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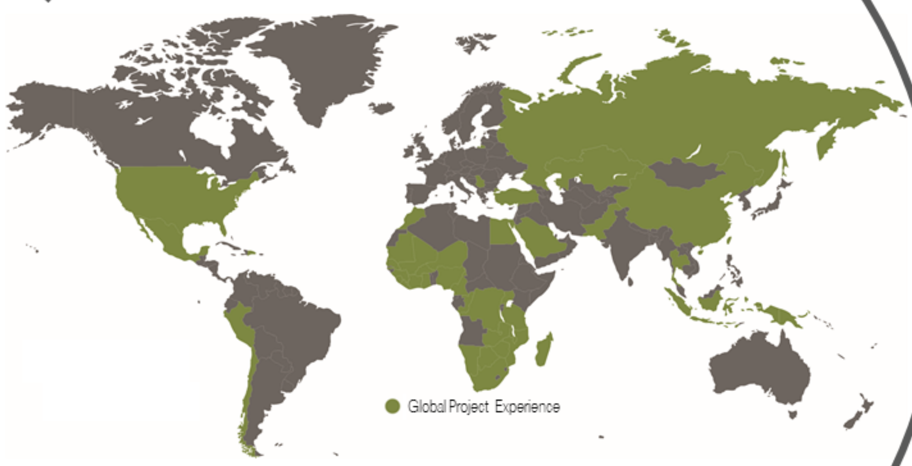

Providing innovative and sustainable solutions throughout the resources sector

Environmental Authorisation for Proposed Additional Infrastructure at the Universal Coal Development III (Pty) Ltd, Ubuntu Colliery, Nkangala, Mpumalanga Province

Surface Water Assessment

Prepared for:

Universal Coal Development III (Pty) Ltd

Project Number:

UCD6097

February 2021

Digby Wells and Associates (South Africa) (Pty) Ltd
Company Registration: 2010/008577/07

Turnberry Office Park,
Digby Wells House.
48 Grosvenor Road,
Bryanston,2191

Phone: +27 (0) 11 789 9495
Fax: +27 (0) 11 789 9495
E-mail: info@digbywells.com
Website: www.digbywells.com

Directors: J Leaver (Chairman)*, NA Mehlomakulu*, A Mpelwane, DJ Otto, M Rafundisani
*Non-Executive

This document has been prepared by Digby Wells Environmental.

Report Type:	Surface Water Assessment
Project Name:	Environmental Authorisation for Proposed Additional Infrastructure at the Universal Coal Development III (Pty) Ltd, Ubuntu Colliery, Nkangala, Mpumalanga Province
Project Code:	UCD6097

Name	**Responsibility**	**Signature**	**Date**
Lungile Lembede	Report Compiler		February 2021
Mashudu Rafundisani	Report Reviewer		February 2021

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DETAILS AND DECLARATION OF THE SPECIALIST

Digby Wells and Associates (South Africa) (Pty) Ltd

Contact person: Lungile Lembede

Digby Wells House
Turnberry Office Park
48 Grosvenor Road
Bryanston
2191

Tel: 011 789 9495
Fax: 011 789 9498
E-mail: lungile.lembede@digbywells.com

Full name:	Lungile Lembede
Title/ Position:	Hydrologist
Qualification(s):	MSc. Hydrology
Experience (years):	3+
Registration(s):	N/A

I, __Lungile Lembede________________________________, declare that: –

1. I act as the independent specialist in this application;
2. I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
1. I declare that there are no circumstances that may compromise my objectivity in performing such work;
2. I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
3. I will comply with the Act, Regulations and all other applicable legislation;
4. I have no, and will not engage in, conflicting interests in the undertaking of the activity;
5. I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

6. All the particulars furnished by me in this form are true and correct; and
7. I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist *Date* February 2021

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EXECUTIVE SUMMARY

Universal Coal Development III (Proprietary) Limited (hereinafter Universal Coal) has appointed Digby Wells Environmental (hereinafter Digby Wells) as the Environmental Assessment Practitioner (EAP) to undertake a Scoping and Environmental Impact Assessment process for environmental authorisation (EA) required for the proposed additional infrastructure at Ubuntu Colliery ("the project"). Ubuntu Colliery is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye Local and Nkangala District Municipalities in the Mpumalanga Province. The objective of this study is to provide a surface water impact assessment as part of the above-mentioned EA process. The scope of the surface water impact assessment includes an update of the baseline water quality and an impact assessment which details the potential risks associated with the project and the provision of mitigation measures to protect the receiving surface water environment. The surface water study was undertaken at desktop level.

Water quality monitoring has been on going at Ubuntu Colliery, existing water quality data and reports were provided by Universal Coal. The major watercourses flowing through the project area are the Wilge River and Kromdraaispruit. Based on the findings of the surface water quality investigation, the sites that show the most exceedances are sites UCBSW2 and UCBSW11. The parameters of concern are EC, Mg, Ca and Cl, which were generally elevated at multiple sites for most of the monitoring period. Fluoride was also elevated at most sites even prior to the commencement of mining within the Ubuntu Colliery. Nitrate was elevated specifically at monitoring point UCBSW2 which is located downstream of 2 tributaries. Agricultural activities are known potential sources of nitrates and this point needs to be monitored closely to identify and rectify the elevated nitrates, which may not necessarily be emanating from mining activities within Ubuntu Colliery.

Total alkalinity was elevated specifically at UCBSW11, which is the most upstream point on Kromdraai tributary with flowing water joining Wilge River. Natural sources of alkalinity include rocks and land surrounding the stream. However, since only UCBSW11 is elevated, this may be caused by human activities such as the presence of limestone which is used to raise the soil pH in agriculture.

It is recommended that the observed water quality be compared to existing mining and associated activities that may be causing exceedances at some sites, especially those that are outliers as was observed with the trend for nitrates. This implies a new activity either within the mine or upstream water users that may be causing the observed change in trends. This will enable the identification of pollutants and remediation of the observed exceedances in water quality parameters. Ongoing water quality monitoring of surface water is imperative during all phases of the project life and post closure to allow for early detection of potential contaminants that may cause unforeseen negative impacts on the receiving environment.

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Appendix A: Impact Assessment Methodology

ACRONYMS, ABBREVIATIONS AND DEFINITION

DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EAP	Environmental Assessment Practitioner
EMPr	Environmental Management Programme Report
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MRA	Mining Right Area
LoM	Life of Mine
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
SS	Suspended Solids
TDS	Total Dissolved Solids
WMA	Water Management Area
WRC	Water Research Commission

Legal Requirement		Section in Report
(1)	A specialist report prepared in terms of these Regulations must contain-	
1.	details of- 1. the specialist who prepared the report; and 2. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Page iii
2.	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Page iii
3.	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1
cA	And indication of the quality and age of the base data used for the specialist report;	Section 5
cB	A description of existing impacts on site, cumulative impacts of the proposed development and levels of acceptable change;	Section 8
4.	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
5.	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of the equipment and modelling used;	Section 5
6.	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure inclusive of a site plan identifying site alternatives;	N/A
7.	an identification of any areas to be avoided, including buffers;	N/A
8.	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
9.	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 4
10.	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 7
11.	any mitigation measures for inclusion in the EMPr;	Section 8

12.	any conditions/aspects for inclusion in the environmental authorisation;	N/A
13.	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8
14.	a reasoned opinion (Environmental Impact Statement) -	Section 10
	whether the proposed activity, activities or portions thereof should be authorised; and	Section 10
	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 10
15.	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
16.	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
17.	any other information requested by the competent authority.	N/A

1. Introduction

Universal Coal Development III (Pty) Ltd (hereafter Universal Coal) has appointed Digby Wells Environmental (hereinafter Digby Wells) as the Environmental Assessment Practitioner (EAP) to undertake a Scoping and Environmental Impact Assessment process for environmental authorisation (EA) required for the proposed additional infrastructure at Ubuntu Colliery ("the project"). Ubuntu Colliery is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye Local and Nkangala District Municipalities in the Mpumalanga Province. The project area is defined as the whole area within which the Mining Right Area (MRA) is located while the study area describes the surface water environmental that is directly affected by the existing mining activities and the proposed new infrastructure to be established within already disturbed land. The objective of this study is to provide a surface water impact assessment as part of the above-mentioned EA process. The scope of the surface water impact assessment includes an update of the baseline water quality and an impact assessment which details the potential risks associated with the project and the provision of mitigation measures to protect the receiving surface water environment. The surface water study was undertaken at desktop level. The detailed project description is detailed in the subsequent sections.

2. Project Description

Universal Coal holds a Mining Right (MR) (MP30/5/1/1/2/10027MR) and EA (17/2/3/N-143) for the formerly known Brakfontein Colliery. The MR was issued in 2017 while the EA was issued in 2013. Since the issuing of these approvals, a name change application for the Brakfontein Colliery was submitted and the MR was amended to reflect what the colliery is now known as: Ubuntu Colliery. This name change was approved in January 2019.

Universal Coal have since undertaken investigations and reconsidered the infrastructure required to undertake the mining (see Section 2.4). This application focuses on the inclusion of new infrastructure not previously considered in the original EA application.

The proposed Project will trigger listed activities as contemplated in the Environmental Impact Assessment (EIA) Regulations, 2014 (GN R 982 of 4 December 2014 as amended by GN R 326 of 7 April 2017) (EIA Regulations, 2014), as amended, promulgated under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA). To comply with the requirements encapsulated in the EIA Regulations, 2014, Universal Coal are required to complete a Scoping and EIA Process for the proposed Ubuntu Project.

2.1. Project Applicant

The Applicant for the Project is Universal Coal. Table 2-1 includes the details of the applicant.

Table 2-1: Applicant Details

Applicant Name:	Universal Coal Development III (Proprietary) Limited
Company Registration No	2008/009596/07
Contact Person	Peter Ntsoane
Telephone	012 460 0805
Physical Address	Universal Coal Head Office 467 Fehrsen Street Brooklyn Pretoria 0181
Postal Address	P O Box 2423 Brooklyn Square 0075

2.2. Project Location

Ubuntu Colliery is located within the Western margins of the Witbank Coalfields within the jurisdiction of the Victor Khanye Local and Nkangala District Municipalities in the Mpumalanga Province (Figure 2-1). The site is located approximately 16km north-east of Delmas town, 14 km and 17 km north of Devon and Leandra, respectively. The colliery is located on Portions 6, 8, 9, 10, 20, 26, 30 and the Remaining Extent of the Farm Brakfontein 264 IR.

2.3. Approved Infrastructure

The authorised infrastructure (as per the approved EMP) includes the following:

- Parking and offices;
- Weighbridge;
- Run of Mine (RoM) pads and Pollution Control Dams (PCD's);
- Mine equipment workshop and stores; and
- Wash bay facility.

The original proposals did not involve any processing infrastructure on site but to transfer the coal to Kangala Colliery for further processing (including crushing, screening and washing). This has subsequently proven to not be a practical solution as crushing and screening is now taking place in the approved pit area with a mobile crusher and screening plant.

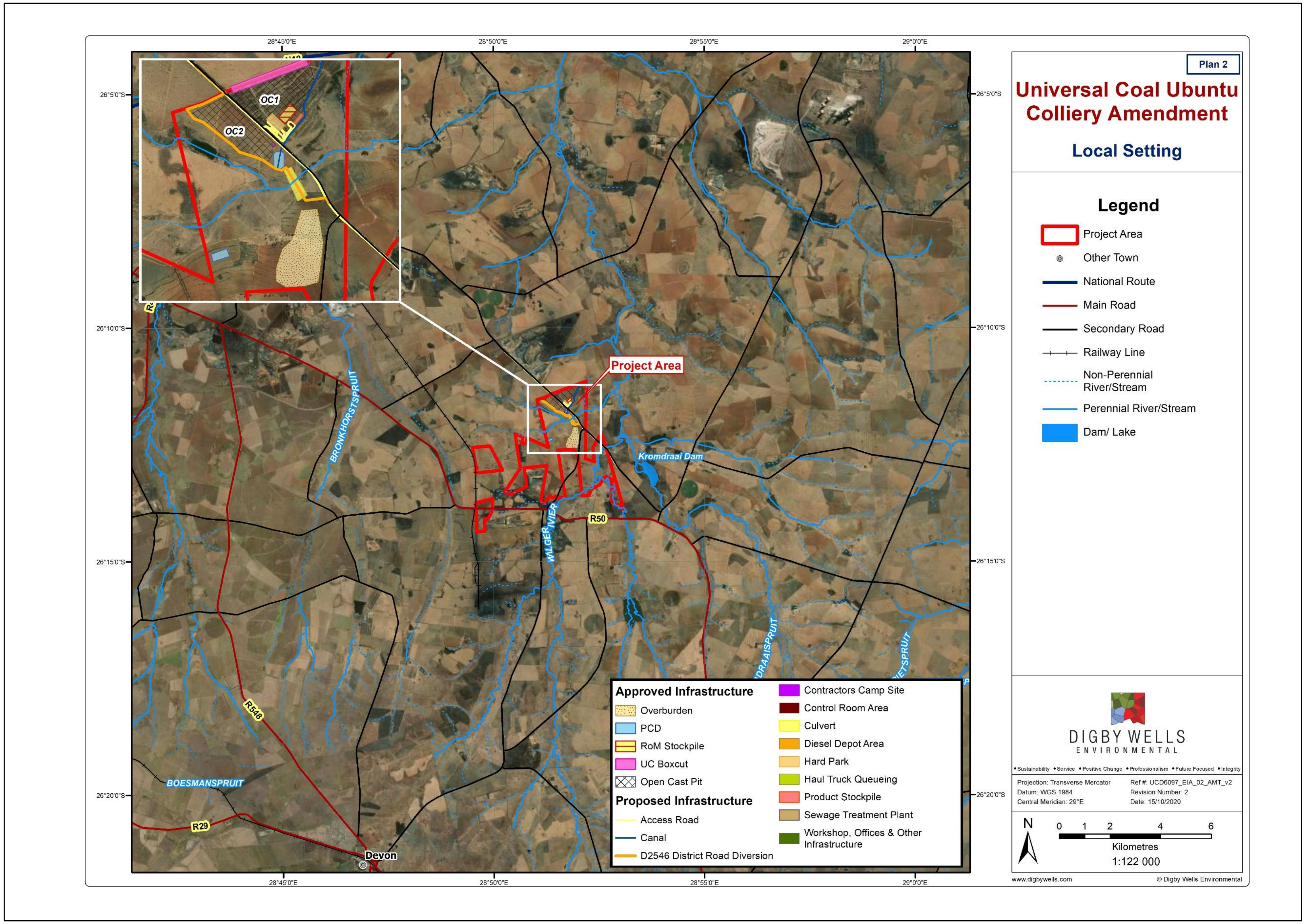


Figure 2-1: Locality Setting for the Ubuntu Colliery Project Area

2.4. New Infrastructure (The Project)

Further to on-site crushing and screening, the following new infrastructure requires environmental authorisation:

- Guard house and access control gate
- Control room
- Toilet facilities
- Haulage truck queueing area
- Hard park area
- Brake test ramp area
- Diesel depot area
- Product stockpile
- Perimeter fencing
- Crushing facilities and stockpile area
- Main access road
- Relocation D2546 District road
- 45 000 litre Silo tank
- LDV and main access road
- Heavy duty truck access road
- Storm water diversion berm/trench
- Access control and boom gate
- Topsoil Safety berm
- Lab office
- Sewage Treatment Plant
- Contractors camp site
- Water Treatment Plant

The following should be further noted pertaining to the above infrastructure:

- The new infrastructure shall be established on previously disturbed land;
- The water treatment plant will treat borehole water sourced from areas in the project footprint. The treated water will be used for domestic use. The daily throughput of the WTP will be 12m^3; and
- The specific designs for the diversion of district road D2546 will be confirmed. It is proposed to have a reserve of 30 m and length of 2,5 km.

Table 2-2: Proposed Project Activities

Phase	Activity
Construction	Surface preparation for infrastructure
	Construction of surface infrastructure
Operational	Operation and maintenance of infrastructure
	Use and maintenance of haul roads (incl. transportation of coal to washing plant)
Decommissioning	Demolition and removal of all infrastructure (incl. transportation off site)

Phase	Activity
	Rehabilitation (spreading of soil, re-vegetation and profiling/contouring)
	Installation of post-closure water management infrastructure

3. Relevant Legislation, Standards and Guidelines

The table below summarises the legal framework applicable to this surface water impact assessment. The assessment includes the construction, operational, decommissioning and closure for the proposed mining activities in the Ubuntu Colliery.

Table 4.1: Applicable Legislation, Regulations, Guidelines and By-Laws

Legislation, Regulation, Guideline or By-Law	Applicability
Section 21 of the National Water Act, 1998 (Act No. 36 of 1998) All water uses listed in terms of Section 21 of the National Water Act (NWA) need to be licenced, unless it is a permissible water use in terms of Section 22 of the NWA	The proposed activities do not constitute as permissible water use in terms of Section 21 of the NWA. Therefore, a Water Use Licence (WUL) for Section 21 is required.
National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), GNR 544 and GNR 545 (Section 24 (1)) Requires that the Environmental Management Plan (EMP) to include a rehabilitation plan, decommissioning plan and mine closure strategy. It must demonstrate pollution control measures and management of mining waste.	The proposed activities will result in environmental impacts which need to be documented and mitigation measures put in place to ensure minimal impacts on the receiving environment.

4. Assumptions, Limitations and Exclusions

The water quality report by Ecosolve Consulting (2020) reviewed by Digby Wells is assumed to present correct water quality data that was collected correctly and analysed appropriately by a SANAS accredited laboratory.

5. Methodology

The management of water resources is legislated under the National Water Act (Act 36 of 1998) (NWA) as amended in the Regulation GN R 704 which specifies the use of water in mining. In managing the surface water resources, the Department of Water affairs (DWA) has promulgated a series of Best Practice Guidelines (BPGs) that guide the use of water in mining. These legislative frameworks are taken into account when considering the specialist surface water assessment.

5.1. Baseline Water Quality Update

The overall objective of the monitoring programme is to establish a surface monitoring database (time series data) that would represent surface water qualities down and up-gradient of the study area prior to the establishment of the of the additional surface infrastructure.

Other objectives of the water monitoring programme are to:

- Serve as an early detection system to allow remedial and mitigation measures to be taken by the mine and affected regions;
- Generate baseline data prior to the proposed establishment of additional infrastructure;
- Identify sources and/or areas of pollution and the extent thereof which constitutes legal implications or liabilities associated with risks of contamination migrating off site;
- Assess compliance with the WUL Limits;
- Assess the impacts of the mining operation and activities on the receiving environment; and
- Recommend management plans to minimise or avoid any mine related impact on the surface water environment.

Water quality monitoring is on-going at Ubuntu Colliery and existing water quality data and reports were provided by Universal Coal. The data were assessed, interpreted and presented to enable the understanding of water quality status for the rivers within and around the project area. This analysis is necessary to identify any water quality changes that may have occurred over time and determine whether this may be the result of mining and associated activities within the Ubuntu Colliery study area, and thereby allow for mitigation or remediation measures. The surface water quality within the Ubuntu Colliery was benchmarked against the WUL Limits for the Ubuntu Colliery as stipulated in the WUL issued by the DWS with Licence No.: 03/B20E/ABCGIJ/4751 on 22 February 2019 (Table 5-1).

Table 5-1: Ubuntu Colliery WUL Limits for Surface Water Quality

Variable	Limits
pH	6.4 – 9.0
Electrical Conductivity (EC) in mS/m	100
Sulphate (SO4) in mg/l	250 – 400
Chloride (Cl) in mg/l	73
Sodium (Na) in mg/l	140
Magnesium (Mg) in mg/l	45
Calcium (Ca) in mg/l	54
Fluoride (F) in mg/l	0.52

Variable	Limits
Nitrate (NO_3) in mg/l	7.9
Total Alkalinity ($CaCO_3$) mg/l	295

5.2. Surface Water Impact Assessment

The surface water impact assessment has been conducted as part of the EIA study and includes:

- Definition of potential surface water impacts that could result from the proposed project and its associated activities. Once the impacts are identified, a rating system that takes into account the intensity, duration, spatial scale and probability of impacts will be used to determine the significance of the identified impacts;
- Recommendation of mitigation measures to prevent and/or minimise identified potential surface water impacts over the life of the project; and
- Development of a monitoring program that will be used as a tool to detect any surface water impacts and to ensure implementation of mitigation measures.

The detailed surface water impact assessment methodology is presented in Appendix A.

6. Baseline Environment

The baseline setting described in this Section is based on a desktop assessment of the study area and the existing literature describing the project area (Ecosolve Consulting, 2020).

6.1. Hydrological Setting

The proposed project area falls predominantly within quaternary catchment B20E while a small portion falls within quaternary catchment B20A of the Olifants Water Management Area (WMA 02) (Figure 6-1). The current land use in the project area is primarily agricultural and mining activities (Ecosolve Consulting, 2020).

The project area is drained by several streams draining from the south to the north (Figure 6-2). On the south east of the study area are two tributaries, namely the Wilge River and the Kromdraaispruit. There are a number of other non-perennial streams and inland water features within the study area, including the Kromdraai Dam and Dieplaagte Dam. The Wilge River eventually drains to the Olifants River further downstream which will then drain into the Limpopo River through Mozambique and into the Indian Ocean. The water supply of the Wilge River is sustained by groundwater aquifers and water from its tributaries (Ecosolve Consulting, 2020).

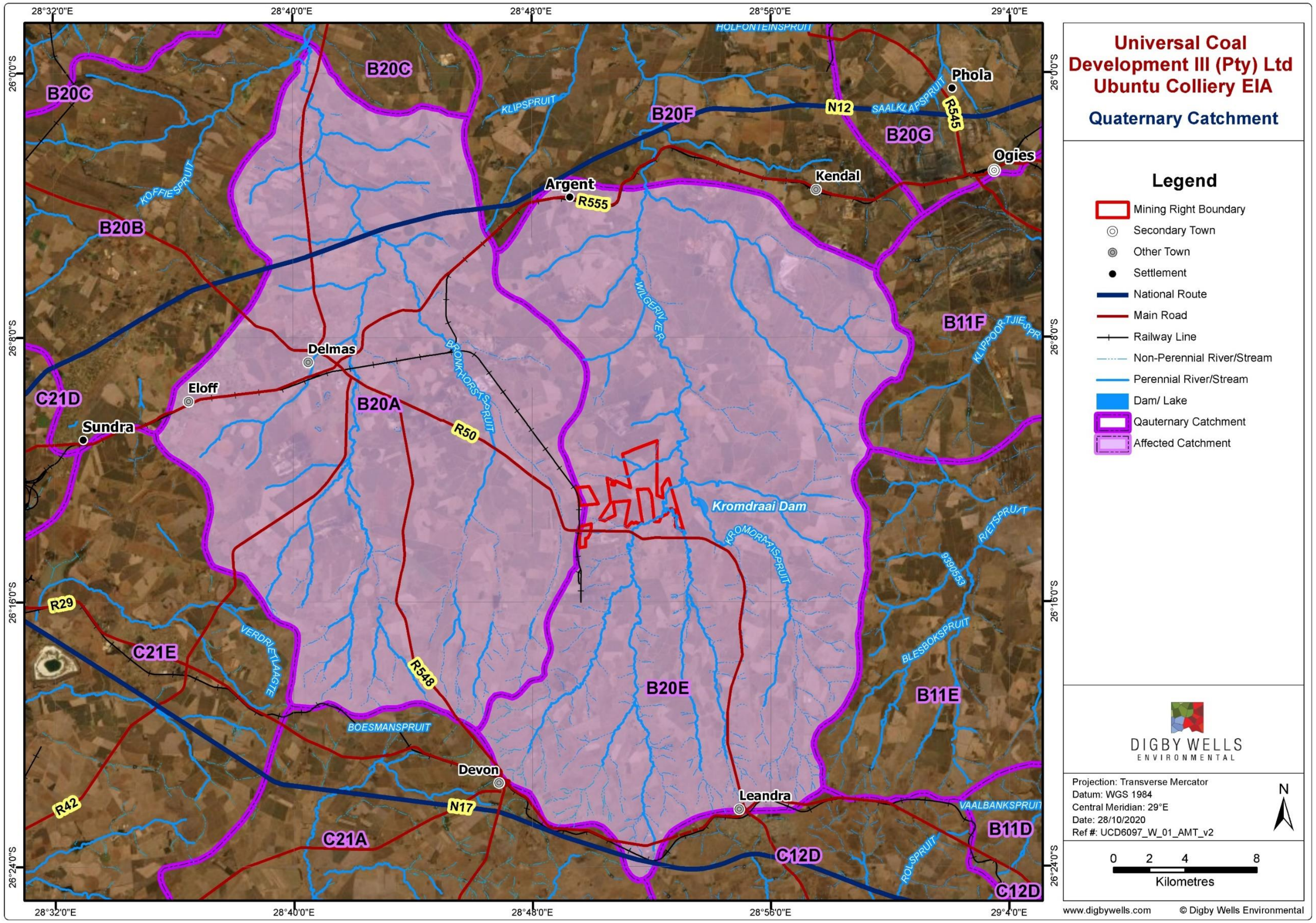


Figure 6-1: Quaternary Catchment for the Ubuntu Colliery Study Area

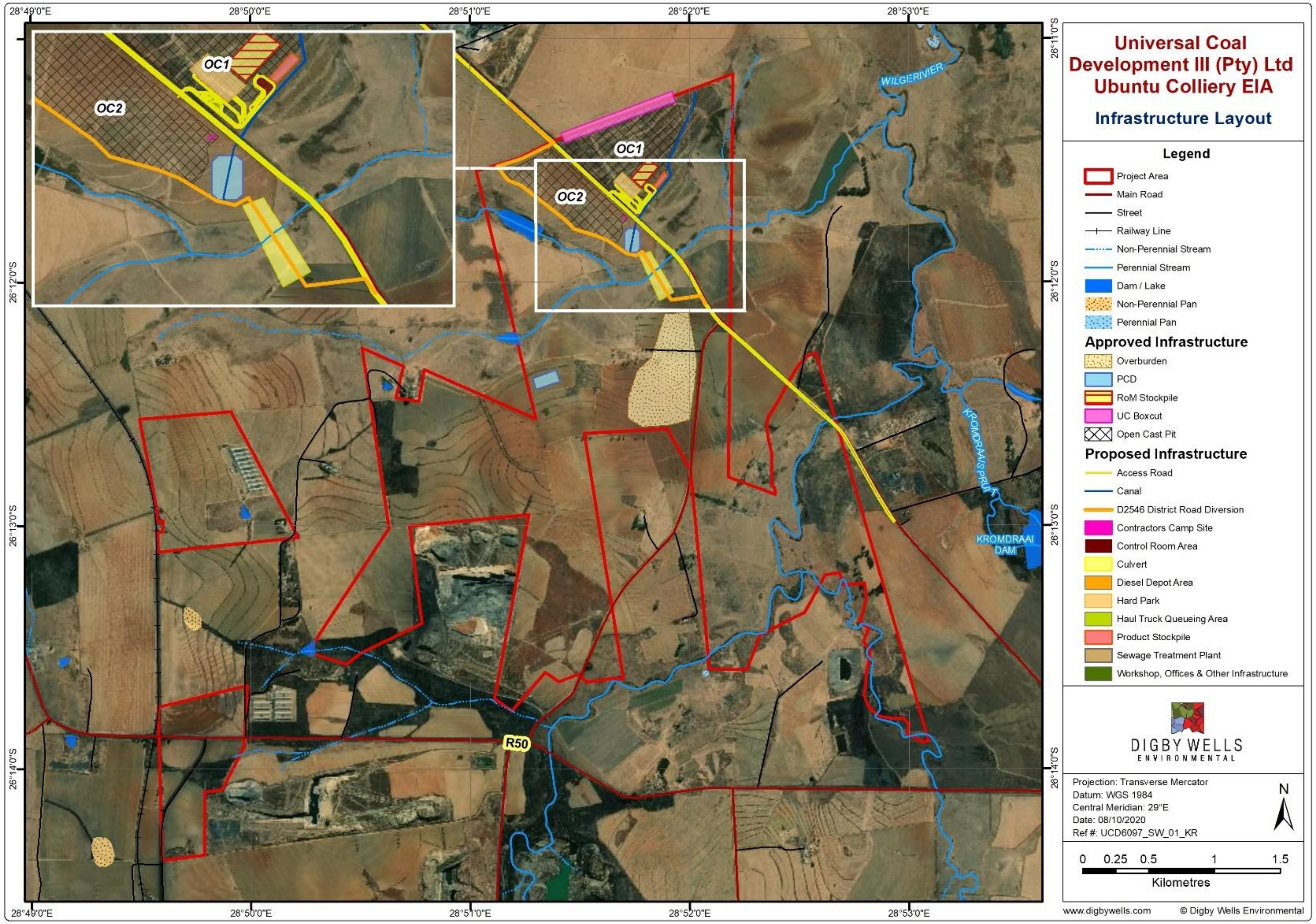
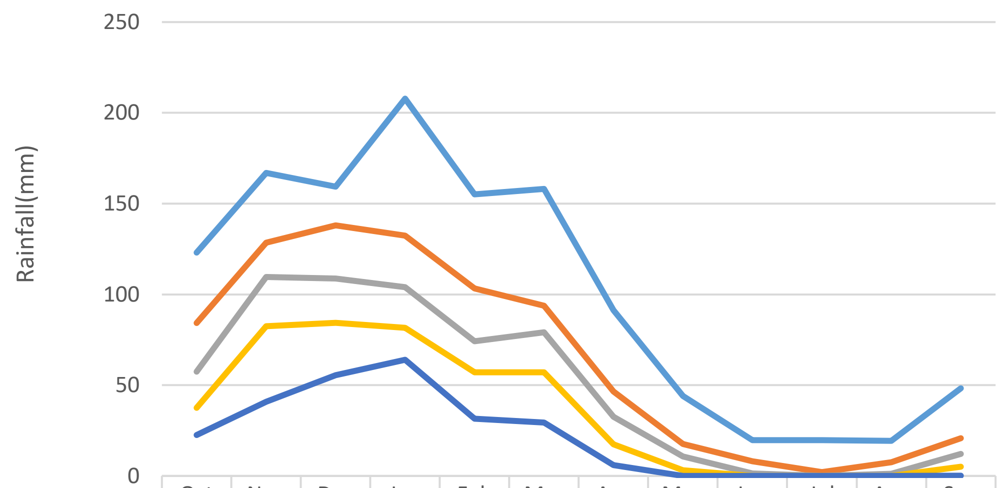


Figure 6-2: Hydrological Setting of the Ubuntu Colliery Study Area

6.2. Climate

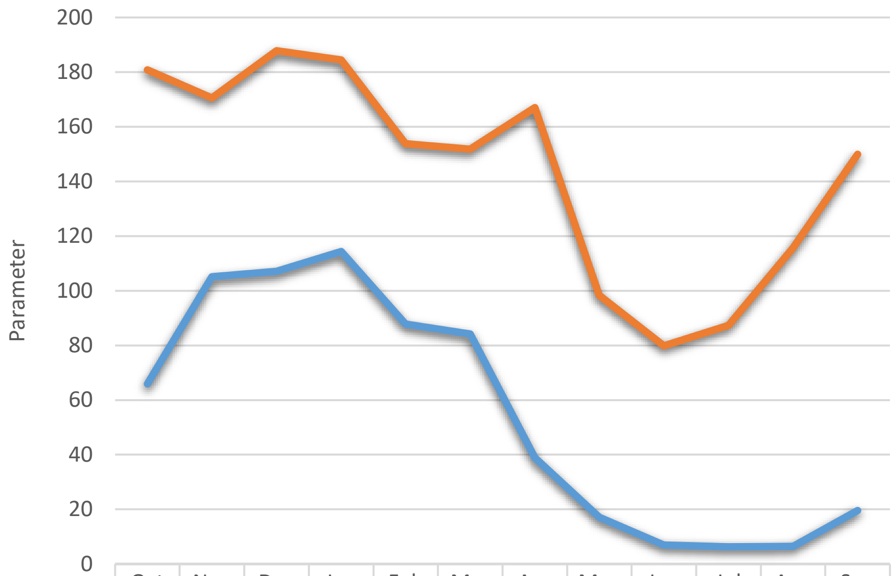
The Mean Annual Precipitation (MAP) for quaternary catchment B20E is 661 mm (WRC, 2015) and is likely to be distributed as shown in Figure 6-3. The normal rainfall (70% of events) for the wettest month (January) will likely not exceed 132 mm, while extreme rainfall (10% of the events) will likely not exceed 208 mm. This implies that the region experiences moderate to high rainfall.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
90 Percentile	123	167	159	208	155	158	91	44	20	20	19	48
70 Percentile	84	128	138	132	103	94	47	18	8	2	8	21
50 Percentile	57	110	109	104	74	79	33	11	1	0	1	12
30 Percentile	38	82	84	82	57	57	17	3	0	0	0	5
10 Percentile	23	41	55	64	32	29	6	0	0	0	0	0

Figure 6-3: Monthly Rainfall Distribution within Quaternary Catchment B20E

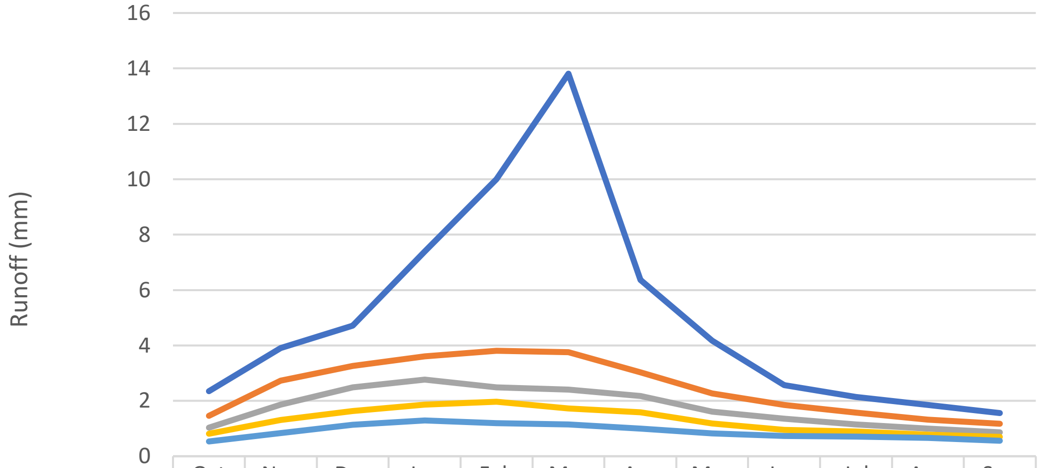
The Mean Annual Evaporation (MAE) for quaternary catchment B20E is 1 727 mm (WRC, 2015). The region experiences higher evaporation than precipitation, giving rise to dry winters and wet summers with a negative natural water balance. The average monthly distribution of potential evaporation and rainfall can be seen in Figure 6-4.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Evaporation(mm)	181	171	188	184	154	152	167	98	80	87	116	150
Rainfall(mm)	66	105	107	114	88	84	39	17	7	6	6	20

Figure 6-4: Monthly Evaporation Distribution within Quaternary Catchment B20E

The Mean Annual Runoff (MAR) depth for the area was calculated to be 36 mm (WRC, 2015), which is approximately 8% of the MAP. The 90th (extreme flow) and 70th (normal flow) percentiles during the month of January are 7.4 and 3.6 mm, respectively. The average MAR for quaternary catchment B20E is likely to be distributed as indicated in Figure 6-5



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
90 Percentile	2.3	3.9	4.7	7.4	10.0	13.8	6.4	4.2	2.6	2.1	1.9	1.6
70 Percentile	1.5	2.7	3.3	3.6	3.8	3.8	3.0	2.3	1.9	1.6	1.3	1.2
50 Percentile	1.0	1.9	2.5	2.8	2.5	2.4	2.2	1.6	1.4	1.2	1.0	0.9
30 Percentile	0.8	1.3	1.6	1.9	2.0	1.7	1.6	1.2	1.0	0.9	0.8	0.7
10 Percentile	0.5	0.8	1.1	1.3	1.2	1.2	1.0	0.8	0.7	0.7	0.7	0.6

Figure 6-5: Monthly Runoff Distribution within Quaternary Catchment B20E

7. Findings

This section includes the findings of the water quality update investigation which was done as part of the EIA investigation for the Ubuntu Colliery.

7.1. Water Quality Update

Water quality data for the third quarter of 2019 (i.e. July to September 2019) was reviewed from the surface and groundwater monitoring report that was compiled by Digby Wells Environmental (2019). Additionally, the quarterly water quality report from the beginning of year 2020 (i.e., January to July 2020) was reviewed as part of the baseline water quality update. The monitoring network within Ubuntu Colliery comprises of eight surface water quality monitoring points. The monitoring sites were selected in consideration of the proposed mine plan with an objective to intersect both surface and groundwater prior to (upstream) and moving away from a pollution source (downstream). The locality of the surface and groundwater monitoring points is presented in Figure 7-1, while Table 7-1 presents the coordinates of the surface water monitoring points.

Table 7-1: Surface and Groundwater Monitoring Sites Coordinates (Ecosolve Consulting, 2020)

Sample Name	Latitude	Longitude	Description of localities
UCBSW2	-26.18335	28.94139	Sampled as UCBSW2, bridge within a wetland area. A low flow was observed
UCBSW3	-26.18359	29.06861	At the Dam
UCBSW4	-26.18343	29.03306	Downstream of dam which is situated just outside the northern part of the Ubuntu Colliery Mine
UCBSW8	-26.18350	28.93556	Downstream outside the Ubuntu Colliery Mine boundary on Wilge River. This was observed as a cattle watering point with flowing water
UCBSW10	-26.20009	28.98861	On Wilge River upstream area.
UCBSW11	-26.20019	28.93222	On Kromdraai tributary with flowing water joining Wilge River
UCBSW12	-26.22562	28.836984	Not sampled-ground water pumped to this sampling point for use at nearby chicken farm
UCBSW15	-26.20008	28.86139	Wetland near proposed strip pit mine design, stagnant water was observed

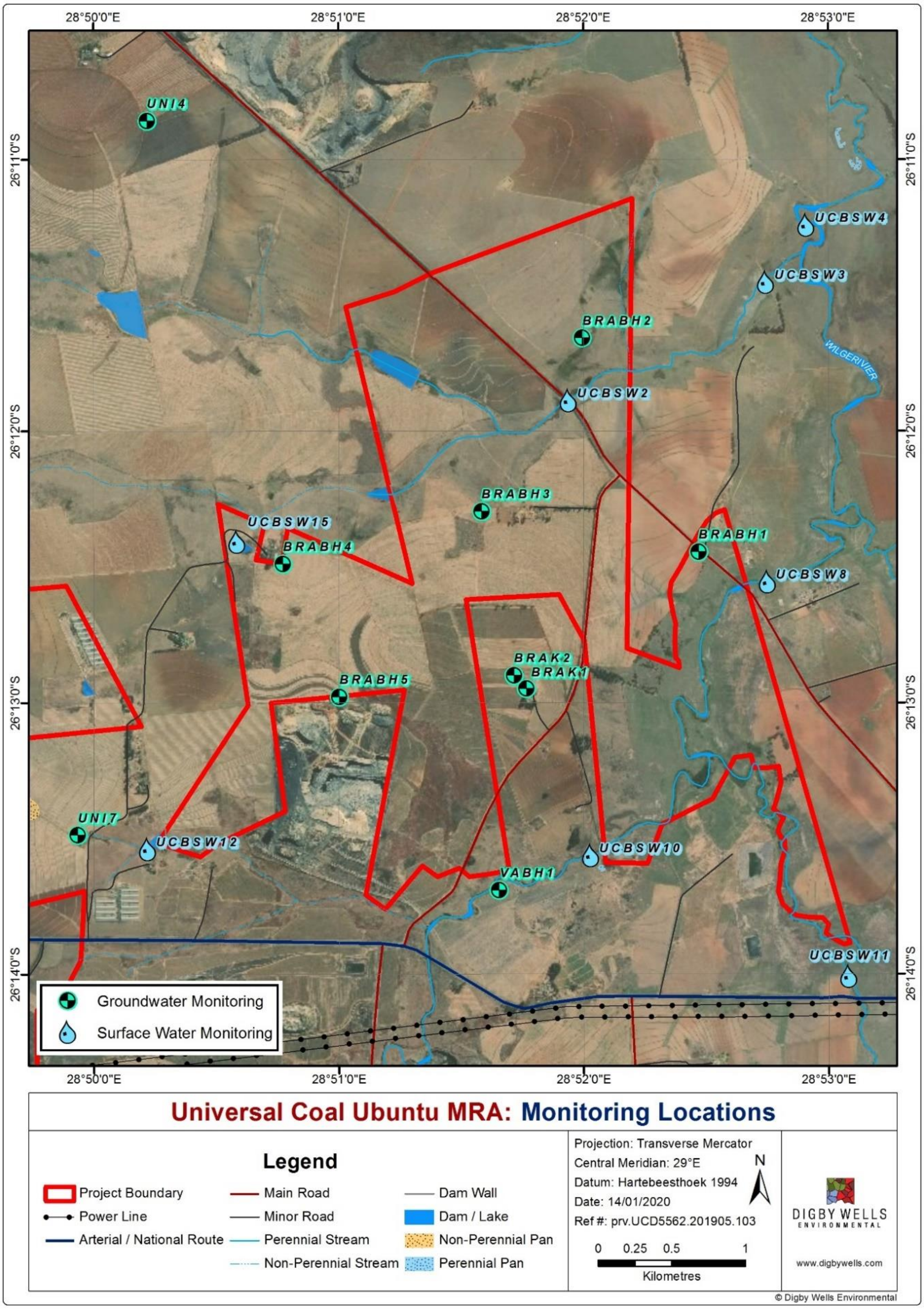


Figure 7-1: Surface and Groundwater Monitoring Locations within Ubuntu Colliery

7.1.1. pH

The pH trend of the surface water monitoring points is given in Figure 7-2. A single monitoring event was undertaken in 2012. More frequent sampling was undertaken from 2018 to date. The pH trend is erratic, with a general increase in pH since September 2019, at which point the pH was elevated beyond the upper WUL within site UCBSW8. Thereafter, the pH trend dropped below the WUL Limit, although the overall trend is increasing over time.

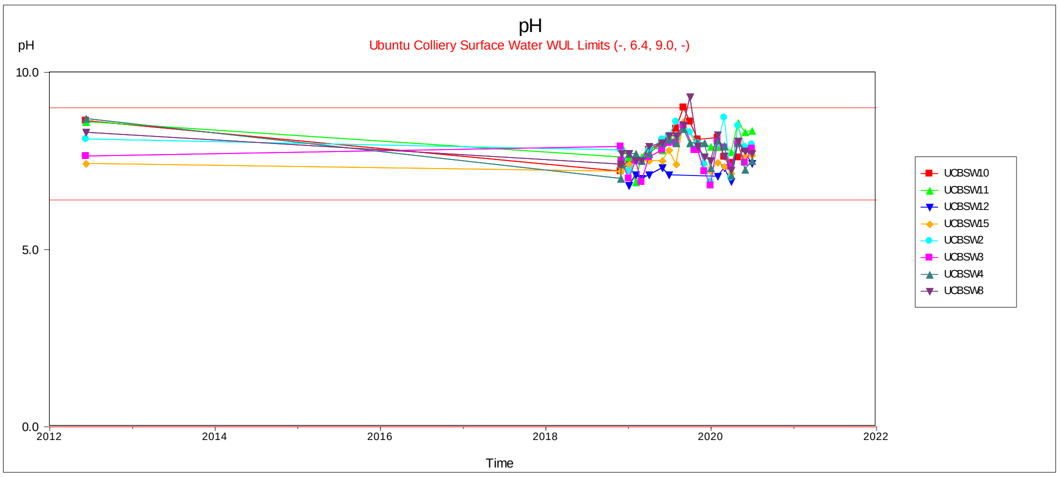


Figure 7-2: pH Trend of the Surface Water Monitoring Sites within Ubuntu Colliery

7.1.2. Electrical Conductivity

The Electrical Conductivity (EC) trend is illustrated in Figure 7-3. Some exceedances were observed in December 2018 at sites UCBSW15 and UCBSW11. Further exceedances were observed at sites UCSSW11 during September to November 2019 and at site UCBSW2 during June to July 2020. From the trend analysis, the sites in which EC exceedances were observed are UCBSW15, UCBSW11 and UCBSW2, with EC exceedances ranging from 105 mS/m to 215 mS/m.

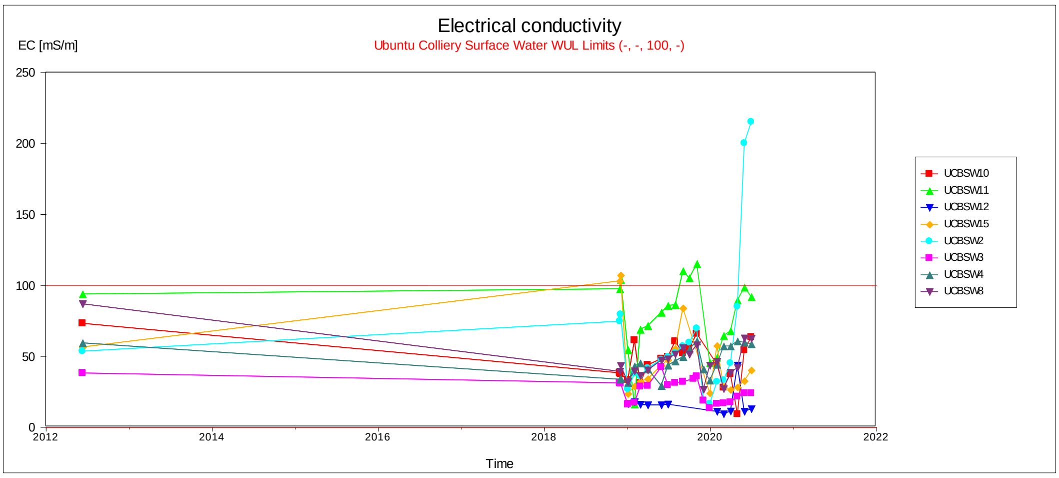


Figure 7-3: EC Trend of the Surface Water Monitoring Sites Within Ubuntu Colliery

7.1.3. Metals

The concentrations of the common cations (i.e., Ca, Mg and Na) are shown in Figure 7-4. The Ca, Mg and Na concentrations show seasonal variation. Some exceedances in Calcium were observed at sites UCBSW11, UCBSW15 and UCBSW10 between December 2018 and November 2019. Magnesium was elevated beyond the WUL Limits at multiple sites, including sites UCBSW2, UCBSW4, UCBSW8, UCBSW10 and UCBSW11 between April and July 2020. Sodium exceedances were observed within site UCBSW2 between June and July 2020.

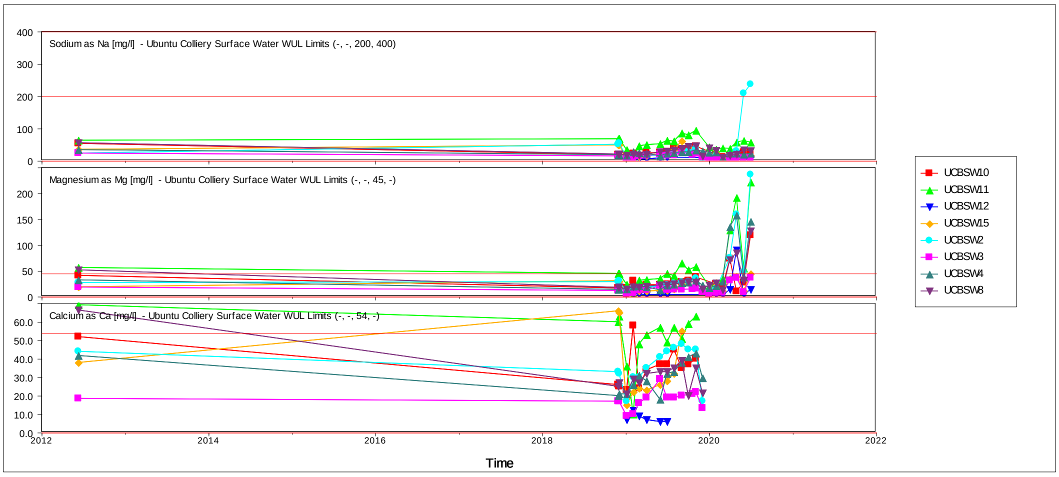


Figure 7-4: Common Cations of The Surface Water Monitoring Sites Within Ubuntu Colliery

7.1.4. Chloride

The chloride concentration time-graph is illustrated in Figure 7-5. The trend shows that the Cl concentration can vary from 7 mg/L at UCBSW12 to 133 mg/L at UCBSW2. Chloride fluctuates within and beyond the WUL Limits at sites UCBSW2 and UCBSW11 throughout the monitoring period. The rest of the monitoring sites are within the WUL Limits.

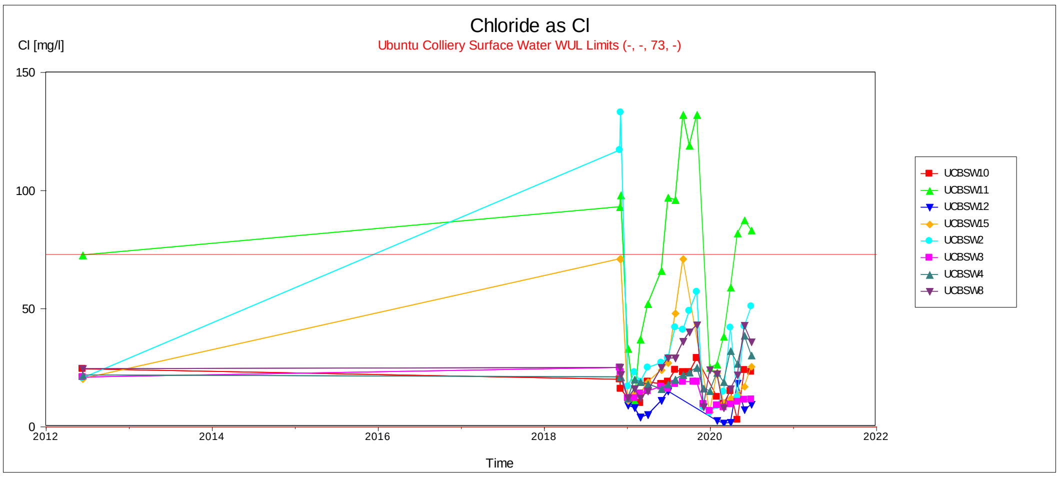


Figure 7-5: Chloride Trend of the Surface Water Monitoring Sites Within Ubuntu Colliery

7.1.5. Sulphate

The sulphate (SO_4) concentration time-graph is illustrated in Figure 7-6. The trend shows that the SO_4 concentration can vary from less than 2 mg/L at UCBSW12 to 282 mg/L at UCBSW15. As of April 2019, all monitoring sites are within the WUL limits for SO_4 concentration, this trend continued into the third quarter. The surface water is not contaminated by mine related activities based on the sulphate concentration.

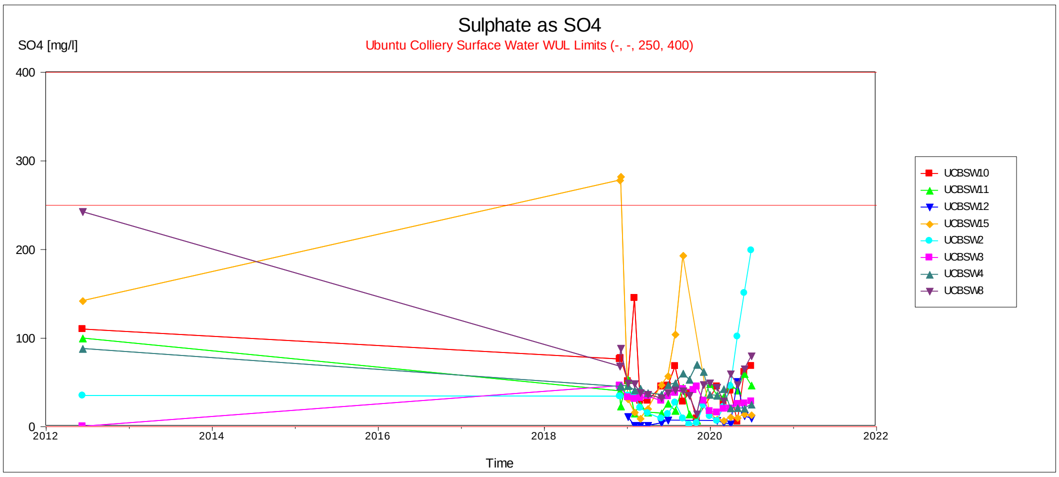


Figure 7-6: Sulphate Trend of the Surface Water Monitoring Sites Within Ubuntu Colliery

7.1.6. Nitrate

The NO_3-N concentration time-graph is illustrated in Figure 7-7. The trend shows that the NO_3-N concentration can vary from less 0.1 mg/L (largely in most of the sampling sites) to 0.8 mg/L at UCBSW3. All monitoring sites have been consistently below or within the WUL limit of 7.9 mg/L throughout the monitoring session, with the exception of substantial exceedances observed in site UCBSW2, which increases exponentially from 61.1 mg/L in May 2020 to 175.6 mg/L in June 2020. A further increase to 200 mg/L was observed in July 2020. This indicates a potential new activity or source which is resulting in the increase in nitrates and this needs to be closely monitored and the potential source identified to effectively manage the observed nitrate concentration.

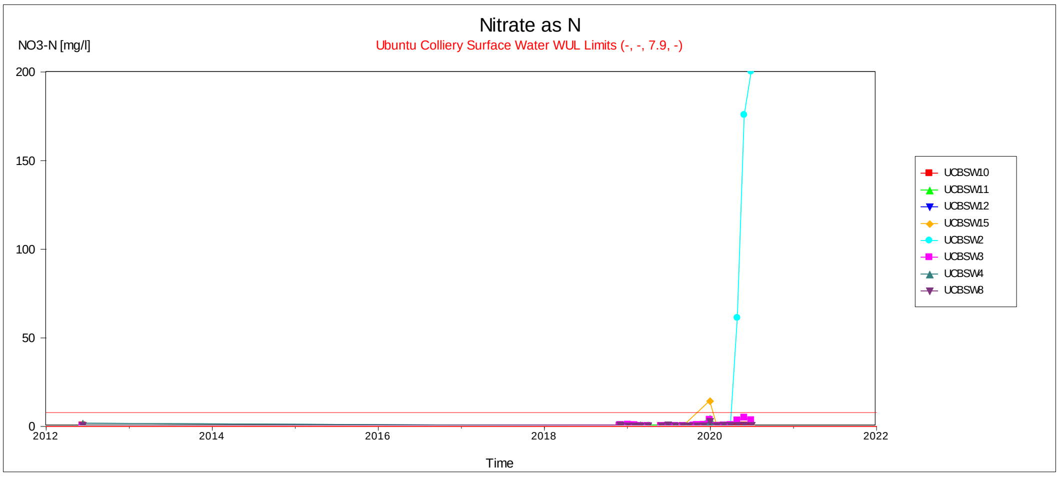


Figure 7-7: Nitrate Trend of the Surface Water Monitoring Sites Within Ubuntu Colliery

7.1.7. Fluoride

The Fluoride (F) concentration time-graph is illustrated in Figure 7-8. The trend shows that the F concentration can vary from 0.3 mg/L at UCBSW10 to 1.6 mg/L at UCBSW15. The trend shows fluctuating F concentration within and/or above the WUL limit of 0.52 mg/L.

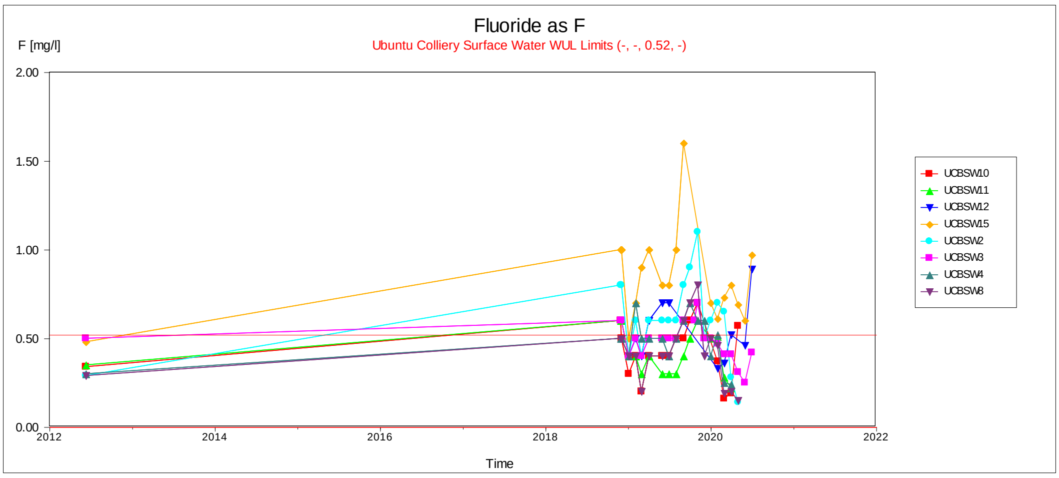


Figure 7-8: Fluoride Trend of the Surface Water Monitoring Sites Within Ubuntu Colliery

7.1.8. Total Alkalinity

The Total Alkalinity concentration time-graph is illustrated in Figure 7-9. The trend shows that the Total Alkalinity is within the WUL limit for all sampling points except for UCBSW11. Slight exceedances were also observed at sites UCBSW2 and UCBSW10.

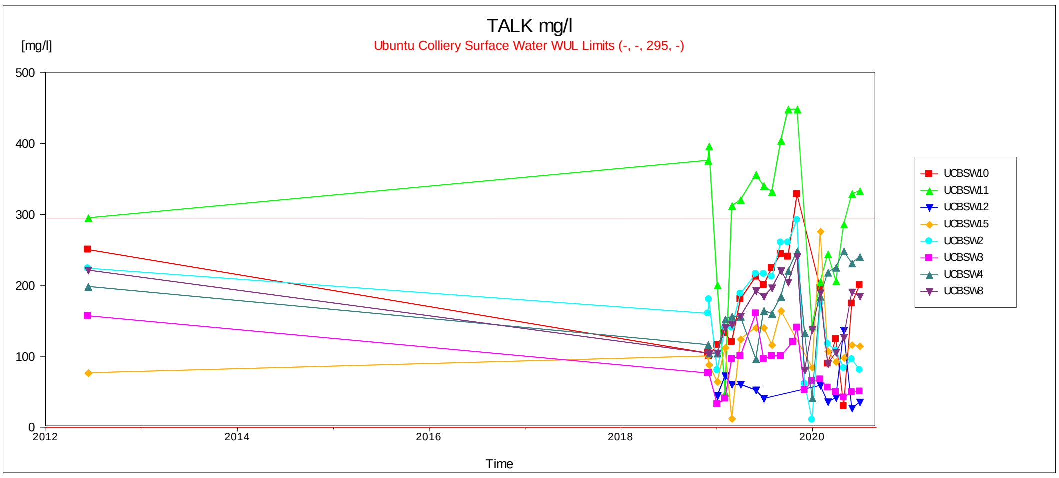


Figure 7-9: Total Alkalinity Trend of the Surface Water Monitoring Sites Within Ubuntu Colliery

7.1.9. Compliance with the WUL

The following can be noted about the water quality within Ubuntu Colliery:

- pH was mostly within the WUL Limits, except an exceedance at UCBSW8 in October 2020;

- EC was exceeded at sites UCBSW15, UCBSW11 and UCBSW2, with fluctuations within and beyond the WUL Limits throughout the monitoring period;
- Some exceedances were observed in the Ca, Mg and Na. Some exceedances in Calcium were observed at sites UCBSW11, UCBSW15 and UCBSW10 between December 2018 and November 2019. Magnesium was elevated beyond the WUL Limits at multiple sites, including sites UCBSW2, UCBSW4, UCBSW8, UCBSW10 and UCBSW11 between April and July 2020. Sodium exceedances were observed within site UCBSW2 between June and July 2020;
- Chlorides were exceeded at sites UCBSW2 and UCBSW11 and fluctuated within and beyond the WUL Limits throughout the monitoring period;
- Sulphate was generally within the WUL Limits and was only exceeded at site UCBSW15 in November and December 2018;
- Nitrate was generally within the WUL Limits for most of the monitoring period until exceedances were observed in UCBSW2 in May 2020;
- Fluoride generally fluctuates within and beyond the WUL Limits across all the monitoring sites, with the greatest concentrations being observed at UCBSW15, followed by UCBSW2;
- Total alkalinity was mostly within the WUL for all points for most of the monitoring points, except at site UCBSW11, where total alkalinity is commonly elevated beyond the WUL Limit.

8. Surface Water Impact Assessment

8.1. Construction Phase

Activities during the construction phase that may have potential impacts (Table 8-1) on the surface water resources are described and the appropriate management/mitigation measures are provided below.

Table 8-1: Interactions and Impacts of Activity

Interaction	Impact
Site preparation including vegetation clearance and excavations, leading to exposure of soils.	Siltation and sedimentation of surface water resources leading to deteriorated water quality.
Handling of hydrocarbons and other chemicals; Loading, hauling and transportation of product coal.	Surface water contamination leading to deterioration of water quality.

8.1.1. Impact Description: Sedimentation and siltation of nearby watercourses

Clearing or removal of vegetation leaves the soils prone to erosion during rainfall events, and as a result, runoff from these areas will be high in suspended solids increasing turbidity in the natural water resources.

Also, dust generated during construction and vehicle movement can also be deposited into the local water courses, thereby contributing to the accumulation of suspended solids in the water course, leading to the siltation of these water bodies.

8.1.2. Impact Description: Surface water contamination leading to deterioration of water quality

Handling of general and hazardous waste including spillages of hydrocarbons such as oils, fuels and grease have potential to contaminate nearby water resources when washed off into rivers, streams and pans.

8.1.3. Management Objectives

Management objectives during the construction phase are mainly to minimize the potential contamination of receiving waterbodies as a result of siltation, hydrocarbon spillages, and hazardous chemical leaks associated with the construction activities.

8.1.4. Management Actions

- If possible, construction activities must be prioritised to the dry months of the year (May to September) to limit mobilisation of sediments, dust generation and mobilisation hazardous substances from construction vehicles used during construction phase;
- Dust suppression on the haul roads and other cleared areas must be undertaken on regular basis to prevent or limit dust generation;
- Hydrocarbon and hazardous waste storage facilities must be appropriately bunded to ensure that leakages can be contained. Spill kits should be in place and construction workers should be trained in the use of spill kits to contain and immediately clean up any leakages or spills;
- Vehicles should regularly be maintained as per a developed maintenance program. Vehicles should also be inspected daily before use to ensure there are no leakages;
- Drip trays must be used to capture any oil leakages. Servicing of vehicles and machinery should be undertaken at designated hard park areas. Any used oil should be disposed of by accredited contractors; and
- Ensuring implementation of a stormwater management plan to prevent the mixing of clean and dirty water.

8.1.5. Impact Ratings

The following tables rate the impacts for the construction phase:

Table 8-2: Impact Significance Rating for the Construction Phase

Dimension	Rating	Motivation	Significance
Impact: Sedimentation and siltation of nearby watercourses			
Duration	5	The impact will likely occur during construction	72- Minor (negative)
Intensity	4	Serious to medium term environmental effects	
Spatial scale	3	Impact has the potential to extend across the site and to nearby water resources.	
Probability	6	Almost certain that the impact will occur	
Post-mitigation			
Duration	2	The impact will only likely occur in the short term given implementation of recommended mitigation measures	18- Negligible (negative)
Intensity	2	Minor effects on biological or physical environment are expected if silt traps and soil stabilisation procedures are followed	
Spatial scale	2	With proper management, the impact will be localized to the immediate downstream of the site	
Probability	3	There is a possibility that the impact will occur	

Dimension	Rating	Motivation	Significance
Impact: Surface water contamination leading to deterioration of water quality			
Duration	5	The impact will likely occur for the life of the project	60- Minor (negative)
Intensity	4	This will moderately impact the water quality and the ecosystem functionality for downstream users	
Spatial scale	3	The impacts will be localized extending across the site and downstream	
Probability	5	The impact will likely occur	

Dimension	Rating	Motivation	Significance
Post-mitigation			
Duration	5	The impact will likely occur for the life of the project	18-Negligible (negative)
Intensity	2	With proper management of hydrocarbon and chemicals on site the impact will have low intensity	
Spatial scale	2	With proper management, the impact will be localized to sites where incidents occur	
Probability	2	The possibility of the impact occurring is very low as a result of implementation of adequate mitigation measures	

8.2. Operational Phase

Activities during the operational phase that may have potential impacts on surface water resources are summarised in Table 8-3 and further described together with recommended management/mitigation measures in the following subsections.

Table 8-3: Interactions and Impact Activity

Interaction	Impact
Runoff from the dirty water areas	Surface water contamination and deterioration of water quality on the natural water resources
Hydrocarbons and chemicals spillages and leakages from equipment, moving haulage trucks and machinery	Surface water contamination by hydrocarbon waste and deterioration of water quality

8.2.1. Impact Description: Surface water contamination by runoff from dirty water areas

Water contamination may occur as a result of runoff from contaminated surfaces within the mine into nearby watercourses. The dirty water areas include coal stockpile areas, processing plant areas, workshop areas etc. The runoff generated from these areas will likely be contaminated and thus will have a detrimental effect on the water quality of nearby streams thereby affecting aquatic ecosystems and downstream water users.

8.2.2. Impact Description: Surface water contamination from hydrocarbon and chemical spillages and leakages

The operational machinery, transportation and storage at the mine site are potential sources of hydrocarbon and chemical spills and leakages. When not properly managed, hydrocarbon and chemical spills and leakages will be washed away with the runoff generated on site and thereby contaminate surface water resources within and in proximity to the project area.

8.2.3. Management Objectives

Management objectives during the operational phase are mainly to minimize the potential contamination of receiving waterbodies as a result of mine contaminated runoff, hydrocarbon spillages, and hazardous chemical leaks associated with the operational activities.

8.2.4. Management Actions

The following mitigation measures are recommended:

- Runoff from dirty areas should be directed to the storm water management infrastructure and should not be allowed to flow into the natural environment, unless DWS discharge authorisation and compliance with relevant discharge standards as stipulated in the NWA is obtained;
- The existing water quality monitoring program should be conducted for the life of mine and for a few years post closure for ongoing monitoring of water resources within and in close proximity to the project area to allow detection of any contamination arising from mine activities;
- The management of general and other forms of waste must ensure collection and disposal into clearly marked skip bins that can be collected by approved contractors for disposal to appropriate disposal sites;
- The overall housekeeping and storm water system management (including the maintenance of berms, de-silting of dams and conveyance channels and clean-up of leaks) must be maintained throughout the life of mine;
- The hydrocarbon and chemical storage areas and facilities must be located on hard-standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances; and
- Training of mine personnel and contractors in proper hydrocarbon and chemical waste handling procedures is recommended.

8.2.5. Impact Ratings

The following tables rate the impacts for the operational phase:

Table 8-4: Impact Significance Rating for Operational Phase

Dimension	Rating	Motivation	Significance
Impact: Surface water contamination by runoff from dirty water areas			
Duration	3	The impact will remain for a medium to short term	60-Minor (negative)

Dimension	Rating	Motivation	Significance
Intensity	5	Very serious, long-term environmental impairment of ecosystem function that may take several years to rehabilitate	
Spatial scale	4	The impacts will likely extend to watercourses in the whole municipal area affecting downstream water users	
Probability	5	The impact may occur if no measures are put in place	
Post-mitigation			
Duration	2	The impact will not last long post mitigation	18-Negligible (negative)
Intensity	2	Proper and continued implementation of storm water management plan and water quality monitoring will lower the intensity of the contaminated runoff impact on proximal water resources	
Spatial scale	2	Limited spatial extent if mitigation measures are adequately implemented	
Probability	2	The possibility of the impact occurring is very low if mitigation measures are adequately implemented	

Dimension	Rating	Motivation	Significance
Impact: Surface water Contamination from hydrocarbon and chemical spillages and leakages			
Duration	5	The impact will likely occur for the duration of the operational phase	72- Minor (negative)
Intensity	4	Moderate impacts to water quality and ecosystem functionality are expected	
Spatial scale	3	The impact may extend across the site and to nearby settlements if contaminants are washed into proximal watercourses	
Probability	6	It is most likely that the impact will occur	
Post-mitigation			
Duration	5	The impact will likely occur for the life of the project	18-Negligible (negative)

Intensity	2	With proper management of hydrocarbon and chemicals on site the impact intensity will be low	
Spatial scale	2	With proper management, the impact will be localised to incident sites, where contaminants will quickly be cleaned up	
Probability	2	The possibility of the impact occurring is very low if mitigation measures re adequately implemented	

8.3. Decommissioning and Closure Phase

Activities during the decommissioning and closure phase that pose potential impacts on surface water resources are summarised in Table 8-5 and further described together with recommended management/mitigation measures in the following subsections.

Table 8-5: Interactions and Impact Activity

Interaction	Impact
Demolition of mine infrastructure (workshops, haul roads, processing plant etc.) Disturbance of soils and erosion by overland flow	Sedimentation and siltation of nearby watercourses and deterioration of water quality
Rehabilitation of disturbed sites close to pre-mining conditions	Restoration of pre-mining streamflow regime in nearby watercourses

8.3.1. Impact Description Impact Description: Sedimentation and siltation of nearby watercourses and deterioration of water quality

During the decommissioning phase demolition of infrastructure, will cause disturbance and subsequent erosion of soils into nearby watercourses. This will result in higher rates of sedimentation and siltation in nearby streams thereby reducing their flow/storage capacities and their ability to sustain aquatic ecosystems. The quantity and quality of water for downstream water users will thus be compromised.

8.3.2. Impact Description: Restoration of pre-mining streamflow regime in nearby watercourses

A positive impact is thus envisaged as water freely flows to downstream water users due to restoration of higher streamflow regime close to pre-mining conditions.

8.3.3. Management Objectives

The management objectives for the decommissioning and closure phase are to minimize potential contamination of receiving waterbodies as a result of the associated decommissioning activities. Furthermore, strategic removal of surface infrastructure should be implemented so that potentially contaminated runoff is diverted away from designated clean water areas. This may be achieved by temporarily retaining stormwater infrastructure to divert dirty water from clean areas while the potentially contaminating sources are decommissioned.

8.3.4. Management Actions

The following mitigation measures are recommended:

- Restore the topography to pre-mining conditions as much as is practically possible by backfilling, removing stockpiles and restore the slope gradient and angle of the site;
- Immediate revegetation of cleared areas;
- Where practical, decommissioning activities should be prioritized during dry months of the year (May to September);
- Movement of demolition machinery and vehicles should be restricted to designated access roads to minimise the extent of soil disturbance;
- Use of accredited contractors for removal or demolition of infrastructure during decommissioning is recommended; this will reduce the risk of waste generation and accidental spillages; and
- Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before decommissioning.

8.3.5. Impact Ratings

The following tables rate the impacts for the decommissioning and closure phases:

Table 8-6: Impact Significance Rating for Decommissioning Phase and Closure Phase

Dimension	Rating	Motivation	Significance
Impact: Sedimentation and siltation of nearby watercourses and deterioration of water quality			
Duration	2	The impact will be short term during the decommissioning phase	63-Minor (negative)
Intensity	4	Serious to medium term environmental effects	
Spatial scale	3	The impacts might extend across the site and to nearby streams	
Probability	7	Without appropriate mitigation, it is probable that this impact will occur	

Dimension	Rating	Motivation	Significance
Post-mitigation			
Duration	2	The impact will likely only occur during the decommissioning phase	12-Negligible (negative)
Intensity	2	The intensity will be low due to implementation of mitigation measures	
Spatial scale	2	The impacts will be localized to sites where demolition will be undertaken and contained by silt traps on site	
Probability	2	The possibility of the impact occurring is very low due to implementation of adequate mitigation measures	

Dimension	Rating	Motivation	Significance
Impact: Restoration of pre-mining streamflow regime in nearby watercourses			
Duration	7	The impact will remain long after the life of the project	112-Major (positive)
Intensity	4	The impact leads to significant increase in the water quality of the receiving environment	
Spatial scale	5	The impact may extend across the project area and to nearby stream	
Probability	7	It is definite that this positive impact will occur (there is no mitigation for this impact)	

9. Environmental Management Plan

This section provides a summary of the proposed project activities, environmental aspects and impacts on the receiving surface waterbodies. The frequency of mitigation, timing of implementation, the roles and responsibilities of persons implementing the EMP are summarized (Table 9-1).

Table 9-1: Environmental Management Plan

Activity/ies	Potential Impacts	Aspects Affected	Phase	Mitigation Measure	Mitigation Type	Time period for implementation
• Site clearing; • Access and haul road construction; • Construction of Infrastructure; • Topsoil stockpiling; and • Loading, transport, tipping and spreading of materials	• Siltation of water resources due to increased turbidity from dust and soil erosion; and • Water contamination due to leaks or spills of hazardous and hydrocarbon containing material	Surface Water Quality	Construction	• If possible, construction activities must be prioritised to the dry months of the year to limit mobilisation of sediments, dust generation and hazardous substances from construction vehicles used during site clearing; • Dust suppression with water on the haul roads and cleared areas must be undertaken to limit dust; • Hydrocarbon and hazardous waste storage facilities must be appropriately bunded to ensure that leakages can be contained. Spill kits should be in place and construction workers should be trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; • Vehicles should regularly be maintained as per the developed maintenance program. This should also be inspected daily before use to ensure there are no leakages underneath; • Drip trays must be used to capture any oil leakages. Servicing of vehicles and machinery should be undertaken at designated hard park areas. Any used oil should be disposed of by accredited contractors; and • Implementation of the proposed stormwater management plan including installation of drains, berms and storage structures.	Storm water management: Control contamination of receiving waterbodies by consideration of potential contamination sources and strategic decommissioning to minimize on potential environmental impacts	During the construction phase

Activity/ies	Potential Impacts	Aspects Affected	Phase	Mitigation Measure	Mitigation Type	Time period for implementation
• Stockpiling; • Diesel storage and explosives magazine; • Movement of vehicles and mine machinery; and • Storage, handling and treatment of hazardous products (including fuel, explosives and oil) and waste	• Siltation of water resources due to increased turbidity from dust and soil erosion; • Water contamination due to leaks or spills of hazardous and hydrocarbon containing material; and	Surface Water Quality	Operational	• Runoff from dirty areas should be directed to the storm water management infrastructure (drains and PCDs) and should not be allowed to flow into the stream, unless DWS discharge authorisation and compliance with relevant discharge standards as stipulated in the NWA is obtained; • The PCDs and dirty water channels should be lined either by concrete or High-Density Polyethylene (HDPE) in order to prevent contamination of groundwater through seepage; • The management of general and other forms of waste must ensure collection and disposal into clearly marked skip bins that can be collected by approved contractors for disposal to appropriate disposal sites; • The overall housekeeping and storm water system management (including the maintenance of berms, de-silting of dams and conveyance channels and clean-up of leaks) must be maintained throughout the LOM; and • The hydrocarbon and chemical storage areas and facilities must be located on hard-standing areas (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilisation of leaked hazardous substances; • Training of mine personnel and contractors in proper hydrocarbon and chemical waste handling procedures is recommended; • Vehicles must only be serviced within designated service bays; • Wash bay and workshop runoff should flow through an oil separator as indicated on the infrastructure plan prior to discharge into the PCD.	Implementation of the proposed stormwater management plan will control the impacts by mitigating the impacts	During the operational phase

Activity/ies	Potential Impacts	Aspects Affected	Phase	Mitigation Measure	Mitigation Type	Time period for implementation
• Demolition and removal of infrastructure; • Rehabilitation and closure.	• Siltation of water resources due to increased turbidity from soil erosion; • Restoration of the pre-mining streamflow regime in adjacent watercourses	Water Quality	Decommissioning	• Restore the topography to pre-mining conditions as much as is practically possible by backfilling, removing stockpiles and restore the slope gradient and angle of the site; • Clearing of vegetation should be limited to the decommissioning footprint area and immediate revegetation of cleared areas; • Decommissioning activities should be prioritized during dry months of the year where practical; • Disturbance of soils during infrastructure demolition should be restricted to relevant footprint areas; • Movement of demolition machinery and vehicles should be restricted to designated access roads to minimise the extent of soil disturbance; • Use of accredited contractors for removal or demolition of infrastructure during decommissioning is recommended; this will reduce the risk of waste generation and accidental spillages; and • Ensure that the infrastructure (pipelines, fuel storage areas, pumps) are first emptied of all residual material before decommissioning.	Storm water management: Control contamination of receiving waterbodies by consideration of potential contamination sources and strategic decommissioning to minimize on potential environmental impacts	During the decommissioning phase

10. Reasoned Opinion Whether Project Should Proceed or Not

Based on the findings of this surface water assessment, it is the opinion of the surface water specialist that the project should proceed as it is envisaged to cause minimal impacts on receiving waterbodies provided that the proposed mitigation measures are implemented.

11. Conclusions and Recommendations

The surface water study was undertaken at desktop level to provide an update of the baseline water quality and impact assessment for the proposed expansion of surface infrastructure within the Ubuntu Colliery.

Based on the findings of the surface water quality investigation, the sites that show the most exceedances are sites UCBSW2 and UCBSW11. The parameters of concern are EC, Mg, Ca and Cl, which were generally elevated at multiple sites for most of the monitoring period. Fluoride was also elevated at most sites even prior to the commencement of mining within the Ubuntu Colliery. Nitrate was elevated specifically at monitoring point UCBSW2 which is located downstream of two tributaries. Agricultural activities are known potential sources of nitrates and this point needs to be monitored closely to identify and rectify the elevated nitrates, which may not necessarily be emanating from mining activities within Ubuntu Colliery. Ongoing water quality monitoring of surface water is imperative during all phases of the project life and post closure to allow for early detection of potential contaminants that may cause unforeseen negative impacts on the receiving environment

Risks associated with the different phases of the proposed project were identified as part of the impact assessment. The potential risks include soil erosion resulting in siltation and sedimentation of the nearby waterbodies, the flow of contaminated runoff due to hydrocarbon leaks and spillage of hazardous chemicals. Mitigation measures were proposed for each of the identified risks (Section 8).

12. References

Ecosolve Consulting. (2020). *Ubuntu Colliery Quarterly Surface and Groundwater Monitoring: Report July 2020.*

Semane. (2014). *Anglo American Thermal Coal Pre-Feasility/Feasibility Stidy for Dalyshope Phase 1.*

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Appendix A: Impact Assessment Methodology

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Impact Rating Methodology

The significance rating formula is as follows:

Significance = Consequence x Probability

Where

Consequence = Type of Impact x (Intensity + Spatial Scale + Duration)

And

Probability = Likelihood of an Impact Occurring

In addition, the formula for calculating consequence:

Type of Impact = ***+1*** *(Positive Impact) or* ***-1*** *(Negative Impact)*

The weighting assigned to the various parameters for positive and negative impacts is provided for in the formula and is presented in Table A-1. The probability consequence matrix for impacts is displayed in Table A-2, with the impact significance rating described in Table A-3.

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Table A1: Surface water Impact Assessment Parameter ratings

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	*Positive Impacts (Type of Impact = +1)*			
7	High significant impact on the environment. Irreparable damage to highly valued species, habitat or ecosystem. Persistent severe damage. Irreparable damage to highly valued items of great cultural significance or complete breakdown of social order.	Noticeable, on-going social and environmental benefits which have improved the livelihoods and living standards of the local community in general and the environmental features.	International The effect will occur across international borders.	Permanent: No Mitigation The impact will remain long after the life of the Project.	Certain/ Definite. There are sound scientific reasons to expect that the impact will definitely occur.
6	Significant impact on highly valued species, habitat or ecosystem. Irreparable damage to highly valued items of cultural significance or breakdown of social order.	Great improvement to livelihoods and living standards of a large percentage of population, as well as significant increase in the quality of the receiving environment.	National Will affect the entire country.	Beyond Project Life The impact will remain for some time after the life of a Project.	Almost certain/Highly probable It is most likely that the impact will occur.
5	Very serious, long-term environmental impairment of ecosystem function that may	On-going and widespread positive benefits to local	Province/ Region	Project Life The impact will cease after the operational	Likely The impact may occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	***Positive Impacts (Type of Impact = +1)***			
	take several years to rehabilitate. Very serious widespread social impacts. Irreparable damage to highly valued items.	communities which improves livelihoods, as well as a positive improvement to the receiving environment.	Will affect the entire province or region.	life span of the Project.	
4	Serious medium-term environmental effects. Environmental damage can be reversed in less than a year. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense social benefits to some people. Average to intense environmental enhancements.	<u>Municipal Area</u> Will affect the whole municipal area.	<u>Long term</u> 6-15 years.	<u>Probable</u> Has occurred here or elsewhere and could therefore occur.
3	Moderate, short-term effects but not affecting ecosystem functions. Rehabilitation requires intervention of external specialists and can be done in less than a month. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some.	<u>Local</u> Extending across the site and to nearby settlements.	<u>Medium term</u> 1-5 years.	<u>Unlikely</u> Has not happened yet but could happen once in the lifetime of the Project, therefore there is a possibility that the impact will occur.

Rating	Intensity		Spatial scale	Duration	Probability
	Negative Impacts (Type of Impact = -1)	***Positive Impacts (Type of Impact = +1)***			
2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by very few of population.	Limited Limited to the site and its immediate surroundings.	Short term Less than 1 year.	Rare/ improbable Conceivable, but only in extreme circumstances and/ or has not happened during lifetime of the Project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures.
1	Limited damage to minimal area of low significance that will have no impact on the environment. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level social and environmental benefits felt by very few of the population.	Very limited Limited to specific isolated parts of the site.	Immediate Less than 1 month.	Highly unlikely/None Expected never to happen.

Table A2: Probability Consequence Matrix for Impacts

Probability	Significance																																					
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Consequence	**-21**	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**

Table A3: Significance Threshold Limits

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	**Major (positive)**
73 to 108	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	Moderate (positive)
36 to 72	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the social and/or natural environment.	Negligible (negative)
-36 to -72	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	Minor (negative)
-73 to -108	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects.	Moderate (negative)

Score	Description	Rating
-109 to -147	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects.	Major (negative)