no reason can be found not to allow the development. It is the recommendation of the specialist that the project be allowed to be implemented.	X	Baseline Environment (Section 10.4), Impact Assessment and Management (Table 35) Tables (Appendix 5)
Terrestrial Biodiversity / Ecological Impact Assessment	2 Seam is planning to add additional opencast mining areas (i.e., OC04A and OC04B) within the existing mining right areas to extend the Life-of-Mine (LoM). Furthermore 2 Seam will be applying for a coal washing plant and tailings facility on site, associated stormwater management infrastructure (PCDs and clean and dirty water berms), a contractor's yard and a river diversion. According to the National Vegetation Map (SANBI 2006 – 2018) the project area is located in the Grassland biome. One vegetation type occurs in the project area, namely Eastern Highveld Grassland (Gm12).	X	Baseline Environment (Section 10.5), Impact Assessment and Management

	Eastern Highveld Grassland is shown as Vulnerable and in the “National List of Ecosystems that are Threatened and need of protection”, which is also reflected by the 2018 National Biodiversity Assessment. The study area contains the following biodiversity classes from the MBSP: • Modified (‘Transformed’): The majority of the project footprint is located on areas categorised as Modified. The Modified areas are located in areas which have been transformed by current and historic mining activities as possible crop cultivation prior to mining. Based on the findings of the site survey, the specialist determined that these areas should be considered as Modified. • Other Natural Areas (ONA): Sections of the proposed project footprint are located in areas categorised as ONA. Based on the findings of the site survey some of the areas categorised as ONA, would be more accurately designated as Modified, due to existing mining activities and crop cultivation. No protected areas, in terms of NEMPAA, are located within 10 km of the project area. No conservation areas (areas responsibly managed for biodiversity conservation but not legally declared as Protected Areas), as per the South African Conservation Area Database (SACAD), are located within 10 km of the proposed road route. <u>SITE SURVEY RESULTS</u> *<u>Habitat integrity and Floral species found</u>* The project footprint is approximately 64 ha in extent. No SCC were identified to occur on the project footprint during the site survey. However, six flora SCC were identified for the project area during the desktop assessment, of which two were considered to be moderately likely to occur on the project footprint, specifically in the riparian and wetland habitats (VU3). *<u>Habitat integrity and Faunal species found</u>* Thirty-seven (37) species have been sighted and one (1) national SCC species confirmed within the footprints. Mammals protected or regulated under MNCA have been found to occur as well, and these species should not be interfered with, nor relocated. Generally, the area was found to be visibly impacted, with predominant mining and agricultural activities prevalent in the surrounding area. Remaining natural footprint areas were mostly still fenced off from the current mining activities and once the project implementation begins, it could impact on sensitive habitat such as the various wetlands found to scattered over the landscape. *<u>SENSITIVITY MAPPING AND GEOSPATIAL ANALYSIS</u>*		(Table 35) Tables (Appendix 6)

	The site verification in terms of plant, animal and terrestrial biodiversity themes found that the majority of the project footprint is of low sensitivity (VU1 and VU2), with riparian zones rated as high sensitivity (VU3). No protected areas, in terms of NEMPAA, are located within 10 km of the project area. No conservation areas (areas responsibly managed for biodiversity conservation but not legally declared as Protected Areas), as per the South African Conservation Area Database (SACAD), are located within 10 km. No NPAES areas are situated within 10 km of the project footprint. The project footprint is not located in a SWSA or a FEPA. It's the reasoned opinion of the specialist that the development may continue if all mitigation measures are implemented.		
Hydrogeological Assessment	• It is recommended that the monitoring network improvements as per Section 9 be implemented. • The following can be done to improve the assumptions and understanding of the groundwater aquifer and hence improve the numerical groundwater model confidence: o Based on available aquifer data, is recommended that 24-hour pump tests be performed on three (3) different boreholes situated within each proposed groundwater management area (so 9 in total). Aquifer pump test data will help to determine and confirm invaluable aquifer parameter data (aquifer storage, aquifer specific yield and aquifer transmissivity) which cannot be determined by slug testing. o All monitoring boreholes drilled in the area should note groundwater occurrences as well as strike depths. The data can be used to update the conceptual hydrogeological model which is incorporated into the numerical flow model. o Water levels of dedicated monitoring boreholes that will be drilled, as well as any new boreholes which are discovered in the area during routine hydrocensus updates, should be monitored (quarterly dedicated holes, bi-annual hydrocensus). • It is recommended that the numerical groundwater model and transport model be updated annually, to: o Recalibrate the flow system based on the dedicated monitoring boreholes drilled and routine water level monitoring data gathered for the site. o Confirm preferential flow paths and groundwater migration velocities as new geological data is attained via mining. o Evaluate the spatial impact (i.e. SO4 plume) calibrated with the proposed monitoring borehole data. o Confirm long-term liabilities associated with the workings (i.e. predict likely changes in flow fields etc.); and o Ensure no monitoring network gaps exist (i.e. check if the monitoring network is representative of the site).	X	Baseline Environment (Section 10.9), Impact Assessment and Management (Table 35) Table (Appendix 9)

	• The numerical groundwater model should be updated when changes to the site plan occur, and at least 5 years before decommissioning and site closure. It is important to verify groundwater quality objectives for the closure phase, and predict what the groundwater liabilities will be post closure. • Ensure that all dams and PCDs are operated to capacities to prevent overflow during 1:50 and 1:100yr storm events.		
Hydropedological Assessment	OC4 could impact on the flow drivers of the wetland systems through interception systems such as dewatering, diversions, drainage systems and water quality changes, for this a berm and wetland diversion is already in place. As OC4A is situated on recharge no wetland impacts (not river impacts) are foreseen except for some decrease in direct rainfall on the footprint area. Mining is at the low point of the wetland and only intersects a small portion of the wetland with lower impacts than expected was obtained during the impact assessment. However, as the wetland system directly feeds into the Olifants river the impacts if not mitigated is expected on the river and therefore should mining be conducted should only be done with a diversion or similar offset strategy. • The water flow and quality in the wetland system should be measured on a quarterly basis for the following variables: ○ Flow (m^3/day) ○ pH (pH units) ○ TDS (mg/l) ○ SO_4 (mg/l) ○ Full metals by ICP-OES (mg/l) ○ The monitoring points should be where the unchanneled valley bottom feeds water to the channelled valley bottom as well as where the wetland enters the Olifants River. • All diversions (wetland and river) should be overseen by a wetland rehabilitation specialist and engineer to prevent negative impacts on the riparian zone of the Olifants river		Baseline Environment (Section 10.10), Impact Assessment and Management (Table 35) Tables (Appendix 10)
Heritage Impact Assessment	The proposed amendment to the existing 2-Seam Mine measures approximately 60.12 ha and consists of the following areas: Additional Opencast Mining Area, River Diversion, Tailings Facility, ROM Stockpile, Processing Plant Area, Plant PCD, PCD, Contractors Yard. These areas have all been disturbed by previous/current mining/agricultural activities and are therefore not considered to be sensitive or significant from a heritage perspective. Should the recommendations made in this study be adhered to and with the approval of the South African Heritage Resources Agency, the proposed amendment to the existing 2-Seam Mine may proceed.		Baseline Environment (Section 10.13), Impact Assessment and Management (Table 35) Tables (Appendix 11)

	The following recommendations are made in terms with the National Heritage Resources Act (25 of 1999) in order to avoid the destruction of heritage remains associated with the areas demarcated for the proposed amendment to the existing 2-Seam Mine: • No sites of heritage significance were identified within the proposed boundaries and all the areas are considered to be disturbed. The demarcated areas associated with the proposed amendment to the existing 2-Seam Mine are therefore not considered to be sensitive or significant from a heritage perspective. • Since the recommendations are based on the current layout of the proposed project, it is recommended that should alterations occur, the report be revised and updated to ensure the safeguarding of heritage resources. • Should additional areas be considered for mining development, a qualified archaeologist must inspect the identified areas and update to report and recommendations accordingly in order to ensure the safeguarding of heritage resources. • Should uncertainty regarding the presence of heritage remains exist, or if heritage resources are discovered by chance, it is advised that the potential site be avoided and that a qualified archaeologist be contacted as soon as possible. • Since archaeological artefacts generally occur below surface, the possibility exists that culturally significant material may be exposed during the development and construction phases, in which case all activities must be suspended pending further archaeological investigations by a qualified archaeologist. Also, should skeletal remains be exposed during development and construction phases, all activities must be suspended and the relevant heritage resources authority must be contacted (See National Heritage Resources Act, 25 of 1999 section 36 (6)). • From a heritage point of view, development may proceed on the demarcated areas, subject to the abovementioned conditions, recommendations, and approval by the South African Heritage Resources Agency.		
Paleontological Assessment	Based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the overlying sols and sands of the Quaternary. There is a small chance that fossils may occur in the shales of the early Permian Vryheid Formation that occur 30-36m below the surface, but nothing will be visible until new ground is broken when the mining commences. Therefore, so a Fossil Chance Find Protocol should be added to the EMPr. If fossils are found by the miners, environmental officer, or other responsible person once mining has commenced, then they should be rescued and a palaeontologist called to assess and collect a representative sample. The impact on the palaeontological heritage would be low until mining has commenced. No site visit is required until fossils are found by the responsible person.		Baseline Environment (Section 10.14), Impact Assessment and Management (Table 35) Tables (Appendix 12)

Aquatic Ecological Assessment	The diversion of any aquatic ecosystem must not be taken lightly and is the most detrimental activity that can be undertaken by a developer. The exact location and magnitude of impacts are very difficult to assess- especially considering the dissolving effect of impacts in water and the transportation of the impact from the impact area to a secondary location. The monitoring of the rehabilitation process is of paramount importance to ensure the efficiency thereof. If rehabilitation does not occur as stipulated, then corrective measures must be enforced through the audit findings and reports. Communication between the rehabilitation implementer, the author of the rehabilitation plan, the developer, and the construction contractor is of principal importance to ensure execution of the rehabilitation plan. If any areas of concern are found, then they must be explored to determine the extent of and solution to the problem. Due to the complexity of the rehabilitation process, it is proposed that a specialist Aquatic Environmental Control Officer (AECO) be on site for the duration of the process. This is advised as the possible impacts on the aquatic ecosystem are of such a concern that a trained person be instated for the full length of the diversion process and pre and post phases. **GO/ NO GO** Many years of mining on site and in the catchment has reduced the condition of the aquatic ecosystems on site. The risk of acid mine drainage will increase each year of operation. The diversion of the river system as proposed will decrease this risk and remove the coal creating AMD conditions. It is important that the activity on site is monitored by a suitably qualified (SACNASP register in the field of aquatic sciences) aquatic ecologist on a quarterly basis to ensure non- and stochastic events and impacts are mitigated. If the proposed management and mitigation measures are incorporated in addition with the rehabilitation plan the project can be supported by the author.	X	Baseline Environment (Section 10.6, 10.7 and 10.8), Impact Assessment and Management (Table 35) Table (Appendix 7)
Closure Assessment	This preliminary closure plan was compiled in alignment to the NEMA GNR.1147 Regulations, the NEMA Appendix 5 (Closure Plan) and based on information provided by client, and specialist work. This report is completed in the extended transitional period as presented the Amendment to Financial Provision Regulations, 2015 (as amended). During the transitional arrangements a holder must review the financial provision in terms of the requirements as set out in Regulations 17(1) and (3). During the extended transitional period, the assessment was in accordance with the requirements as set out in Regulation 53 and 54 (MPRDA Regulations). This Closure Cost Assessment was performed in accordance with the requirements as set out in Regulation 53 and 54. More specifically Regulation 54(2) (GNR 527, 23 April 2004, MPRDA) that required the holder mining right to annually update and review the quantum of the financial provision.	X	Baseline Environment (Section 19 and Appendix 15)

	No additional contribution is currently required towards the Rehabilitation Trust as sufficient provision is currently in place for the Un-scheduled Closure Cost. The following contributions will be required for the Scheduled Closure Cost. • OC04A - **R 5 984 490,25** • OC6 - **R 13 935 022,88** The contribution to the Rehabilitation Trust for each of the mining areas must be made before mining commences at the mining area. It is estimated that mining will commence at OC04A in 2023 and in 2025 at OC6.		

Attach copies of Specialist Reports as appendices.

15.4 ENVIRONMENTAL IMPACT STATEMENT

15.4.1 Summary of the Key Findings of the Environmental Impact Assessment

The findings of the specialist studies undertaken for this EIA/EMP process provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that should prevent the proposed project from proceeding.

In order to achieve appropriate environmental management standards and ensure that the findings of the environmental studies are implemented through practical measures, the recommendations from this EIA/EMP will form part of the contract with the contractors appointed to construct and maintain the mine and associated infrastructure. The EIA/EMP would be used to ensure compliance with environmental specifications and management measures. The implementation of this EIA/EMP for key cycle phases (i.e. operation and closure/decommissioning) of the project is considered to be fundamental in achieving the appropriate environmental management standards as detailed for this project.

For a detailed impact assessment layout specifying all the ratings used to obtain Significance of impacts with and without mitigation, refer to Table 35 above. For a summary giving only the Significance obtained, refer Table 39 below. Impacts have been discussed in Section 14.5.

Table 39: Summary of Key findings in terms of Impact Significance

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
No-go option	Socio-Economic	Reduced period of development and upliftment of the surrounding communities and infrastructure.	N/A	Medium	45	N/A	1	Medium	45
No-Go Option	Socio-Economic	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	N/A	Medium	45	N/A	1	Medium	45
No-Go Option	Socio-Economic	**Positive:** No additional negative impacts on I&APs or surrounding land users	N/A	Positive Medium	45	N/A	1	Positive Medium	45
No-Go Option	Natural Environment and Wetlands	**Positive:** No additional negative impacts on the environment	N/A	Positive Medium	45	N/A	1	Positive Medium	45
Stripping of topsoil for river diversion	Wetlands and Aquatics	Sediment ingress into the aquatic ecosystem, clearing of vegetation	Construction	Low	33	Medium	0,6	Very Low	19,8
River diversion	Wetlands and Aquatics	Diversion of the Olifants River	Construction	Very High	80	Medium	0,6	Medium	48
Stockpiling of topsoil for river diversion	Wetlands and Aquatics	Sediment releases, impact of area disturbed by stockpile	Construction	Medium	48	Medium	0,6	Low	28,8
Excavation of river diversion	Wetlands and Aquatics	Area impacted by placement of soils on surface next to excavation	Operational	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Excavation of river diversion	Wetlands and Aquatics	Sediment ingress	Operational	Medium	52	Medium	0,6	Low	31,2
Excavation of river diversion	Wetlands and Aquatics	Increased flow volumes	Operational	Medium	52	Medium	0,6	Low	31,2
Excavation of river diversion	Wetlands and Aquatics	Impact on long term ecosystem health	Operational	Medium	56	Medium	0,6	Low	33,6
Excavation of river diversion	Wetlands and Aquatics	Reduced functionality of buffer	Operational	High	75	Medium	0,6	Medium	45
Excavation of river diversion	Wetlands and Aquatics	Ecotone removal	Operational	High	75	Medium	0,6	Very Low	45
Excavation of river diversion	Wetlands and Aquatics	Possible spillage into natural area	Operational	Medium	48	Medium	0,6	Low	28,8
Excavation of river diversion	Wetlands and Aquatics	Refilling of machinery with hydrocarbons	Operational	Medium	44	Medium	0,6	Low	26,4
Excavation of river diversion	Wetlands and Aquatics	Stockpiling of soils	Operational	Medium	44	Medium	0,6	Low	26,4
Excavation of river diversion	Wetlands and Aquatics	Physical excavation in soil	Operational	Medium	44	Medium	0,6	Low	26,4
Transportation from site due to river diversion	Wetlands and Aquatics	Area impacted by waiting trucks and machinery	Operational	Medium	44	Medium	0,6	Low	26,4
Transportation from site due to river diversion	Wetlands and Aquatics	Crossing of aquatic ecosystem on existing roads and bridges	Operational	Medium	48	Medium	0,6	Low	28,8
Hydrocarbon spill (river diversion)	Wetlands and Aquatics	Possible spillage into natural area	Operational	Medium	52	Medium	0,6	Low	31,2
Hydrocarbon spill (river diversion)	Wetlands and Aquatics	Refilling of machinery	Operational	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Access Road for river diversion	Wetlands and Aquatics	Crossing of aquatic ecosystem with machinery	Operational	Low	30	Medium	0,6	Very Low	18
Impoundment of water in excavation pit (river diversion)	Wetlands and Aquatics	During rainfall events the excavation pit can fill with water (unlikely but included)	Operational	Medium	52	Medium	0,6	Low	31,2
Alien vegetation spreading and establishment (river diversion)	Wetlands and Aquatics	Alien vegetation establishment and spread	Operational	High	65	Medium	0,6	Low	39
Post development/ rehabilitation (river diversion)	Wetlands and Aquatics	Decompaction of soil	Decommissioning and rehabilitation	Low	32	Medium	0,6	Very Low	19,2
Post development/ rehabilitation (river diversion)	Wetlands and Aquatics	Removal of crossings over aquatic ecosystem	Decommissioning and rehabilitation	Low	40	Medium	0,6	Low	24
Removal of crossings over aquatic ecosystem (river diversion)	Wetlands and Aquatics	Altering of beds and banks	Decommissioning and rehabilitation	Low	30	Medium	0,6	Very Low	18
Removal of crossings over aquatic ecosystem (river diversion)	Wetlands and Aquatics	Sediment ingress	Decommissioning and rehabilitation	Low	33	Medium	0,6	Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Replacement of soil into excavated area (unlikely)	Decommissioning and rehabilitation	Low	33	Medium	0,6	Very Low	19,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Low	33	Medium	0,6	Very Low	19,8
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Levelling of topsoil's	Decommissioning and rehabilitation	Low	33	Medium	0,6	Very Low	19,8
Erosion of replaced soils (river diversion)	Wetlands and Aquatics	Replaced surface soils are washed away if not stabilised or planted before the first rainfall	Decommissioning and rehabilitation	Low	27	Medium	0,6	Very Low	16,2
Alteration of soil chemical properties (river diversion)	Wetlands and Aquatics	Alteration of soil chemical properties reducing soil productivity	Decommissioning and rehabilitation	Medium	48	Medium to low	0,8	Low	38,4
Alien vegetating eradication (river diversion)	Wetlands and Aquatics	Application of herbicides	Decommissioning and rehabilitation	Medium	48	Medium	0,6	Low	28,8
New processing plant	Wetlands and Aquatics	Flood attenuation	Operational	Low	30	Medium	0,6	Very Low	18
New processing plant	Wetlands and Aquatics	Streamflow regulation	Operational	Low	30	Medium	0,6	Very Low	18
New processing plant	Wetlands and Aquatics	Sediment trapping	Operational	Low	30	Medium	0,6	Very Low	18
New processing plant	Wetlands and Aquatics	Phosphate assimilation	Operational	Low	30	Medium	0,6	Very Low	18
New processing plant	Wetlands and Aquatics	Nitrate assimilation	Operational	Low	30	Medium	0,6	Very Low	18
New processing plant	Wetlands and Aquatics	Toxicant assimilation	Operational	Low	30	Medium	0,6	Very Low	18

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
New processing plant	Wetlands and Aquatics	Erosion control	Operational	Low	30	Medium	0,6	Very Low	18
New processing plant	Wetlands and Aquatics	Carbon storage	Operational	Low	30	Medium	0,6	Very Low	18
New processing plant	Wetlands and Aquatics	Alien vegetation establishment and spread	Operational	Medium	40	Medium	0,6	Low	24
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Low	27	Medium	0,6	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Replacement of soil	Decommissioning and rehabilitation	Low	27	Medium	0,6	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Low	27	Medium	0,6	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Levelling of topsoil	Decommissioning and rehabilitation	Low	27	Medium	0,6	Very Low	16,2
Decompaction, infilling of soil and or placement of topsoil	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Decompaction, infilling of soil and or placement of topsoil	Wetlands and Aquatics	Replacement of soil	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Decompaction, infilling of soil and or placement of topsoil	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Decompaction, infilling of soil and or placement of topsoil	Wetlands and Aquatics	Levelling of topsoil	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Decompaction, infilling of soil and or placement of topsoil	Wetlands and Aquatics	Alien vegetation establishment and spread	Decommissioning and rehabilitation	Very Low	48	Medium	0,6	Low	28,8
Contractors yard	Wetlands and Aquatics	Flood attenuation	Operational	Medium	48	Medium	0,6	Low	28,8
Contractors yard	Wetlands and Aquatics	Streamflow regulation	Operational	Medium	48	Medium	0,6	Low	28,8
Contractors yard	Wetlands and Aquatics	Sediment trapping	Operational	Medium	48	Medium	0,6	Low	28,8
Contractors yard	Wetlands and Aquatics	Phosphate assimilation	Operational	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Wetlands and Aquatics	Nitrate assimilation	Operational	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Wetlands and Aquatics	Toxicant assimilation	Operational	Medium	40	Medium	0,6	Low	24
Contractor's yard	Wetlands and Aquatics	Erosion control	Operational	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Wetlands and Aquatics	Carbon storage	Operational	Medium	48	Medium	0,6	Low	28,8
Contractor's yard	Wetlands and Aquatics	Alien vegetation establishment and spread	Operational	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Contractor's yard	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Wetlands and Aquatics	Replacement of soil	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Wetlands and Aquatics	Levelling of topsoil	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Contractor's yard	Wetlands and Aquatics	Alien vegetation establishment and spread	Decommissioning and rehabilitation	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Flood attenuation	Operational	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Streamflow regulation	Operational	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Sediment trapping	Operational	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Phosphate assimilation	Operational	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Nitrate assimilation	Operational	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Toxicant assimilation	Operational	Medium	40	Medium	0,6	Low	24
Pollution Control Dams	Wetlands and Aquatics	Erosion control	Operational	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Carbon storage	Operational	Medium	48	Medium	0,6	Low	28,8
Pollution Control Dams	Wetlands and Aquatics	Alien vegetation establishment and spread	Operational	High	48	Low to medium	0,8	Medium	38,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Pollution Control Dams	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Wetlands and Aquatics	Replacement of soil	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Wetlands and Aquatics	Levelling of topsoil	Decommissioning and rehabilitation	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams	Wetlands and Aquatics	Alien vegetation establishment and spread	Decommissioning and rehabilitation	Medium	48	Medium	0,6	Low	28,8
Clearing topsoil from footprint areas will influence the rate of infiltration of water to the shallow groundwater system and/or baseflow component to shallow streams.	Groundwater	Water Quantity > Groundwater > Olifants River	Construction	Low	30	Medium	0,6	Very Low	18
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Groundwater	Water Quantity > Groundwater > Olifants River	Construction	Very High	85	No mitigation possible			

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Handling of waste and transport of material can cause various types of spills (domestic waste, sewage water, hydrocarbons) which can infiltrate and contaminate the groundwater system. Poor quality mine drainage from material removed during the opencast development (i.e. from overburdened rock piles) may cause local soil and groundwater contamination. Oil and fuel spills and leakages at hard park areas, and in the mining pits, may cause poor quality seepage and soil contamination.	Groundwater	Water Quantity > Groundwater > Olifants River	Construction	Medium	48	Medium	0,6	Low	28,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Stripping of the topsoil during the channel creation for the Olifants River diversion may cause temporary sedimentation as the river takes to the new flow path. There may be some bank erosion which could also lead to sedimentation and suspended solid transport. If vehicles and machines leak hydrocarbons during the diversion trenching, there may be local soil contamination that could impact the surface and groundwater quality.	Groundwater	Water Quantity > Groundwater > Olifants River	Construction	Medium	48	Medium	0,6	Low	28,8
Opencast mining will result in groundwater inflows into the pits which need to be pumped out for mine safety and will lead to a lowering of groundwater levels in the surrounding aquifers.	Groundwater	Water Quantity > Groundwater Level	Operational	Medium	65	Low to medium	0,8	Medium	52
Dewatering activity may impact shallow baseflow to Olifants River and tributaries.	Groundwater	Water Quantity > Baseflow	Operational	Medium	60	Medium	0,6	Low	36

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Groundwater	Water Quantity > Olifants River	Operational	Very High	90	No mitigation possible			
Analyses showed that acid mine drainage (AMD) formation is expected and poor-quality leachate can occur based on the leaching potential of the material. This can influence the water quality in the surrounding aquifers. However, groundwater flow directions will be directed towards the opencast workings and contaminant migration away from the mining areas will be limited during active mining.	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Operational	Medium	56	Low to medium	0,8	Medium	44,8
Potentially contaminated groundwater ingress if fracture networks from underground workings are intercepted during opencast mining.	Groundwater	Water Quality > Aquifer zones (water table)	Operational	Medium	42	Medium	0,6	Low	25,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Coal transport via haulage roads.	Groundwater	Water Quality > Soil water > Aquifer zones (water table) > Dust fallout along the rivers and streams in the project area	Operational	Low	39	Medium	0,6	Low	23,4
Concurrent backfilling of opencast pits - poor quality seepages.	Groundwater	Water Quality > Aquifer zones (water table)	Operational	Medium	52	Medium	0,6	Low	31,2
Waste disposal on surface - poor quality seepages.	Groundwater	Water Quality > Aquifer zones (water table)	Operational	Medium	56	Low to medium	0,8	Medium	44,8
Coal and ROM Stockpiles.	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Operational	Medium	52	Low to medium	0,8	Medium	41,6
Operation of the plant could lead to spillages/seepage	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Operational	Medium	48	Low to medium	0,8	Medium	38,4
Workshops and spillages (hydrocarbons, sewage, domestic waste).	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Operational	Medium	44	Medium	0,6	Low	26,4
Pollution Control Dams (existing and proposed)- poor quality seepages.	Groundwater	Water Quality > > Soil water > Aquifer zones (water table)	Operational	High	65	Medium	0,6	Low	39
Infrastructure	Groundwater	Seepage that makes it from the plant areas PCD and ROM area and contractors yard via the vadose and aquifer zones, and enters streams as baseflow.	Operational	Low	21	Medium	0,6	Very Low	12,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Infrastructure	Groundwater	Dewatering may impact groudnwater table and groundwater uses	Operational	Very Low	12	High	1	Very Low	12
Rehabilitated mining areas - rebounding water levels.	Groundwater	Groundwater Quantity > Groundwater Levels	Decommissioning and rehabilitation	Medium	45	Medium	0,6	Low	27
Rehabilitated mining areas - Migration of groundwater contaminant plume and contaminated groundwater seepage to streams and Olifants river (salt load).	Groundwater	Water Quality > Olifants River > Groundwater table	Decommissioning and rehabilitation	High	70	Medium	0,6	Medium	42
Rehabilitated mining areas - depending on the pit water balance, the pit can decant at the lowest topographical area and negatively impact groundwater and stream quality. This is particularly probable for OC4A.	Groundwater	Water Quality > Olifants River > Groundwater table	Decommissioning and rehabilitation	High	65	Medium	0,6	Medium	39
Potentially contaminated groundwater ingress if fracture networks from underground workings were intercepted during mining.	Groundwater	Water Quality > Olifants River > Groundwater table	Decommissioning and rehabilitation	Medium	42	Medium	0,6	Low	25,2
Seepage from plant area, ROM area, contractors' yard and PCD	Groundwater	Vadose zone soils and subsequent aquifer (groundwater table)	Decommissioning and rehabilitation	Low	24	Medium	0,6	Very low	14,4
No River diversion	Hydropedology	No change in flow is expected	Construction and operational	Medium	40	High	1	Medium	40

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
River diversion	Hydropedology	OC4 could impact on the flow drivers of the wetland systems through interception systems such as dewatering, diversions, drainage systems and water quality changes.	Construction and operational	Medium	40	Low to medium	0,8	Low	32
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Development related activities will specifically lead to damage or degradation of highly sensitive habitats (VU3) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction of these additional activities further fragmentation, degradation or compression may occur.	Construction	Medium to high	64	Low to medium	0,8	Medium	51,2
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Development and related activities could impact on the sensitive habitats (VU3) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	Construction	High	68	Low to medium	0,8	Medium	54,4

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Fragmentation of habitat areas due to possible fencing or the placement of boundary structures could lead to increased edge effects. Habitat that is not to be cleared, needs to be protected.	Construction	Medium	45	Medium	0,6	Low	27
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	Construction and operational		45	Medium	0,6	Low	27

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and Tailings Facility)	Ecological	Anthropogenic influence stemming from employees, visitors and contractors that infiltrate the natural veld areas will damage and impact on species communities within certain areas. Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU3).	Construction and operational	Medium	56	Medium	0,6	Low	33,6
Closure of opencast mine, plant and related infrastructure	Ecological	Rehabilitation could be ineffective if measures are not appropriately complied to. Without the necessary mitigation measures, rehabilitation will be unsuccessful, and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture	Closure	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of infrastructure and opencast mine	Heritage	No heritage features were found within the proposed amendment areas of the mining boundary	Construction and operational	Very low	5	High	0,2	Very Low	1
Construction of infrastructure and opencast mine	Palaeontological	No fossils were found within the proposed amendment areas of the mining boundary	Construction and operational	Very low	5	High	0,2	Very Low	1
Closure and Rehabilitation	Sites of archaeological and cultural interests	Graves to be protected in-situ	Closure Phase	Low	21	Low	0,8	Very Low	16,8
Construction of infrastructure and opencast mine	Agriculture, Soil and Land Capability	Loss of agricultural land for grazing and planting	Construction and operational	Very low	6	High	0,2	Very Low	1,2
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of overburden stockpiles and backfilling of opencast with waste rock and tailings; Waste rock stockpiling, Tailings backfill into Carbonaceous layer, ROM Stockpiles - Waste Residue Deposits; Hauling and Transporting on new roads; Dust suppression; Removal of indigenous vegetation.	Soils	Soil compaction by heavy duty vehicles.	Construction & Operational Phase	Low	33	High	0,2	Very Low	6,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of overburden stockpiles and backfilling of opencast with waste rock and tailings; Waste rock stockpiling, Tailings backfill into Carbonaceous layer, ROM Stockpiles - NEW Waste Residue Deposits; Hauling and Transporting on new roads; Dust suppression; Removal of indigenous vegetation.	Soils	Contamination of soils through:	Construction & Operational Phase	Low	33	High	0,2	Very Low	6,6
Closure and Rehabilitation	Geology and Soils	Soil compaction by heavy duty vehicles.	Closure Phase	Low	21	High	0,2	Very Low	4,2
Closure and Rehabilitation	Geology and Soils	Contamination of soils through: Indiscriminate disposal of waste; and Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints.	Closure Phase	Low	21	High	0,2	Very Low	4,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of additional mining infrastructure and opencast mine and diversion of river	Visual	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the waste management facilities and mining activities.	Construction and operational	Very low	16	Medium to high	0,4	Very Low	6,4
Closure and Rehabilitation	Visual aspects	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	Closure Phase	Low	32	Low	0,8	Low	25,6
Closure and Rehabilitation	Visual aspects	Visibility of solid domestic and operational waste.	Closure Phase	Low	32	Low	0,8	Low	25,6
All	Traffic	Continued change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	Construction & Operational Phase	Medium	44	Low	0,8	Low	35,2
Construction of additional infrastructure and opencast mining	Traffic	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	Construction and operational	Medium	52	Medium	0,6	Low	31,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Construction of surface infrastructure	Air Quality	The construction of infrastructure. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust).	Construction	Medium	65	Low	0,8	Medium	52

General transportation, hauling and vehicle movement on site	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator's visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.	Construction	High	70	Medium	0,6	Medium	42

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles.	Air Quality	Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles may result in increased fugitive emission sources and may impact on the ambient air quality specifically an increase in daily PM10 concentrations and TSP concentrations	Operational	Very high	80	Low to medium	0,8	Medium	64
Closure and Rehabilitation	Air Quality	Dust (soil and ore fines) pollution due to rehabilitation activities and heavy-duty vehicles.	Closure Phase	Low	30	Medium	0,6	Very Low	18
Closure and Rehabilitation	Air Quality	Windborne dust (soil and ore fines) and vehicle fumes and particulate matter PM10, altering air quality.	Closure Phase	Low	30	Medium	0,6	Very Low	18
Closure and Rehabilitation	Noise and Lighting	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy-duty vehicles and equipment.	Closure Phase	Low	24	Low	0,8	Very Low	19,2
Closure and Rehabilitation	Noise and Lighting	Disturbance due to vibrations caused by heavy duty vehicles.	Closure Phase	Low	21	Low	0,8	Very Low	16,8

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Closure and Rehabilitation	Noise and Lighting	Impact of security lighting on surrounding landowners and animals.	Closure Phase	Low	21	Low	0,8	Very Low	16,8
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Ground vibration	Construction & Operational Phase	Medium	52	Medium	0,6	Low	31,2
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Air Blasting	Construction & Operational Phase	Medium	52	Medium	0,6	Low	31,2
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Fly Rock	Construction & Operational Phase	Low	36	Medium	0,6	Low	21,6
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically on sensitive close by receptors	Construction & Operational Phase	Medium	52	Medium	0,6	Low	31,2
All	Health and Safety	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers.	Construction & Operational Phase	Low	36	Medium	0,6	Low	21,6
All	Health and Safety	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	Construction & Operational Phase	Low	36	Medium	0,6	Low	21,6
All	Health and Safety	Increased risk to public and worker health and safety	Construction & Operational Phase	Low	36	Medium	0,6	Low	21,6

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
All	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Construction & Operational Phase	Medium	42	Medium	0,6	Low	25,2
All	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners specifically the close-by receptors such as Mr Swanepoel, the Gogo identified by the community and the Potgieter farmers	Construction & Operational Phase	High	75	Medium	0,6	Medium	45
All	Socio-Economic: **Positive Impacts**	Extended employment provision due to the implementation of the mining activities, allowing mining activities to commence.	Construction & Operational Phase	Medium	45	N/A	1	Medium	45
All	Socio-Economic: **Positive Impacts**	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Construction & Operational Phase	Medium	48	N/A	1	Medium	48
Closure and Rehabilitation	Health and Safety	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	Closure Phase	Low	27	Medium	0,6	Very Low	16,2

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	PHASE	Significance without mitigation		Mitigation Efficiently		Significance with mitigation	
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Health and Safety	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and possible loss of life to mine workers and visitors to the site.	Closure Phase	Low	27	Medium	0,6	Very Low	16,2
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Closure Phase	Low	33	Medium	0,6	Very Low	19,8
Closure and Rehabilitation	Socio-Economic	Economic impact should there be an incident of public health and safety.	Closure Phase	Medium	45	Low	0,8	Low	36
Closure and Rehabilitation	Socio-Economic	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Closure Phase	Low	39	Low	0,8	Low	31,2
Closure and Rehabilitation	Socio-Economic	Reduced period of providing employment for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	Closure Phase	Low	30	Medium	0,6	Very Low	18

15.5 FINAL SITE MAP

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attach as Appendix.

Please refer to Appendix 2 and Appendix 3.

15.6 IMPACT MANAGEMENT OBJECTIVES AND THE IMPACT MANAGEMENT OUTCOMES FOR INCLUSION IN THE EMPR

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorization.

Specialist recommendations which could be included as conditions have been discussed in Table 38. Specialist management measures as well as the significance of the impacts prior and post mitigation are provided in Table 37 and contained in the respective studies.

Table 40: Impact management objectives and the impact management outcomes for inclusion in the EMPr

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
No-go option	Socio-Economic	Reduced period of development and upliftment of the surrounding communities and infrastructure.	No Additional Management Objectives if Project does not proceed	No management possible if no development occurs
No-Go Option	Socio-Economic	Reduced period of development of the economic environment, by job provision and sourcing supplies for and from local residents and businesses.	No Additional Management Objectives if Project does not proceed	No management possible if no development occurs
No-Go Option	Socio-Economic	**Positive:** No additional negative impacts on I&APs or surrounding land users	No Additional Management Objectives if Project does not proceed	No management possible if no development occurs
No-Go Option	Natural Environment and Wetlands	**Positive:** No additional negative impacts on the environment	No Additional Management Objectives if Project does not proceed	No management possible if no development occurs
Stripping of topsoil for river diversion	Wetlands and Aquatics	Sediment ingress into the aquatic ecosystem, clearing of vegetation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
River diversion	Wetlands and Aquatics	Diversion of the Olifants River	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Stockpiling of topsoil for river diversion	Wetlands and Aquatics	Sediment releases, impact of area disturbed by stockpile	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Excavation of river diversion	Wetlands and Aquatics	Area impacted by placement of soils on surface next to excavation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained.
Excavation of river diversion	Wetlands and Aquatics	Sediment ingress	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
			To protect wetlands and ensure their ecological function continues.	Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Excavation of river diversion	Wetlands and Aquatics	Increased flow volumes	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Excavation of river diversion	Wetlands and Aquatics	Impact on long term ecosystem health	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Excavation of river diversion	Wetlands and Aquatics	Reduced functionality of buffer	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Excavation of river diversion	Wetlands and Aquatics	Ecotone removal	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Excavation of river diversion	Wetlands and Aquatics	Possible spillage into natural area	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Excavation of river diversion	Wetlands and Aquatics	Refilling of machinery with hydrocarbons	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Excavation of river diversion	Wetlands and Aquatics	Stockpiling of soils	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Excavation of river diversion	Wetlands and Aquatics	Physical excavation in soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Transportation from site due to river diversion	Wetlands and Aquatics	Area impacted by waiting trucks and machinery	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Transportation from site due to river diversion	Wetlands and Aquatics	Crossing of aquatic ecosystem on existing roads and bridges	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Hydrocarbon spill (river diversion)	Wetlands and Aquatics	Possible spillage into natural area	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Hydrocarbon spill (river diversion)	Wetlands and Aquatics	Refilling of machinery	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Access Road for river diversion	Wetlands and Aquatics	Crossing of aquatic ecosystem with machinery	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Impoundment of water in excavation pit (river diversion)	Wetlands and Aquatics	During rainfall events the excavation pit can fill with water (unlikely but included)	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Alien vegetation spreading and establishment (river diversion)	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Post development/ rehabilitation (river diversion)	Wetlands and Aquatics	Decompaction of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Post development/ rehabilitation (river diversion)	Wetlands and Aquatics	Removal of crossings over aquatic ecosystem	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Removal of crossings over aquatic ecosystem (river diversion)	Wetlands and Aquatics	Altering of beds and banks	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Removal of crossings over aquatic ecosystem (river diversion)	Wetlands and Aquatics	Sediment ingress	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Replacement of soil into excavated area (unlikely)	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Infilling of soil and or placement of topsoil (river diversion)	Wetlands and Aquatics	Levelling of topsoil's	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Erosion of replaced soils (river diversion)	Wetlands and Aquatics	Replaced surface soils are washed away if not stabilised or planted before the first rainfall	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Alteration of soil chemical properties (river diversion)	Wetlands and Aquatics	Alteration of soil chemical properties reducing soil productivity	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Alien vegetating eradication (river diversion)	Wetlands and Aquatics	Application of herbicides	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
New processing plant	Wetlands and Aquatics	Flood attenuation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
New processing plant	Wetlands and Aquatics	Streamflow regulation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
New processing plant	Wetlands and Aquatics	Sediment trapping	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
New processing plant	Wetlands and Aquatics	Phosphate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).
New processing plant	Wetlands and Aquatics	Nitrate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
New processing plant	Wetlands and Aquatics	Toxicant assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
New processing plant	Wetlands and Aquatics	Erosion control	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained.
New processing plant	Wetlands and Aquatics	Carbon storage	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
			To protect wetlands and ensure their ecological function continues.	Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment.
New processing plant	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Replacement of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Decompaction, infilling of soil and or placement of topsoil due to processing plant	Wetlands and Aquatics	Levelling of topsoil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment.
Decompaction, infilling of soil and or placement of topsoil	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Flood attenuation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Streamflow regulation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Contractor's yard	Wetlands and Aquatics	Sediment trapping	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Phosphate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Nitrate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Toxicant assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Contractor's yard	Wetlands and Aquatics	Erosion control	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Carbon storage	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Replacement of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
			To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Moving of topsoil from stockpile rehabilitated areas	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Contractor's yard	Wetlands and Aquatics	Levelling of topsoil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Contractor's yard	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Flood attenuation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Streamflow regulation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Sediment trapping	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Phosphate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Nitrate assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal.

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Pollution Control Dams	Wetlands and Aquatics	Toxicant assimilation	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Pollution Control Dams	Wetlands and Aquatics	Erosion control	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Carbon storage	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Ripping of area and access roads to reduce compaction	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	
Pollution Control Dams	Wetlands and Aquatics	Replacement of soil	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	Early detection and prevention of possible impacts. Integrity of aquatic system remains as is and the ecological function within the ecosystem continues as normal. Control through proper soil management procedures. Ensure biodiversity and ecological function is maintained. Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas). Remedy/modify through wetland rehabilitation. Prevent Discharge to the environment
Pollution Control Dams	Wetlands and Aquatics	Alien vegetation establishment and spread	To prevent the loss of aquatic biodiversity and ecological function within the ecosystem. To protect wetlands and ensure their ecological function continues.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Clearing topsoil from footprint areas will influence the rate of infiltration of water to the shallow groundwater system and/or baseflow component to shallow streams.	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	
Handling of waste and transport of material can cause various types of spills (domestic waste, sewage water, hydrocarbons) which can infiltrate and contaminate the groundwater system. Poor quality mine drainage from material removed during the opencast development (i.e. from overburdened rock piles) may cause local soil and groundwater contamination. Oil and fuel spills and leakages at hard park areas, and in the mining pits, may cause poor quality seepage and soil contamination.	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Stripping of the topsoil during the channel creation for the Olifants River diversion may cause temporary sedimentation as the river takes to the new flow path. There may be some bank erosion which could also lead to sedimentation and suspended solid transport. If vehicles and machines leak hydrocarbons during the diversion trenching, there may be local soil contamination that could impact the surface and groundwater quality.	Groundwater	Water Quantity > Groundwater > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)
Opencast mining will result in groundwater inflows into the pits which need to be pumped out for mine safety and will lead to a lowering of groundwater levels in the surrounding aquifers.	Groundwater	Water Quantity > Groundwater Level	Prevent hydrogeological impacts and prevent contamination of water resources	
Dewatering activity may impact shallow baseflow to Olifants River and tributaries.	Groundwater	Water Quantity > Baseflow	Prevent hydrogeological impacts and prevent contamination of water resources	
Diversion of the Olifants river to a new flow path will void the existing river segment and subsequent alluvium aquifer sone of groundwater baseflow.	Groundwater	Water Quantity > Olifants River	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Analyses showed that acid mine drainage (AMD) formation is expected and poor-quality leachate can occur based on the leaching potential of the material. This can influence the water quality in the surrounding aquifers. However, groundwater flow directions will be directed towards the opencast workings and contaminant migration away from the mining areas will be limited during active mining.	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	
Potentially contaminated groundwater ingress if fracture networks from underground workings are intercepted during opencast mining.	Groundwater	Water Quality > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	
Coal transport via haulage roads.	Groundwater	Water Quality > Soil water > Aquifer zones (water table) > Dust fallout along the rivers and streams in the project area	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)
Concurrent backfilling of opencast pits - poor quality seepages.	Groundwater	Water Quality > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	
Waste disposal on surface - poor quality seepages.	Groundwater	Water Quality > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	
Coal and ROM Stockpiles.	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Operation of the plant could lead to spillages/seepage	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	
Workshops and spillages (hydrocarbons, sewage, domestic waste).	Groundwater	Water Quality > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	
Pollution Control Dams (existing and proposed)- poor quality seepages.	Groundwater	Water Quality > > Soil water > Aquifer zones (water table)	Prevent hydrogeological impacts and prevent contamination of water resources	
Infrastructure	Groundwater	Seepage that makes it from the plant areas PCD and ROM area and contractors' yard via the vadose and aquifer zones, and enters streams as baseflow.	Prevent hydrogeological impacts and prevent contamination of water resources	
Infrastructure	Groundwater	Dewatering may impact groundwater table and groundwater uses	Prevent hydrogeological impacts and prevent contamination of water resources	
Rehabilitated mining areas - rebounding water levels.	Groundwater	Groundwater Quantity > Groundwater Levels	Prevent hydrogeological impacts and prevent contamination of water resources	
Rehabilitated mining areas - Migration of groundwater contaminant plume and contaminated groundwater seepage to streams and Olifants river (salt load).	Groundwater	Water Quality > Olifants River > Groundwater table	Prevent hydrogeological impacts and prevent contamination of water resources	Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling)
Rehabilitated mining areas - depending on the pit water balance, the pit can decant at the lowest topographical area and negatively impact groundwater and stream quality. This is particularly probable for OC4A.	Groundwater	Water Quality > Olifants River > Groundwater table	Prevent hydrogeological impacts and prevent contamination of water resources	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Potentially contaminated groundwater ingress if fracture networks from underground workings were intercepted during mining.	Groundwater	Water Quality > Olifants River > Groundwater table	Prevent hydrogeological impacts and prevent contamination of water resources	
Seepage from plant area, ROM area, contractors' yard and PCD	Groundwater	Vadose zone soils and subsequent aquifer (groundwater table)	Prevent hydrogeological impacts and prevent contamination of water resources	
No River diversion	Hydropedology	No change in flow is expected	Prevent hydropedological impacts on the wetlands.	1. Avoid and control through implementation of preventative measures
River diversion	Hydropedology	OC4 could impact on the flow drivers of the wetland systems through interception systems such as dewatering, diversions, drainage systems and water quality changes.	Prevent hydropedological impacts on the wetlands.	
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Development related activities will specifically lead to damage or degradation of highly sensitive habitats (VU3) and overall loss of biodiversity and ecosystem function within the clearance area. As a result of the construction of these additional activities further fragmentation, degradation or compression may occur.	Early detection of impacts and remediation thereof.	Control through implementation of EMPR mitigation measures (e.g. limit area of disturbance, training) Avoid/Stop through relocation of threatened or protected species Control through implementation of ESMS.
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Development and related activities could impact on the sensitive habitats (VU3) situated in and around the development footprint, including impacts from effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas.	Early detection of impacts and remediation thereof.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Construction (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Fragmentation of habitat areas due to possible fencing or the placement of boundary structures could lead to increased edge effects. Habitat that is not to be cleared, needs to be protected.	Early detection of impacts and remediation thereof.	
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and ROM)	Ecological	Impacts may lead to the further increase of invasive species from the surrounding areas and may change the vegetation structure and composition of this unit. It may also result in the spread of the invaders already found on-site to other surrounding areas. Proliferation of AIP species in riparian areas are especially problematic due to the relative ease of AIP transport to downstream areas.	Early detection of impacts and remediation thereof.	Control through implementation of EMPR mitigation measures (e.g. limit area of disturbance, training) Avoid/Stop through relocation of threatened or protected species Control through implementation of ESMS.
Construction and operation (River diversion, opencast mine, Pollution Control Dams, Plant and Tailings Facility)	Ecological	Anthropogenic influence stemming from employees, visitors and contractors that infiltrate the natural veld areas will damage and impact on species communities within certain areas. Effluent discharge into the environment from the coal stockpiles, coal spillages and other contaminated areas may negatively affect terrestrial ecosystems, especially sensitive habitats associated with riparian and wetland areas (VU3).	Early detection of impacts and remediation thereof.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Closure of opencast mine, plant and related infrastructure	Ecological	Rehabilitation could be ineffective if measures are not appropriately complied to. Without the necessary mitigation measures, rehabilitation will be unsuccessful, and the environment will not be self-sustaining. Without mitigation the alien invasive species will increase and result in a degraded veld condition making the property less viable for post-closure land use activities such as wilderness, grazing and agriculture	Early detection of impacts and remediation thereof.	Control through implementation of EMPR mitigation measures (e.g. limit area of disturbance, training) Avoid/Stop through relocation of threatened or protected species Control through implementation of ESMS.
Construction of infrastructure and opencast mine	Heritage	No heritage features were found within the proposed amendment areas of the mining boundary	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	Avoid and control through implementation of preventative measures (e.g. Palaeontological site visit and training, watching brief) Modify through removal and curation of fossils
Construction of infrastructure and opencast mine	Palaeontological	No fossils were found within the proposed amendment areas of the mining boundary	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	
Closure and Rehabilitation	Sites of archaeological and cultural interests	Graves to be protected in-situ	To avoid disturbing sites of archaeological and cultural interest. If any new heritage aspects are discovered, a specialist must be called for evaluation. This must be done in accordance with legal requirements. Apply for Section 38 Permit for Graves identified, Conduct Risk Assessment in terms of MHSA, Section 17.7(a).	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Construction of infrastructure and opencast mine	Agriculture, Soil and Land Capability	Loss of agricultural land for grazing and planting	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. .
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of n stockpiles and backfilling of opencast with waste rock and tailings; Hauling and Transporting on roads; Dust suppression; Removal of indigenous vegetation.	Soils	Soil compaction by heavy duty vehicles.	Limit impacts on agricultural activities.	
Opencast Mining; Bulk earthworks including foundations, trenches, berms; Establishment of overburden stockpiles and backfilling of opencast with tailings;, backfill into Carbonaceous layer, ROM Stockpiles - Hauling and Transporting on roads; Dust suppression; Removal of indigenous vegetation.	Soils	Contamination of soils:	Limit impacts on agricultural activities.	Avoid through preventative measures (e.g. bunding, spill kits) Remedy through clean-up and waste disposal. Early detection and prevention of possible impacts Modify through soil treatment if required.
Closure and Rehabilitation	Geology and Soils	Soil compaction by heavy duty vehicles.	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Closure and Rehabilitation	Geology and Soils	Contamination of soils through: Indiscriminate disposal of waste; and Accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g. paints.	Limit impacts on agricultural activities.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability
Construction of additional mining infrastructure and opencast mine and diversion of river	Visual aspects	Visibility from sensitive receptors / visual scarring of the landscape and impact on 'Sense of Place' as a result of the visibility of the mining site including the waste management facilities and mining activities.	Early detection of impacts and remediation thereof.	Reducing disturbing noise/light and vibration to outside boundaries.
Closure and Rehabilitation	Visual aspects	Visibility from sensitive receptors / visual scarring of the landscape as a result of the closure and rehabilitation activities.	Early detection of impacts and remediation thereof.	
Closure and Rehabilitation	Visual aspects	Visibility of solid domestic and operational waste.	Early detection of impacts and remediation thereof.	
All	Traffic	Continued change in the traffic patterns as a result of increased traffic entering and exiting the operations on the surrounding road infrastructure and existing traffic.	To limit impacts on traffic as a result of the project.	Traffic Control and prevention of impacts

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Construction of additional infrastructure and opencast mining	Traffic	Nuisance, health and safety risks caused by increased traffic on an adjacent to the study area including cars and heavy vehicles.	To limit impacts on traffic as a result of the project.	
Construction of surface infrastructure	Air Quality	The construction of infrastructure. Activities of vehicles on access roads, levelling and compacting of surfaces, as well localised drilling and blasting will have implications on ambient air quality. The above-mentioned activities will result in fugitive dust emissions containing TSP (total suspended particulate, giving rise to nuisance impacts as fallout dust).	To decrease impacts on air quality	Early detection and prevention of possible impacts. Implementation of dust suppression to reduce impact. Ensure health and safety of mine workers within the underground sections as well as the surrounding environment. Conservation of the soil resource

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
General transportation, hauling and vehicle movement on site	Air Quality	Transportation of the workers and materials in and out of mine site will be a constant feature during the construction phase. This will however result in the production of fugitive dust (containing TSP, as well as PM10 and PM2.5) due to suspension of friable materials from earth roads. It is anticipated this activity will be short-term and localised and will seize once the construction activities are finalised. Haul trucks generate the majority of dust emissions from surface operations. Observations of dust emissions from haul trucks show that if the dust emissions are uncontrolled, they can be a safety hazard by impairing the operator's visibility. Substantial secondary emissions may be emitted from material moved out from the site during grading and deposited adjacent to roads. Passing traffic can thus loosen and re-suspend the deposited material again into the air. In order to minimize these impacts the stockpiles should be vegetated for the duration that it is exposed.	To decrease impacts on air quality	Early detection and prevention of possible impacts. Implementation of dust suppression to reduce impact. Ensure health and safety of mine workers within the underground sections as well as the surrounding environment. Conservation of the soil resource
Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles.	Air Quality	Use and maintenance of the access road. Dust from material handling and wind erosion from stockpiles may result in increased fugitive emission sources and may impact on the ambient air quality specifically an increase in daily PM10 concentrations and TSP concentrations	To decrease impacts on air quality	Early detection and prevention of possible impacts. Implementation of dust suppression to reduce impact. Ensure health and safety of mine workers within the underground sections as well as the surrounding environment. Conservation of the soil resource

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
Closure and Rehabilitation	Air Quality	Dust (soil and ore fines) pollution due to rehabilitation activities and heavy-duty vehicles.	To decrease impacts on air quality	
Closure and Rehabilitation	Air Quality	Windborne dust (soil and ore fines) and vehicle fumes and particulate matter PM10, altering air quality.	To decrease impacts on air quality	
Closure and Rehabilitation	Noise and Lighting	Nuisance and health risks caused by an increase in the ambient noise level as a result of noise impacts associated with the operation of heavy-duty vehicles and equipment.	To prevent impact of noise and lighting nuisance.	Reducing disturbing noise/light and vibration to outside boundaries.
Closure and Rehabilitation	Noise and Lighting	Disturbance due to vibrations caused by heavy duty vehicles.	To prevent impact of noise and lighting nuisance.	
Closure and Rehabilitation	Noise and Lighting	Impact of security lighting on surrounding landowners and animals.	To prevent impact of noise and lighting nuisance.	
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Ground vibration	To prevent impacts on people and animals and to avoid damage to structures.	Safe mining environment. Prevention of blasting related impacts. Adhere to Risk Assessment and specifications for Blasting set out within the report to ensure no harm befalls. Avoid and control through implementation of preventative measures (e.g. Fire breaks, Blasting procedures, hazardous substances management).
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Air Blasting	To prevent impacts on people and animals and to avoid damage to structures.	
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically - Fly Rock	To prevent impacts on people and animals and to avoid damage to structures.	
Opencast Mining, Drilling and Blasting	Blasting	Blasting hazard, specifically on sensitive close by receptors	To prevent impacts on people and animals and to avoid damage to structures.	

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
All	Health and Safety	Possibility of mining activities and workers causing veld fires, which can potentially cause injury and or loss of life to mine workers and surrounding landowners, visitors and workers.	Minimise impacts on socio-economic environment.	Early detection and prevention of possible impacts. Implementation of dust suppression to reduce impact. Ensure health and safety of mine workers within the underground sections as well as the surrounding environment. Conservation of the soil resource
All	Health and Safety	Increased risk to public health and safety: Dangerous areas including the waste management activities and waste poses health risks and possible loss of life to mine workers and visitors to the site.	Minimise impacts on health and safety environment.	
All	Health and Safety	Increased risk to public and worker health and safety	Minimise impacts on health and safety environment.	
All	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Minimise impacts on socio-economic environment.	To ensure the implementation of the Social Labour Plan
All	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners specifically the close-by receptors such as Mr Swanepoel, the Gogo identified by the community and the Potgieter farmers	Minimise impacts on socio-economic environment.	Avoid through preventative measures (e.g. communication with landowners, timing of activities). Control through implementation of EMPR mitigation measures (e.g. Noise abatement measures).
All	Socio-Economic: **Positive Impacts**	Extended employment provision due to the implementation of the mining activities, allowing mining activities to commence.	Minimise impacts on socio-economic environment.	Increased Employment Opportunities in the Long term, Increased employment for the surrounding communities. Implementation of the Social and Labour Plan Implement Social and Labour Plan with the specific objectives:

ACTIVITY	ASPECTS AFFECTED	POTENTIAL IMPACT	MANAGEMENT OBJECTIVES	MANAGMENT OUTCOMES
All	Socio-Economic: **Positive Impacts**	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Minimise impacts on socio-economic environment.	To ensure effective transformation as envisaged in the Minerals and Petroleum Resources Development Act (28/2002) the Regulations, and the Mining Charter To promote fair and equitable employment practices as prescribed in the Employment Equity Act (55/1998). The social and economic advancement of the community influenced and affected by 2 Seam (Pty) Ltd. The positively strive towards equitable practices in accordance with the procurement plan. Supporting, utilising and building local economy
Closure and Rehabilitation	Health and Safety	Possibility of closure activities and workers causing veld fires, which can potentially cause injury and or loss of life to workers and surrounding landowners and visitors.	Minimise impacts on socio-economic environment.	
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Health and Safety	Increased risk to public health and safety: Dangerous areas including the waste management facilities poses health risks and possible loss of life to mine workers and visitors to the site.	Minimise impacts on socio-economic environment.	Early detection and prevention of possible impacts. Restoration of Landscape function and Capability, adhere to management outcomes/mitigation measures as described for Operational phase.
Rehabilitation of site, removal of infrastructure, closure of waste management facilities (including Stormwater)	Socio-Economic	Socio-economic impact on farmers, labourers and surrounding landowners and residents due to negative impacts on groundwater, dust pollution, noise pollution etc.	Minimise impacts on socio-economic environment.	
Closure and Rehabilitation	Socio-Economic	Economic impact should there be an incident of public health and safety.	Minimise impacts on socio-economic environment.	
Closure and Rehabilitation	Socio-Economic	Sourcing supplies from local residents and businesses boosting the local economy for an extended period of time.	Minimise impacts on socio-economic environment.	To enhance the socio-economic benefits of the project. Focus on skill-transfer.
Closure and Rehabilitation	Socio-Economic	Reduced period of providing employment for local residents and skills transfer to unskilled and semi-skilled unemployed individuals.	Minimise impacts on socio-economic environment.	To enhance the socio-economic benefits of the project. Focus on skill-transfer.

15.7 FINAL ALTERNATIVES

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

Alternatives have been described within Section 7. The positioning of the current mining areas was informed by the position of the mineable resource and ensuring a feasible access point to the mineable resource.

16 ASPECTS FOR INCLUSION AS CONDITIONS OF AUTHORIZATION

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorization.

Refer to Table 38 for conditions which could possibly be included in the Environmental Authorisation. The Mitigation measures as specified within the Table 40 and within Part B: EMPR are to be included in the Environmental Authorisation.

To ensure compliance with, and implementation of the EMPr by:

- Appointing of a suitably qualified individual to oversee implementation of the EMPr during all phases of the project; and
- Appointing a suitably qualified Environmental Control Officer to undertake audits on a regular basis throughout the construction phase.

To ensure that all staff, contractors and sub-contractors are aware of and understand the requirements of the EMPr and environmental issues in relation to their individual areas of work by:

- Developing an induction and training program covering the EMPr, environmental awareness, dealing with environmental incidents and waste management; and
- Advising staff commissioned during pre-construction and construction, including sub-contractors, of EMPr requirements through the induction program as well as on notice boards at the contractor's camps during construction and notice boards during operation. These notice boards should cover the EMPr, environmental awareness, dealing with emergencies and waste management.

Submission of a Water Use License Application and the undertaking of all relevant specialist studies for that purpose (WUL in process). A detailed water balance will need to be produced before commencement and needs to include all water uses, volumes and rates.

It is recommended that the groundwater monitoring network improvements as per Section 8.1.2 in Part B: EMPR be implemented.

It is recommended that the numerical groundwater model and transport model be updated annually

A specialist Aquatic Environmental Control Officer (AECO) must be on site for the duration of the process of the river diversion and rehabilitation.

The proposed mine has to be held accountable for any environmental damage caused as a result of their mining process as prescribed by the need for environmental liability financial provision.

The Air Quality Monitoring Programme needs to be continued with as per the current monitoring programme.

SASS needs to be implemented at the mine as indicated in Section 8.1.4 in Part B: EMPR.

Continue with the approved Surface Water monitoring programme Section 8.1.3 in Part B: EMPR.

The recommendations made by the Heritage Specialist in terms with the National Heritage Resources Act (25 of 1999) in order to avoid the destruction of heritage remains associated with the areas demarcated for development need to be included as discussed in Table 38.

17 DESCRIPTION OF ANY ASSUMPTION, UNCERTAINTIES AND GAPS IN KNOWLEDGE

(Which relate to the assessment and mitigation measures proposed?)

Please refer to Section 13 giving a description of all the "Limitations and Assumptions" of the study. No other uncertainties are known at this stage relating to the assessment or the mitigation measures.

18 REASONED OPINION AS TO WHETHER THE ACTIVITIY SHOULD OR SHOULD NOT BE AUTHORISED

18.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

Please refer to Section 15.4 for the impact statements. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that post the provided mitigation, should prevent the proposed project from proceeding. The proposed 2 Seam amendment and associated infrastructure can, therefore, go ahead.

18.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORIZATION

Please refer to Section 16, which states the conditions which could possibly be included is provided in Table 38.

18.2.1 Rehabilitation Requirements: Closure Objectives

Adhere to the Closure and Rehabilitation Plan (Appendix 15). The following broadly accepted principles have been adopted to guide the preliminary closure planning for 2 SEAM:

- Providing the vision, objectives, targets and criteria for final rehabilitation, decommissioning, and closure of the project.
- Outlining the design principles for closure.
- Explaining the risk assessment approach and outcomes and link closure activities to risk rehabilitation.
- Detailing the closure actions that clearly indicate the measures that will be taken to mitigate and/or manage identified risks and describes the nature of residual risks that will need to be monitored and managed post closure.
- Committing to a schedule, budget, roles and responsibilities for final rehabilitation, decommissioning and closure of each relevant activity or item of infrastructure.
- Identifying knowledge gaps and how these will be addressed and filled.
- Detailing the full closure costs for the life of project at increasing levels of accuracy as the project develops and approaches closure in line with the final land use proposed; and
- Outlining monitoring, auditing, and reporting requirements.

According to the NEMA GNR 1147 the objective of the final rehabilitation, decommissioning, and closure plan, is to identify a post-mining land use that is feasible.

- Rehabilitation and Closure Planning must comply with relevant legislation, as well as with generally accepted good practices.
- Closure objectives must be realistic and achievable.
- Closure related rehabilitation of land disturbed by mining must be conducted to allow for pre-determined post-mining land uses, as agreed with stakeholders. In this regard, the rehabilitated areas must be safe, stable, and non-polluting for integration into the existing land uses.
- Closure actions / measures conceptualised and implemented must limit the potential adverse effects of the closed mine site on the receiving environment, and thereby ensure that the quality of life of the surrounding / resident communities is not compromised after closure by possible threats to the health and safety of people and their animals.
- Closure measures must be sustainable under foreseeable natural events.
- Priority must be given to the use of locally available natural materials and / or vegetation as opposed to imported / synthetic material and / or exotic vegetation. The measures provided must be appropriate for the site-specific conditions.
- Manage activities within the study area in order to maintain and/ or improve ecological integrity of the study area.
- Maximise the service provision and ecological function of the watercourse
- The success, performance and sustainability of the closure measures must be demonstrated and confirmed by suitable monitoring and measurement for an adequate period post closure.
- A site with limited residual care-and-maintenance requirements must be sought. In this regard, proven sustainable passive measures must be favoured over measures that require ongoing maintenance and / or active care post-closure.
- Involvement of stakeholders must be undertaken in a meaningful manner to inform Closure planning by reflecting local requirements, priorities, and preferences, as well as the requirements as stipulated in local and provincial planning as well as the municipal Integrated Development Plans / frameworks; and
- Closure should be achieved as efficiently and cost effectively as possible.

18.2.2 SPECIFIC CLOSURE ACTIONS

Specific rehabilitation and closure actions forming the basis of the rehabilitation and closure operations. The actions are aligned with the mitigations defined in the comparative risk assessment. These actions are planned to comply with the requirements of the vision and objectives. The closure actions form the basis for the closure liability assessment. The actions are indicated according to the following categories:

- Mining area – Open pit.
- Topsoil Berm.
- Overburden Stockpiles, Haul Road.
- Office Complex (Security, offices, PCD, Plant); and
- General surface rehabilitation and water management.

Mining Area - Open pit & Final void

The concurrent rehabilitation during the operations, will limit the mass earthworks during final rehabilitation. Final rehabilitation and closure measures, once mining has ceased, include the following:

The overburden will initially be hauled to an above-ground overburden dump, the overburden material will be utilised to be backfilled into the final void. The concurrent backfilling during the operations, will limit the mass earthworks to backfill the final void. The backfilled box cuts, and voids shall follow the natural surrounding topographical features and ensure minimised slopes to maximise potential land capability and reduce erosion risks as far as possible. None of the areas must be overfilled as this may result in a shortfall of material required to require the final landform. Stormwater berms should be installed on slopes. This will be to limit the length of a single slope and to create areas where vegetation can be established.

Rehabilitation should follow the following requirements:

- Each horizon (i.e., Horizon A – Topsoil, Horizon B – subsoil and Hard overburden Rock) should be backfilled following the sequence it was removed.
- Shape and contour slopes to be free draining and non-erosive.
- Rocks or clay to be utilised to protect steep sections of the slope.
- Load, haul topsoil or shovel from the topsoil berm, tip at the correct spacing and level to the specified depths (assumed 300mm).
- Conduct fertility sampling, have the soils analysed at an accredited laboratory and define amelioration measures based on the results.
- Cross rip replaced soils with an agricultural ripper to alleviate compaction and scarify the area; and
- Establish vegetation (includes specified amelioration and seed mix application).

Topsoil berm

- Load, haul topsoil or shovel topsoil berm onto slopes and backfilled areas.
- Ensure that the footprint is cleared of any fugitive material that could damage agricultural equipment.
- Cross rip in-situ soils with an agricultural ripper to alleviate compaction and scarify the area.
- Conduct fertility sampling, have the soils analysed at an accredited laboratory and define amelioration measures based on the results; and
- Establish vegetation (includes specified amelioration and seed mix application).

Haul roads

Haul roads will remain intact and be utilised during the final void backfilling operation. Sections of the road will remain for monitoring op the area and as farm roads. Rehabilitation will commence after topsoil has been replaced on the opencast post mining landform. The following actions will be implemented.

- Remove all signage.
- Re-establish natural drainage.
- Rip haul roads with construction equipment to a depth of at least 0.5 m, and over-rip with agricultural equipment to create suitable conditions for vegetation establishment.
- Profile to be free draining and emulate the natural surface topography.

- Conduct fertility sampling, have the soils analysed at an accredited laboratory and define amelioration measures based on the results; and
- Establish vegetation (includes land preparation, specified amelioration and seed mix application).

Infrastructure

All infrastructures will be removed from the mining area. Container, mobile office will be removed, and the footprint rehabilitated and re-vegetated. Contractors will be responsible for the removal of any infrastructure establish by the contractor.

Closure actions as detailed in the "Guidelines for the Rehabilitation of Mined Land" include:

- All power and water services to be disconnected and certified as safe prior to commencement of any demolition works.
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition.
- All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary disposal yards.
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/ chemical residue remains.
- All above ground electrical, water and other service infrastructure and equipment to be removed and placed in designated temporary salvage yards, to be sold as scrap.
- Electrical, water and other services that are more than one metre below ground surface will remain.
- All pipes and structures deeper than one metre need to be sealed to prevent possible ingress and ponding of water.
- Non-hazardous concrete slabs and footings will be broken. This concrete (and metal) will be broken up and disposed of in the base of the pits.
- Soils beneath the plant, storage tanks and chemical storage areas will be sampled. Any contaminated soils found will be removed for disposal.
- Sacrificial layer underplant will be removed and coal will be removed, discard will be placed back into the final void.
- Plant and equipment will be removed from site and concert will be removed and used as backfill (be placed more than 1m under surface level); and
- All excavations resulting from demolition of plant, buildings, roads, etc. and earth structures will be left in a safe manner.

Pollution Control Dam

Pollution control dam will be retained during the majority of the closure period to provide water for closure activities as well as to capture any flows of contaminated water which may be generated on the site. The expectation is that as rehabilitation continues the contaminated water catchment area will reduce until there is no further need for containment. During this period the contained contaminated water will be evaporated or used for dust suppression. The dam will be dozed flat, and the area shaped to form a stable landform congruent with the surrounding landscape during final closure.

- Demolish all concrete structures.
- Remove any silt that accumulated in the dam, sample the silt according to Hazardous waste classification and dispose of accordingly.
- Remove liners and dispose of; accordingly, and
- Profile footprint to be free draining with no low points to accumulated water.

General Surface Rehabilitation

The general surface rehabilitation measures for the proposed opencast pit are limited to the following:

- Seeding of areas with natural grasses.
- Development of free draining profile as per landform design.
- Maintaining of area to prevent erosion.
- Soils, which should have been stripped according to form, should be replaced according to a pre-existing plan.
- A soil reserve should be retained to repair localised surface subsidence areas.
- Compaction should be minimised by use of appropriate equipment and replacing soils to the greatest possible thickness in single lifts.
- Soils should be moved when dry to minimise compaction. If they have to be moved when wet, shovel and truck should be used as bowl scrapers create massive compaction when moving wet soils.
- Where multi-layer soil profiles are re-created, running over the lower layers with heavy equipment should be minimised.
- Minimise compaction during smoothing of replaced soils by using dozers rather than graders.
- Following placement, all soils should be ripped to full rooting depth; and
- Where natural revegetation is not possible, the soils should be tilled to produce a seed-bed suitable for the plant species selected for seeding.
- Lime and superphosphate are applied to the surface.
- These ameliorants are then incorporated by deep ripping, which penetrated 100 mm through the soil into the underlying overburden material.
- Compound (NPK + Zn) fertilizer is applied and disced in as part of seedbed preparation.
- A grass seed mix is then planted, usually with first rains, or after rains have commenced; and
- The site is then mulched using locally obtained grass; this is to stimulate the long-term establishment of indigenous vegetation and to reduce erosion during early plant growth.
- No cost is allocated for any shortfall in topsoil. A topsoil balance to be established and any shortfall shall be costed for, and provision made before final closure.

Operational storm water measures

The measures are assumed to be limited to shallow trenching and berm construction. All berms, trenches and paddocks will be flattened by backfilling the excavations or dozing the structures to a functioning topography, except where they have been positioned prevent additional water flowing onto rehabilitated pit areas. The following will be undertaken:

- Shape the area and slopes to be free draining
- Cross rip in-situ soils with an agricultural ripper to alleviate compaction.
- Conduct fertility sampling have the soils analysed at an accredited laboratory and define amelioration measures based on the results; and
- Establish vegetation (includes land preparation, specified amelioration and seed mix application).

Long term water issues

Provision has been made for a passive water treatment system. Monitoring of groundwater and surface water resources will take place during the closure and aftercare phases of the project. As passive treatment system will be design and implemented when decant is detected.

During the closure phase the following will be undertaken:

- Installation of monitoring boreholes in the rehabilitated opencast area.

The groundwater monitoring point located within the rehabilitated are will be utilised to track the pollution plume and the possible formation of ADM. These mitigation and management measures will be investigated in future updates and the associated cost, management measures will be included.

Aftercare and Maintenance

During after care and maintenance a number of actions, monitoring and audits will be required to establish if the Relinquishment Criteria for each of the aspect have been reached. The Proposed Relinquishment criteria are presented in the Closure Report (Appendix 15).

Any corrective measures required as a result of the monitoring or audits must be implemented during this period. It is anticipated that a stable final landform will be created within a period of 5 years. The annual audit will be utilised to established if the relinquishment criteria have been reached or if additional measures are required.

18.3 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

The 2 Seam Mine is an existing operation. Including the additional OC4A and OC4B pits will extend the Life of Mine until 2042.

19 FINANCIAL PROVISION

Environmental management infrastructure that is required at the outset will be financed out of the project capital. On-going environmental management and rehabilitation as identified in this document and as set out in the EMP will be funded from working costs during the life of the project.

19.1 EXPLAIN HOW THE AFORESAID AMOUNT WAS DERIVED

This section provides details on the closure cost. The outlined assumptions and limitations also underpin the basis of this closure cost determination. It is important to note that the estimation is based on existing information. The closure cost calculation has been performed in accordance with NEMA GNR 1147 financial provision, in the transitional period.

Due to the current uncertainty surrounding the change in the financial provision regulations, this report has utilised the current existing regulations but has only calculated the final rehabilitation cost and no concurrent rehabilitation cost is included based on the mine schedule.

Concurrent annual environmental costs will be included into the operating budget of the mine. The closure costs of the aspects linked with the project have been determined using current contractor cost.

This Closure Cost Assessment was compiled in order to comply with the requirements of Regulation 54(2) of the MPRDA. This financial provision is submitted in terms of regulation 53 and 54 of the MPRDA, within the extended transitional period as presented in Government Notice No. R. 495 of 11 June 2021: "*unless regulation 17A, a holder of a right or permit, who applied for such right or permit prior to 20 November 2015, regardless when the right or permit was obtained –*

(a) must by no later than 19 June 2022 comply with these Regulations; and

(b) shall, until 19 June 2022, be regarded as having complied with the provisions of these Regulations, if such holder has complied with the provisions and arrangements regarding financial provisioning, approved as part of the right or permit issued in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)."

19.1.1 METHODOLOGY

The costing methodology applied is summarized as follows:

- Developed an itemised plan indicating an inventory of closure aspects based on the proposed mine schedule and discussions with mine personnel.
- Defined specific rehabilitation actions for each through reviewing specialist studies, impact assessment outcomes, industry guidelines, conceptual modelling, and rehabilitation experience.
- Calculated monitoring and maintenance costs.
- Compiled a dedicated closure spreadsheet to determine the closure costs of the quantified actions through applicable rates. All quantities have been provided by the mine.
- Determine and update applicable unit rates by applying a Consumer Price Index (CPI) linked increase
- Determine Contingencies; Preliminary and General (P&G)
- DMR Guideline Process Approach

Refer to the Closure Report attached in Appendix 15 for the detailed methodology on how the final closure liability was estimated for 2 Seam.

The un-scheduled closure liability assessment is presented in Table 41. The scheduled cost for OC4A is presented in Table 42 and the scheduled cost for OC6 is presented in Table 43.

Table 41:Un-scheduled Closure Liability – 2 Seam

CALCULATION OF THE QUANTUM							
Mine:	2 SEAM	**Location:**	MP				
Evaluators:	Elemental Sustainability	**Date:**	10-Nov-22				
			A	**B**	**C**	**D**	**E=A*B*C*D**
No.:	**Description:**	**Unit:**	**Quantity**	**Master rate**	**Multiplication**	**Weighting**	**Amount**
					Factor	**Factor 1**	**(Rands)**
3	Rehabilitation of access roads	m2	16500	R 42,10	1	1	R 694 720,41
6	Opencast rehabilitation including final voids & ramps	ha	20,89	R 265 044,10	1	1	R 5 536 771,21
8 (A)	Rehabilitation of overburden & spoils	ha	48,14	R 176 696,07	1	1	R 8 506 148,59
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	5,06	R 639 192,70	1	1	R 3 234 315,06
10	General surface rehabilitation	ha	43,77	R 139 973,08	1	1	R 6 126 509,88
13	Water management	ha	43,77	R 53 221,71	1	1	R 2 329 471,60
14	2 to 3 years of maintenance & aftercare	ha	43,77	R 18 627,60	1	1	R 815 315,06
15 (A)	Specialist study	SUM	5%	R 265 375,00	1	1	R 265 375,00
			Subtotal 1 (Sum of 1-15 above)				
			Escalated Sum of 1-15 above				R 27 508 626,81
			Weighting factor 2			1.00	R 27 508 626,81
			Preliminary and General			12%	R 3 301 035,22
			Contingencies			10%	R 2 750 862,68
			(Subtotal 1 plus P&G and contingencies) Sub Total 2				**R 33 560 524,70**
			VAT (15%)				R 5 034 078,71

	GRAND TOTAL	**R 38 594 603,41**

Table 42: Closure Cost Assessment – Un-scheduled – OC04A

CALCULATION OF THE QUANTUM							
Mine:	2 SEAM - OC4A	**Location:**	MP				
Evaluators:	Elemental Sustainability	**Date:**	10-Nov-22				
			A	**B**	**C**	**D**	**E=A*B*C*D**
No.:	**Description:**	**Unit:**	**Quantity**	**Master rate**	**Multiplication**	**Weighting**	**Amount**
					Factor	**Factor 1**	**(Rands)**
2(B)	Processing Plant	m2	1000,00	R 372,54	1	1	R 372 544,04
3	Rehabilitation of access roads	m2	0	R 42,10	1	1	R 0,00
6	Opencast rehabilitation including final voids & ramps	ha	4,50	R 265 044,10	1	1	R 1 192 698,44
8 (A)	Rehabilitation of overburden & spoils	ha	0,00	R 176 696,07	1	1	R 0,00
8 (C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	ha	0,50	R 639 192,70	1	1	R 319 596,35
10	General surface rehabilitation	ha	4,50	R 139 973,08	1	1	R 629 878,87
13	Water management	ha	4,50	R 53 221,71	1	1	R 239 497,69
14	2 to 3 years of maintenance & aftercare	ha	4,50	R 18 627,60	1	1	R 83 824,19
15 (A)	Passive Treatment System	ha	2,50	R 720 000,00	1	1	R 1 800 000,00
			Subtotal 1 (Sum of 1-15 above)				
			Escalated Sum of 1-15 above				R 4 265 495,54
			Weighting factor 2			1.00	R 4 265 495,54
			Preliminary and General			12%	R 511 859,47
			Contingencies			10%	R 426 549,55
			(Subtotal 1 plus P&G and contingencies) Sub Total				**R 5 203 904,56**

	2	
	VAT (15%)	R 780 585,68
	GRAND TOTAL	**R 5 984 490,25**

Table 43: Closure Cost Assessment – Un-scheduled – OC06

CALCULATION OF THE QUANTUM							
Mine:	2 SEAM - OC6	**Location:**	MP				
Evaluators:	Elemental Sustainability	**Date:**	2022/11/10 (as assessed in OC6 application)				
			A	**B**	**C**	**D**	**E=A*B*C*D**
No.:	**Description:**	**Unit:**	**Quantity**	**Master rate**	**Multiplication**	**Weighting**	**Amount**
					Factor	**Factor 1**	**(Rands)**
2(A)	Demolition of steel buildings and structures	m2	270,00	R 212,69	1	1	R 57 426,30
2(B)	Demolition of reinforced concrete buildings and structures	m2	780,00	R 313,43	1	1	R 244 475,40
3	Rehabilitation of access roads	m2	17100,00	R 38,06	1	1	R 650 826,00
5	Demolition of housing and/or administration facilities	m	1580,00	R 425,38	1	1	R 672 100,40
6	Opencast rehabilitation including final voids & ramps	ha	6,31	R 222 986,17	1	1	R 1 407 042,73
8 (A)	Rehabilitation of overburden & spoils	ha	15,89	R 148 657,45	1	1	R 2 362 612,85
10a	General surface rehabilitation (topsoil)	ha	18,42	R 117 537,89	1	1	R 2 165 047,93
10b	General surface rehabilitation (seeding)	ha	19,47	R 15 885,88	1	1	R 309 298,08
12	Fencing	m	4210,00	R 134,33	1	1	R 565 529,30
13	Water management	ha	6,31	R 44 776,34	1	1	R 282 538,71
14	2 to 3 years of maintenance & aftercare	ha	19,47	R 15 671,72	1	1	R 305 128,39
15 (A)	Specialist study (Groundwater boreholes into mine area)	ha	1,00	R 319 785,00	1	1	R 319 785,00

	Subtotal 1 (Sum of 1-15 above)	

	Escalated Sum of 1-15 above		R 9 341 811,09
	Weighting factor 2	1.00	R 9 341 811,09
	Preliminary and General	12%	R 1 121 017,33
	Administration and supervision costs	6%	R 560 508,67
	Closure Plan		R 159 893,00
	Contingencies	10%	R 934 181,11
	(Subtotal 1 plus P&G and contingencies) Sub Total 2		**R 12 117 411,20**
	VAT (15%)		R 1 817 611,68
	GRAND TOTAL		**R 13 935 022,88**

19.2 DESCRIBE THE CLOSURE OBJECTIVES AND THE EXTENT TO WHICH THEY HAVE BEEN ALIGNED TO THE BASELINE ENVIRONMENT DESCRIBED UNDER REGULATION 22 (2) (D) AS DESCRIBED IN 2.4 HEREIN

Adhere to the Closure and Rehabilitation Plan compiled for the specific project (Appendix 15) and refer to Objectives provided per item in Section 18.2.1. above.

19.3 CONFIRM SPECIFICALLY THAT THE ENVIRONMENTAL OBJECTIVES IN RELATION TO CLOSURE HAVE BEEN CONSULTED WITH LANDOWNER AND INTERESTED AND AFFECTED PARTIES

The environmental objective in relation to closure have been made available to all registered I&APs for comment. All comments received and the relevant meeting minutes will be appended to this report.

19.4 PROVIDE A REHABILITATION PLAN THAT DESCRIBES AND SHOWS THE SCALE AND AERIAL EXTENT OF THE MAIN MINING ACTIVITIES, INCLUDING THE ANTICIPATED MINING AREA AT THE TIME OF CLOSURE

Refer to Section 18.2.1 above. All infrastructure established will be removed and rehabilitated in accordance with the approved Closure Plan and Final Land use. Also refer to Appendix 15.

19.5 EXPLAIN WHY IT CAN BE CONFIRMED THAT THE REHABILITATION PLAN IS COMPATIBLE WITH THE CLOSURE OBJECTIVES

The rehabilitation plan will be compiled in accordance with the objectives and goals according to the Mine and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) as amended and GNR 1147 of the National Environmental Management Act, 1988 (Act No. 107 of 1998). Refer to Section 19.2. A preliminary Closure Plan has been drafted and is included in Appendix 15.

19.6 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION REQUIRED TO MANAGE AND REHABILITATE THE ENVIRONMENT IN ACCORDANCE WITH THE APPLICABLE GUIDELINE

The Closure Quantum was conducted and updated in 2022 to ensure compliance with annual update required since the initial submission was made. Refer to Table 41, Table 42 and Table 43.

19.7 CONFIRM THAT THE FINANCIAL PROVISION WILL BE PROVIDED AS DETERMINED

2 Seam will provide the amount/financial guarantee as specified to the DMRE. These guarantees are audited on a yearly basis and need to be updated on a yearly basis.

20 DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

20.1 DEVIATIONS FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

The tailings storage facility was removed as an activitiy from this application during the EIA phase.

The MPTA requested that a Cost Benefit Analysis (CBA) be undertaken, however, this was not included as all activities will occur within the existing mining area.

20.2 MOTIVATION FOR THE DEVIATION

The CBA was not included as the proposed activities will take place within the existing mining right boundary and the Agricultural Impact Assessment Specialist indicated that the mine will not have a neglible impact on the land use or land capability.

The tailings storage facility was removed as an activitiy from this application during the EIA phase as the tailings will be filter pressed and there will no longer be a need for the tailings storage facility.The proposed processing plant has a filter press and the tailings will be backfilled into opencast pit as part of rehabilitation.

21 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

21.1 COMPLIANCE WITH THE PROVISIONS OF SECTIONS 24(4)(A) AND (B) READ WITH SECTION 24 (3) (A) AND (7) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) THE EIA REPORT MUST INCLUDE THE FOLLOWING:

21.1.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial *diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as Appendix*.

2 Seam is an existing mine with a SLP in place. The proposed activities will extend the LoM and ensure the job security of the existing workers.

21.1.1.1 CRIME, HEALTH AND HIV

As the mine is existing no additional influx of foreigners and job seekers should occur started no further negative social impacts such as crime, alcoholism and prostitution in and around the project area are expected. A medium to low or low negative impact is expected, with several positive impacts as well.

21.1.1.2 LAND TENURE, USE AND CAPABILITY

The land tenure and land capability will not be further impacted as the proposed activities will occur within the existing mining right boundary area. Surface impacts and changes in land capability and land use will be expected where the river diversion is proposed.

21.1.1.3 NOISE

The impact of noise from various aspects and equipment of the mining operation will be of medium to low negative significance. Recommendations have been made for mitigation measures to ensure that impacts will be low, managed and monitored (Table 37).

21.1.1.4 AIR POLLUTION

The impact is considered low to insignificant negative significance. The dust generated during associated activities and operational phase may reduce the air quality of the localised air. Occupational Health monitoring as part of the management should be initiated, as well as monthly dust monitoring. Monitoring is to be performed in accordance with the requirements as set out in GNR 827, ASTM D1739 and SANS 1929.

21.1.1.5 LIGHT AND VISUAL ASPECTS

Light and visual impacts will be of low significance overall. Visual impacts, like any other will affect sensitive receptors identified close by more than those on a local scale. That does not mean that the impact should be rated higher, since the impacts rated are based on methodology to ensure objectivity and standard.

21.1.1.6 ECONOMIC OPPORTUNITIES, INFRASTRUCTURE DEVELOPMENT AND EMPLOYMENT

The proposed activities will have the following socio-econonomic impacts:

- The LOM will be increase and the mine will be able to provide for Active treatment

The mine is in process of negotiating with the surrounding mine to contribute to an active treatment system as all the groundwater of the area will accumulate at OC4A as the lowest point.

- OC4A will provide 1.2mil tons of coal

2 Seam to sign contract with Eskom to supply coal from OC4A for a 2-year period.

- The mine will be placed on care and maintenance for a period before historical underground sections can be mined, resulting in job losses.

21.1.2 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

(Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

The heritage assessment for the proposed 2 Seam amendment and associated infrastructure was undertaken by Tobias Coetzee. Mitigation measures have been included in this EIAR and the specialist HIA assessment is included in the impact management tables and EMPr. The proposed activities will not impact on heritage features.

21.2 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist.).

Please refer to Section 7 where alternatives have been discussed in detail.

22 UNDERTAKING

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment Report and the Environmental Management Programme report.

The signed undertaking is included in Section 11 of Part B and is valid for both the Environmental Impacts Assessment (Part A) and the Environmental Management Programme (Part B).

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24 APPENDICES

Appendix 1: Qualifications and Resume of EAP

Appendix 2: Locality Plans (A3)

Appendix 3: Master layout plan / Site Layout information (A3 Drawings)

Appendix 4: Public Participation Documents (

Appendix 5: Specialist report – Agricultural Assessment, Soil and Land Capability Report

Appendix 6: Specialist report – Terrestrial Ecology

Appendix 7: Specialist report – Aquatic Ecology Assessment and Wetland Impact Assessment

Appendix 8: Water Monitoring Report

Appendix 9: Specialist report – Hydrogeology

Appendix 10: Specialist report –Hydropedological

Appendix 11: Specialist report – Heritage Impact Assessment

Appendix 12: Specialist report – Paleontological Impact Assessment

Appendix 13: Specialist report – Risk Assessment

Appendix 14: Rehabilitation Plan

Appendix 15: Closure Assessment