mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Environmental Impact Assessment
And
Environmental Management Plan

for Listed Activities Associated with the Proposed Rail Loop, Road Diversion and Pipeline Project near Lephalale, Limpopo Province

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:	Temo Coal (Pty) Ltd
Tel no:	+27 12 346 4662
Fax no:	+27 12 346 4771
Postal Address:	Private Bag 2001, Menlyn Pretoria, 0063
Physical Address:	1st Floor, Block 5, Ashea Gardens 180 Garsfontein, Pretoria
File Reference Number SAMRAD:	**LP 30/5/1/2/2/199 MR** (Tem Coal Mine)

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Draft EIA and EMPr**
Project Name:	**Environmental Impact Assessment and Environmental Management Programme Report for the Proposed Rail Loop, Road Diversion and Project associated with the Temo Coal Mine, Limpopo Province**
Project Code:	**NAM5335**

Name	Responsibility	Signature	Date
Anita Gutu	Report Complier		February 2019
Sanusha Govender	Report Reviewer Project Manager		March 2019
Barbara Wessels	Report Reviewer		March 2019

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: -

- determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- 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;
- determine the: -
    - nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    - degree to which these impacts: -
    - can be reversed;
    - may cause irreplaceable loss of resources, and
    - can be avoided, managed or mitigated.
- identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- identify suitable measures to manage, avoid or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

Temo Coal Mining (Pty) Ltd (hereafter Temo Coal) has submitted an application for Environmental Authorisation for Listed Activities associated with ancillary infrastructure (road diversion, rail loop and water pipeline) which is proposed in relation to the approved Temo Coal Mine (Temo Mine).

This report constitutes the draft Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) which is submitted to Interested and Affected Parties (I&APs) and relevant Authorities for review and comment in terms of the application for Environmental Authorisation under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and associated EIA Regulations, 2014 (as amended).

Project Applicant

The details of the Project Applicant are included in the table below.

Company Name:	Temo Coal Mining (Pty) Ltd
Contact Person:	Jan Britz
Physical Address:	1st Floor, Block 5, Ashlea Gardens, 180 Garsfontein Road, Pretoria
Telephone:	012 346 4662
Email:	jan@namane.co.za

Project Overview

The project entails the construction and operation of a road diversion, rail loop, and bulk water transfer pipeline. This infrastructure will be associated with the operation of the approved Temo Mine project (Mining Right Reference No.: LP 30/5/1/2/2/199 MR; Environmental Authorisation Reference No.: 12/1/9/2-W5).

The existing D175 road runs along the western corner of the Temo Mine Mining Right Area which transects the south-western corner of the approved open pit area. To facilitate continued mining, Temo Coal is proposing that the D175 be diverted around the mining area. The proposed rail loop is intended to enable Temo Mine to transport coal to domestic markets as well as transport export-grade coal product to the Richards Bay Coal Terminal (RBCT). The rail loop is proposed to join the Boikarabelo rail link located south of the Temo Mine Mining Right Area. Lastly, Temo Coal also proposes to construct and operate an underground bulk water transfer pipeline between Temo Mine and the Lephalale Waste Water Treatment Works (WWTW). The purpose of the pipeline is to provide water to the mine as process water.

Purpose of this Report

This draft EIA and EMPr Report aims to outline the project activities and examine environmental and social effects caused by the implementation of the project. It aims to identify the potential impacts, based on the specialist investigations undertaken, that could result from the proposed project activities (positive or negative), and to propose management measures for such impacts.

Environmental Consultants

Digby Wells Environmental (Digby Wells) has been appointed by Temo Coal as the independent Environmental Assessment Practitioner (EAP) to conduct the environmental-legal process as well as the associated specialist studies and the required Public Participation Process (PPP) for the proposed project. The details of the EAP are contained in the table below.

Company name:	Digby Wells and Associates (South Africa) (Pty) Ltd T/A Digby Wells Environmental
Contact person:	Sanusha Govender
Physical address:	Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191
Telephone:	011 789 9495
Email:	sanusha.govender@digbywells.com

Approach and Methodology for the Public Participation Process

A PPP was initiated during the Scoping Phase, which is central to the investigation of environmental and social impacts, as it is important that stakeholders that may be affected by the project are given an opportunity to identify concerns and to ensure that local knowledge, needs and values are understood and taken into consideration as part of the impact assessment process. The comments from the stakeholders from the Scoping Phase are included in the Comment and Response Report (CRR) (Appendix 3). The CRR will be updated after the public review of this report.

This draft EIA and EMPr has been submitted to the public for their input and comments for a period of 30 days. The commenting period is from the 08 April 2019 and ends on 10 May 2019. The draft EIA and EMPr is available for review on the Digby Wells website (www.digbywells.com). Electronic copies (CDs) are available from the Digby Wells Public Participation Office as well as in hardcopy at the locations listed below:

- Lesedi Village, Steenbokpan; and
- Lephalale Local Municipality Public Library.

Public meetings are planned to be held during this commenting period to present the draft EIA and EMPr and obtain comments from the Interested and Affected Parties (I&APs). The draft EIA and EMPr will be updated with all the comments received from the I&APs prior to submission to the DMR for consideration. Once the DMR has made a decision this will be communicated to all the registered I&APs.

Environmental Baseline

The proposed project is located approximately 60 kilometres (km) from Lephalale in the Limpopo Province. The project area is located within the Limpopo Sweet Bushveld and the landscape features characteristic of this vegetation type includes plains traversed by several tributaries of the Limpopo River.

The main land use in the area are grassland for grazing. The land is confined almost exclusively to low intensity livestock grazing and game farming. It is noted that the pipeline trajectory traverses urban development land uses, namely the towns Lephalale, Onverwacht and Steenbokpan.

The area is located within the Limpopo Water Management Area (WMA 1), which forms part of the Limpopo River basin which is a regarded as a dry catchment with no significant dams (with the exception of the Mokolo Dam) and a low growth potential for land-use development.

A total of 49 watercourses (inclusive of the Sandloop River and two artificial systems) were identified in the vicinity of the project area, which are classified predominantly as depression (pan) wetlands with Present Ecological State (PES) scores which range from Category A (Natural) to Category D (Largely modified).

Environmental Impact Statement

The EIA considered potential negative and positive impacts associated with the proposed project. For all potential impacts, mitigation and management measures have been proposed which, if correctly implemented, are likely to reduce the significance of all impacts to minor or negligible significance.

The key potential positive implications associated with the proposed project are temporary employment opportunities and opportunities for local goods and services suppliers which will result in improved livelihoods. At a broader scale, the establishment of the proposed ancillary infrastructure will positively support the planned Temo Mine operation. Through this ancillary infrastructure Temo Mine is ensuring that the project is optimised as far as possible. The diversion of the D175 road will ensure that the targeted coal reserve is accessible to its full extent while also reducing public health and safety risks associated with having the road in proximity to the mining area. Through the establishment of the rail loop and associated rail link, Temo Coal intends to leverage off existing and planned rail infrastructure to effectively and efficiently transport coal to the intended markets. Lastly, the proposed water pipeline between the Lephalale WWTW and Temo Mine will secure a water source for operational activities at the mine which is sustainable in the water scarce region.

The key negative implications associated with establishing the ancillary infrastructure include the loss of topsoil resources as a result of soil erosion and the loss of a total of 363 ha of natural habitat. This, in some parts, includes habitat that supports red data species and Species of Special Concern (SSC).

The key impacts identified through the EIA are presented in the table below.

Activity	Potential Impact	Aspects Affected	Pre-Mitigation Significance	Post-Mitigation Significance
Site clearing and vegetation removal; Topsoil and subsoil removal and stockpiling; and Establishment of infrastructure	Direct loss of 364 ha of natural habitat	Flora and Fauna	Moderate (negative)	Moderate (negative)
	Loss and/or compromised ecological services provided by areas of high sensitivity		Moderate (negative)	Moderate (negative)
	Potential loss of faunal species as a result of habitat destruction and roadkills		Moderate (negative)	Minor (negative)
	Soil erosion and soil compaction	Soil, Land Use and Land Capability	Moderate (negative)	Minor (negative)
	Loss of topsoil resources		Moderate (negative)	Minor (negative)
Operation of infrastructure; and Maintenance of infrastructure	Soil erosion and soil compaction	Soils, Land Use and Land Capability	Moderate (negative)	Minor (negative)
	Habitat loss and continual pressure on the ecosystem	Flora and Fauna	Moderate (negative)	Minor (negative)
Demolition and removal of all infrastructure; Rehabilitation of disturbed footprints	Soil erosion and soil compaction if rehabilitation is not done correctly.	Soils, Land Use and Land Capability	Moderate (negative)	Minor (negative)
	Habitat loss and continual pressure on the ecosystem	Flora and Fauna	Moderate (negative)	Minor (negative)

The potential risks identified as a result of the proposed project include hydrocarbon spills from vehicles, heavy machinery, hazardous materials or waste storage facilities, and leaks from the water pipeline. It is noted that the water from the Lephalale WWTW would have been treated prior to being pumped to the Temo Mine, therefore any leaks will not be of significant environmental impact.

Conclusions and Recommendations

Various specialist studies were undertaken during the EIA Phase of the project with the objective of identifying and weighing anticipated impacts and risks associated with the proposed project activities.

The findings of the impact assessment have shown that the project will have some moderately significant negative impacts on the receiving environment, namely; the loss of topsoil on cleared land (mainly along the proposed pipeline routes); soil erosion and the permanent loss of natural habitat and alteration of ecological services thereof. The project will have positive

implications namely related to socioeconomic aspects including job opportunities and businesses opportunities for local suppliers of goods and services. Furthermore, at a broader scale the project is aimed at optimising the planned Temo Mine operation and therefore proposed ancillary infrastructure will positively contribute to the operation.

Based on the assessment of the potential negative and positive impacts associated with the project, it is concluded that the proposed project should be authorised. No long-term negative impacts are expected to arise from the project-specific activities should the proposed mitigation measures be correctly implemented. Furthermore, direct environmental and induced social impacts that are positive can be realised.

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Part A: Scope of Assessment and Environmental Impact Assessment Report

1 Introduction

Temo Coal Mining (Pty) Ltd (hereafter Temo Coal) has submitted an application for Environmental Authorisation for Listed Activities associated with proposed ancillary infrastructure required for the Temo Coal Mine (Temo Mine). This report constitutes the draft Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) which is submitted to Interested and Affected Parties (I&APs) and relevant Authorities for review and comment in terms of the application for Environmental Authorisation under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and associated EIA Regulations, 2014 (as amended) (Government Notice No. R. 982 of 4 December 2014 as amended by Government Notice No. R.326 of 7 April 2017).

The Temo Mine was previously granted the following authorisations:

- Mining Right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MRPDA) by the Department of Mineral Resources (DMR) (Reference No.: LP 30/5/1/2/2/199 MR, dated 27 September 2013); and
- Environmental Authorisation in terms of the NEMA by the Limpopo Department of Economic Development, Environment and Tourism (LEDET) (Reference No.: 12/1/9/2-W5, dated 13 July 2015).

Notwithstanding the above approvals, the Temo Mine has not commenced with construction to date and is therefore not operational.

To support the approaching development of the Temo Mine, additional activities which were initially not part of the approved operation are still required. These activities pertain to the diversion of the D175 Road which traverses the south-eastern corner of the future pit area as well as the construction of supplementary linear infrastructure namely, a rail loop for the transportation of coal and a water transfer pipeline between Temo Mine and the existing Lephalale Waste Water Treatment Works (WWTW) (the project).

Listed Activities in terms of the EIA Regulations, 2014 (as amended) which were promulgated under NEMA have been identified for these activities which require a Scoping and EIA Process to be followed for Environmental Authorisation. Authorisation in terms of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) has also been sought out as part of this environmental-legal process.

Digby Wells Environmental (Digby Wells) has been appointed by Temo Coal as the independent Environmental Assessment Practitioner (EAP) to conduct the environmental-legal process as well as the associated specialist studies and the required Public Participation Process (PPP) for the activities.

This EIA and EMPr aims to outline the project activities and examine environmental and social effects caused by the implementation of the project. It aims to identify the potential impacts, based on the specialist investigations undertaken, that could result from the proposed project

activities (positive or negative). Furthermore, mitigation and management measures are proposed for such impacts.

A Plan of Study was submitted as part of the Scoping phase of this process and approved accordingly. This report has therefore been compiled in accordance to the approved Plan of Study.

2 Item 3: Project Applicant

Temo Coal is a subsidiary of the Namane Resources based in Pretoria, Gauteng Province. Refer to applicant details in the table below.

Table 2-1: Project Applicant Details

Company Name:	Temo Coal Mining (Pty) Ltd
Contact Person:	Jan Britz
Physical Address:	1st Floor, Block 5, Ashlea Gardens, 180 Garsfontein Road, Pretoria
Telephone:	012 346 4662
Email:	jan@namane.co.za

2.1 Item 3(a)(i): Details of the EAP

The details of the EAP are included in the table below.

Table 2-2: Contact details of the EAP

Name of Practitioner:	Digby Wells and Associates (South Africa) (Pty) Ltd T/A Digby Wells Environmental Sanusha Govender
Telephone:	011 789 9495
Fax:	011 069 6801
Email:	sanusha.govender@digbywells.com

2.2 Item 3(a)(ii): Expertise of the EAP

2.2.1 The Qualifications of the EAP

Sanusha Govender holds a Bachelor of Science (BSc) degree in Environment and Development from the University of KwaZulu-Natal.

2.2.2 Summary of the EAP's Past Experience

Sanusha Govender is a Senior Environmental Consultant at Digby Wells with over 12 years of experience as both an EIA Consultant and as a Sustainability Programme Manager. She has project managed and delivered quality products on a range of environmental assessments

and sustainability solutions. Projects have included EIA's across various sectors, managing large teams of interdisciplinary specialists and advisors.

Please refer to Appendix 2 for the EAP's Curriculum Vitae (CV) and qualifications.

3 Item 3(b): Description of the Property

Temo Mine MRA is situated in the Lephalale Local Municipality of the Limpopo Province on various farm portions, namely: Verloren Valey 246 LQ, Duikerpan 249 LQ, Japie 714 LQ, Hans 713 LQ and Kleinberg 252 LQ. Property details for the project are provided in the table below.

The regional and local setting of the project area is depicted in Plan 1 and Plan 2, Appendix 1.

Table 3-1: Property Details

Farm Name:	**Road diversion:** ▪ Swelpan 245LQ:RE ▪ Draai Om 244LQ:RE ▪ Verloren Valey 246LQ: RE ▪ Dalyshope 323LQ: RE ▪ Nazarov 685LQ: RE **Rail loop:** ▪ Verloren Valey 246: RE ▪ Duikerpan 249:RE:RE ▪ Swelpan 24:RE ▪ Kleinpan 269:RE ▪ Wildebeesvlakte 268:RE ▪ Groote-Zwart-Buld 290:RE **Water transfer pipeline:** ▪ Draai Om 244: Re ▪ Swelpan 245: RE ▪ Verloren Valey 246:RE ▪ Nieuw Holland 247:RE ▪ Wildebeestvlakte 268:1 ▪ Kleinpan 269:RE ▪ Houwhoek 270:RE ▪ Groot-Zwart-Bult 290:RE ▪ Grootdoorn 292:RE,1,2 ▪ Theunispan 293:RE/19,20,22,25 ▪ Vangpan 294:RE & 1 ▪ Steenbokpan 295:RE,1&3 ▪ Slangkop 296:2 ▪ Zandbult 300: RE ▪ Loopleegte 302:2 and 3 ▪ Vetleegte 304:RE ▪ Vaalpensloop 313:1 ▪ Hooikraal 315:RE ▪ Vergulde Helm 321:RE

<table>
<tr><td></td><td>

- Hieromtrent 460:RE
- Turfvlakte 463:RE
- Waterkloof 502:4
- Waterkloof 502:RE/53,57,149,158,165,
- Onverwacht 503:RE,3,17,28,30,
- Groothoek 504:RE
- Eendracht 505:RE
- Altoostyd 506:RE
- Hanglip 508:1,3,5,9,10
- Naauw Ontkomen 509:RE & 1
- Paarl 522:RE &1
- Schaapplaats 524:RE/23,25,26,27,37,
- Eenzaamheid 687:RE & 1
- Pontes Estates 712:RE
- Pontes Estate 744:RE

</td></tr>
<tr><td>Application Area (Ha):</td><td>

- Rail loop: 22.25 kilometres (km) (55.6 hectares (ha))[1]
- Road diversion: 2.8 km (8.4 ha)[2]
- Water transfer pipeline[3]:
  - Pipeline: Option 1: 64.5 km (12.9 ha)
  - Pipeline: Option 2: 62.4 km (12.5 ha)
  - Pipeline: Option 3: 61.1 km (12.2 ha)

Total Project area: 101.6 ha

</td></tr>
<tr><td>Magisterial District:</td><td>Lephalale Magisterial District</td></tr>
<tr><td>Distance and direction from nearest town:</td><td>Approximately 60 km west of Lephalale</td></tr>
<tr><td>21 digit Surveyor General Code for each farm portion:</td><td>

Farm	Surveyor General Code
Road diversion:	
Swelpan 245LQ:RE	T0LQ00000000024500000
Draai Om 244LQ:RE	T0LQ00000000024400000
Verloren Valey 246LQ: RE	T0LQ00000000024600000
Dalyshope 323LQ: RE	T0LQ00000000032300000
Nazarov 685LQ: RE	T0LQ00000000068500000
Rail loop:	
Verloren Valey 246: RE	T0LQ00000000024600000
Duikerpan 249:RE:RE	T0LQ00000000024400000
Swelpan 24:RE	T0LQ00000000002400000
Kleinpan 269:RE	T0LQ00000000026900000
Wildebeesvlakte 268:RE	T0LQ00000000026800000
Groote-Zwart-Buld 290:RE	T0LQ00000000029000000
Water transfer pipeline:	
Draai Om 244: RE	T0LQ00000000024400000

</td></tr>
</table>

[1] Based on a 25 metres (m) servitude

[2] Based on a 30 m servitude

[3] Based on a 2 m servitude

	Swelpan 245: RE	T0LQ00000000024500000
	Verloren Valey 246:RE	T0LQ00000000024700000
	Nieuw Holland 247:RE	T0LQ00000000024900000
	Wildebeestvlakte 268:1	T0LQ00000000026800001
	Kleinpan 269:RE	T0LQ00000000026900000
	Houwhoek 270:RE	T0LQ00000000027000000
	Groot-Zwart-Bult 290:RE	T0LQ00000000029000000
	Grootdoorn 292:RE,1,2	T0LQ00000000029200000 T0LQ00000000029200001 T0LQ00000000029200002
	Theunispan 293:RE/19,20,22,25	T0LQ00000000029300019 T0LQ00000000029300020 T0LQ00000000029300022 T0LQ00000000029300025
	Vangpan 294:RE & 1	T0LQ00000000029400000 T0LQ00000000029400001
	Steenbokpan 295:RE,1&3	T0LQ00000000029500000 T0LQ00000000029500001 T0LQ00000000029500003
	Slangkop 296:2	T0LQ00000000029600002
	Zandbult 300:RE	T0LQ00000000030000000
	Loopleegte 302:2 and 3	T0LQ00000000030200002 T0LQ00000000030200003
	Vetleegte 304:RE	T0LQ00000000030400000
	Vaalpensloop 313:1	T0LQ00000000031300001
	Hooikraal 315:RE	T0LQ00000000031500000
	Vergulde Helm 321:RE	T0LQ00000000032100000
	Hieromtrent 460:RE	T0LQ00000000046000000
	Turfvlakte 463:RE	T0LQ00000000046300000
	Waterkloof 502:4	T0LQ00000000050200004
	Waterkloof 502:RE/53,57,149,158,165,	T0LQ00000000050200053 T0LQ00000000050200057 T0LQ00000000050200149 T0LQ00000000050200158 T0LQ00000000050200165
	Onverwacht 503:RE,3,17,28,30,	T0LQ00000000050300000 T0LQ00000000050300003 T0LQ00000000050300017 T0LQ00000000050300028 T0LQ00000000050300030
	Groothoek 504:RE	T0LQ00000000050400000
	Eendracht 505:RE	T0LQ00000000050500000
	Altoostyd 506:RE	T0LQ00000000050600000
	Hanglip 508:1,3,5,9,10	T0LQ00000000050800001 T0LQ00000000050800003 T0LQ00000000050800005 T0LQ00000000050800009 T0LQ00000000050800010
	Naauw Ontkomen 509:RE &1	T0LQ00000000050900000 T0LQ00000000050900001
	Paarl 522:RE &1	T0LQ00000000052200000 T0LQ00000000052200001
	Schaapplaats 524:RE/23,25,26,27,37,	T0LQ00000000052400023 T0LQ00000000052400025 T0LQ00000000052400026

		T0LQ00000000052400027 T0LQ00000000052400037
	Eenzaamheid 687:RE & 1	T0LQ00000000068700000 T0LQ00000000068700001
	Pontes Estates 712:RE	T0LQ00000000071200000
	Pontes Estate 744:RE	T0LQ00000000074400000

A Land Tenure Map is included as Plan 3, Appendix 1.

4 Item 3(c) of Appendix 3: Locality Map

An A3 Locality Map is attached as Plan 2 in Appendix 1 and shown in Figure 4-1 below.

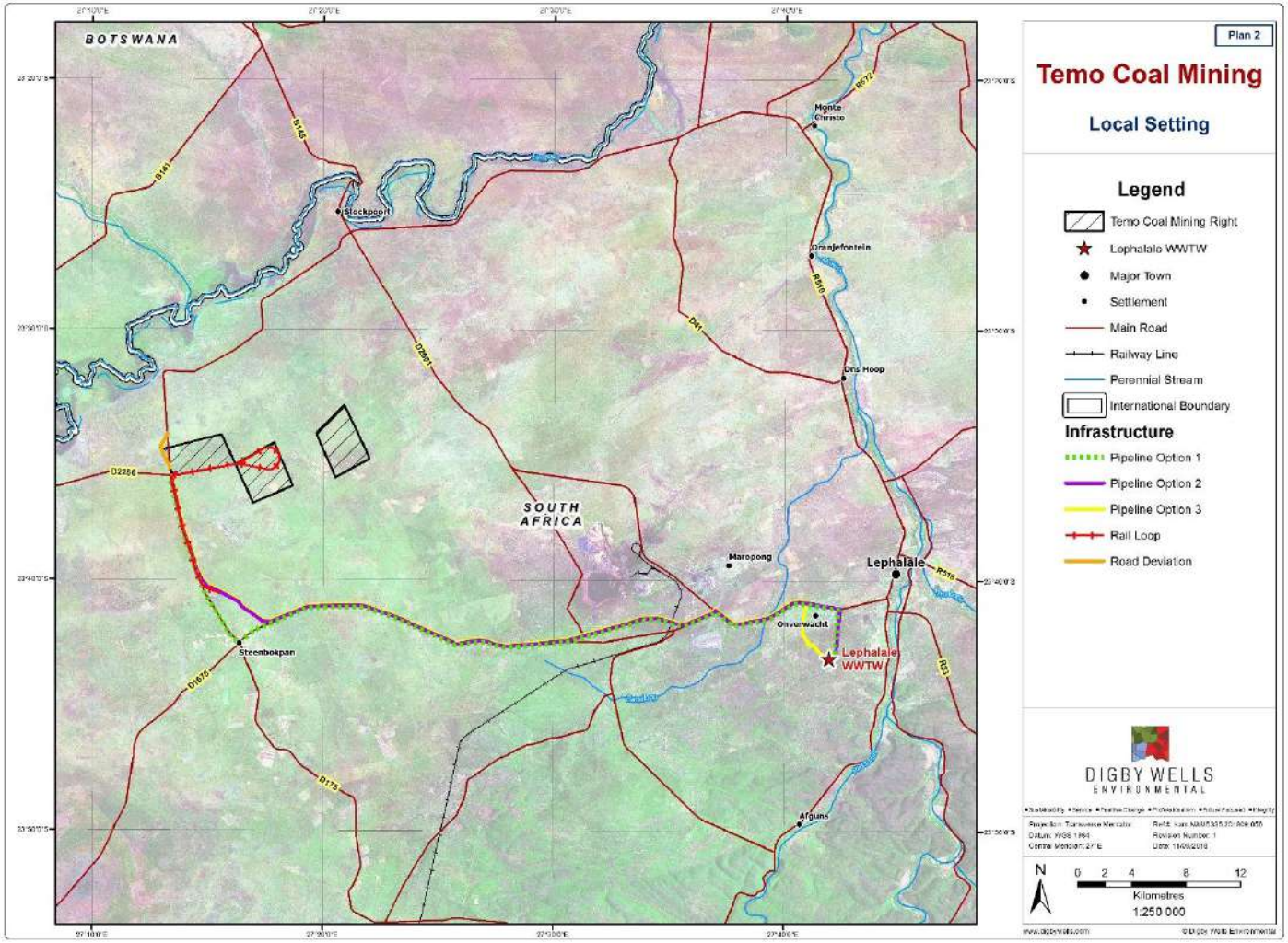


Figure 4-1: Local Project Setting

5 Item 3(d) of Appendix 3: Description of the Scope of the Proposed Overall Activity

The project entails the construction and operation of a road diversion, rail loop, and bulk water transfer pipeline. This infrastructure will be associated with the operation of the approved Temo Mine project.

Road Diversion: The existing D175 road runs along the western corner of the Temo Mine MRA which transects the south-western corner of the approved open pit area. To facilitate continued mining, Temo Coal is proposing that the D175 be diverted around the mining area.

Rail Loop: The proposed rail loop is intended to enable Temo Mine to transport coal to domestic markets as well as transport export-grade coal product to the Richards Bay Coal Terminal (RBCT). The rail loop is proposed to join the existing Boikarabelo rail link located south of the Temo Mine MRA.

Water pipeline: Temo Coal also proposes to construct and operate a bulk water transfer pipeline between Temo Mine and the Lephalale WWTW. The purpose of the pipeline is to provide water to the mine for operational use.

It is noted that Temo Coal is also exploring the possibility of sourcing water through the Moloko and Crocodile River (West) Water Augmentation Project (MCWAP). The Department of Water and Sanitation (DWS) obtained Environmental Authorisation in March 2019 for Phase 2 of the MCWAP relating to the construction of bulk water transfer infrastructure to transfer water from the Moloko Dam and Crocodile River to the Lephalale and Steenbokpan areas. The objective of the project is to support major development in the Waterberg coalfields area as it is in a water scarce region. Should Temo Coal wish to source water from this project, this would entail the construction of a water pipeline from the Temo Mine to the MCWAP Operational Reservoir in the Steenbokpan area. However, this is not a preferred option as Temo Coal's first preference would be the use of dirty water for coal beneficiation so as to not deplete clean water resources. Therefore sourcing water from through the MCWAP would be a last resort / back-up option. This option is not explored further in this EIA given the limited information regarding its implementation which is available and feasibility assessment of this option at this stage.

The proposed project Infrastructure Layout Plan is provided in Figure 5-1 below. It is noted that no amendment have been made to the layout presented during the Scoping Phase. This plan is also included as an A3 map as Plan 4, Appendix 1. Further detail pertaining to this infrastructure at its operation is provided in Section 0 below.

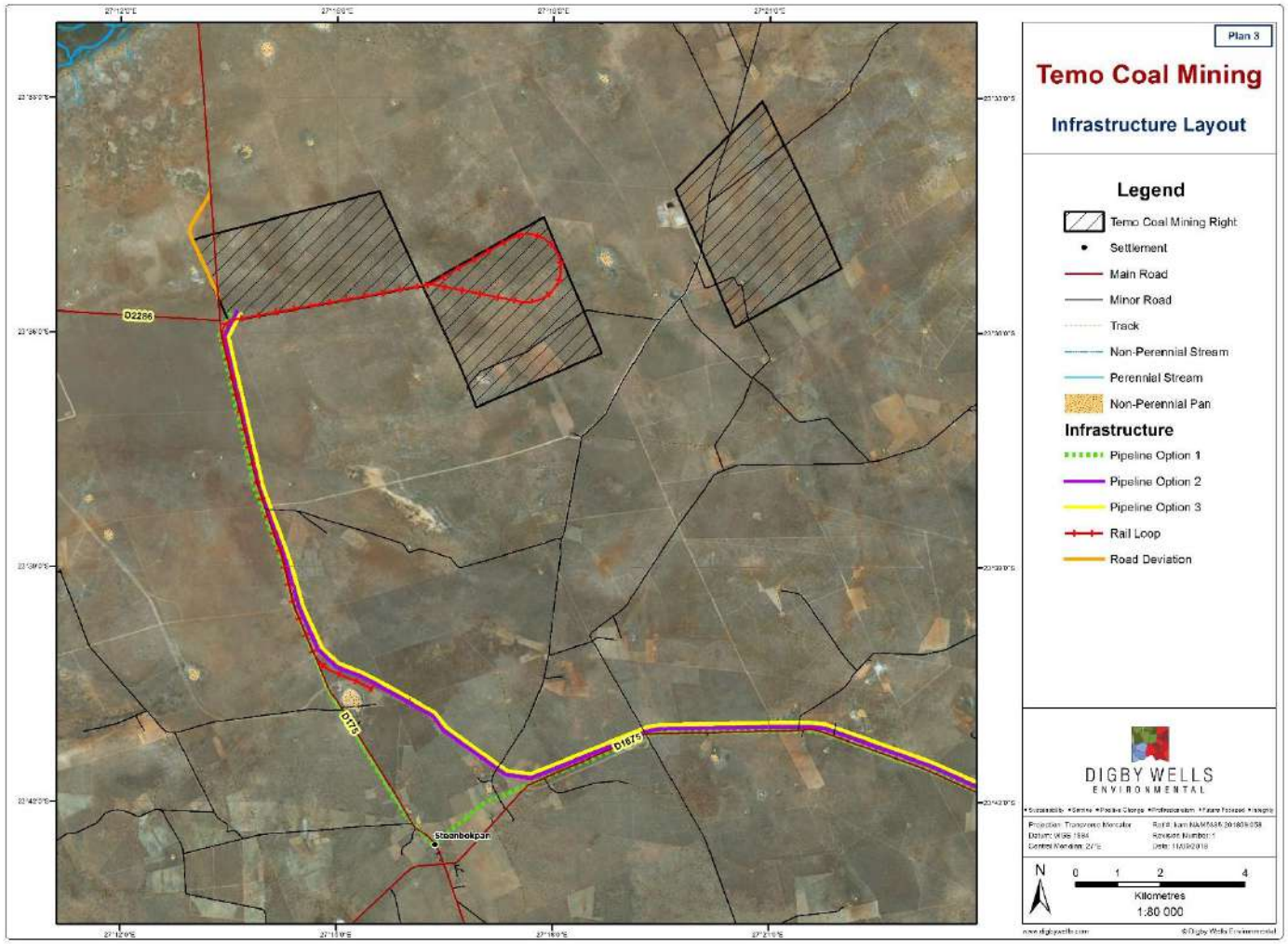


Figure 5-1: Infrastructure Layout Plan

5.1 Item 3(d)(i): Listed and Specified Activities

In terms of the EIA Regulations, 2014 (as amended), the Minister published Regulations in terms of Section 24 and 24D of NEMA for Activities that require Environmental Authorisation prior to their commencement.

Activities which are listed in Listing Notice 1 (GN R 327) or Listing Notice 3 (GN R 324) requires a Basic Assessment Process. Activities listed under Listing Notice 2 require that a Scoping and EIA Process be followed when applying for Environmental Authorisation.

This proposed project involves activities which are identified in Listing Notices 1 and 2, therefore requiring the Scoping EIA Process to be followed.

Table 5-1 provides the Listed Activities in terms of NEMA associated with the proposed project requiring authorisation. These triggered Activities were identified during the Scoping Phase of this project and no subsequent amendments have been made.

Table 5-1: Listed Activities associated with the project

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Expansion of rail link to an approved railway line (Boikarabelo)	Rail loop and rail link - 22.25 km	**Activity 64:** The expansion of railway lines, stations or shunting yards where there will be an increased development footprint, **excluding**- (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in mines; or (iii) additional railway lines within the railway line reserve.	**GN R 327 – Listing Notice 1**	N/A
Development of a pipeline	3 mega litre per day (Ml/day) bulk water transfer pipeline – 62.4 km.	**Activity 9:** 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.	**GN R 327 – Listing Notice 1**	N/A
Development of the Rail Loop	22.25 km	**Activity 12:** The development of railway lines, stations or shunting yards **excluding**- (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in a mining area; or (iii) additional railway lines within the railway line reserve.	**GN R 325 – Listing Notice 2.**	N/A

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Road realignment	The road realignment is approximately 2.8 km in length with 30 m servitude.	**Activity 27 (ii):** The development of a road- (iii) with a reserve wider than 30 metres; or (iv) catering for more than one lane of traffic in both directions; but **excluding a road-** a. 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, in which case activity 24 in Listing Notice 1 of 2014 applies; b. which is 1 kilometre or shorter; or c. where the entire road falls within an urban area.	**GN R 325 – Listing Notice 2.**	N/A

5.2 Item 3(d)(ii): Description of the Activities to be Undertaken

The Temo Mine is planned to be established to mine coal reserves from the Waterberg Coalfield via conventional open pit bench mining method. The operation is estimated to produce approximately 12 - 16 Million tonnes per annum (Mtpa) of Run-of-Mine (ROM) coal over a total Life-of-Mine (LOM) of approximately 30 years. Once extracted ROM coal will be processed through a coal beneficiation plant before is it transported off-site to domestic and export markets. Initially Temo Coal intended to transport the beneficiated coal product off-site via the D175 road towards Steenbokpan and then eastwards on the D1675 towards Lephalale to connect to railway line developments in the vicinity. This may be a short-term solution until the operation of the rail loop and associated link to the Boikarabelo line. Furthermore, roads may also be used for relatively short-distance haulage within the vicinity of the project to and from the Temo Mine. Various ancillary infrastructure including ROM stockpiles, a discard dump, dirty water containment facilities, workshops and haul roads are also planned to be established.

This project was granted a Mining Right (Reference No.: 30/5/1/2/2/19 MR) in 2013 and subsequently the EMPr was approved in 2015 (Reference No.: 12/1/9/2-W55).

This application relates to additional ancillary activities which are proposed to support the Temo Mine development. Temo Coal is applying for the following:

- Divert a road around the approved mining right area as a small section of the road infringes on the open pit footprint;
- Construct a rail loop and link for the transportation of coal to export markets; and
- Construct a pipeline for water supply from the Lephalale WWTW operated by the Local Municipality.

A site layout of the planned additional ancillary infrastructure subject to this application in relation to the approved infrastructure for the Temo Mine is illustrated on Plan 5, Appendix 1. This additional ancillary infrastructure and related activities are discussed in detail in the subsequent subsections.

5.2.1 Diversion of Road D175

The approved open pit area has a road, the D175, which transects the south-western corner of the future pit area and continues to exit the mining right boundary near to its north-western corner. To facilitate continued mining at the Temo Coal Mine, Temo proposes that the D175 be diverted around the mining area. The length of the road diversion is approximately 2.8 km with a 30 m servitude, resulting in a total footprint of 8.4 ha.

The proposed diversion will diverge from the existing route at the western mine boundary (west of the mine office area) and will be diverted just inside the eastern farm boundary of the Farm Draai Om 244 LQ. Where the southern boundary of the farm Nazarov 685 LQ meets the eastern boundary of Farm Draai Om 244 LQ, the diversion will head in a north-easterly

direction and re-join the existing D175 alignment at the western boundary of Farm Dalyshope 323 LQ (refer to Plan 3, Appendix 1).

5.2.2 Rail Loop and Link

The rail loop and associated link to the approved Boikarabelo railway line will facilitate the transportation of the beneficiated coal to domestic markets as well as transport export-grade coal product to the RBCT. The rail loop will include a loading loop which is within the Temo Mine MRA. The total extent of the rail loop is 22.25 km in length with 25 m wide servitude, resulting in a total footprint of 55.6 ha.

The loop itself will be on the Farm Duikerpan 249 LQ and the railway line will then run to the west of the loop along the southern boundary of the mine, within the Farm Verloren Valey 246 LQ towards the D175 road. Once the railway meets the D175, the railway will bend to the south on the farm Swelpan 246 LQ, crossing Kleinpan 269 LQ and Wildebeesvlakte 268 LQ, and then traverse slightly to the east to meet with the approved Boikarabelo rail link on the Farm Groote-Zwart-Buld 290 LQ (refer to Plan 3, Appendix 1).

5.2.3 Water Transfer Pipeline

A 3 Ml/day bulk water transfer pipeline is proposed to be constructed between the Lephalale WWTW where process water for the Temo Mine will be sourced. The proposed pipeline will be buried beneath surface, with the exception of crossing points and other areas which where it is deemed more practical and for safety reasons.

Pump stations will be constructed at the Lephalale WWTW and within the Temo Mine MRA. Three options are being investigated for the pipeline route. The details of these route options are provided in the subsections below. The route options are depicted on Plan 4, Appendix 1 and Figure 5-1 above.

5.2.3.1 Option 1 – Pipeline Route

The pipeline alignment for Option 1 follows the following route:

- From the proposed pump station at the Lephalale WWTW the pipeline runs on the western side of the Onverwacht road reserve toward Nelson Mandela Drive.
- At the intersection of Onverwacht road and Nelson Mandela Drive the pipeline alignment changes direction and runs on the southern side of the Nelson Mandela Drive road reserve toward Grootegeluk Mine.
- At the intersection of Nelson Mandela Drive and district road D1675 the alignment changes direction to the northern side of the D1675 road reserve toward Steenbokpan.
- At the intersection of D1675 and D175, the alignment changes direction to the eastern side of the D175 road reserve until it reaches the pump station at Temo Mine.

This pipeline option is approximately 64.5 km in length with a 2 m wide servitude, resulting in a total footprint of 12.9 ha.

5.2.3.2 Option 2 – Pipeline Route

The pipeline alignment for Option 2 follows the following route:

- From the proposed pump station at the Lephalale WWTW the pipeline runs on the western side of the Onverwacht road reserve toward Nelson Mandela Drive;
- At the intersection of Onverwacht Road and Nelson Mandela Drive the pipeline alignment changes direction and runs on the southern side of the Nelson Mandela Drive road reserve toward Grootegeluk Mine.
- At the intersection of Nelson Mandela Drive and district road D1675 the alignment changes direction to the northern side of the D1675 road reserve toward Steenbokpan.
- Before the intersection of D1675 and D175, the alignment changes direction to the eastern side of the railway reserve until it reaches the pump station at Temo Mine.

This option is approximately 62.4 km in length with a 2 m wide servitude, resulting in a total footprint of 12.5 ha. The water is pumped for the first 31.8 km and then gravitates down the remaining 30.6 km to Temo Mine.

5.2.3.3 Option 3 – Pipeline Route

The pipeline alignment for Option 3 follows the following route:

- From the proposed pump station at the Lephalale WWTW, the pipeline runs through Portion RE and Portion 1 of the farm Paarl 522 LQ and joins Palala Drive on the western side.
- At the intersection of Palala Drive and Nelson Mandela Drive the pipeline alignment changes direction and runs on the southern side of the Nelson Mandela Drive road reserve toward Grootegeluk Mine.
- At the intersection of Nelson Mandela Drive and district road D1675 the alignment changes direction to the northern side of the D1675 road reserve toward Steenbokpan.
- Before the intersection of D1675 and D175, the alignment changes direction to the eastern side of the railway reserve until it reaches the pump station at Temo Mine.

This option is approximately 61.1km in length with a 2 m wide servitude, resulting in a total footprint of 12.2 ha.

5.2.4 Related Infrastructure/Activities

5.2.4.1 Access Roads

The access road to the rail loop site will be 10 m wide and have a reserve of 30 m, resulting in a total footprint of 300 m^2. The road will be used temporarily for construction purposes and will be used during operations for maintenance activities but will form part of the mining infrastructure.

5.2.4.2 Water Management

The road diversion will be constructed with a 3% cross fall to ensure proper drainage of the gravel wearing coarse road. This water will discharge adjacent to the road and infiltrate into the surrounding environment. Since the area is extremely flat, not natural water courses cross the proposed road and therefore not culverts are envisaged for the road.

The rail loop will be elevated above the natural ground level and will therefore form a berm which will prevent rainwater from spilling into the rail loop area. Rainwater falling within the rail loop will be channelled to a stormwater attenuation dam. This stormwater will be recycled as process water for the mine and used to prevent the contamination of surrounding clean water areas.

As indicated above, the bulk water transfer pipeline will be buried beneath surface therefore no water management related structures will be constructed in relation to this infrastructure.

5.2.4.3 Waste Management

During the construction of the ancillary infrastructure, waste streams anticipated include domestic and hazardous waste as well as waste water. Hazardous waste will predominantly be a result from the operation, maintenance and servicing of vehicles and machinery used on site, mostly during the construction phase.

Separate waste bins within a bunded area will be made available at construction sites for temporary waste storage. All waste generated will subsequently be disposed of by the waste contractor to a designated and registered waste disposal site.

Waste water will result from the use of water predominantly during the construction phase of both the road diversion and rail loop.

5.2.4.4 Traffic Management

For the duration of the road diversion construction, the existing road will remain operational and construction workers will be instructed to guide traffic onto the correct route. Once the diversion has been completed the existing road will be closed and traffic will be directed onto the new diverted road.

The construction of the rail loop will not result in any traffic problems; however, the EMPr will consider a traffic management plan for the construction of the pipeline.

5.2.4.5 Ancillary Infrastructure

The majority of construction activities envisaged for the rail loop and the road diversion will require diesel and therefore the use of electricity will be minimal. There will however be electricity made available from the existing electrical supply point within the area.

5.2.4.6 Employment Requirements

The anticipated labour force for construction of the proposed ancillary infrastructure will reach a maximum of 150 personnel excluding mine construction.

6 Item 3(e): Policy and legislative Context

An application in terms of NEMA to obtain Environmental Authorisation has been submitted to the DMR for the Listed Activities provided in Section 5.1 above. Various policy and legislative requirements are applicable to the Environmental Authorisation application and assessment process as detailed in Table 6-1 below.

Table 6-1: Policy and Legislative Context

Applicable Legislation and Guidelines Applicable to the Project	Reference Where Applied
The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Under section 24 of the Constitution of the Republic of South Africa, it is clearly stated that: *Everyone has the right to (a) an environment that is not harmful to their health or well-being; and (b) 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* *(iii) Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.*	A Scoping and EIA process has been undertaken to determine the impacts associated with the Project. As part of the EIA process, mitigation measures and monitoring plans will be recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
National Environmental Management Act, 1998 (Act No. 107 of 1998) and EIA Regulations (as amended in 2017) The NEMA, as amended, was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The EIA Regulations, 2014, in GN R.982 were published on 04 December 2014 and promulgated on 08 December 2014, and amended in April 2017. The Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) for activities requiring environmental authorisation: a. Regulation GN R.983 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process. b. Regulation GN R.984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process.	Activities associated with the proposed ancillary infrastructure are identified as Listed Activities in the Listing Notices (as amended) and therefore require environmental authorisation prior to being undertaken. This Scoping and EIA Process has been duly informed by the requirements of the NEMA and Regulations thereunder.

Applicable Legislation and Guidelines Applicable to the Project	Reference Where Applied
c. Regulation GN R.985 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002)(MPRDA) The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities. The MPRDA ensures that environmental management principles as set out in the NEMA are applied to all mining operations. The MPRDA serves as a guideline for interpretation, administration and implementation of environmental requirements and ensures that mineral resources are exploited in a sustainable manner to serve both present and future generations.	The proposed ancillary infrastructure is associated with mining-related activities and portions of a MRA; therefore, the provisions set under the MPRDA will be duly observed.
National Water Act, 1998 (Act No. 36 of 1998) (NWA) The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. GN R 704 was published in June 1999 and aims to regulate the use of water for mining and related activities for the protection of water resources and states the following: d. Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution; e. Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, and f. Regulation 7 details the requirements necessary for the protection of water resources.	An IWULA and an associated Integrated Water and Waste Management Plan (WWMP) are required in terms of Section 21 of the NWA for the Project. The IWULA and IWWMP will be compiled and submitted to the DWS as the decision making authority. The water uses which may be triggered under Section 21 of the NWA in relation to the Project are listed below: ■ DW762 – S21(b) – "Storing water." ■ DW763 – S21(c) – "Impeding or diverting the flow of water." ■ DW768 – S21(i) – "Altering the bed, banks or characteristics of a watercourse." ■ DW805 - S21(j) –"Removing, discharging or disposing of water found underground if it is necessary for the effective continuation of an activity."
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA)	As part of this Project, a flora, fauna, wetlands and aquatic assessment have been undertaken to determine the current status of the

Applicable Legislation and Guidelines Applicable to the Project	Reference Where Applied
The NEM: BIOA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. The following regulations which have been promulgated in terms of the NEM: BIOA are also of relevance: g. Alien and Invasive Species Lists, 2014 published (GN R.599 in GG 37886 of 1 August 2014); h. National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; and i. National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R.1002, 9 December 2011).	environment and to determine any potential ecological sensitivities to be avoided and/or mitigated. Mitigation measures have been prescribed to avoid impacts to sensitive habitats.
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM: AQA) According to the NEM: AQA, the Department of Environmental Affairs (DEA), the provincial environmental departments and the local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA, is the establishment of National Ambient Air Quality Standards (NAAQS). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.	An Air Quality Assessment has undertaken as part of the EIA process to determine the baseline conditions of the air prior to the implementation of the proposed ancillary activities. The project's activities will set out to abide by the NEM: AQA and standards set out in the NAAQS. The required measures will be included in the EMPr.
National Forests Act, 1998 (Act No. 84 of 1998) Species that are nationally protected have been listed under the Protected Trees List as part of the National Forests Act, 1998 (Act No. 84 of 1998).	A fauna and flora assessment was undertaken where Plant Species of Special Concern (SSC) were identified in the project area. Permits may be applied for from the provincial authorities to either translocate these species (where possible) or remove them.
National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The NHRA is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agencies, in this case the South African Heritage Resources Agency (SAHRA)	A Heritage Resource Management (HRM) process has been undertaken for the proposed project with the specific aim of detailing identified

Applicable Legislation and Guidelines Applicable to the Project	Reference Where Applied
and Limpopo Provincial Heritage Resources Authority (LPHRA), be notified as early as possible of any developments that may exceed certain minimum thresholds.	heritage resources within the site-specific area which may be disturbed. This included the compilation of a Heritage Impact Assessment (HIA).
The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) This Act is administered by the Mine Health and Safety Inspectorate of the DMR. The Mine Health and Safety Act, 1996 (Act No. 29 of 1996) is set out to provide for protection of the health and safety of employees and other persons at mines and to require employers and employees to identify hazards and eliminate, control and minimise the risks relating to health and safety at mines. Section 2(1) of the act requires; *"2. (1). The owner of every mine that is being worked must* *b) ensure, as far as reasonably practicable, that the mine is designed, constructed and equipped* *(i) to provide conditions for safe operation and a healthy working environment; and* *(ii) with a communication system and with electrical, mechanical and other equipment as necessary to achieve those conditions"*	Health and safety policies and procedures were duly considered in the compilation of this EIA and EMPr.
Environmental Conservation Act, 1989 (ECA), (Act No. 73 of 1989) - National Noise Control Regulations, GN R.154 (10 January 1992) These regulations make provision for guidelines pertaining to noise control and measurements. The regulations make reference to the use of the South African National Standards 10103:2008 (SANS) guidelines for the Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication.	A Noise Impact Assessment has been undertaken as part of the EIA process to understand the impact of the proposed mine activities on the ambient noise environment.

7 Item 3(f): Need and Desirability of the Proposed Activities

The Temo Mine is an approved planned operation which will extract coal from the Waterberg Coalfield area. The Temo Mine will supply approximately 5 Mt/a of coal to Eskom and other domestic markets, supporting its domestic coal demand to sustain and increase energy security which in turn promotes economic development. A further 2 Mt/a will be supplied to the export market which will contribute to the country's foreign currency earning. In addition, the establishment of the operation will have socioeconomic benefits to the local area including employment opportunities and local skills development in accordance with the approved Social and Labour Plan (SLP).

The proposed activities subject to this application are planned to support the development and operation of Temo Mine. Currently the D175 traverses the approved open pit area within the Temo mining right area, thereby sterilizing a portion of the targeted coal reserve. As such, the proposed realignment of the D175 will allow for mining to proceed unhindered by the road.

The purpose of the rail loop and associated railway link to the Boikarabelo railway line will be to ensure that beneficiated coal product reaches the intended markets. The transportation of product coal via rail has been deemed the most effective method as it leverages other existing and planned rail network infrastructure in the area. The rail loop will act as an extension to the proposed Boikarabelo line which will be utilised for transporting coal to domestic markets and the RBCT, thereby avoiding the impact to the national road network from coal trucks transporting coal.

The Temo Mine will require process water for activities such as coal washing in the beneficiation plant and dust suppression. From the Department of Water and Sanitation's (DWS) water use register database (WARMS) that was obtained 16/07/2015, the registered water users in the region include agricultural and mining land uses. The main sources of water to support these activities are abstractions of groundwater and from the Limpopo River. These activities coupled with the relatively low rainfall and high evaporation rate that characterises the region has a significant impact on water availability. Alternative sources of water are therefore imperative to sustaining development within the region. To this end, Temo Coal intends to recycle water from the Lephalale WWTW to use as process water at the Temo Mine as the most feasible alternative. The proposed bulk water pipeline which is subject to this application will facilitate the transfer of water from the WWTW to the mine.

Through this EIA Process, the potential impacts associated with the abovementioned ancillary infrastructure have been identified and mitigation measures have been established to avoid adverse environmental impacts. Where impacts are unavoidable, measures to reduce the significance of such impacts as far as possible have been determined.

8 Item 3(g): Motivation for the Preferred Development Footprint within the Approved Site including a Full Description of the Process followed to reach the Proposed Development Footprint within the Approved Site

The diversion of the D175 road is required as the current alignment traverses a portion of the planned open pit area. The preferred realignment route diverts the road west of the open pit area, this places the road outside of the Temo Mine MRA. This will also significantly reduce any health, safety and environmental risks to road users. Furthermore, preferred realignment route only affects a limited portion of the road resulting in a diversion by 2.8 km which is the shortest option to divert the existing alignment outside of the Temo Mine MRA and it does not have an impact on other surrounding road routes.

The farm Duikerpan 249LQ, where the rail loop is planned, is believed to have coal that is not economically viable and this would therefore be the most suitable site of all the farms surrounding the Temo Mine to locate the proposed rail loop. The farm Verloren Valey 246LQ, where the open pit is located, has been chosen to avoid sterilising viable coal reserves. The rail loop remains within the Temo Mine MRA which limits disturbance to surrounding properties. The preferred route for the associated rail link runs adjacent to the D175 until it reaches the Boikarabelo rail line. This route is preferred as it limits disturbance and the establishment of access roads.

Temo Coal has investigated three routes for the proposed water transfer pipeline. The preferred route is Option 2 which is planned to run along road reserves and the railway reserve from the Lephalale WWTW until it reaches Temo Mine. The pipeline is proposed to be buried to avoid nuisance and other environmental impacts such as erosion. Similar to the rail link, the location of the pipeline along road reserves limits disturbance and the need for the establishment of access roads.

8.1 Item 3(g)(i): Details of the development footprint alternatives considered

A project alternative is defined as a possible course of action, in place of another, that would meet the same purpose and need (DEAT, 2004).

In an EIA process, project alternatives serve to determine the most effective way of meeting the objectives of that project. This is generally done through either enhancing the benefits of an activity and/or mitigating the negative impacts and risks of an activity.

According to the Department of Environmental Affairs (DEA) Criteria for Determining Alternatives in the EIA Guideline (2004), there are various types or categories of alternatives, including:

- Activity alternative – consideration of different means to achieve the same project objective;

- Location alternative – alternative project sites in the same geographic area;
- Site layout alternative – consideration of the different options to place project infrastructure;
- Process/design alternative – alternative process/design/equipment;
- Routing alternative – consideration of different routes for linear infrastructure; and
- No-go alternative – the proposed project/activity does not proceed, implying that the current situation or status quo remains.

Based on the nature of the proposed project and association to the approved Temo Mine, only activity, routing and the no-go alternatives were considered for this EIA in the subsections below. In addition, land use alternatives were presented during the Scoping Phase which are also discussed below.

8.1.1 Activity Alternatives

The objectives of the ancillary infrastructure proposed are as follows:

- To transport product coal to domestic and export markets;
- To optimise coal extraction through the road diversion at the targeted reserve; and
- To source water for operational activities at Temo Mine (beneficiation of coal).

Two activity alternatives were considered to transport product coal to domestic and export markets, namely transportation via road or rail. Export-grade coal product is planned to be transported to the RBCT which is located over 900 km from Temo Mine. Impacts associated with road haulage include but are not limited to safety risks (e.g. accidents with other road users), adverse traffic impacts and increased degradation of public road networks due to increased use for coal haulage. Transportation of the coal product via rail is the preferred alternative as opportune rail infrastructure is in place or planned within the region. The Integrated Development Plan (IDP) developed for the Lephalale District Municipality (LDM) (2018/2019) establishes a need for further investment in infrastructure which includes the South African rail network to support the growing mining activities within the Waterberg coalfield area. Therefore, the establishment of a direct link to the planned Boikarabelo Line, which will be approximately 22 km in length, is in line with the objectives of the IDP and leverages existing rail infrastructure which provides sustainable access to both domestic and export markets.

Alternative options for sourcing water for operational activities at Temo Mine include abstraction of groundwater, surface water from surrounding water resources, sourcing water from the MCAWP or the reuse of water from the Lephalale WWTW. It is well established that Temo Mine is located in an area that is water scarce and there is no reliable water source for the operation of the mine. Therefore, sourcing water from the Lephalale WWTW is deemed the most sustainable alternative, requiring a pipeline to be constructed to transfer water from

the WWTW to the Temo Mine. It is further noted that this preferred alternative would also not result in pressure to the clean water resource to be supplied by the MCAWP.

No activity alternatives were considered for the proposed diversion of the road D175 as the road traverses the planned open pit area, therefore sterilising a portion of the coal reserve. To meet the objective of optimising coal extraction, the diversion of the road to access the full extent of the coal reserve is deemed the only feasible option.

8.1.2 Routing Alternatives

Routing alternatives were considered for the proposed water transfer pipeline. Three options, as discussed in Section 5.2.3, have been considered. The proposed pipeline options all run along road reserves and the rail servitude along a similar trajectory from the Lephalale WWTW until they reach Temo Mine. Option 1 is the shortest route, however, this is not the preferred option as it affects more public area. This route option travels along the D1675 road reserve up to the intersection with D175 before it changes direction to the eastern side of the D175 road reserve to the Temo Mine.

Option 2 and Option 3, which vary in length by approximately 1.3 km, divert from the D1675 before it intersects with the D175 road and runs along the planned reserve for the Boikarabelo railway line and proposed rail link. This route has been deemed more suitable than that of Option 1 as it results in a reduced disturbance to the public road reserve and transects fewer public farm properties. In terms of the preferred option between Option 2 and Option 3, these routes differ in alignment from the Lephalale WWTW to their trajectory from the Nelson Mandela Drive. Option 2 is preferred in this respect as its alignment with the Onverwacht road reserve towards Nelson Mandela Drive is along the outskirts of Lephalale town whereas the alignment of Option 3 along the Palala Drive reserve towards Nelson Mandela Drive cuts through the town. The construction of the pipeline along the Option 3 trajectory therefore holds a higher risk of disturbance of existing infrastructure and more intensified nuisance impacts to the surroundings. To this end, Option 2 which is the longest of the three options is preferred as it is deemed to have the least disturbance to public, therefore reducing the likelihood of associated nuisance impacts.

8.1.3 Land Use Alternatives

Land use alternatives were considered for properties associated with the proposed ancillary infrastructure. The rail loop is planned on the farm Duikerpan 249 LQ and its current land use is agricultural. Temo is in the process of altering the land use to Industrial as this property falls within the Temo Mine MRA.

The current land use of Draai Om 224 LQ which is associated with the road diversion is mining and therefore the section of the road diversion that will be constructed on this farm will not negatively impact this land use.

Due to the minimal footprint of the proposed water transfer pipeline, the existing land uses may continue after construction is completed.

8.1.4 No-go Alternatives

If the road diversion does not to go ahead, the production of coal at the Temo Mine would not be viable. If the rail loop is not constructed, the cost to Temo for the transportation of coal would increase due to transporting export coal via road with coal trucks. The road network will also be negatively impacted due to the increased usage of the roads by coal trucks.

The pipeline not going ahead would mean that the Temo Mine will not be able to be operational as there is no other long-term solution which is deemed feasible for water supply to the Temo Mine to run operations.

9 Item 3(g)(ii): Details of the Public Participation Process followed

The PPP was developed to ensure compliance with environmental regulatory requirements and to provide I&APs with an opportunity to evaluate the proposed project. The PPP was initiated during the Scoping Phase of the project and all stakeholder comments received to date have been captured in the Comments and Responses Report (CRR).

The subsection below provides a summary of PPP undertaken to date. A detailed Public Participation Chapter is included as Appendix 3.

9.1 Stakeholder Identification

During the Scoping Phase, various methods were utilised to develop a project specific stakeholder database which was representative of potentially interested or affected stakeholders. These methods included desktop searches as well as responses received from the various public documents released (newspaper advertisement, site notices, Background Information Document (BID) and notification letter).

Stakeholders were grouped into various categories such as land owners/occupiers, communities, relevant government organisations, non-governmental organisations (NGOs) and business enterprises.

Stakeholders were encouraged to register as I&APs throughout the PPP and the stakeholder database updated throughout the PPP with new stakeholders.

9.2 Directly Affected Landowners

The directed affected landowner and those of adjacent properties are detailed in the table below.

Table 9-1: Directly Affected and Adjacent Farms

Farm	Portion	Owner
Altoostyd 506	RE	Limpopo District Municipality
Dalyshope 232	RE	Anglo Operations (Pty) Ltd
Draai Om 244	RE	Resgen South Africa (Pty) Ltd
Duikerpan 249	RE	Privately Owned
Eendracht 505	RE	Privately Owned

Farm	Portion	Owner
Eenzaamheid 687	RE, 1	Eskom Holdings Ltd
Grootdoorn 292	RE, 1, 2	Privately Owned
Groothoek 504	RE	Exxaro Coal Pty
Groote-Zwart-Bult 290	RE	Sasol Mafutha (Pty) Ltd
Gruisfontein 230	RE	Prostart Traders 136 (Pty) Ltd
Hanglip 508	1, 3, 5, 9, 10	Batis Prop Pty Ltd ; Waterkloof familie trust; and Privately Owned
Hieromtrent 460	RE	To be confirmed
Hooikraal 315	RE	Utafutaji Trading 75 Pty Ltd
Houwhoek 270	RE	Sasol Mafutha (Pty) Ltd
Kleinpan 269	RE	Resgen South Africa (Pty) Ltd
Loopleegte 302	2, 3	Resgen South Africa (Pty) Ltd; and Privately Owned
Naauw ontkomen 509	RE, 1	Eskom Holdings Ltd
Nazarov 685	RE	Ekosto 1058 (Pty) Ltd
Nieuw Holland 247	RE	Privately owned
Onverwacht 503	RE, 3, 17, 28, 30	To be confirmed. Portions have been changed.
Paarl 522	RE, 1	Blue Horison INV 11 Pty Ltd; and Kenani Boerdery CC
BUFFELSJAGT,317	RE	Private Owner
Pontes Estates 712	RE	Pontes Estates
Schaapplaats 524	RE/23, 25, 26, 27, 37	Privately Owned
Slangkop 296	2	Sasol Mafutha Pty Ltd
Steenbokpan 295	RE, 1, 3	Exxaro Coal Pty; and Genecorp
Swelpan 245	RE	Resgen South Africa (Pty) Ltd
Theunispan 293	RE/19, 20, 22, 25	Amber Sunrise Properties 96 Lephalale Property Investments
Turfvlakte 463	RE	Exxaro Coal Pty
Vaalpensloop 313	1	Exxaro Coal Pty
Vangpan 294	RE, 1	Privately Owned
Vergulde helm 321	RE	H J L Hills Boerdery Pty LTD
Verloren Valey 246	RE	Swanepoel Magrieta Elizabeth (Pvt ownership)
Vetleegte 304		Privately Owned
Waterkloof 502	4, RE/53, RE/57, RE/149, 158, 165	Gabbiano's Restaurant Cadvest trust Pontes Estate
Wildebeestvlakte 268	1	To be confirmed
Zandbult 300	RE	Resgen South Africa Pty LTD

9.3 Public Consultation during the Scoping Phase

The table below provides a summary of the PPP activities undertaken during the Scoping phase, together with referencing materials under Appendix 3.

Table 9-2: Scoping Phase Consultation

Activity	Details
Identification of stakeholders	A stakeholder database was developed which includes I&APs from various sectors of society, including directly affected and adjacent landowners, in and around the proposed project area.
Distribution of announcement letter and Background Information Document (BID)	A pre-announcement letter was sent to Interested and affected parties, on **27 September 2018.** A BID, announcement letter with Registration and Comment Form will emailed and posted to stakeholders on **26 October 2018.**
Placing of newspaper advertisement	An English advert will be placed in the **Mogol Post on 26 October 2018**
Putting up of site notices	English site notices were put up at the proposed project site, local libraries and municipal offices on **25 October 2018.** Site notices were placed at the following locations: ▪ Lesedi Village, Steenbokpan; and ▪ Lephalale Local Municipality Public Library. A site notice placement map and report were also developed to geographically indicate the various site notice locations.
Announcement of Scoping Report	Announcement of availability of the Scoping Report was emailed and posted to stakeholders together with the formal project announcement on **26 October 2018**. Copies of the Scoping Report were available at: ▪ Lesedi Village, Steenbokpan; and ▪ Lephalale Local Municipality Public Library. The Scoping Report is also available on www.digbywells.com (under Public Documents) and was made available before the Public Meeting. (30-day comment period for the Scoping Report: Friday, 26 October 2018 to the Monday, 26 November 2018).
Stakeholder Meeting	A Public Meeting was undertaken as follows: Mogol Club (Cnr. George Wells and Nelson Mandela Drive, Onverwacht) on **Wednesday 14 November 2018 at 10:00am – 12:00pm**
Announcement of updated Scoping Report	Announcement of availability of the updated Scoping Report was emailed and posted to stakeholders on **26 October 2018**, together with a Comment Form, and is available on www.digbywells.com (under Public Documents). A SMS was used to inform stakeholders of availability.

9.4 Public Consultation during the EIA Phase

This Draft EIA and EMP Report serves to provide feedback on the findings of the specialist studies and the determined mitigation measures to avoid adverse environmental impacts as far as possible.

Table 9-3 provides summary of the PPP activities undertaken to date as well as those still to be undertaken during this EIA Phase of the process. The PPP material has been appended to this report as Appendix 3.

Table 9-3: Public Participation Impact Assessment Phase Activities

Impact Assessment Phase	
Announcement of Draft EIA and EMP Reports	Announcement of availability of the Draft EIA and EMP Reports was sent via email and SMS to stakeholders on **08 April 2019**. Similar to the Scoping Report, copies of the Draft EIA and EMP Reports were available at: ▪ Lesedi Village, Steenbokpan; and ▪ Lephalale Local Municipality Public Library. The Draft EIA and EMPr was also made available on www.digbywells.com (under Public Documents) and at the various stakeholder meetings. **(Comment period: 08 April 2019 – 10 May 2019)**
Public Meeting	A Public Meeting will be held with all stakeholders, and specifically communities, during the Draft EIA public review period. Further details will be provided to I&APs once the time and venue have been confirmed.
Obtaining comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders will continue to be captured and included in the CRR during the EIA Phase.
Announcement of the Final EIA and EMP Report	Notification for availability of the Final EIA and EMPr Report will be emailed and sent via SMS to stakeholders. Copies of the reports will be made available Digby Wells Website www.digbywells.com under Public Documents.

9.5 Item 3(g)(iii): Summary of Issues Raised by I&APs

Views, concerns and objections provided by I&APs to date (Scoping Phase) have been captured in the CRR. The CRR includes responses provided (please refer to Appendix 3). Following the public review period and consultation of this Draft EIA and EMPr together, the CRR will be updated with all comments received.

10 Item 3(g)(iv): The Environmental Attributes associated with the Development Footprint Alternatives

The purpose of understanding the environmental baseline conditions relates to the potential project impact on the existing environment. This section also considers existing environmental aspects that may influence a proposed development in terms of design, location, technology and layout.

A number of specialist studies were undertaken during the EIA phase for the proposed project and are appended to this report, as shown in Table 10-1 below.

Table 10-1: Specialist Reports and Associated Appendices

Specialist Study	Appendix
Soil, Land Use and Land Capability Assessment	Appendix 4
Flora and Fauna Assessment	Appendix 5
Wetland and Aquatic Ecology Assessment	Appendix 6
Surface Water Assessment	Appendix 7
Groundwater Assessment	Appendix 8
Air Quality	Appendix 9
Noise Assessment	Appendix 10
Heritage Assessment	Appendix 11
Socio-economic Assessment	Appendix 12
Rehabilitation and Closure Liability Assessment	Appendix 13

The subsection below provides the baseline bio-physical and socio-economic environmental conditions currently present on the project site. The information provided in this section has been obtained from the abovementioned specialist reports and previous studies undertaken. The main source of information was the Temo Mine EIA undertaken by Digby Wells in 2014 and other subsequent studies conducted in the region.

10.1 Regional Climate

An understanding of the regional climate is important as the climatic conditions influence various environmental aspect with which the proposed activities interact. Climate data was obtained from Lakes MM5 for a three year period between January 2012 and December 2014.

Lephalale experiences hot summers and mild winters. Summer season experiences long and dry afternoons, with an average sunshine duration of 65%, and moderate summer evening temperatures. Annual mean temperature of 31°C was recorded for the region for a three year period. During the winter, temperature can drop to 3.7°C on average in July.

The average annual rainfall is between 350mm to 400mm, normally occurring during the mid-summer period. In terms of evaporation, the average evaporation rates measured by the South African Weather Service (SAWS) for the period 1983 to 1987 are 2364.9 mm, 2118.9 mm and 2662.4 mm respectively.

The predominant wind direction is from the northeast and east northeast respectively. The percentages of wind from the NE and ENE are ~30% and 24% respectively. Wind speed greater than 5.4 m/s are important to note as they likely to increase dust generation and erosion. For the study area, wind speed exceeding 5.4 m/s occurred for about 9% throughout the three year period.

10.2 Regional Geology

The coal deposit at the Temo Mine Project site is hosted in Karoo Supergroup formations which rest unconformably on the Waterberg Group and pre-Waterberg rocks.

The coal seams in the area form part of the Upper (Volksrust formation) and Middle Ecca (Vryheid formation) with an average coal thickness of 115 metres. The Upper Ecca is on average 60 metres thick and comprises interblended shale and bright coal successions whilst the Middle Ecca, on average 50 metres thick, forms the lower part of the coal deposit and contain dull coal, carbonaceous shale, as well as grit and sandstone.

The Waterberg coal field is fault-bounded along its northern and southern limits. The Eenzaamheid fault, with a displacement of at least 250 metres, forms the southern boundary, whilst the northern boundary is formed by the Zoetfontein fault. The Daarby fault, with a displacement of 250 metres, divides the Waterberg coal field into two areas: a shallow western area where it is possible to obtain the coal through open pit mining methods and a deep north-eastern area where the coal occurs at a depth of 250 metres below surface. Although this coal field covers a relatively small surface area, it is one of South Africa`s most important coal fields in terms of in-situ resources. The coalfield extends west across the Limpopo River into Botswana, where it is known as the Mmamabula Coalfield.

10.3 Topography and Sensitive Visual Receptors

The project area and surrounds are relatively flat. The relatively flat topography is expected to provide only minimal screening of the proposed Temo Rail Loop and Road Diversion Project. According to Mucina and Rutherford (2012) the dominant vegetation types of the project area and surrounds is Limpopo Sweet Bushveld characterised by grassland, bushes and trees. The vegetation of the project area and surrounds is relatively dense and has an average height of 5 metres. This vegetation type is expected to provide moderate screening of the proposed rail loop and road diversion project.

The potential visual receptors of the proposed project include residents of the farm residences and tourists visiting game lodges. Roads that could potentially be affected include the district and farm roads in the vicinity of the project area.

10.4 Soils, Land Use and Land Capability

The Soil and Land Capability Assessment undertaken is appended to this report as Appendix 4.

10.4.1 Land Type and Soil Form

The land type data gathered suggested that the dominant land types on site were Ae252, Ae257, Ah86, Bc44 and Bd46 characterised by red yellow apedal, freely drained and upland duplex and margalitic soils; respectively, as illustrated in Plan 6, Appendix 1. In terms of agricultural potential, these land types are characterised as low potential due to low rainfall and high evaporation rates.

10.4.2 Land Capability

Land capability was determined by assessing a combination of soil, terrain and climate features. The land classes were identified based on soil forms, texture and fertility. The low rainfall of this area limits the utilization potential of the study area to low intensity grazing and wildlife conservation. The land capability class was identified as Class VI, as summarised in **Table 10-2** and illustrated in Plan 7, Appendix 1. Land in Class VI has limitations that make land unsuited for cultivation and its use largely to pasture, wildlife and range. Limitations that cannot be corrected include severe erosion hazard and low water holding capacity.

Table 10-2: Land Capability Classification

Land Type	Land Capability Class	Agricultural Potential
Ae252	VI – Grazing	Low
Ae257	VI – Grazing	Low
Ah86	VI – Grazing	Low
Bc44	VI – Grazing	Low
Bd46	VI – Grazing	Low

10.4.3 Present Land Use

The present land use was identified using satellite images and visual observations during the site visit. The main land uses in the area are grassland for grazing, as illustrated in Plan 8, Appendix 1. The land is confined almost exclusively to low intensity livestock grazing and game farming. It is noted that the pipeline trajectory (which mostly follows existing servitudes) traverses urban development land uses, namely the towns Lephalale, Onverwacht and Steenbokpan.

10.4.4 Soil Chemical and Physical Characteristics

Based on background information it is reported that the soils are inherently low in calcium and magnesium, have low to very low concentrations of organic carbon and retain lower than average quantities of potassium and sodium. The soils are prone to erosion (low clay and

organic carbon), albeit that the topography is generally flat to slightly undulating, a factor that tempers the erosion index to low.

10.5 Flora and Fauna

A Fauna and Flora Assessment was undertaken and is appended to this report as Appendix 5. One in-field survey was carried out within the summer rainfall season (December 2018) to establish the baseline vegetation and faunal environment in the project area. Information from previous surveys was also utilised accordingly.

10.5.1 Flora Characteristics

10.5.1.1 Regional Vegetation

The project area falls within the Limpopo Sweet Bushveld as described by Mucina and Rutherford (2006) (refer to Plan 9, Appendix 1). This vegetation type occurs within the Limpopo Province at an altitude of 700 - 1 000 m. The vegetation extends across the border, into Botswana. The vegetation consists of plains, which are traversed by several tributaries of the Limpopo River. Areas which have been disturbed are dominated by thickets of Blue Thorn (*Acacia (Vachellia) erubescens*), Black Thorn (*Acacia (Senegalia) mellifera*) and Sickle Bush (*Dichrostachys cinerea*) (Mucina and Rutherford, 2006).

Tall trees include Ankle thorn (*Acacia (Vachellia) robusta*) and Black Monkey Thorn (*Acacia (Senegalia) burkei*). Smaller trees include Blue Thorn (*Acacia (Vachellia) erubescens*), *Acacia (Senegelia) cinerea, Acacia (Vachelia) nilotica, Acacia (Senegalia) senegal, Albizia anthelminitica, Boscia albitrunca, Combretum apiculatum,* and *Terminalia sericea.*

10.5.1.1.1 Species of Special Concern (SSC)

IUCN Read Data species

No Red Data species are expected to occur for the Quarter Degree Square for the site. *Acacia erioloba* (Camel Thorn) however, is listed as Declining.

Protected Trees

A number of National protected tree species (National Forests Act, 2001) were identified within the site (Table 10-3). Further to this, additional protected species listed under the Limpopo Environmental Management Act, 2003 (Act No. 7 of 2003) (LEMA), may occur.

For the removal or disturbance of any of these trees, a tree removal permit will need to be applied for from the Department of Agriculture, Forestry and Fisheries (DAFF).

Table 10-3: Protected tree species likely to be found in the proposed Project site

Family	Scientific name	Common name	Red data status
Capparaceae	*Boscia albitrunca*	Shepherds Bush Tree	Least concern (protected)
	Sclerocarya birrea	Marula	Least concern
Combretaceae	*Combretum imberbe*	Leadwood	Least concern (protected)
Fabaceae	*Acacia (Vachellia)erioloba*	Camel Thorn	Declining

10.5.1.1.2 Limpopo Conservation Plan

The Limpopo Conservation Plan Version 2 (C-Plan v2) was published in September 2013 and delivered a detailed map of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) for the Limpopo Province. The C-Plan in relation to the ancillary infrastructure is depicted in Plan 10, Appendix 1. The proposed rail loop and the road diversion do not fall in classified conservation areas while a small portion of the rail link where it meets with the Boikarabelo line is within CBA 2. The majority of the pipeline trajectory from the Temo Mine does not fall within classified conservation areas with portions towards the Lephalale WWTW along the D1675 road reserve falling within CBA 1, ESA 1 and ESA 2. Therefore, this infrastructure trajectory intersects with areas of some sensitive biodiversity.

10.5.1.2 Site Specific Vegetation

A total of eight vegetation habitats were delineated within the vicinity of the proposed ancillary infrastructure during the field survey, as summarised in the table below.

Generally, bushveld vegetation does not typically show large variation and therefore communities were similar with an abundance of some cosmopolitan species. Common and characteristic shrubs, grasses and forbs were observed throughout the project area.

These vegetation habitats are depicted on Plan 11, Appendix 1.

Table 10-4: Vegetation Habitats

Vegetation Habitat		Main trees and shrubs present	Main grasses present	Site Observations	Photographic Evidence
1	**Commiphora bushveld**	*Commiphora angolensis; C pyracanthoides; Combretum apiculatum; Peltophorum africanum; Vachellia erioloba; Elephantorirza elephantine;*	*Aristida rhinochloa; Panicum maximum*	The grass layer was poor in the project area with on average 35% bare ground present. Aristida spp were present, which are predominantly hardy grasses that are typical of overgrazed veld, with Panicum spp present in the protected shady areas and on occasion *Digitatria eriantha* (Digit Grass) was found. The predominant land use was cattle farming and overutilization was observed. The habitat is utilised by naturally occurring ungulate species as well.	
2	**Combretum-dominated thornveld**	*Combretum apiculatum; Dichrostachys cinera; Grewia bicolor, G. flava; G. flavescens; Boscia foetida subsp rehamnniana; Boscia albitrunca*	*Aristida rhinochloa; A. diffusa; A. stipitataa*	The grass layer was very poor in this area with Aristida spp being present, which are predominantly hardy grasses that are typical of overgrazed veld, and Panicum spp were present in the protected shady areas under trees and shrubs. Species diversity was generally low with an absence of unique species. This vegetation type is impacted by the adjacent agricultural fields as well as the cattle grazing that are practiced on the farm by the land owner. Ground cover was often below 50%, which contributes to the susceptibility of the soil to erosion.	
3	**Combretum/Marula thornveld**	*Combretum apiculatum; Sclerocarya birrea; Senegalia erioloba; S. nigrescens Dichrostachys cinera; Terminalia sericea; Boscia foetida subsp rehamnniana; Grewia bicolor, G. flava; G. flavescens*	*Aristida spp; Panicum maximum; Urochloa mosambicensis; Tragus berteronianus; Schmidtia pappophoroides; Tricholaena monachne*	The grass layer of this habitat was of greater variety of species and better overall cover in comparison to the habitats one and two of the neighbouring farms. This is a relatively small habitat type and the predominant land use of this area was cattle farming; however, the impact from trampling and grazing appears to be less than that observed on the habitats one and two.	
4	**Terminalia/Marula bushveld**	*Terminalia sericea; Sclerocarya birrea; Combretum apiculatum; Peltophorum africanum; Bauhinia petersiana; Combretum molle; Combretum hererorense; Senegalia erioloba; Grewia bicolor, G. flava; G. flavescens;*	*Aristida congesta subsp congesta; A. stipitada; Digitaria eriantha; Urochloa masambicensis; Scmidtia pappophoroides; Stipagrostis uniplumis; Panicum maximum; P. coloratum; Eragrostis rigidior; E. pallens; E. lehmanniana*	This habitat type covers a large part of the central parts of the study area. The grass component of this area was varied, and the land uses within this habitat type varied from cattle farming with some agricultural fields to tourism uses with game farming and hunting lodges. This therefore leads to the health condition of the bushveld to vary with the different management measures.	

Vegetation Habitat		Main trees and shrubs present	Main grasses present	Site Observations	Photographic Evidence
5	**Terminalia/ Pterocarpus bushveld**	*Terminalia sericea; Pterocarpus rotundifolius; Combretum apiculatum; Commiphora pyracanthoides; C. angolensis; Sclerocarya birrea; Boscia foetida subsp rehmanniana; Senegalia nigrescens; Dichrostachys cinera; Grewia bicolor, G. flava; G. flavescens;Senegalia burkei; Peltophorum africanum*	*Urochloa masambisensis; Panicum coloratum; P. maximum; Schmidtia pappophoroides*	This habitat type covers a moderately large part of the central to southern part of the study area and the grasses observed in this area were predominantly comprised of *Urochloa masambisensis*, *Panicum coloratum, P.* maximum and *Schmitdia pappophoroides*. The land use associated with this vegetation type was a combination of some cattle farming and agricultural practices with most other areas practicing natural game stocking and game farming. Some of the areas were not able to be assessed in the field due to limited access and desktop extrapolation was done.	
6	**Combretum/Senegalia thornveld**	*Combretum apiculatum; C. hererorense; ; C. zeyheri; Terminalia sericea; Senegalia erubescens; S. nigrescens; Vachellia gerrardia; V. robusta; V. karoo; Ziziphus mucronata; Peltophorum africanum; Burkea africana; Commiphora pyracanthoides; Grewia bicolor, G. flava; G. flavescens; Senegalia burkei; Boscia foetida subsp rehmanniana*	*Panicum maximum; Aristida stipitata; Eragrostis sp's*	This habitat type covers a moderately large part of the central to southern part of the study area and the grasses were dominated by the hardy species typical of the area including Panicum spp., Aristida spp. and Eragrostis spp. This habitat type is dominated by game farming as a land use offering hunting safaris. Some of the areas were not able to be assessed in the field due to access issues and thus desktop extrapolation was done.	
7	**Transformed Areas**	*Dichrostachys cinera; Senegalia melilfera ; S. toritillis;*	*Aristida stipitada; Eragrostis sp's; Stipagrostis uniplumis*	These areas are characterised by current or abandoned agricultural fields or grazing lands in which the natural habitat has been considerably altered. These areas are found throughout the study area and in most cases have a variety of grasses with the most common tree being *Dichrostachys cinerea*, which colonises impacted areas and can become an indigenous invader.	
8	**Ephemeral Pans**	*Senegalia melilfera ; S. toritillis; Ziziphus mucronata; Combretum imberbe*	*Dactyloctenium aegyptium; Ammocharis coranica; Urochloa mosambicensis*	Endorheic ephemeral pans are found along the pipeline route and these provide a unique habitat for both flora and fauna. This habitat provides important ecological functions as well as a high diversity of faunal species, particularly birds. Ephemeral pans generally provide good habitat for frog species which are able of breeding in temporary environments of seasonal inundation (Du Preez and Caruthers 2009), such as the African Bullfrog (Pyxicephalus adspersus). Senegalia mellifera and Vachellia tortilis dominated the edges of pans, in addition to occasional occurrences of Ziziphus mucronata, which is a wetland indicator species. Refer to the next section for detailed wetland assessment findings.	

10.5.1.2.1 Species of Special Concern

Protected plant species are listed under the LEMA Protected Plants Schedule 11 or the National Protected Trees list and/or the national protected trees list under the National Forests Act, 1998 (Act No. 84 of 1998) (NFA). Note that, *Vachellia (Acacia) erioloba* (Camel Thorn) is listed as Declining. The table below lists the SSC recorded during the field visit.

Table 10-5: Plant Species of Special Concern recorded on site

Species Name	Common Name	Threat Status	National Tree Number
Vachellia (Acacia) erioloba	Camel Thorn	Declining; Nationally protected	168
Boscia albitrunca	Shepherd's Tree	Least Concern (LC); Nationally protected	122
Combretum imberbe	Leadwood	LC; Nationally protected	539
Spirostachys africana	Tamboti	LC; Provincially protected	341
Sclerocarya birrea	Marula	LC; Nationally protected	360

10.5.1.2.2 Alien and Invasive Plant Species

Five alien plant species were recorded along the ancillary infrastructure trajectories, as listed in the table below.

Table 10-6: Alien Plant Species recorded on Site

Species Name	Common Name	CARA; NEMBA Category	Habitat Observed
Datura stramonium	Downy Thorn Apple	1; 1b[4]	Recorded in predominantly Habitat 9 (Transformed area) and scattered in all others
Solanum lichtensteinii	Lichtenstein's Solanum	No category	
Solanum mauritanium	Bugweed	1; 1b	
Solanum incanum	Bitter Apple	No category	
Tribulus terrestris	Devil's Weed	No category	

10.5.1.2.3 Medicinal Plants

A total of five common medicinal plants were identified in the project area namely *Terminalia sericea, Vachellia (Acacia) karoo, Combretum spp., Ziziphus mucronata* and *Elephantorriza elephantine.*

[4] Category 1b: Invasive species controlled by an invasive management programme;

10.5.2 Faunal Characteristics

10.5.2.1 Regional Fauna

Fauna expected to occur on site include assemblages within terrestrial and wetland ecosystems: mammals, birds, reptiles, amphibians and invertebrates. Each of these assemblages occurs within unique habitats, the ecological state of these habitats directly relates to the number of species found within them. The main habitats occurring in the project area are bushveld plains with little altitudinal variation.

10.5.2.1.1 Mammals

The variety of vegetation types occurring in the area of interest ensures an ecologically diverse assemblage of plant species which in turn supports a variety of mammal species.

Digby Wells (2011, 2016), identified 177 mammals (SANBI: SIBS, 2011, 2016), 20 Red Data mammal species and 22 NEMBA listed species. According to the Animal Demography Unit (ADU) (2019) eight mammal species have been recorded in the project area, four Red Data (IUCN 2019) and four NEMBA listed species and an additional eight species that are endemic to the region. A detailed list is provided in the specialist report, Appendix 5. In 2011, Digby Wells recorded a total of 25 mammal species occurring in the project area.

10.5.2.1.2 Avifauna

Birds have been viewed as good ecological indicators, since their presence or absence tends to represent conditions pertaining to the proper functioning of an ecosystem. Bird communities and ecological conditions are linked to land cover. According to the South African Bird Atlas Project (SABAP2), almost 300 species of birds have been identified in the area; the majority of these birds are comprised of bushveld species. The project area would be considered to be unique from an avifaunal perspective in that if falls within the transition area of the dry western region meeting the more tropical eastern habitats. Of all birds that could be present within the study area, 12 have been assigned a Red Data status (either South African or IUCN), 25 are either endemic or near-endemic to South Africa, these species of special concern that have been recorded from the study area are listed in the Impact Assessment report, Appendix 5.

10.5.2.1.3 Herpetofauna

Reptiles are ectothermic (cold-blooded) meaning they are organisms that control body temperature through external means. As a result, reptiles are dependent on environmental heat sources. Due to this, many reptiles regulate their body temperature by basking in the sun, or in warmer areas. The absence of rocky out crops within the study area could mean

fewer reptile species present. The desktop assessment revealed that there are 199 reptile and 49 amphibian (frogs) species occurring in the Limpopo Province, with 53 reptiles and three frogs endemic to the Province, of these 17 reptiles and two frog species have Red Data status, 13 reptile (snake, lizard, tortoise species) and 12 frog species have been recorded within the project area (ADU, 2019) as detailed in the specialist report, Appendix 5. In 2011, Digby Wells recorded five reptile species and no frog species.

10.5.2.1.4 Invertebrates

According to the Schedules published in Government Notice (GN) 38600 of NEMBA, certain invertebrate species in South Africa are listed as either Critically Endangered, Endangered, Vulnerable and Protected species, of which 24 are relevant to the project area as listed in the specialist report, Appendix 5.

A total of 126 spider species have been identified in the Limpopo Province, of which no species are listed as Red Data or protected (ADU, 2016). A total of 31 Scorpion species are reported to occur in the Limpopo Province, there are no Red Data listings (ADU 2016), however two protected species according to NEMBA which have a medium probability of occurring in the project site.

Butterflies are a good indication of the habitats available in a specific area (Woodhall 2005). Although many species are eurytropes (able to use a wide range of habitats) and are widespread and common, South Africa has many stenotrope (specific habitat requirements with populations concentrated in a small area) species which may be very specialised. There are 1,098 species of butterflies listed as occurring in the Limpopo Province of which there are 15 Red Data species and 14 species are endemic to the Limpopo Province (ADU 2016) as detailed in the Impact Assessment report, Appendix 5.

10.5.2.2 Site Specific Fauna

The faunal survey presented below is based on the results from the Digby Wells 2015/16 fauna, flora and wetland report, and is included here to depict the faunal environment that prevails in the general area of the rail loop, water pipeline and road diversion.

10.5.2.2.1 Mammals

Fourteen (14) large mammal species as detailed in the specialist report were recorded as in the project area which traverses two regional vegetation types namely Limpopo Sweet Bushveld and the Western Sandy Bushveld. The region had below average rainfall at the time of the survey. The majority of species were observed against the fence line of the property boundaries or close to manmade watering holes due to the effect the drought is having on the area.

Of note was the presence of the Honey Badger *(Mellivora capensis*) (Vulnerable), Porcupine *(Hystrix africaeaustralis)* and Black Backed Jackal *(Canis mesomelas)* confirmed on Duikerpan 249 as well as Steenbok *(Raphicerus campestris)* and Impala *(Aepyceros melampus).*

Brown Hyena *(Hyaena brunnea)* spoor and scats (Figure 10-1) were observed throughout the project area. Brown Hyena is listed as 'Near Threatened' according to the IUCN. The territory of a single clan can be as large as 400 km^2. Major threats include human persecution in the form of poisoning, trapping and shooting as well as minor threats from traditional medicine hunters.

Figure 10-1: Evidence of mammal presence

a) Scat of a Brown Hyena (*Hyaena brunnea*); b) tracks of a Gemsbok *(Oryx gazella);* c) potential Aardvark (*Orycteropus afer*) excavations

In terms of small mammals, small rodents were observed and heard but only two were identified. A Rock Elephant Shrew *(Elephantulus myurus)* (Least Concern) was observed on the farm Slangkop 256 and a Dwarf Mongoose *(Helogale parvula)* (Least Concern) was also observed.

10.5.2.2.2 Avifauna

Table 10-7 below provides a list of the main avifauna observed in each vegetation type relevant to the project area. A full list of all avifauna observed is provided in the specialist report, Appendix 5.

Table 10-7: Selected Bird Species per Vegetation Habitat type

Vegetation Habitat		Selected species
1	*Commiphora* Bushveld	*Barred Wren-Warbler, Black-chested Snake-Eagle, Chestnut-vented Tit-Babbler, Kalahari Scrub Robin, Shaft-tailed Whydah, Little Sparrowhawk*
2	*Combretum* Thornveld	*Barred Wren-Warbler, Kori Bustard, Burnt-necked Eremomela, Chestnut-vented Tit-Babbler, European Roller, Crimson-breasted Shrike, Pale Chanting Goshawk*
3	*Combretum/Marula* Thornveld	*Burnt-necked Eremomela, Chestnut-vented Tit-Babbler, European Roller, Southern-black Tit, Chinspot Batis*

Vegetation Habitat		Selected species
4	*Terminalia/Marula* Bushveld	*Cape Vulture (flight), Kori Bustard, Fawn-coloured Lark, European Roller, Village Indigobird, Pale Chanting Goshawk, Wahlberg's Eagle, Red-crested Korhaan*
5	*Terminalia/Pterocarpus* Bushveld	*Burnt-necked Eremomela, Chestnut-vented Tit-Babbler, Fawn-coloured Lark, European Roller, White-backed Vulture (flight), Common Whitethroat*
6	*Combretum/ Senegalia thornveld*	*Barred Wren-Warbler, Brubru, Chinspot Batis, White-fronted Bee-eater*
7	*Transformed Areas*	*Barn Owl, Kori Bustard, European Roller, Quail Finch, Rufous-naped Lark, Pale Chanting Goshawk, European Bee-eater, Chestnut-backed Sparrowlark*
8	*Ephemeral Pans*	*Tawny-flanked Prinia, Common Sandpiper, Greenshank, Three-banded Plover, Brown-hooded Kingfisher, Swallow-tailed Bee-eater, Comb Duck*

Six Red Data species were found to occur in the vicinity of the project area. The majority were birds of prey and observed in flight. Many of these species were observed throughout the project area. Some are shown in Figure 10-2.

Figure 10-2: Avifaunal species observed using power lines as vantage points

a) Black-breasted Snake Eagle *(Circaetus pectoralis);* b) Carmine Bee-eater(*Merops nubicoides)*; c) Shaft-tailed Whydah *(Vidua regia);* d) White-backed Vulture *(Gyps africanus)*; e) Pale-chanting Goshawk (*Melierax canorus*)

10.5.2.2.3 Herpetofauna

At the time of the survey drought conditions prevailed and below average rainfall had occurred in the study area. Therefore, it was expected that low numbers of herpetofauna assemblages would be encountered. Very little snake activity was observed. This is indicative of general food shortages due to the climatic conditions. Six herpetofaunal species were observed while walking in the project area including the African Rock Python (Near Threatened).

No frog species were encountered during the survey. Although the lack of rainfall was evident, and the pan systems were extremely dry, the habitat is suitable for the African Bullfrog which has been observed in the area before by Digby Wells.

Three baboon spider nests were identified previously. One was successfully identified and one Horned Baboon Spider (*Ceratogyrus darling)* as shown in Figure 10-3 below. Horned baboon spiders *(Ceratogyrus darlingi)* are endemic to southern Africa and have a distinctive horn projecting from the top of their carapace. It is a nationally protected species and as the two nests that were observed falls just south of Duikerpan 249, and a relocation programme will be required to manage these species, if impacts are identified.

Figure 10-3: Horned Baboon Spider (*Ceratogyrus darlingi*) and its nest

10.5.2.2.4 Invertebrates

Twelve invertebrate species (refer to specialist report) were observed while surveying the project area which includes nine butterfly species and three beetle species.

10.6 Wetlands

A combined Wetland and Aquatic Ecology Assessment was undertaken and is appended to this report as Appendix 6. This section deals with the findings associated with wetlands specifically.

10.6.1 Wetland Delineation and Classification

A total of 49 watercourses were identified in the vicinity of the project area, with a total extent of 322.67 ha (315.66 ha excluding two artificial systems). Based on the findings of the field assessment, it is evident that the wetlands and freshwater features within the project area consist mostly of pans, followed by ephemeral systems. The pan or depression wetland HGM setting is described as a basin shaped area with a closed elevation contour that usually is not connected to the drainage network (Ellery *et al*, 2009). Pans can receive water both from surface and groundwater flows, which then accumulates in the depression owing to a generally impervious underlying layer, which prevents the water draining away (Goudie and Thomas, 1985; Marshall and Harmse, 1992).

The 49 watercourses are divided in Hydro-Geomorphic (HGM) units as follows:

- Pans – 45 HGM units totalling 49.56 ha;
- Sandloop River – totalling 235.47 ha;
- Dam – totalling 6.83 ha;
- Channelled Valley Bottom – totalling 30.63 ha; and
- Drain – totalling 0.18 ha.

The delineated wetlands are illustrated on Plan 12 to Plan 14, Appendix 1.

10.6.1.1 Wetland Characteristics

Vegetation diversity was homogenous between the systems and the pans along the pipeline route/s were homogenous in vegetation and structure. In most cases no vegetation was identified in the centres of the pans with grass species surrounding the pans such as, *Urochloa mosambicensis, Cenchrus ciliaris, Digitaria eriantha subsp. eriantha, Enneapogon cenchroides, Stipagrostis uniplumis, Bothriochloa radicans* and *Panicum maximum* along the edges. In some cases, there were dense stands of *Senegalia mellifera* and *Dichrostachys cinerea* encircling the pans. Other tree and shrub species included *Grewia flava, Bauhinia petersiana subsp. macrantha, Boscia albitrunca* and *Vachellia (Acacia) nilotica.*

An example of the type of wetland habitat encountered is illustrated in Figure 10-4.

Figure 10-4: Wetland habitat types

(A; B: Pans; C: Sandloop system; D: Stormwater outlet)

The Sandloop River, an ephemeral system, is characterised by a sandy channelled area, interspersed with sandstone bedrock with various depressions. Dominant grass species include *Urochloa mosambicensis, Melenis repens* and *Chloris virgata. Grewia flava* and *Acacia nilotica* lined the edges of the system. *Crinum bulbispermum* and various *Cyperus* species were also found within the system.

The channelled valley bottom system was largely impacted by the sewage treatment works, which has impacted on species diversity and structure. *Typha capensis* is the

dominant species most likely due to the additional nutrient inputs. Other species also included *Urochloa mosambicensis and Chloris virgata.*

10.6.2 Sensitivity of the Site

10.6.2.1 Present Ecological State

Due to the large number of pans, these were grouped according to the type of impact for assessment purposes. The pans that have been categorised as Category A (*Natural*) have no visible impacts, aside from trampling associated with grazing activities. This may likely be attributed to general access restrictions on farms or game reserves in the vicinity of the proposed project activities (Figure 10-5).

Figure 10-5: *Natural* pans

The main impacts associated with the pans categorised as Category B (*Largely natural*) included erosion, impacts related to grazing activities and encroachment by *Dichrostachys cinerea* and *Senegalia mellifera*, which although indigenous have the potential to become invasive (Figure 10-6). The hydrology of these systems remained unaffected.

Figure 10-6: Largely natural pans

The PES values of pans classified as Category C (*Moderately modified*, Figure 10-7) were affected by the presence of roads, high levels of erosion, and water abstraction, which impacts the hydrology, geomorphic and vegetation characteristics of these systems. In many cases, excessive cattle-grazing activities were noted, which results in trampling impacts and erosion. These activities cause increased sedimentation within the systems

due to exposed substrate. Sedimentation alters the natural hydrological and geomorphological functioning of the wetlands. Impaired water quality may also result from additional loading of phosphates and nitrates.

Figure 10-7: Moderately modified pans

The channelled valley bottom wetland (Figure 10-8) was categorised as a Category D (*Largely modified*) due to the large hydrological (increased water input) and geomorphic impacts (impoundments) that the sewage treatment works has on the system. Proliferation of *Typha capensis* indicates a high nutrient load, which is to be expected due to discharges/seepage of water from the Lephalale Municipality's Paarl Sewage Works observed. The road crossing also has an impact on the wetland in the form of ponding upstream and channelisation downstream.

Figure 10-8: Channelled Valley Bottom System

Although, PES calculations are not intended for use in ephemeral river systems, the tool was applied to the Sandloop River to give an indication of the health of the system. The ephemeral system is impacted on by the road crossing as well as various impoundments, which impacts on the geomorphology and hydrology of the system.

Figure 10-9: Sandloop River

Table 10-8 provides the detailed PES scores for the various HGM Units observed. PES scores range from Category A (*Natural*) to Category D (*Largely modified*). The overall PES categories for the HGM units associated with the ancillary infrastructure trajectories are illustrated on Plan 15 to Plan 17, with the Appendix 1.

Table 10-8: Present Ecological Health Scores

HGM Unit	Hydrological Health Score	Geomorphological Health Score	Vegetation Health Score	Ecological Health Score	PES Score
Pan	0	0.1	0.4	0.11	A
Pan	0	0.5	5.6	1.72	B
Pan	3.5	0.4	1.4	2.01	C
Channelled Valley Bottom	4	5.7	4.2	4.54	D
Sandloop	4	0.3	4.1	2.97	C

10.6.2.2 Ecological Importance and Sensitivity

Table 10-9 indicates the EIS scores for the various HGM Units with the final EIS scores ranging from 1.8 (Moderate) to 2.4 (High).

The overall EIS categories for the HGM units associated with the ancillary infrastructure trajectories are illustrated in Plan 18 to Plan 20, Appendix 1.

Table 10-9: EIS Scores

HGM Unit	Ecological Importance & Sensitivity	Hydrological/Functional Importance	Direct Human Benefits	Final EIS Score	Final EIS Category
Pipelines (2019)					
Pan A	2.4	0.8	1	2.4	High
Pan B	2.4	0.8	1.3	2.4	High
Pan C	1.8	0.6	1.3	1.8	Moderate

HGM Unit	Ecological Importance & Sensitivity	Hydrological/Functional Importance	Direct Human Benefits	Final EIS Score	Final EIS Category
Channelled Valley Bottom	1.8	2.1	0.7	2.1	High
Sandloop	2	0.5	0.7	2	Moderate

The majority of the pans had high biodiversity scores as they provide habitat for various plant and animal species. Hydrological importance values were low due to the nature of the HGM unit type and direct human benefits were moderate (higher for the pans where water abstraction was observed). The channelled valley bottom, scores highly with regards to hydrological importance and function as it plays a role in phosphate, nitrate and toxicant removal due to the input of sewage.

Although, EIS calculations are not intended for use in ephemeral river systems, the tool was applied to the Sandloop River to give an indication of the ecological importance of the system. It predominantly provides habitat and services for humans, but hydrological importance is low as water is not retained for long periods in the system and therefore there is no assimilation of nutrients of stream-flow regulation capabilities.

10.7 Aquatic Ecology

A combined Wetland and Aquatic Ecology Assessment was undertaken and is appended to this report as Appendix 6. This section deals with the findings associated with aquatic ecology specifically.

10.7.1 Baseline Aquatic Environment

South Africa is divided into nine Water Management Areas (WMA) which are made up of quaternary catchments which relate to the drainage regions of South Africa. These drainage regions are subdivided into four known divisions based on size. Each of the quaternary catchments has associated hydrological parameters. The project area is located within the Limpopo WMA 01, in the A4 secondary catchment, within the A41E, A42J and A42H quaternary catchments. For the aquatic assessment the only Sub-Quaternary Reach (SQR) delineated within the project area forms the Sandloop River (SQR A42J-00182), which is a first order stream that reports to the Mokolo River. The system expresses an ephemeral nature and as such, biological composition is strongly dependent upon the presence of water within the system.

The available desktop information on the considered SQR is presented Table 10-10.

Table 10-10: Desktop Information for the A42J-00182SQR (Department of Water and Sanitation, 2014)

Component	Rating
Reach Length (km)	41.84
Stream Order	1
PES	Category C – Moderately modified
Ecological Importance	Moderate
Ecological Sensitivity	Low
Default Ecological Category	Category C – Moderately modified

The aforementioned categories have been derived based on the following criterion ratings:

- **Small Impacts:** Bed and channel disturbance, small dams, inundation, roads, urbanisation, and vegetation removal.
- **Moderate Impacts:** Crop cultivations, low water crossings, erosion, overgrazing/trampling, and mining runoff/contamination.
- **Large Impacts:** Livestock grazing pressure.

In light of the inherent ephemeral nature of the watercourse, there is an indication that the biological composition of this system in terms of inhabiting aquatic macroinvertebrate taxa and fish species is only evident at time of inundation (water availability). Therefore, the ecological category is largely derived from both the instream habitat integrity during periods of inundation, which is regarded as largely impacted.

In terms of ecological importance, the associated SQR was classified as moderate primarily due to a low biological diversity expected during periods of inundation and a very high importance in relation to the condition and extent of natural riparian-wetland vegetation. Similarly, the ecological sensitivity of the associated SQR was regarded as low, as the species (including riparian/wetland vegetation) expected to colonise these naturally harsh and dynamic systems are generally believed to be well-adapted (e.g. branchiopod crustaceans) or tolerant opportunistic species.

10.8 Surface Water

The Surface Water Assessment is appended to this report as Appendix 7.

10.8.1 Hydrological Setting

The hydrological setting of the project area is depicted in Plan 21, Appendix 1. As discussed above, the project area is located within the Limpopo WMA 01 within the A41E, A42J and A42H quaternary catchments. However, most of the proposed activities are situated within quaternary catchment A41E.

The surface water attributes of the affected catchments namely Mean Annual Runoff (MAR), Mean Annual Precipitation (MAP) and Mean Annual Evaporation (MAE) were obtained from WR2005 study and are summarised in Table 10-11.

Table 10-11: Surface water attributes of the A41E quaternary catchment

Catchment	Area (km^2)	MAP (mm)	MAR (mm)	MAR m^3* 10^6	MAE (mm)
A41E	816	438	2.73	5.29	1950

The A41E quaternary catchment has a net area of 816 km^2 and has an MAR of 5.29 Million cubic meters (Mm^3). Runoff emanating from this quaternary catchment drains in a north-westerly direction via the non-perennial streams and drainage lines towards the Limpopo River.

Elevations in the A41E quaternary range from 990 metres above mean sea level (mamsl) at the highest point within the catchment to 830 mamsl at the outlet/lowest point of the catchment.

10.8.1.1 Rivers and Drainage

The Limpopo River is the only perennial river associated with this quaternary catchment and marks the boundary between South Africa and Botswana. Within this quaternary catchment there are few unnamed, non-perennial streams and drainages that eventually feed into the Limpopo River. The project area is approximately 7 kilometres from the Limpopo River.

An assessment of the 1:50 000 topographical maps gives an indication that the proposed Project area does not have Rivers within or traversing through the area. There are few pans located on some of the surrounding farm portions, which may be indicative of the relative flat topography.

10.8.2 Water Use and Availability

The DWS water use register database (WARMS) (2015) indicates the registered water users in the A41E quaternary include Agriculture (Irrigation, & Livestock watering) and mining. From the database, mining within this quaternary are registered to extract from

groundwater while most of the irrigation uses are registered to abstract from the Limpopo River.

Due to the importance of the Limpopo River as a shared watercourse between South Africa, Botswana, Zimbabwe and Mozambique, the allocation of water for any use has to be signed off by the Southern African Development Community (SADC) river basin commission. Furthermore, the reduced flow as a result of the increased abstractions in the agricultural sector, the high evaporation rate and the looming climate change impacts, the Limpopo River is not a readily available source of water for any developments in South Africa including critical sectors such as power generation (Digby Wells, Surface Water Specialist Report, 2013).

10.9 Groundwater

The Groundwater Assessment is appended to this report as Appendix 8.

10.9.1 Current Groundwater Usage

A total of 26 boreholes were surveyed within 5 km radius of the project area as listed in Table 10-12.

Out of the 26 boreholes identified:

- Three boreholes are used for game watering only;
- Six boreholes are used for livestock watering;
- Three boreholes are used for human drinking and livestock watering;
- Seven boreholes are used for cattle and game watering; and
- The remaining seven boreholes are unused.

Table 10-12: Summary of the groundwater usage

Site ID	Cartesian X (m)	Cartesian Y (m)	Type	Farm and Farm Portion	Groundwater Level	Equipment	Use
VLV1	-2609990	24437	Borehole	Verloren Valley 246-LQ	21.08	Submersible pump	Drinking water and Livestock watering
VLV2	-2609328	25641	Borehole	Verloren Valley 246-LQ	No access	Mono pump	Livestock watering
VLV3	-2608203	25392	Borehole	Verloren Valley 246-LQ	19.52	None	None
VLV4	-2608960	22518	Borehole	Verloren Valley 246-LQ	No access	Windpump	None
DKP1	-2609875	29318	Borehole	Duikerpan 249-LQ	24.65	Windpump	Livestock watering
DKP2	-2611437	29943	Borehole	Duikerpan 249-LQ	41.92	Windpump	None
DKP3	-2612257	29150	Borehole	Duikerpan 249-LQ	21.84	Mono pump	Livestock watering
SARF1	-2605481	37535	Borehole	Kleinberg 252 LQ, Hans 713 LQ & Japie 714 LQ	27.14	Submersible pump	Drinking water and Livestock watering
SARF2	-2610791	34888	Borehole	Kleinberg 252 LQ, Hans 713 LQ & Japie 714 LQ	14.02	None	None
SARF3	-2606719	36124	Borehole	Kleinberg 252 LQ, Hans 713 LQ & Japie 714 LQ	19.59	Submersible pump	None
SARF4	-2609395	36085	Borehole	Kleinberg 252 LQ, Hans 713 LQ & Japie 714 LQ	11.82	Windpump	None
SARF5	-2609885	34992	Borehole	Kleinberg 252 LQ, Hans 713 LQ & Japie 714 LQ	No access	Windpump	Game watering
SARF6	-2609886	35039	Borehole	Kleinberg 252 LQ, Hans 713 LQ & Japie 714 LQ	12.61	Windpump	None
TP01	-2611600	24825.48	Borehole	Twispan 265 LQ	Unable to measure	Submersible pump	Cattle and game watering
TP02	-2610835	26985.54	Borehole	Twispan 265 LQ	Unable to measure	Submersible pump	Cattle and game watering
TP03	-2611989	27312.31	Borehole	Twispan 265 LQ	Unable to measure	Submersible pump	Game watering
TP04	-2613245	27677.05	Borehole	Twispan 265 LQ	Unable to measure	Submersible pump	Game watering
TP05	-2613045	25229.85	Borehole	Twispan 265 LQ	Unable to measure	Submersible pump	Cattle and game watering
WP01	-2609107	40122	Borehole	Wolwepan 253 LQ	Unable to measure	Submersible pump	Cattle and game watering
WP02	-2608725	38677	Borehole	Wolwepan 253 LQ	Unable to measure	Wind pump	Cattle and game watering
WP03	-2608701	38735	Borehole	Wolwepan 253 LQ	22.54	Wind pump	Cattle and game watering
WP04	-2608447	38435	Borehole	Wolwepan 253 LQ	19.29	Solar pan with submersible pump	Cattle and game watering
GRUIS 1	-2608856	27794	Borehole	Gruisfontein 230 LQ	19.40	Submersible pump and external generator	Domestic and livestock
GRUIS 2	-2607017	26860	Borehole	Gruisfontein 230 LQ	17.20	Submersible pump and external generator	Livestock
GRUIS 3	-2606024	27779	Borehole	Gruisfontein 230 LQ	14.61	Submersible pump and external generator	Livestock
GRUIS 4	-2606264	29288	Borehole	Gruisfontein 230 LQ	17.25	Submersible pump and external generator	Livestock

10.9.2 Baseline Water Level and Flow Direction

The groundwater depth within the project area is approximately 20.7 m below ground surface, but ranges between 8.7 and 48.0 m. The natural groundwater flow direction within the project area is directed from south to north and north-west as shown in, Plan 22, Appendix 1. The flow direction is towards the Limpopo River.

Water table flow direction: Determining the different heights of the hydraulic head (water level elevation above sea level), in the project area, establishes the flow direction. The maximum hydraulic head (is found in the southern part of the project site, at an elevation of 870 mamsl). The lowest hydraulic head is found in north-western part of the project site at an elevation of 830 mamsl. The maximum hydraulic difference along a northwest-south profile is therefore 40 m (i.e. 870 – 830 m).

Water table gradient: To determine the slope/gradient of the existing groundwater table in the project area. It was important to establish the distance between the north-western and southern boundary of the project area. This distance is approximately 13 200 m. This would mean that the hydraulic gradient (groundwater table slope) along the groundwater flow direction is 0.003.

10.9.3 Baseline Groundwater Quality

The groundwater quality was evaluated by comparing the borehole samples with the South African Water Quality Guidelines (SAWQG, 1996) for human drinking. A total of seven boreholes were sampled for the baseline assessment. These boreholes are illustrated in Plan 23, Appendix 1.

Boreholes VLV1 and DKP1 are within the ideal quality standard, and therefore no threat to human health or the environment is expected. The rest of the boreholes, except for SARF2 and VLV3, are classified with the acceptable quality. They contain slightly elevated levels of nitrate, chloride, and fluoride. The nitrate is likely to be associated with the fertiliser application, while the chloride and fluoride are natural dissolution of the host rocks. At the current concentrations, the effects will be purely aesthetic, and no adverse health or environmental effects are expected.

Boreholes VLV3 and SARF2 contains high levels of fluoride and iron respectively, both exceeding the maximum allowable limits. This type of water is not suitable for domestic use. The elevated concentrations of iron and fluoride are suspected to be due to naturally elevated concentrations as derived from the natural erosional processes of the underlying formations.

Table 10-13: Water quality results as compared with the South African drinking standards

Sample ID		Total Dissolved Solids	Nitrate NO3 as N	Chlorides as Cl	Total Alkalinity as CaCO3	Sulphate as SO4	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Iron as Fe	Manganese as Mn	Conductivity at 25° C in mS/m	pH-Value at 25° C	Aluminum as Al	Ammonia as N	Fluoride as F
Class 0	(Ideal)	<450	<6.0	<100	N/S	<200	<80	<30	<100	<25	<0.01	<0.05	<70	6.0-9.0	<0.15	N/S	<0.5
Class I	(Acceptable)	450-1000	6.0-10.0	100-200	N/S	200-400	80-150	30-70	100-200	25-50	0.01-0.2	0.05-1.0	70-150	5-6 or 9.0-9.5	0.15-0.3	N/S	0.5-1
Class II	(Max. Allowable)	1000-2400	>10-20	>200-600	N/S	>400-600	>150-300	>70-100	200-400	50-100	>0.2-2	>0.1-1	>150-370	4-5 or 9.5-10	>0.3-0.58	N/S	1-1.5
Class III	(Exceeding)	>2400	>20	>600	N/S	>600	>300	>100	>400	>100	>2	>1	>370	<4 or >10	>0.58	N/S	>1.5
VLV1		641.00	0.26	151.30	293.50	64.31	65.31	36.15	137.26	10.33	0.01	0.01	138.40	7.48	-0.01	-0.02	0.58
DKP1		494.00	7.21	105.50	280.90	13.74	39.86	24.19	132.93	2.49	0.08	0.05	109.10	7.20	-0.01	0.03	0.60
VLV2		731.00	14.43	199.70	279.10	59.10	76.07	38.39	166.56	9.45	0.02	0.01	158.90	7.51	-0.01	-0.02	0.74
SARF2		621.00	-0.06	194.20	289.40	4.59	56.30	33.54	154.19	4.53	2.52	0.11	136.20	7.12	-0.01	-0.02	0.74
SARF3		746.00	9.94	205.20	290.70	54.58	60.93	33.78	197.42	10.08	0.02	0.02	161.90	7.83	-0.01	-0.02	1.38
SARF4		791.00	-0.06	136.20	582.70	-0.13	69.91	35.48	182.68	17.25	0.05	0.59	158.60	7.73	-0.01	5.88	1.25
VLV3		831.00	-0.06	199.60	436.40	56.63	108.73	54.30	140.05	9.77	0.02	0.25	165.30	7.79	-0.01	0.08	2.17

10.10 Air Quality

The Air Quality Impact Assessment (AQIA) is appended to this report as Appendix 9.

10.10.1 Baseline Results

Ambient air quality concentrations measured were compared with the South African standards to confirm if current background levels are conducive for healthy living and within compliance of the South African regulatory standards. The subsections below provide the results obtained for Particulate Matter and Gases which were monitored.

10.10.1.1 Particulate Matter

10.10.1.1.1 Total Suspended Particulate

The dust fallout sampling and analyses was conducted according to the American Society for Testing and Methods (ASTM) D1739 – 98 Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter), adopted in by the South African National Standard (SANS 1137:2012).

Dust deposition monitoring data between January 2014 and May 2015 was used to understand the background dust deposition rates in the Project area (Figure 10-10 and Figure 10-11). This data was considered sufficient to evaluate background dust levels. The dust network comprises a network of 11 sites (DM-01 to DM-11) which are depicted in Plan 24, Appendix 1. Only three exceedances were observed throughout the monitoring campaign of 15 months as shown in Figure 10-10 and Figure 10-11 below. In the month of December 2014, at site DM10, a dust deposition rate of 7 440 mg/m^2/day was measured (result was discarded as this was considered a sabotage, since deposition rates of that magnitude is not common to the area). In general, the deposition rates measured in the project area showed that the dust fallout were below the residential and industrial limit values as stipulated in the standards.

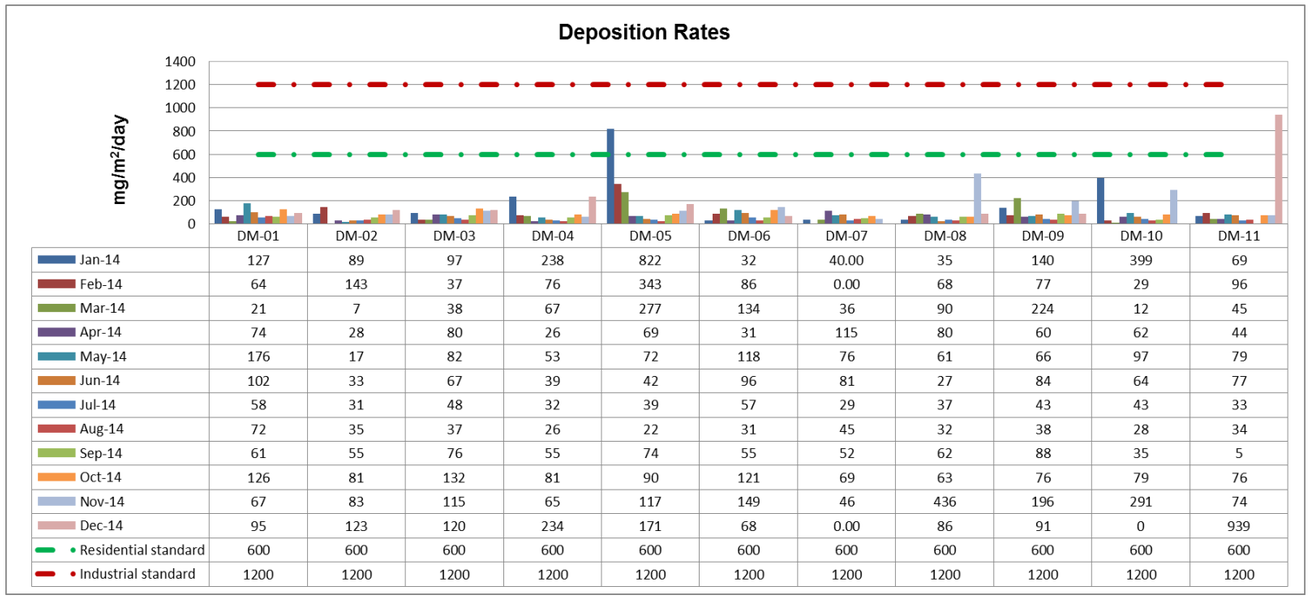
10.10.1.1.2 PM10 and PM2.5

The real-time sampler was set up in January 2019 and the PM_{10} and $PM_{2.5}$ records measured for the first two weeks of February 2019 are shown to be below the South African standard for 24-hour averaging period of 75 µg/m^3 and 40 µg/m^3 respectively as illustrated in Figure 10-12 and Figure 10-13 below.

Temo Coal plans to continue monitoring for a period of no less than three months and as more data are collected, insight into the background PM_{10} and $PM_{2.5}$ scenario at the Project site and at surrounding receptors will be obtained.

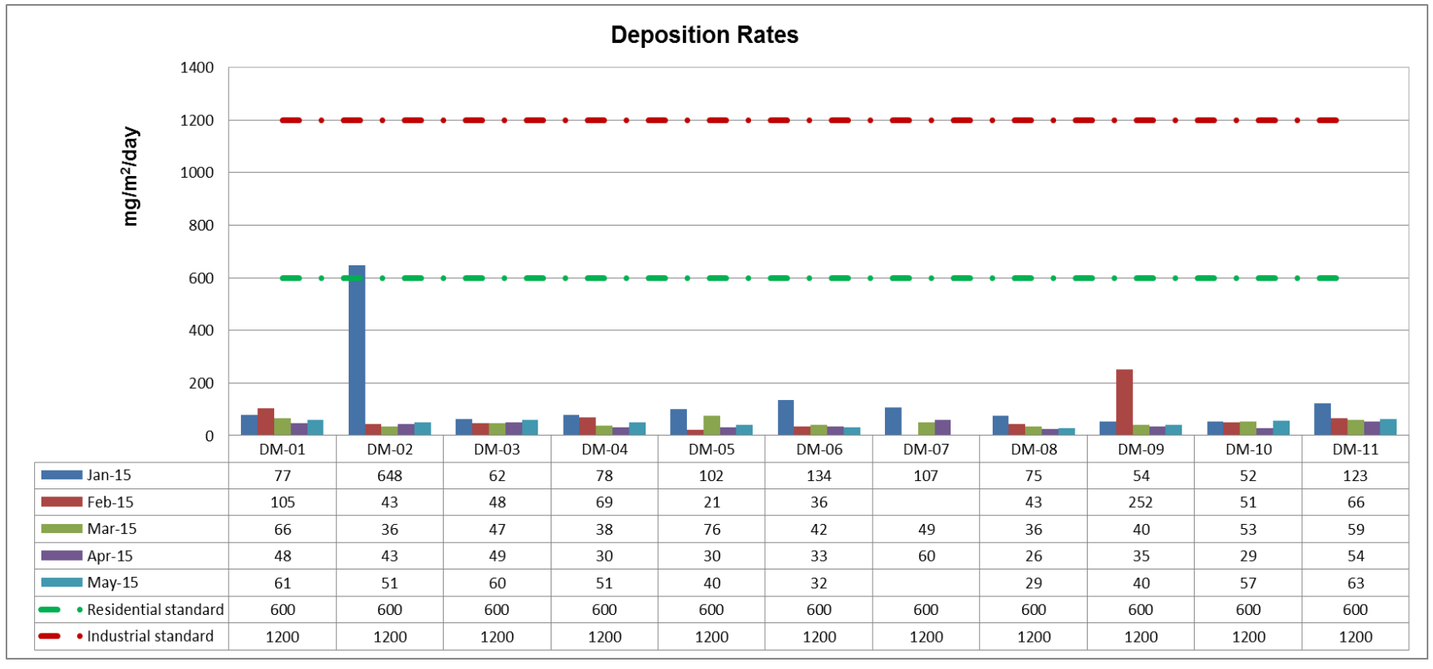
10.10.1.1.3 Gases

The ambient concentrations of SO_2, NO_2, and CO measured are below the South African standards for the different averaging period. However, the background concentrations of O_3 are already exceeding the South African standard.



	DM-01	DM-02	DM-03	DM-04	DM-05	DM-06	DM-07	DM-08	DM-09	DM-10	DM-11
Jan-14	127	89	97	238	822	32	40.00	35	140	399	69
Feb-14	64	143	37	76	343	86	0.00	68	77	29	96
Mar-14	21	7	38	67	277	134	36	90	224	12	45
Apr-14	74	28	80	26	69	31	115	80	60	62	44
May-14	176	17	82	53	72	118	76	61	66	97	79
Jun-14	102	33	67	39	42	96	81	27	84	64	77
Jul-14	58	31	48	32	39	57	29	37	43	43	33
Aug-14	72	35	37	26	22	31	45	32	38	28	34
Sep-14	61	55	76	55	74	55	52	62	88	35	5
Oct-14	126	81	132	81	90	121	69	63	76	79	76
Nov-14	67	83	115	65	117	149	46	436	196	291	74
Dec-14	95	123	120	234	171	68	0.00	86	91	0	939
Residential standard	600	600	600	600	600	600	600	600	600	600	600
Industrial standard	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200

Figure 10-10: Dust Deposition Data (2014)



	DM-01	DM-02	DM-03	DM-04	DM-05	DM-06	DM-07	DM-08	DM-09	DM-10	DM-11
Jan-15	77	648	62	78	102	134	107	75	54	52	123
Feb-15	105	43	48	69	21	36		43	252	51	66
Mar-15	66	36	47	38	76	42	49	36	40	53	59
Apr-15	48	43	49	30	30	33	60	26	35	29	54
May-15	61	51	60	51	40	32		29	40	57	63
Residential standard	600	600	600	600	600	600	600	600	600	600	600
Industrial standard	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200

Figure 10-11: Dust Deposition Data (2015)

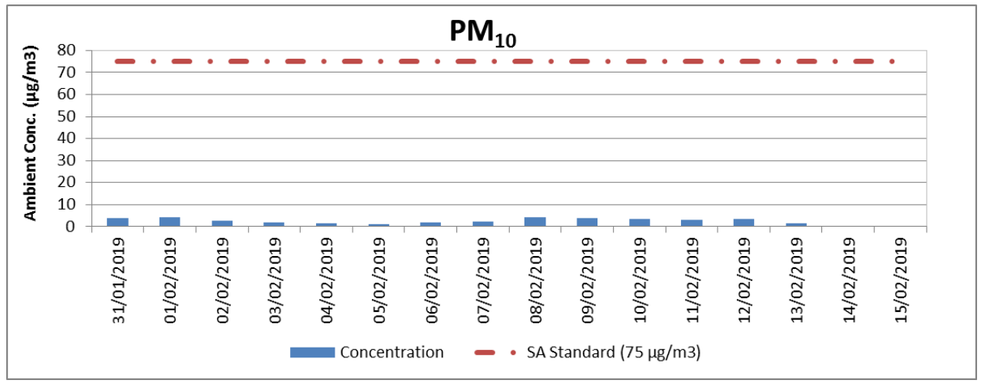


Figure 10-12: Site PM_{10} Data

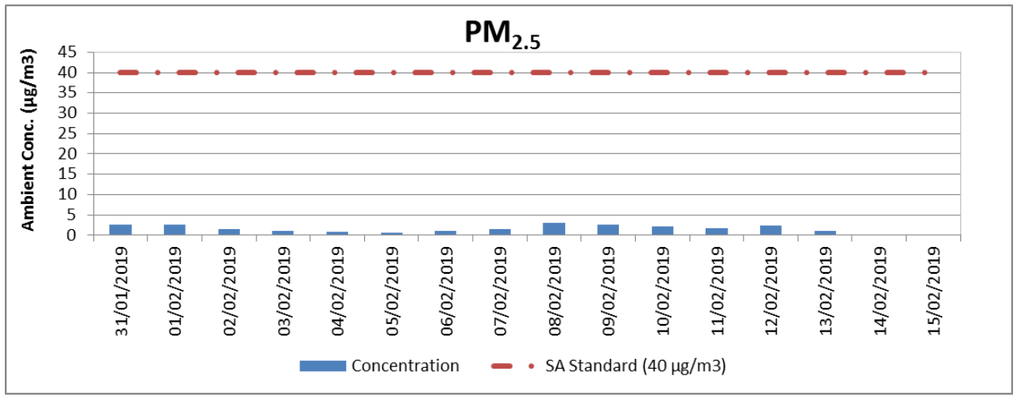


Figure 10-13: Site $PM_{2.5}$ Data

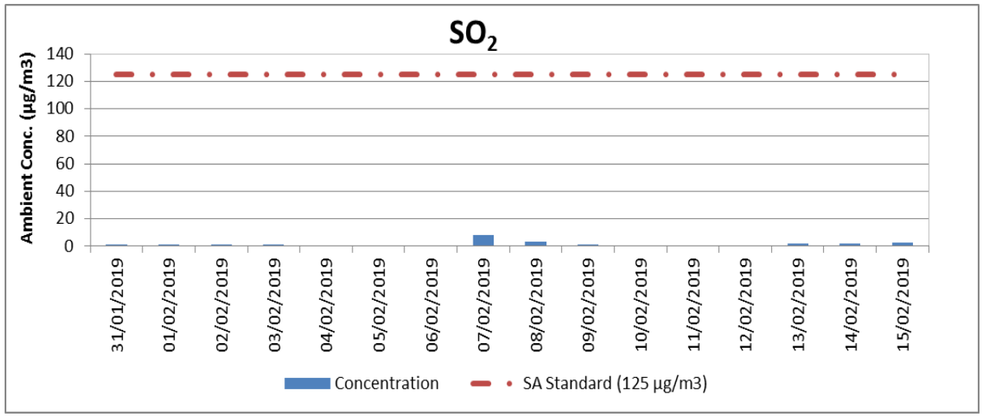


Figure 10-14: Site SO_2 Data

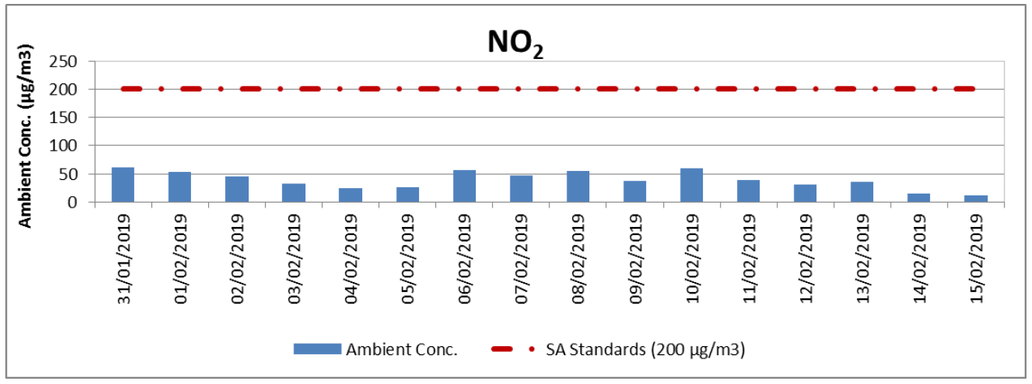


Figure 10-15: Site NO_2 Data

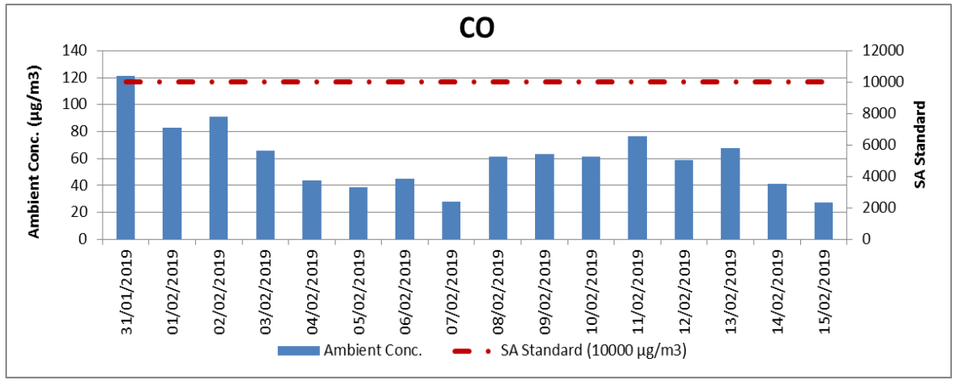


Figure 10-16: Site CO Data

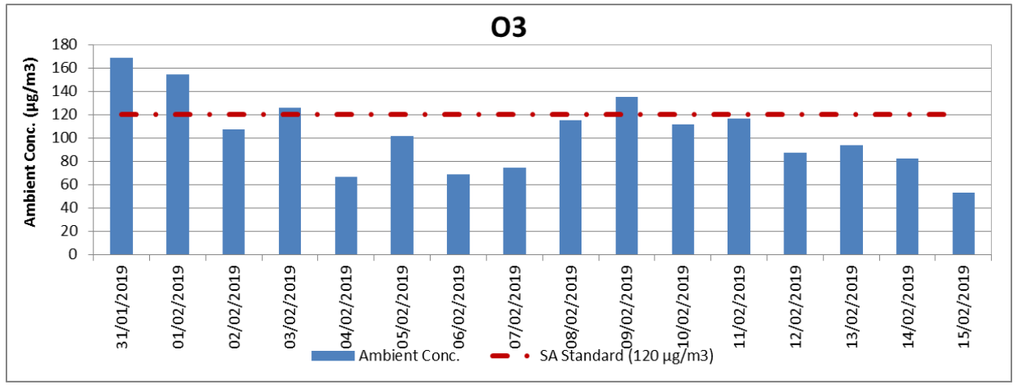


Figure 10-17: Site O_3 Data

The findings from this baseline assessment and potential impacts anticipated are summarised as follows:

- The dust deposition rates measured in the Project area are very low and below the recommended standards as discussed in Section 3.2. Hence, it is anticipated that the construction of the rail loop and road diversion will have minimal impacts;
- Similarly, the ambient concentrations of PM_{10} and $PM_{2.5}$ measured within the project area are below the respective standards therefore impacts are anticipated to be minimal; and
- Impacts associated with the construction of the rail loop and road diversion are anticipated to be minimal for the same reasons as above on the ambient levels of SO_2, NO_2, and CO, except O_3. The ambient levels of O_3 will be assessed at a later as more data are received to confirm the actual scenario at the project site.

10.11 Noise

The Noise Assessment is appended to this report as Appendix 10.

10.11.1 Baseline Results

Baseline noise measurements were taken at three locations (refer to Plan 25, Appendix 1) in the area of the proposed project. The measurements were taken to determine the existing ambient noise levels in the area. The measurements were taken for a 24 hour period at each location, taking into account the daytime as well as night time noise characteristics. The noise sources that were audible during the baseline measurements at the time of the noise survey are summarised in Table 10-14.

Table 10-14: Summary: Baseline Noise Sources Audible at Monitoring Locations

Noise Source Description					
ID	**Location**	**Day**	**Duration**	**Night**	**Duration**
N1	Lerekhureng Combined School (Steenbokpan)	Vehicles and human voices	Continuous	Birdsong, *Gryllidae*	Continuous
N2	Verloren Valey, Portion 246	Vehicles	Continuous	Birdsong, *Gryllidae*	Continuous
N3	Verloren Valey, Portion 246	Vehicles	Continuous	Birdsong, *Gryllidae*	Continuous

The results of the measurements are described in more detail n subsections below. The noise meter recordings for the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 10-15.

10.11.1.1 Day-time Noise Baseline Results

Based on the daytime results, the existing average sound levels are above the SANS 10103:2008 guidelines for rural districts (45dBA) for N1 and N3, with average noise levels ($L_A$eq) of 57dBA and 47dBA respectively. At location N1, the main sources of intermittent noise impacting on the measurements included private vehicles dropping learners off at School and teachers, coupled with noise from learners. Though the L_{Aeq} was above the relevant SANS daytime rating, the L_{A90} (background) level of 34 dBA was below the daytime limit for rural district.

At N3, L_{Aeq} of 47dBA was recorded and the main sources of intermittent noise impacting on the measurements included vehicles passing on the D175 road and birds' songs. Though the L_{Aeq} was slightly above the relevant SANS daytime rating limit guidelines (45dBA), the L_{A90} (26dBA) was below the guidelines for daytime limit for rural district.

10.11.1.2 Night-time Baseline Noise Results

Night-time results as recorded at the three sampling points indicated that two locations recorded average noise levels above the relevant SANS night-time rating guideline for rural district.

At N1, the L_{Aeq} was 40dBA measured above the relevant SANS night-time rating limit guidelines (35dBA), the main sources of intermittent noise included sound from vehicles travelling via the D175 road and vehicular traffic to and from a number of isolated settlements in the area.

At N3, the L_{Aeq} was 45 dBA measured above the relevant SANS night-time rating limit guidelines (35dBA), with the main sources of intermittent noise coming from vehicles travelling on the D175 road, birds' songs and high pitch sound produced by the *gryllidae* (crickets).

The background (L_{A90}) sound level measured at this location of 26dBA was below the relevant SANS night-time rating limit guidelines (35dBA).

However, there were several exceedances of the night-time "Acceptable Rating Levels" of 35dBA due to the high pitch sound produced by the *gryllidae* (crickets) at night. The maximum average noise levels ($L_A$eq) recorded in the area was 39dBA.

Table 10-15: Noise measurements results

Sample ID	SANS 10103:2008 Guidelines							
	Type of district	**Period**	**Distance from Rail loop/road (m)**	**Acceptable rating level dBA**	**L_{Aeq} dBA**	**L_{A90}**	**Maximum/Minimum dBA**	**Date**
N1	Rural	Daytime	300m from D175 road	45	57	34	93/27	30/01/2019
		Night time		35	40			30/01/2019
N2	Rural	Daytime	543 m from the proposed rail loop	45	43	24	77/19	31/01/2019
		Night time		35	34			31/01/2019
N3	Rural	Daytime	90 from D175 road	45	47	26	69/20	01/02/2019
		Night time		35	45			01/02/2019
	Indicates current L_{Aeq} levels above either the daytime rating limit or the night time rating limit							

10.12 Heritage

A Heritage Resource Management (HRM) Process was undertaken which included the identification of heritage resources within the vicinity of the proposed projects as well as an assessment of their Cultural Significance as part of the baseline investigation. The Heritage Impact Assessment (HIA) is appended to this report as Appendix 11.

10.12.1 Baseline Heritage Resources Identified

10.12.1.1 Previously identified heritage resources

Plan 26, Appendix 1 presents a summary of the heritage resources identified through prior heritage assessments in proximity to the project area. Identified heritage resources represent the Stone Age, Farming Communities and, to a lesser degree, the historical periods.

No impact to these previously-identified heritage resources is envisaged from the proposed ancillary infrastructure.

10.12.1.2 Results from the pre-disturbance survey

A non-intrusive pre-disturbance survey was undertaken for the proposed ancillary infrastructure project. No heritage resources or palaeontological surface features (i.e. outcrops of palaeontologically significant formations) were identified within the proposed development footprints or within 50 m of these footprints. The infrastructure trajectory is characterised by high disturbance. The results of the pre-disturbance survey are illustrated on Plan 26, Appendix 1.

Historical layering was undertaken to identify potential structures that may be older than 60 years and would therefore be protected under Section 34 of the NHRA. Some potential structures were identified on the historical map, only one of which was within 100 m of the proposed development footprints. This was ground-truthed on site during the pre-disturbance survey, however, no structure was visible. No Section 34 heritage resources were identified within the Project area.

10.13 Socio-economic

The Socio-economic Assessment is appended to this report as Appendix 12. The socio-economic baseline profile presented here focuses on the primary and secondary study areas as summarised in Table 10-16. Ward 3 is a fairly extensive area and is mostly rural in nature. It includes the Mepudi Power Station, a portion of the Grootegeluk Coal Mine and several airstrips. There are no major towns within this ward. Onverwacht and the Lephalale town are unevenly divided into Wards 4 and 13. Ward 4 includes most of the urban area of both these urban centres and is smaller than Ward 13, which also includes some of the rural surrounds.

Table 10-16: Primary and secondary study areas

Primary Study Area	Secondary Study Areas		
Ward 3	Ward 11	Waterberg District Municipality (WDM)	Limpopo Province
Ward 4			
Ward 13			

10.13.1 Regional Area

Limpopo is divided into five district municipalities which include a total of 22 local municipalities. Of these, WDM is the largest district municipality, comprising 35.71% of the province (Wazimap, 2017). WDM is divided into five local municipalities: Bela-Bela, Lephalale, Modimolle-Mookgophong, Mogalakwena and Thabazimbi. Lephalale Local Municipality (LLM) is the largest of the local municipalities within WDM. The project area is located within Wards 3, 4 and 13.

10.13.2 Population Demographics

The 2011 Census registered 5 404 868 people, or approximately 10.44% of the population of the country, in the Limpopo province. (Statistics South Africa, 2011; Wazimap, 2017). Within the province, WDM is the smallest of the district municipalities by population and includes 679 336 people, approximately 12.57% of the population of Limpopo. Within WDM, Lephalale is the second largest local municipality in terms of population with 118 865 people (17.50% of the WDM population).

Table 10-17 below provides a summary of the indicative population statistics for the wards under consideration as compared to the secondary study area.

Table 10-17: Indicative statistics related to the population of the primary and secondary study areas as per 2011 Census

Statistic	Secondary study area			Primary study area		
	Limpopo	WDM	LLM	Ward 3	Ward 4	Ward 13
Population	5 404 868	679 336	118 865	10 836	5 428	6 054
Size *(km²)*	125 806.1	45 315.6	13 826.1	4509.0	7.8	31.4
Population density *(as whole people/km²)*	43	15	9	2	696	193
Number of households	1 447 658	191 214	33 599	3 762	1 832	1 976
Average household size	3.73	3.55	3.54	2.88	2.96	3.06

Adapted from Wazimap (2017)

WDM reported increases in population between 2011 and 2016 (WDM, 2018). This included an increase in the population of WDM (of 9.78% between these years) as well as population increases in individual local municipalities, which ranged from 3.4% to 18.02%. Previous assessments showed increases in some local municipalities and decreases in others.

Table 10-18 provides a summary of the racial distribution of the population of the regional study area. Across all levels of the study area, the majority population is black African, followed by white. “Other” population groups constitute the smallest portion of the population. The percentage component of Indian/Asian and coloured varies across the study areas, but the coloured population is generally larger than the Indian/Asian population.

Table 10-18: Distribution of the population by race (in percentages)

Race	Limpopo	WDM	LLM	Ward 3	Ward 4	Ward 13
Black African	96.7	91.2	90.9	68.4	51.8	65.7
Coloured	0.3	0.5	0.9	2.0	3.3	4.0
Indian or Asian	0.3	0.4	0.3	0.6	0.9	1.5
White	2.6	7.6	7.7	28.6	43.8	28.1
Other	0.2	0.3	0.3	0.4	0.2	0.7

Adapted from Wazimap (2017)

The age distribution of population is presented in Figure 10-18. Across the areas of study, the ‘three largest age components differ between the different areas but include groups between zero and 34 years of age.

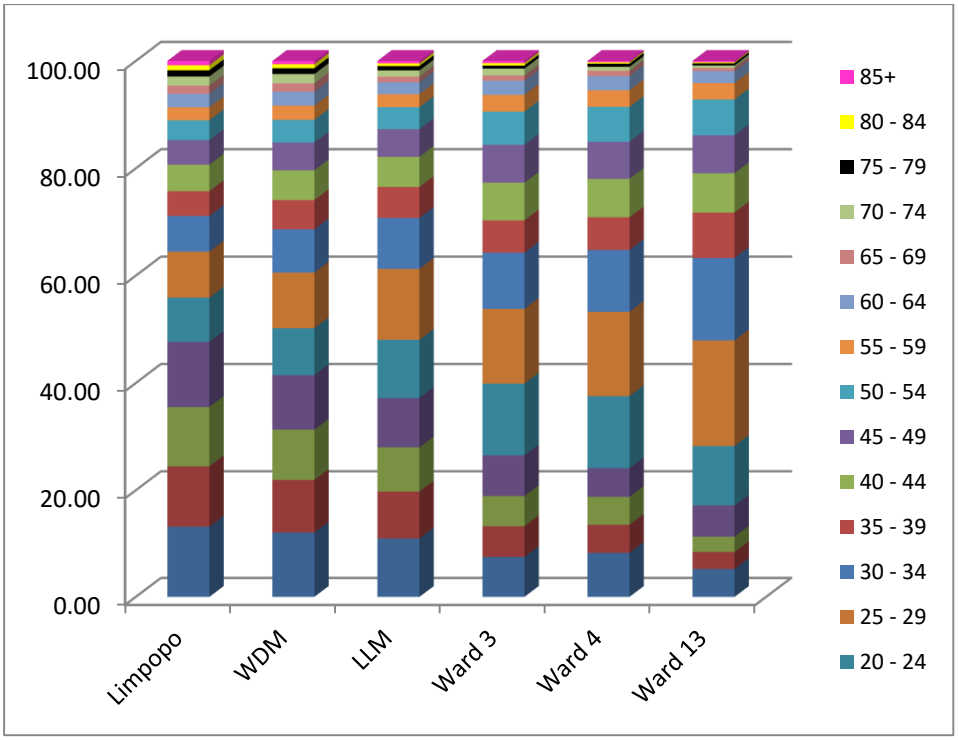


Figure 10-18: Age distribution of the population (in percentages)

Adapted from Wazimap (2017)

Figure 10-19 presents the distribution with respect to gender. Gender is divided fairly equally across the study area, with females comprising slightly larger portions of the population.

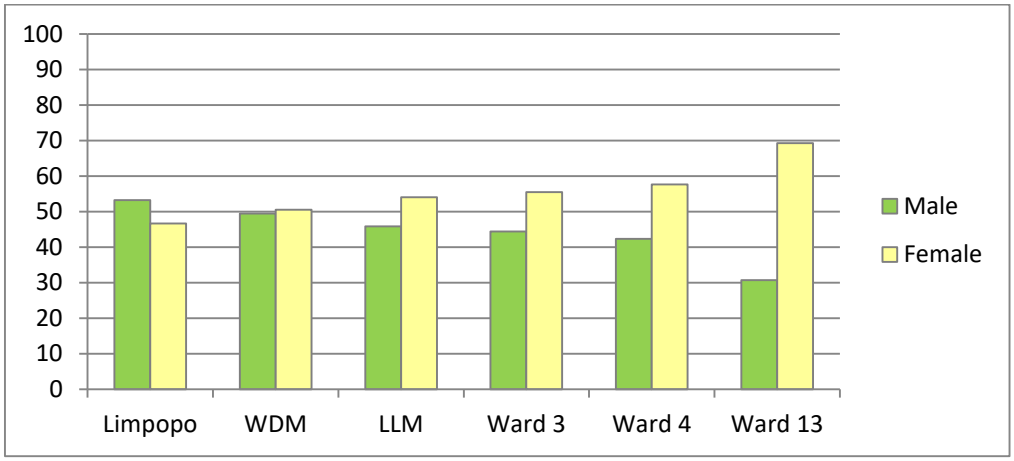


Figure 10-19: Gender distribution within the greater study area, in percentages

Adapted from Wazimap (Wazimap, 2017)

The most and least common languages spoken are summarises in Table 10-19 below.

Table 10-19: Most and least common home languages within the areas of interest

Language	Limpopo	WDM	LLM	Ward 3	Ward 4	Ward 13
Most common	Sipedi	Sipedi	Sipedi	Afrikaans	Afrikaans	"Not applicable"
Second-most common	Xitsonga	Setswana	Setswana	Setswana	Sipedi	Afrikaans
Third-most common	Tshivenda	Xitsonga	Afrikaans	Sipedi	English	Sipedi
Least common	Sign Language	Sign Language / SiSwati	Sign Language	Sign Language	Sign Language	Sign Language

Adapted from Wazimap (2017)

10.13.3 Education

The State of the Nation (SONA) address from 2018 reported an increase in the matric pass rate nationally from 6.6% in 2009 to 75.1% in 2017 (WDM, 2018). In contrast, the Limpopo Province reported a 'sharp decline' in the matric pass rate in the State of the Province (SOPA) address in 2018 from the previous year. The rate of the population completing tertiary education studies is expected to increase with the roll-out of programmes from 2016 aimed at making tertiary studies affordable, or free, to eligible households who cannot ordinarily afford it.

The LLM IDP (2018) reports that the quality of education for learners, notably black African learners, remains poor. The LLM highlights the need to improve the level and quality of education and provide more opportunities for training. LLM includes a Mayoral Initiative Programme which provides several training programmes and includes learnerships, artisanal training and skills training (including security and drivers licenses).

Table 10-20 presents the learner to educator ratio within the WDM (WDM, 2018). The LLM has 94 schools with a total of 1 146 classrooms and 1 290 teachers. The WDM IDP notes a backlog in terms of service delivery to the schools.

Table 10-20: Educator to learner ratio in Public ordinary Schools

Local Municipality	Learners	Educators	Ratio
Bela-Bela	13 707	395	1:35
Lephalale	34 692	1 066	1:33
Modimolle-Mookgophong	26 129	841	1:31
Mogalakwena	89 542	2 915	1:31
Thabazimbi	11 477	368	1:31

Adapted from WDM (2018)

Figure 10-20 below shows highest level of education completed by the population of the study areas. This includes again only the population that is older than 20.

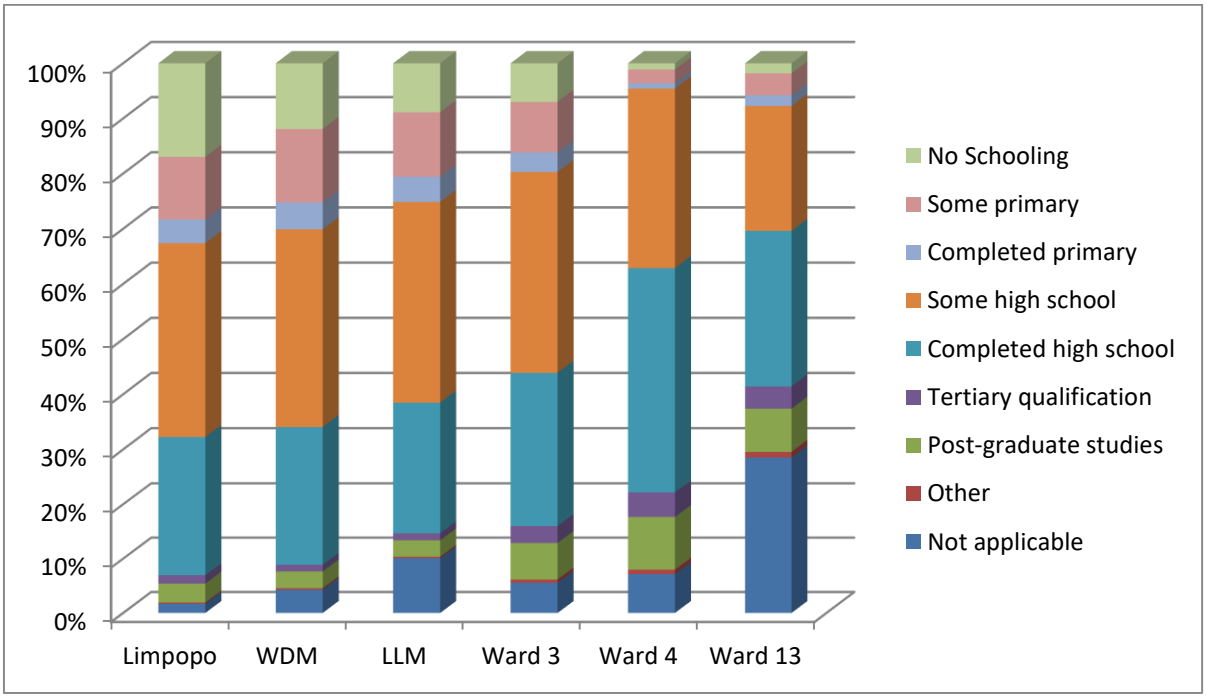


Figure 10-20: Highest level of education for the population 20 years and older

Adapted from Wazimap (2017)

10.13.4 Economy

The key sectors contributing to the WDM economy include: agriculture, manufacture, mining and tourism (WDM, 2018). Mining activities centre around Mokopane, Lephalale and the Northam-Thabazimbi area. Minerals mined within the WDM include: chrome, coal, iron nickel, platinum, tin, and tungsten. The Waterberg field contains an estimated 76 billion tons of coal, which is more than 40% of the national coal reserve. The WDM produces the most platinum

within the Limpopo Province and contributes the most in terms of GDP to the national mining sector. Mining contributes 47.4% of the WDM GDP.

Agriculture is a significant source of employment within the WDM (WDM, 2018). Predominant crops include cotton, soya beans, sunflower and tobacco. Predominant crops are variable, as fluctuating international prices and the climate influence the success of a crop in terms of yield, profit and sustainability. Additional, alternative, crops cultivated in the WDM include groundnuts, Lucerne, paprika, potato and wheat, with varied levels of success and security. Most crop cultivation within the WDM requires some form of irrigation. This is leading to increased stress on the limited water supply within the district.

As a result of these water constraints, the cattle and game industry is experiencing transformation in some areas (WDM, 2018). Areas that have previously been used for dry-land and irrigated farming have now been consolidated and converted for extensive livestock production. Other cultivated land, and land previously used for livestock grazing, has now been converted to game ranching and used for ecotourism. Some game ranch owners are now diversifying into lodges and ecotourism as well.

Agriculture, mining and manufacture are the three most important contributors to the LLM Gross Domestic Product (GDP) (LLM, 2018). Agriculture is the largest provider of employment within the LLM, employing 38.85% of the workforce. The community services industry is the second largest, employing 15.71% of the workforce. Agriculture has the potential to expand further and contribute more to the LLM economy, especially within the red meat sub-industry.

10.13.4.1 Development Context

The WDM has identified a number of potential developments within the more significant economic sectors (WDM, 2018). This includes the development of mining tourism and a platinum corridor within the mining sector and the expansion into agro-tourism, game farming, agro-processing and a “meat and horticulture cluster”. Suggested future agricultural enterprises include: citrus, game, grapes, hydroponics, irrigated vegetable production, milk production and poultry. Development potential within the tourism industry includes the development or support of tourism transport operators, tour operators, business tourism and theme parks or additional recreational facilities.

The LLM aims to achieve the following goals in terms of its economy:

- Improving infrastructure;
- Transitioning to a low-carbon economy through using water more sustainably and reducing carbon emissions;
- Creating an inclusive and integrated rural economy by 2030; and
- Realising a green economy (LLM, 2018). Goals for the green economy range from the short term, which includes generating ‘green’ employment and improving the environmental quality of the municipality, to the long term, which includes a paradigm

shift for the local municipality in terms of the relationship between the economy and the environment.

10.13.4.2 Employment

Figure 10-21 presents an overview of the employment status of the population within the WDM and within each area of interest. In this figure, 'not applicable' refers to those who are not considered to be of working age (i.e. individuals younger than 18 and older than 65 years of age).

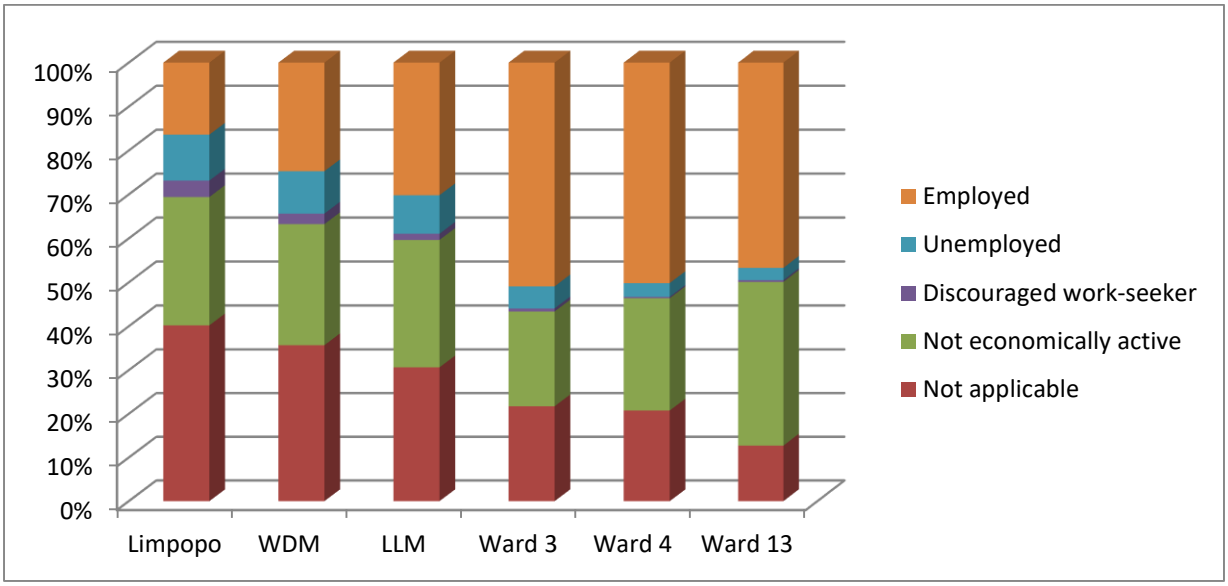


Figure 10-21: Employment statistics within the greater study area

Adapted from Wazimap (Wazimap, 2017)

Employment trends are not consistent within the broader study area. The employment rate varies from 16.39% in the Limpopo Province to 50.93% in Ward 3. Unemployment is highest in the Limpopo Province (10.45%) and lowest in Ward 13 (2.79%). All participants in the census specified their employment status.

Figure 10-22 provides an overview of the employment per sector within the WDM. In this figure, "Not applicable" refers to individuals who are not employed (i.e. unemployed, not economically active, not of working age and discouraged work seekers). This category is the largest in each of the areas of interest, but is especially large in the Limpopo Province, accounting for 83.32% of the respondents.

Between 0.97% and 1.22% of respondents did not know in which sector they were employed. Across all the study areas, the formal sector is the largest provider of employment. The informal sector is the smallest provider of employment in the LLM, Ward 3 and Ward 4 and the private household is the smallest provider of employment for Limpopo, WDM and Ward 13.

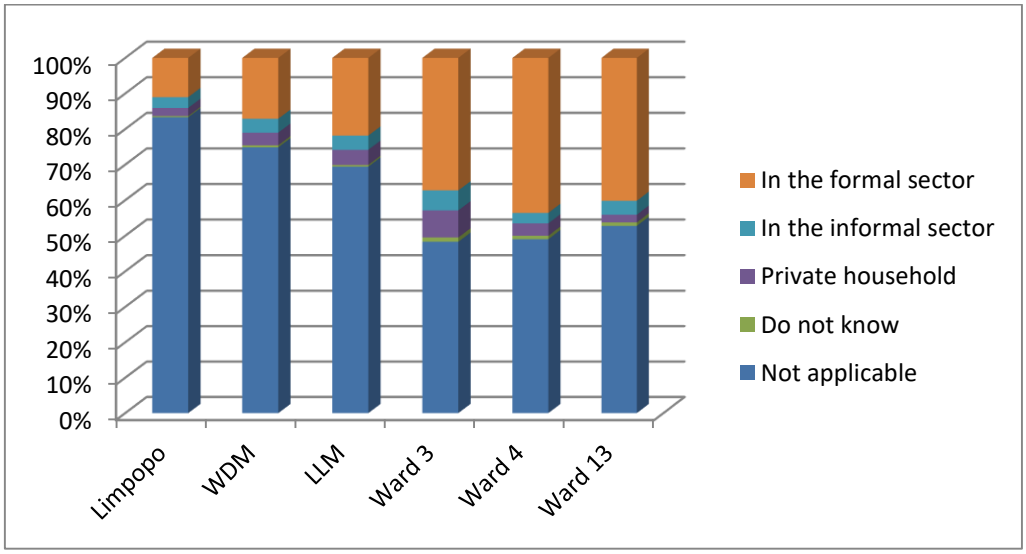


Figure 10-22: Employment per section within the broader study area

Adapted from Wazimap (Wazimap, 2017)

Figure 10-23 summarises the annual income for employed individuals. These figures are as per the 2011 census and have not been updated to consider inflation. Between 2.51% and 6.76% of the respondents did not specify their annual earnings. Between 2.79% and 9.55% of the respondents reported they earned no income. This category was largest in the Limpopo Province and smallest in Ward 3.

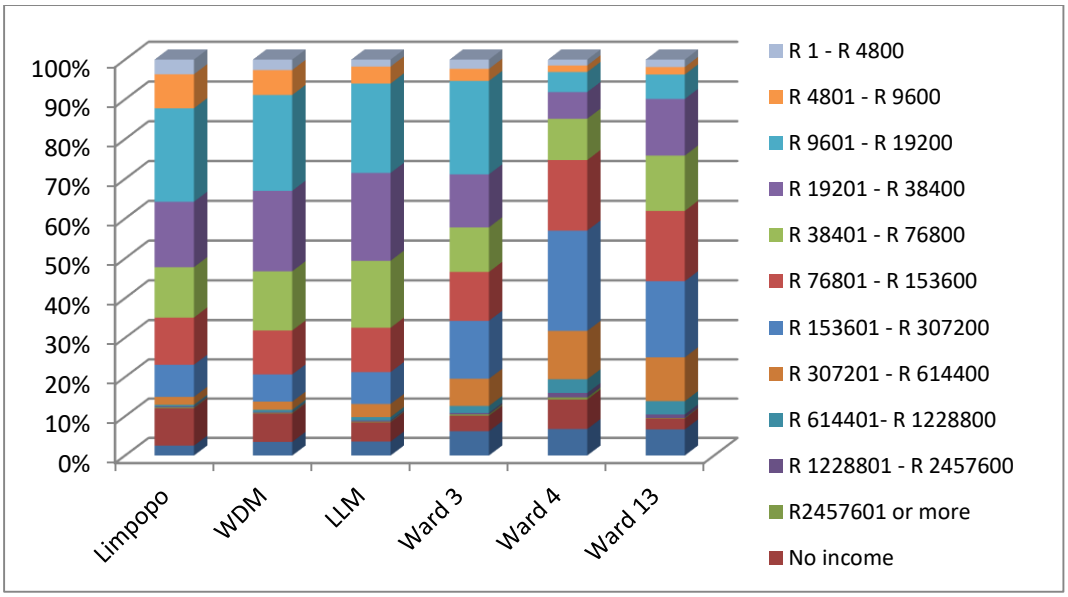


Figure 10-23: Annual income for employed individuals within the broader study area

Adapted from Wazimap (Wazimap, 2017)

10.13.5 Household services

10.13.5.1 Water

The urban water supply within LLM originates from the Mokolo Dam (LLM, 2018). Grootegeluk Coal Mine originally constructed the main supply lines, pump station, balancing dam and purification works and still maintains the dam and the supply today. The Marapong township receives water from the Matimba Power Station. The rural areas obtain their water mostly from groundwater sources, predominantly boreholes.

Figure 10-24 illustrates the sources of water for the households within the areas of interest. In this figure, the regional/local water scheme refers to a scheme that is operated by the municipality or other water services provider. Stagnant water includes dams and pools of water.

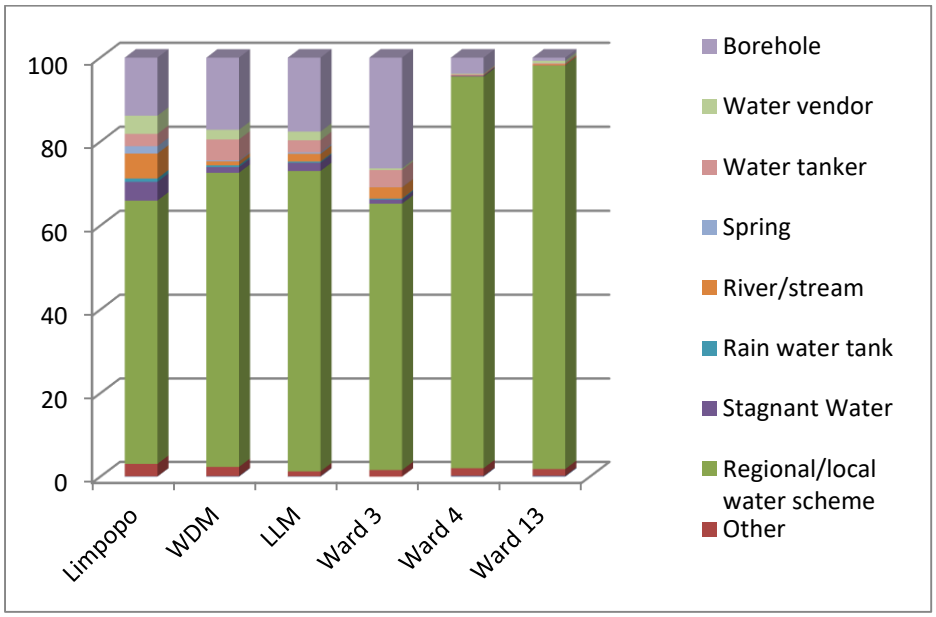


Figure 10-24: Sources of water for households within the greater study area

Adapted from Wazimap (2017)

10.13.5.2 Sanitation and toilet facilities

Figure 10-25 illustrates the access to toilet facilities within the broader study area. This includes pit toilets with and without ventilation and flush toilets connected to septic tanks or the sewerage system.

Across the study area, most households have access to a flush toilet connected to the sewerage system. Between 19.99% and 96.74% of households have access to this type of toilet facility.

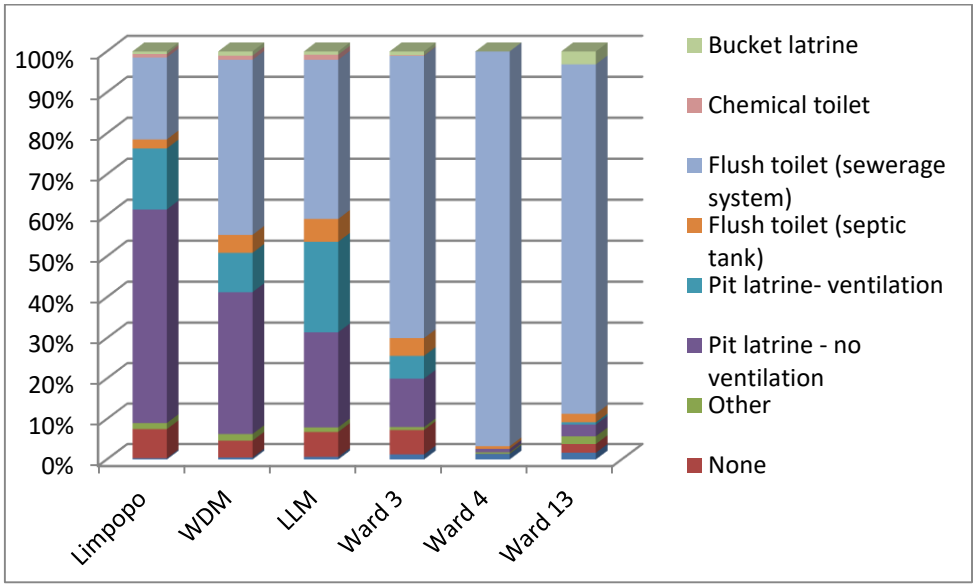


Figure 10-25: Household toilet access within all areas of interest

Adapted from Wazimap (2017)

10.13.5.3 Waste

Waste management within the LLM is not without challenges, as described in the IDP (LLM, 2018). Refuse removal services are not delivered in some rural communities. LLM has one permitted waste disposal facility and is in the process of conducting feasibility studies for the development of another. The refuse receptacles for waste storage are inadequate. At present, the municipality is in the process of rolling out 6 m^3 bins to replace the 1.75 m^3 bins which have been provided to communities and businesses. The illegal dumping of garden waste in Marapong and Onverwacht especially is an issue, due to the lack of adequate garden refuse sites in these areas.

LLM includes no drop-off point, garden sites, transfer stations, material recovery facilities or buy-back facilities for recycling (LLM, 2018). As such, the municipality is wholly dependent on private companies and community programmes for recyclable goods recovery. Privates companies including Collect-a-can, Consul, Mondi, Nampak and Transpaco are involved in the recovery of paper, plastic and aluminium recyclables. Informal recyclers also collect these materials at landfills within the municipality.

There are two main trends across the areas of interest: one within the Limpopo Province, WDM and LLM and the other within the three wards. Within the secondary study area, the most common method of dealing with refuse are individual refuse dumps, which is employed by between 45.11% and 67.58% of households at this level. The least common is refuse removal by a local authority or private company less than once per week. This service reaches between 0.63% and 0.78% of the households. Within the primary study area, communal refuse dumps are the least common refuse management strategy employed by 0.08% to 1.02% of

the households. The most common strategy is refuse being removed by a local authority or private company once a week. This option is available to between 65.44% and 95.80% of the households in the wards.

10.13.6 Housing

The WDM IDP (2018) highlights the need for more housing, as there is a total backlog of 68 828 houses of varying types. The LLM accounts for 20 575 of these houses (29.89% of the backlog). The WDM IDP described the challenges to the provision of housing, which include the poor quality of the RDP houses and inadequate land for development.

Table 10-17 above summarises the numbers of households within each of the areas of interest. Figure 10-26 below presents an overview of the type of dwellings household reside in. The WDM IDP (2018/19 Integrated Development Plan, 2018) defines the 'not applicable' category as including collective living quarters. Across the study areas, between 0.4% and 1.5% of the households reported a different ('other') dwelling type. Between 1.81% and 20.88% responded that this was 'not applicable' to their household and between 0.29% and 1.65% of the respondents did not specify their dwelling type.

Dwellings on separate stands are the most common dwelling type across the larger study area. The other trends are very variable across the different areas of interest. Table 10-21 below highlights the most and least common dwelling types for each area.

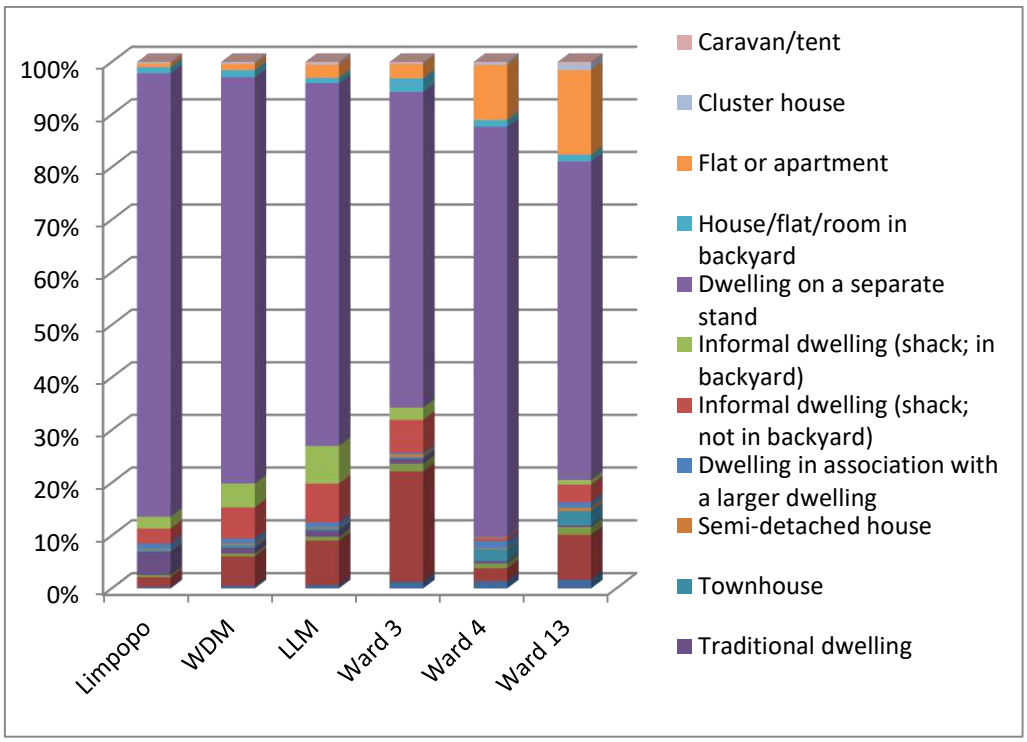


Figure 10-26: Household dwellings by type

Adapted from Wazimap (Wazimap, 2017)

Table 10-21: Most and least common dwelling types within the areas of interest

Dwelling type	Limpopo	WDM	LLM	Ward 3	Ward 4	Ward 13
Most common	Separate stand	Separate stand	Separate stand	Separate stand	Separate stand	Separate stand
Second-most common	Traditional Dwelling	Informal, other	Informal, other	Informal, other	Flat or apartment	Flat or apartment
Third-most common	Informal, other	Informal, in backyard	Informal, in backyard	Flat or apartment	Townhouse	Informal, other
Least common	Caravan / Tent	Caravan / Tent	Semi-detached	Cluster house	Caravan / Tent	Traditional Dwelling

Adapted from Wazimap (Wazimap, 2017)

Figure 10-27 presents the types of ownership within the larger study area. Between 2.38% and 5.46% reported a different ("other") type of house ownership. Between 1.81% and 20.88% responded that this was not applicable to their household. A further 0.29% to 1.65% did not specify in which way their house is owned.

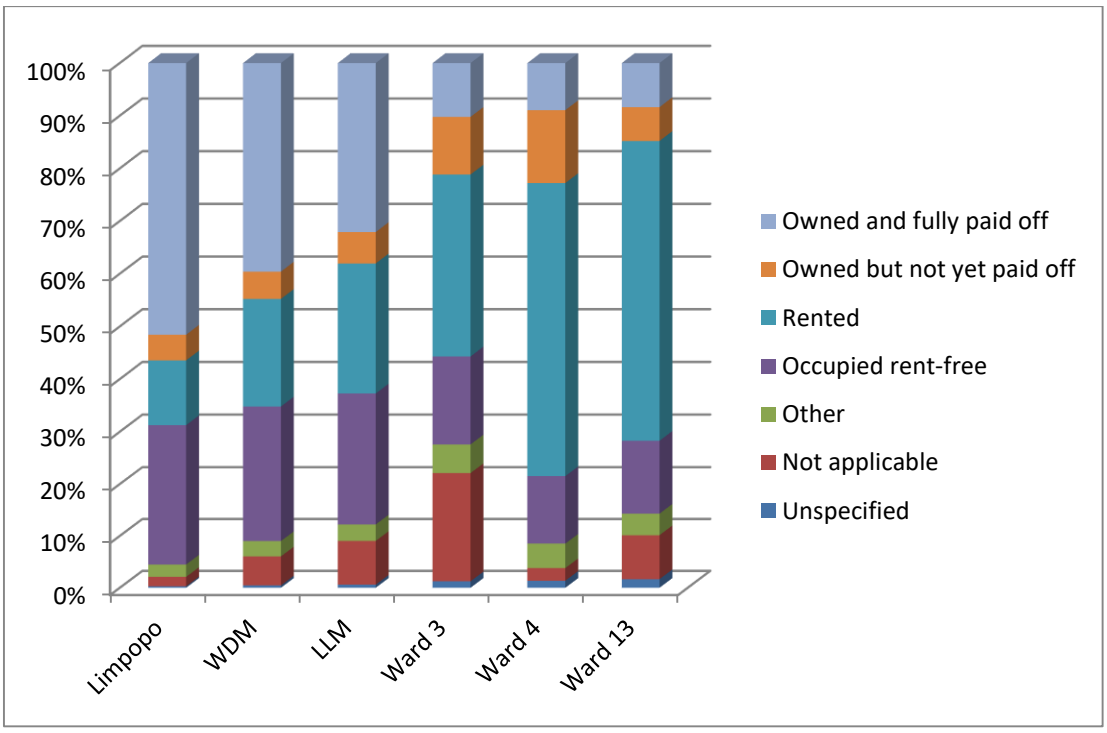


Figure 10-27: House ownership within the areas of interest

Adapted from Wazimap (Wazimap, 2017)

10.13.7 Land use and land tenure

The most prevalent form of land tenure within the LLM is private land ownership (LLM, 2018). Lephalale Town, most of the local service points and all farms within the municipality are owned in this way. “Population concentration points” and all 38 villages within the LLM are communally owned. Communal land is technically vested in the national government, but land is used by local residents. The Marapong Township is owned as a deed of grant which is not considered full ownership as the applicable legal proclamation has become obsolete. Large portions of this land are now owned by the Limpopo Department of Local Government and Housing.

In 2001, 197 land claims were lodged with the Land Restitution Commission within the LLM (2018). These land claims constitute approximately 197 831 hectares (ha). As of 2018, 52 claims have been accepted and 28 land claims in Lephalale have been settled and gazetted. The other land claims are in various stages of investigation and negotiation. Land claims have been investigated by the public participation specialist and are addressed in the overall EIA report.

The LLM IDP (2018) lists the following uses for land within the municipality: business, offices and industrial parks, residential and institutional. As part of the compilation of the LLM Spatial Development Framework (SDF), land has been divided into six functional zones: urban, rural, mining, agricultural, cattle and ranching and conservation. These areas were analysed for the SDF development, but the results were not reported in the IDP. The IDP does note that the above-mentioned land claims have the potential to impact land-use planning, management and socio-economic development in ways that have not yet been explored.

10.13.8 Safety and vulnerability

10.13.8.1 Health, Safety and Security

Table 10-22 presents an overview of the types and quantities of healthcare facilities within the WDM and at local municipality level.

Table 10-22: Health Care facilities within the WDM

Local Municipality	Government Hospital	Private Hospital	Clinic	Mobile Clinic	Community Health Centre
Bela-Bela	1	1	4	2	-
Lephalale	2	1	7	7	-
Modimolle-Mookgophong	1	0 (*1)	7	6	1
Mogalakwena	3	0	29	13	-
Thabazimbi	1	0	10	4	-
Total (WDM)	**8**	**2 (1)**	**57**	**32**	**1**
Modimolle-Mookgophong includes 1 specialised clinic, demarcated with the asterisk.					

Adapted from WDM (2018)

Within the WDM, there are 25 police stations (WDM, 2018). Of these, six are in LLM. All six of these police stations are considered ‘main stations’. Several challenges to safety and security are noted in the WDM IDP, which include:

- Monitoring the utilisation of licences and permits issued to liquor outlets;
- The illegal operation of unlicensed shebeens and taverns;
- Access to some crime scenes can be rendered difficult due to poor road conditions and lighting;
- Domestic violence; and
- Substance abuse issues.

11 Item 3(g)(v): Impacts and Risks Identified including the Nature, Significance, Consequence, Extent, Duration and Probability

This section aims to rate the significance of the identified potential impacts pre-mitigation and post-mitigation. The potential impacts identified in this section are informed by the baseline investigations presented in Section 10 above and are a result of both the environment in which the project activity takes place, as well as the activity itself.

The potential impacts are discussed per environmental feature / aspect and according to each phase of the project i.e. the Construction, Operational and Decommissioning / Post Closure Phases. The activities associated with each project phase are summarised in the table below.

Table 11-1: Project Activities

Phase of Project	Activity
Construction phase	▪ Site Clearing; ▪ Topsoil and subsoil removal and stockpiling; ▪ Temporary storage of construction materials, hazardous material, waste and water storage; and ▪ Establishment of ancillary infrastructure (road diversion, water pipeline and rail loop and associated rail link).
Operational phase	▪ Operation of rail loop and water pipeline; and ▪ Maintenance of rail loop and water pipeline.
Decommissioning, rehabilitation and closure phase	▪ Demolition and removal of rail loop infrastructure and water pipeline; ▪ Rehabilitation, including spreading of soil, re-vegetation and profiling or contouring; ▪ Storage, handling and disposal of hazardous and non-hazardous waste; and ▪ Post-closure monitoring and rehabilitation

11.1 Identified Potential Impacts

The subsections below provide the identified potential for the environmental aspects investigated in this EIA for each project phase. Furthermore, the significance, extend, duration and probability of the potential impact are detail and possible mitigation measure that could be applied are provided for each potential impact. It is noted that only direct impacts are assessed in this section, potential risks are detailed in Section 11.2 below.

11.1.1 Soils, Land Use and Land Capability

Construction Phase: Construction activities on the site will lead to land clearing and disturbance of the soil and the potential generation of dust. The clearing of vegetation, the exposing of soil during construction of the project, may lead to erosion due to wind or water. Soil compaction is also anticipated as a result of vehicle movement on soil surfaces during the construction phase. Soil compaction reduces infiltration rates and ability for plant roots to penetrate the soil. The current land capability of the project area is low as a result of existing mining related activities therefore will not experience any change.

Table 11-2: Construction Phase: Impact Assessment - Loss of Soil

Activity: Site clearing and topsoil removal								
Impact Description: Erosion of cleared bare surface as well as soil compaction due to heavy vehicle movement on the soil surface which reduces the vegetation's ability to grow and as a result could also result in erosion. Furthermore, topsoil losses could occur as a result of erosion of stockpiles.								
Without Mitigation/Management					**With Mitigation/Management**			
Dimension	Duration	**Rating**	4	The impact on soil erosion and compaction will occur until the soils have been fully rehabilitated (>10 years).	**Dimension**	Duration	**Rating**	3	With mitigation measures, impact can be reversible.
	Extent		4	Loss of soil will only occur within project area and its surroundings.		Extent		3	Loss of soil is limited only within project area and surroundings.
	Intensity		5	Loss of soil resource due to erosion. Once the resource has been lost on the landscape it cannot be recovered.		Intensity		3	If mitigations are not implemented, resource cannot be recoverable.
	Probability		6	By moving equipment on the soil surface, soils will certainly be compacted and erosion will definitely occur.		Probability		4	If mitigation measures are not followed it is likely that the impact will occur.

	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 78					**Minor (negative) - 36**				
Mitigation/Management Actions ▪ Runoff must be controlled and managed by use of proper stormwater management measures at construction sites; ▪ Establishment of effective soil cover and adequate protection from wind and water; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals and after high rainfall events; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; and ▪ Limit the removal of the natural vegetation cover to footprint areas only.									

Operational Phase: During the operational phase maintenance activities (i.e. movement of heavy machinery on access roads) may result in soil compaction which reduces the vegetation's ability to grow and as a result the risk of erosion will increase. The loss of topsoil along the access roads of the ancillary infrastructure may also occur due to erosion which will have negative impact and the natural regeneration of a few millimetres of topsoil takes hundreds of years. Topsoil along the pipeline will however be replaced after construction while topsoil associated with the rail loop and road diversion will be preserved in stockpiles for rehabilitation purposes at Temo Mine.

Table 11-3: Operational Phase: Impact Assessment: Maintenance of Roads

Activity: Maintenance of access roads									
Impact Description:	Topsoil losses will occur during the operational phase as a result of rainwater runoff and wind erosion of stockpiles created during the construction phase. Compaction of soils during operational phase will occur due to vehicular movement for maintenance activities.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	6	Haul roads will be used for the length of this operation therefore posing an impact on soils of not mitigated accordingly	**Dimension**	Duration	**Rating**	5	The roads will used for the project life
	Extent		3	Loss of topsoil is anticipated along the access roads where vehicle movement and disturbance will occur		Extent		2	Loss of soil will only occur within project area

	Intensity		5	Loss of usable topsoil will result in loss of land capability and land use. Soil regeneration takes a very long time.		Intensity		3	If access and haul roads are not maintained, the impact on the soils will be minimal
	Probability		7	Compaction and erosion of soil if mitigations are not implemented will definitely occur		Probability		4	Impact on soils will probable occur if haul roads and topsoil stockpiles are not maintained
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 98					**Minor (negative) - 36**				
Mitigation/Management Actions ▪ Runoff must be controlled and managed by use of proper stormwater management measures at construction sites; ▪ Establishment of effective soil cover and adequate protection from wind and water; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals and after high rainfall events; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; and ▪ Limit the removal of the natural vegetation cover to footprint areas only.									

Table 11-4: Maintenance of the Pipeline Route

Activity: Operation of pipeline routes									
Impact Description:	The maintenance and inspections of the pipeline route will cause a loss of topsoil as a resource through erosion and compaction due to vehicle movement and disturbance on soil surfaces.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	When the soil has eroded the impact will be permanent and is potentially irreversible	**Dimension**	Duration	**Rating**	2	Impact on soil can be less than a year if mitigation measures are implemented
	Extent		4	Compaction and erosion will occur on a limited scale		Extent		2	Compaction and erosion will occur on a very limited scale

	Intensity		3	Impact will be reduced if mitigation measures are implemented		Intensity		3	Intensity of the impact on soils will be reduced if mitigation measures are implemented
	Probability		3	Impact is unlikely to occur if mitigation measures are implemented		Probability		2	Impact will rarely occur if mitigation measures are followed
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) - 36					**Negligible (negative) - 14**				
Mitigation/Management Actions ▪ Maintenance and inspections of erosion and compaction must be conducted along the pipeline trajectory; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place; and ▪ Only the designated access routes are to be used to reduce any unnecessary compaction.									

Decommissioning Phase: During the decommissioning phase the railway loop and pipeline infrastructure will be demolished and the areas will be rehabilitated by spreading topsoil and re-vegetating the disturbed footprints. Should vegetation not establish accordingly, soil will be prone to erosion. Lack of vegetation cover exacerbates the impact as runoff potential, leading to soil erosion. Once the soil is eroded it reduces the overall soil depth and as a result the land capability reduces. Furthermore, soil compaction may also occur due to heavy vehicle movement over soil surfaces during the demolition activities.

Table 11-5: Compaction of Soils and Soil Erosion

Activity: Decommissioning of the infrastructure									
Impact Description: The movement of heavy machinery on the soil surface causes compaction which reduces the vegetation's ability to grow and as a result erosion could occur.									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	The impact on soil erosion and compaction will occur until the soils have been fully rehabilitated (>10 years).	**Dimension**	Duration	**Rating**	4	With mitigation measures, impact can be reversible.
	Extent		4	Loss of soil will only occur within project area and its surroundings.		Extent		3	Loss of soil is limited only within project area and surroundings.

	Intensity		4	Loss of soil resource due to erosion. Once the resource has been lost on the landscape it cannot be recovered.		Intensity		3	If mitigations are not implemented, resource cannot be recoverable.
	Probability		6	By moving equipment on the soil surface, soils will certainly be compacted and erosion will definitely occur.		Probability		4	If mitigation measures are not followed it is likely that the impact will occur.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 78					**Minor (negative) - 40**				
Mitigation/Management Actions ▪ Runoff must be controlled and managed by use of proper stormwater management measures; ▪ Establish effective soil cover and adequate protection from wind and water during rehabilitation activities; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place at regular intervals and after high rainfall events (refer to Rehabilitation Report) ; ▪ Vehicle movement must be restricted to designated access routes are to be used to reduce any unnecessary compaction; ▪ Minimise unnecessary removal of the natural vegetation cover; ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure successful re-vegetation and a surface profile that allows good drainage.									

11.1.2 Fauna and Flora

Construction Phase: Site clearance for the construction of the road diversion, rail loop and pipeline and associated access roads will lead to the loss of approximately 328 ha of natural vegetation. It is envisaged that the project area will endure a permanent loss of vegetation and habitat in areas where the road diversion, pipeline and rail loop will be constructed.

The loss of natural vegetation will in turn adversely impact ecological services for example loss of habitat for faunal species provided to these areas including the woodlands areas which are characterised as highly sensitive. Indirect impacts, namely road kills of faunal species may also occur due to construction activities and vehicle movement in the project areas.

Table 11-6: Loss of Natural Habitat

Activity: Clearing of vegetation and increased traffic during construction									
Impact Description:	Direct and permanent loss of approximately 55 ha of natural habitat on the farm Duikerpan for the rail loop and road diversion project area and direct loss of natural habitat of approximately 313 ha in the pipeline servitude (Option 2) as a result of site clearing for the establishment of infrastructure.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	6	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible.	**Dimension**	Duration	**Rating**	6	The impact will remain for some time after the life of the project and is potentially irreversible even with management
	Extent		4	Loss of habitat will occur locally but will impact mobile faunal species of a greater area.		Extent		3	Local extending only as far as the development site area.
	Intensity		4	Serious loss and/or damage to physical or biological resources or **moderately** sensitive environments.		Intensity		3	Moderate loss and/or damage to biological or physical resources.
	Probability		7	These impacts will occur if the project goes ahead.		Probability		7	These impacts will occur if the project goes ahead.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 98					**Moderate (negative) - 84**				
Mitigation/Management Actions ▪ Use previously disturbed footprints for the establishment of infrastructure as far as possible to minimise removal of natural vegetation; ▪ Relocate Red Data or protected species identified prior to site clearing. Any required permits must be obtained prior to the removal of Red Data species; ▪ A 100 m buffer is recommended for the pan, wetland and woodland habitats; ▪ Ensure that construction sites are fenced off to limit the ingress of animal and plant species into the construction areas, including alien invasive species; ▪ Ensure that environmental awareness training is held prior and during construction operations; ▪ No poaching or lighting of fires or feeding of fauna must be permitted; and								

- To further mitigate the permanent loss of natural habitat, ecological offsetting must be considered.

Table 11-7: Loss of Ecological Services

Activity: Clearing of vegetation									
Impact Description:	Loss of and/or compromised ecological services provided by areas of high sensitivity including the pan vegetation and woodland areas along the water pipeline servitude and rail loop.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	6	The impact will remain for some time after the life of the project and is potentially irreversible even with management	**Dimension**	Duration	**Rating**	6	Loss of ecological services will remain an impact beyond the project life.
	Extent		4	Loss of ecological services will occur locally but will impact mobile faunal species of a greater area utilising these habitats.		Extent		3	Local extending only as far as the development site area.
	Intensity		4	Serious damage to sensitive biophysical resources limiting ecosystem function.		Intensity		3	With adequate mitigation, this can be moderate damage to sensitive biophysical resources limiting ecosystem function.
	Probability		7	There are sound scientific reasons to expect that this impact will occur if the project goes ahead.		Probability		7	There are sound scientific reasons to expect that this impact will occur if the project goes ahead.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 98					**Moderate (negative) - 84**				
Mitigation/Management Actions ▪ If the sensitive areas in the road, pipeline and rail line servitude are not able to be avoided, retain as much natural vegetation within these habitats as possible; ▪ Use previously disturbed areas where possible; ▪ Plan to relocate Red Data or protected species prior to site clearing;									

- A 100 m buffer is recommended for the pan, wetland and woodland habitats if possible;
- Ensure that construction sites are fenced off to limit the ingress of animal and plant species into the construction areas, including alien invasive species;
- To further mitigate the permanent loss of natural habitat, ecological offsetting must be done.

Table 11-8: Potential loss of Faunal Species due to Road Kills

Activity: Clearing of vegetation and increased traffic during construction									
Impact Description:	Potential road kills of faunal species (including Red Data species) due to increased vehicle movement and increased habitat fragmentation resulting in increased migration.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	Construction activities will occur within 1-5 years.	**Dimension**	Duration	**Rating**	3	Construction activities will occur within 1-5 years.
	Extent		4	Indirect impacts (such as road kills) will occur locally but will impact mobile faunal species of the greater area.		Extent		4	Loss of ecological services will occur locally but will impact mobile faunal species of a greater area utilising these habitats.
	Intensity		4	Serious damage to or loss of sensitive biophysical resources such as SCC.		Intensity		4	Serious damage to or loss of sensitive biophysical resources such as SCC.
	Probability		7	There are sound scientific reasons that the impact will definitely occur.>80% probability		Probability		5	The will always remain the possibility of deaths due to the mobility of the fauna
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 77					**Minor (negative) - 55**				
Mitigation/Management Actions ▪ Ensure that the width and length of the road is kept to a minimum; ▪ Use previously disturbed areas or existing roads where possible; ▪ Plan to relocate red data or protected species prior to construction;									

- Ensure that vehicle speeds are kept to a minimum;
- Ensure that noise levels are reduced;
- Limit construction to daylight as far as practically possible only to reduce noise;
- Ensure that the project area is demarcated and no persons or vehicles permitted outside the demarcated area; and
- Ensure that environmental awareness training is held prior and during construction operations are held.

Operational Phase: The operation of the road, pipeline and rail line within the line servitude will have impacts to the surrounding and remaining natural vegetation. Direct and continual loss of 313 ha of habitat as well as continual compromised ecological services along the ancillary infrastructure servitudes will persist during the operational phase. Indirect impacts, namely disturbance and loss of faunal species due to the operation of infrastructure and maintenance activities is probable.

Table 11-9: Continual Loss of Habitat

Activity: Operation and maintenance of ancillary infrastructure									
Impact Description:	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	The impact will remain for the life of the project but is not reversible even with management	**Dimension**	Duration	**Rating**	5	The impact will remain for the life of the project but is not reversible even with management.
	Extent		4	Impacts may occur locally but will impact mobile faunal species of a greater area		Extent		3	Sound mitigation and management measures may ensure the impacts occur locally.
	Intensity		4	Serious damage to or loss of sensitive biophysical resources such as SCC.		Intensity		4	Sound mitigation and management measures may ensure the damage to or loss of sensitive biophysical resources is moderate.
	Probability		7	There are sound scientific reasons that the impact will definitely occur.>80% probability		Probability		6	Sound mitigation and management measures may ensure the impacts are less likely to occur.

	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 91					**Minor (negative) - 72**				
Mitigation/Management Actions ▪ Ensure that a Biodiversity Action Plan is implemented; ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented. ▪ Ensure continuous environmental awareness training takes place through induction and awareness campaigns.									

Table 11-10: Compromised Ecological Services

Activity: Maintenance of the servitude through continual vegetation cut backs.									
Impact Description:	Direct and continual loss of the 313 ha of habitat in the servitude and continually compromised ecological services provided by areas of medium sensitivity including the pan buffers and woodland areas.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	The impact will remain for the life of the project but is not reversible even with management	**Dimension**	Duration	**Rating**	5	The impact will remain for the life of the project but is not reversible even with management
	Extent		4	Impacts may occur locally but will impact mobile species of a greater area will be impacted by habitat loss		Extent		3	Sound mitigation and management measures may ensure the impacts occur locally
	Intensity		3	Serious damage to or loss of sensitive biophysical resources.		Intensity		4	Sound mitigation and management measures may ensure the damage to or loss of sensitive biophysical resources is moderate.
	Probability		7	There are sound scientific reasons that the impact will definitely occur.>80% probability		Probability		6	Sound mitigation and management measures may ensure the impacts are less likely to occur

	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 91					**Minor (negative) - 72**				
Mitigation/Management Actions ▪ Operational activities must be restricted to disturbed areas only; no new habitat is to be impacted; ▪ A 100 m buffer is recommended for the pan, wetland and woodland habitats if possible; ▪ Ensure that environmental awareness training is held prior and during activity; ▪ No poaching or lighting of fires or feeding of fauna must be permitted; and ▪ To further mitigate the permanent loss of natural habitat, ecological offsetting must be done.									

Decommissioning Phase: The demolition of the rail loop and associated infrastructure areas, and rehabilitation of access roads may have negative impacts similar to that of the construction activities due to the similarities of the actions. Potential impacts include habitat loss and continual pressure exerted on the ecosystem by the decommissioning activities and potential indirect impacts due to industrial activity occurring in a largely natural landscape.

Table 11-11: Potential impacts of the Decommissioning phase on the ecological environment

Activity: Decommissioning and demolition of infrastructure									
Impact Description:	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	The impact will remain for the life of the project but is not reversible even with management.	**Dimension**	Duration	**Rating**	5	The impact will remain for the life of the project but is not reversible even with management.
	Extent		4	Impacts may occur locally but will impact mobile faunal species of a greater area.		Extent		3	Sound mitigation and management measures may ensure the impacts occur locally.

	Intensity		3	Moderate damage to or loss of biophysical resources.		Intensity		4	Sound mitigation and management measures may ensure the damage to or loss of sensitive biophysical resources is moderate.
	Probability		7	There are sound scientific reasons that the impact will definitely occur.>80% probability.		Probability		6	Sound mitigation and management measures may ensure the impacts are less likely to occur.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Moderate (negative) - 84					**Minor (negative) - 72**				
Mitigation/Management Actions ▪ Ensure that a Biodiversity Action Plan is implemented; ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented; and ▪ Ensure continuous environmental awareness training takes place.									

11.1.3 Wetlands and Aquatic Ecology

Construction Phase: The main activities during the construction phase that could result in impacts to the freshwater ecology of the area include site clearing, soil disturbances, topsoil stockpiling, storage and dumping of construction materials, compaction of soils and crossing of the wetland and river systems.

Associated impacts include erosion and sedimentation, the potential loss of biodiversity and habitat, fragmentation of the systems present and potential loss of catchment yields and surface water recharge to the systems further downstream. Removal of vegetation and disturbance of soils in the vicinity of the construction footprint is likely to give rise to an increased potential for encroachment by robust pioneer species and Alien Invasive Plants (AIPs), further altering the natural vegetation profiles of the freshwater resources encountered in the vicinity of the project footprint.

Table 11-12: Direct Loss of Wetlands due to Site Clearance

Activity: Site clearing and excavation activities									
Impact Description:	Site clearing for the establishment of infrastructure resulting in a direct loss of wetland and other freshwater habitat for infrastructure. This in turn will result in a loss of connectivity (i.e. in the Sandloop River and the channelled valley bottom system). Furthermore, construction phase activities may result in erosion associated with land clearing and subsequent sedimentation of wetlands, leading to the deterioration of wetland PES and provision of ecosystem services.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	The impact will cease after the life of the project has been completed.	**Dimension**	Duration	**Rating**	5	The impact will cease after the life of the project has been completed and rehabilitation has taken place.
	Extent		3	Increased erosion and general scouring from sedimentation, as well as degraded habitat due to water quality deterioration will affect the immediate watercourses.		Extent		2	Impacts will be limited only to the local area and will be rehabilitated accordingly on completion of the decommissioning phase.
	Intensity		3	Due to the flat terrain and nature of the systems (mostly pans), should no management or mitigation measures be employed, activities could result in moderate medium-term impacts.		Intensity		2	Should the appropriate precautions and management or mitigation measures be employed, the project could result in only a minor ecological impact to the wetland systems present.
	Probability		5	Should no precautionary measures be implemented, further impacts to the wetlands present are considered likely.		Probability		4	Should the proposed project proceed, impacts to the ecological integrity of the systems present are still considered probable.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) – 55					**Minor (negative) – 40**				

Mitigation/Management Actions

- Construction activities should be restricted to the road servitude to limit impacts to the system as a result of vegetation clearing and compaction of soils;
- Ensure that there is no impoundment or ponding of water of the ephemeral system and the channelled valley bottom system;
- Ensure that no incision and canalisation of the ephemeral drainage lines present takes place;
- Ensure a soil management programme is implemented and maintained to minimise erosion and sedimentation;
- Active rehabilitation, re-sloping, and re-vegetation of disturbed areas must be undertaken immediately after construction;
- Implement and maintain an alien vegetation management programme. This must be put in place so as to prevent further encroachment by invasive species as a result of disturbance to the surrounding terrestrial zones;
- If it is absolutely unavoidable that any of the freshwater areas present will be affected, disturbance must be minimised and suitably rehabilitated;
- All erosion noted within the construction footprint should be remedied immediately and included as part of an ongoing rehabilitation plan;
- Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified;
- All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel;
- No unnecessary crossing of the freshwater features and their associated buffers should take place and the substrate conditions of the ephemeral drainage lines and downstream stream connectivity must be maintained;
- No vehicles or heavy machinery may be allowed to drive indiscriminately within any freshwater areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the construction footprint.

Table 11-13: Loss of Wetlands due to Stockpiling and Material Storage

Activity: Stockpiling and storage of construction materials									
Impact Description:	Stockpiling and storage of materials resulting in soil compaction and loss of freshwater habitat areas. Stockpiling could result in soil erosion due to wind and water which could subsequently lead to sedimentation of wetlands and potential establishment of AIPs. This ultimately would result in a deterioration of wetland PES and provision of ecosystem services.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	The impact will cease after construction has been completed.	**Dimension**	Duration	**Rating**	2	The impact will cease after construction has been completed and any leftover material has been removed.
	Extent		3	Increased erosion and general scouring from sedimentation, as well as degraded habitat due to water quality deterioration will affect the immediate watercourses.		Extent		2	Impacts will be limited only to the local area and will be rehabilitated accordingly on completion of the decommissioning phase.

	Intensity		3	Due to the flat terrain and nature of the systems (mostly pans), should no management or mitigation measures be employed, activities could result in moderate medium-term impacts.		Intensity		2	Should the appropriate precautions and management or mitigation measures be employed, the project could result in only a minor ecological impact to the wetland systems present.
	Probability		5	Should no precautionary measures be implemented, further impacts to the wetlands present are considered likely.		Probability		4	Should the proposed project proceed, impacts to the ecological integrity of the systems present are still considered probable.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) – 45					**Negligible (negative) – 24**				
Mitigation/Management Actions ▪ Stockpiling of soil during the burying of the pipeline should not be placed within wetlands and should be replaced as soon as possible to reduce sedimentation and fragmentation of the systems; ▪ Ensure that there is no impoundment or ponding of water of the ephemeral system and the channelled valley bottom system; ▪ Ensure that no incision and canalisation of the ephemeral drainage lines present takes place; ▪ Ensure a soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ All erosion noted within the construction footprint should be remedied immediately and included as part of an on-going rehabilitation plan; and ▪ No material may be dumped or stockpiled within any freshwater features.									

Operational Phase: The main activities during the operational phase that could result in impacts to the freshwater ecosystems of the area are associated with the storm water management systems, maintenance and operational activities, including movement of coal, increased vehicular movement, management of soils and crossing of the wetland and river systems.

Associated impacts include loss of catchment yield and surface water recharge, erosion of bare surface and consequently sedimentation of freshwater ecosystems, the potential loss of biodiversity and habitat and further fragmentation of the systems present. Removal of indigenous vegetation is likely to give rise to an increased potential for encroachment by robust pioneer species and AIPs, further altering the natural vegetation profiles of the freshwater resources encountered in the vicinity of the project footprint. This will adversely impact PES and EIS.

Hardened surfaces have the potential to result in sheet runoff and there is likely to be a loss in wetland service provision in terms of flood attenuation, sediment trapping and assimilation of toxicants and other pollutants. Storage of water, which is an important service, provided by wetlands in this area, will be compromised. Further alterations to the natural flow regimes will take place and is likely to result in the creation of preferential flow paths over time.

Table 11-14: Wetland Disturbance and Deterioration due to Operational Activities

Activity: Operational and maintenance activities									
Impact Description:	Operational activities resulting in erosion and consequently sedimentation to wetlands and riparian zones. This leads to a deterioration of PES and EIS.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	The impact will cease the after the project has been completed.	**Dimension**	Duration	**Rating**	5	The impact will cease the after the project has been completed.
	Extent		3	Increased erosion and general scouring from sedimentation, as well as degraded habitat due to water quality deterioration will affect the immediate watercourses.		Extent		2	Impacts will be limited only to the local area and will be rehabilitated accordingly on completion of the operational phase.
	Intensity		3	Due to the fact that the project falls mainly within a road servitude, activities could result in only moderate medium-term impacts.		Intensity		2	Should the appropriate precautions and management or mitigation measures be employed, the project could result in only a minor ecological impact to the wetland systems present.
	Probability		5	Should no precautionary measures be implemented, further impacts to the wetlands present are considered likely.		Probability		4	Should the proposed project proceed, impacts to the ecological integrity of the systems present are still considered probable.

	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) – 55					**Negligible (negative) – 36**				

Mitigation/Management Actions

- Ensure that as far as possible all operational infrastructures are placed outside of freshwater areas and their associated 100 m zone of regulation;
- Limit the footprint area of the operational activities to what is absolutely essential in order to minimise impacts as a result of any potential vegetation clearing and compaction of soils (all areas but critically so in freshwater areas);
- If it is absolutely unavoidable that any of the freshwater areas present will be affected, disturbance must be minimised and suitably rehabilitated;
- Ensure that no incision and canalisation of the freshwater features present takes place as a result of the proposed operational activities;
- All erosion noted within the operational footprint as a result of any potential surface activities should be remedied immediately and included as part of the on-going rehabilitation plan;
- A suitable AIP control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones;
- Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified;
- All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel;
- No unnecessary crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained;
- No material may be dumped or stockpiled within any of the ephemeral drainage lines in the vicinity of the proposed operational footprint;
- No vehicles or heavy machinery may be allowed to drive indiscriminately within any freshwater areas and their associated zones of regulation. All vehicles must remain on demarcated roads; and
- Monitor all systems for erosion and incision.

Table 11-15: Wetland Deterioration due to Loss of Catchment Yields and Sheet Runoff

Activity: Hardened surfaces, sheet runoff and separation of clean and dirty water									
Impact Description:	Reduced ecological integrity and functioning of wetlands as a result of loss of catchment yield and surface water recharge due to stormwater management systems. The establishment of infrastructure and vehicular movement will result in additional hardened surfaces resulting in sheet run-off which could lead to erosion to freshwater ecosystems.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimens ion	Duration	**Rating**	5	The impact will continue for longer than 15 years if not mitigated appropriately.	**Dim**	Duration	**Rati**	4	The impact will continue between 6 and 15 years

	Extent		3	Increased erosion and general scouring from sedimentation, as well as degraded habitat due to water quality deterioration will affect the immediate watercourses.		Extent		2	Impacts will be limited only to the local area and will be discovered and rehabilitated during the monitoring of the operational phase.
	Intensity		3	Due to the flat terrain and nature of the systems (mostly pans), should no management or mitigation measures be employed, activities could result in moderate medium-term impacts.		Intensity		2	Should the appropriate precautions and management or mitigation measures be employed, the project could result in only a minor ecological impact to the wetland systems present.
	Probability		6	Should no precautionary measures be implemented, further impacts to the wetlands present are considered likely.		Probability		4	Should the proposed project proceed, impacts to the ecological integrity of the systems present are still considered probable.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) – 66					**Negligible (negative) – 32**				
Mitigation/Management Actions ▪ Limit the footprint area of the operational activities to what is absolutely essential in order to minimise impacts as a result of any potential vegetation clearing and compaction of soils (all areas but critically so in freshwater areas); ▪ Ensure that no incision and canalisation of the freshwater features present takes place as a result of the proposed operational activities; ▪ Dirty water areas must be kept to a minimum and clean water must be diverted away from infrastructure areas as far as possible; ▪ All erosion noted within the operational footprint as a result of any potential surface activities should be remedied immediately and included as part of the on-going rehabilitation plan; ▪ Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No unnecessary crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; and ▪ Monitor all systems for erosion and incision.									

Decommissioning Phase: Among the impacts associated with the proposed decommissioning phase are compaction of soils, potential loss of natural vegetation and the increased potential for erosion and sedimentation in the decommissioned areas, resulting in impacts further

downstream. Any temporary storage or dumping of decommissioned infrastructure within freshwater areas or any of the ephemeral drainage lines, has the potential to result in loss of stream connectivity, loss of refuge areas, alterations to the terrain profiles of the areas and the creation of preferential flow paths, which may result in sedimentation, alterations to the vegetation structure of the area, encourage alien vegetation encroachment and result in increased erosion and sedimentation potentials. Removal of vegetation and disturbance of soils in the vicinity of the decommissioning footprint is likely to give rise to an increased potential for encroachment by robust pioneer species and AIPs, further altering the natural vegetation profiles of the freshwater resources encountered in the vicinity of the decommissioning footprint.

Table 11-16: Wetland Deterioration due to Decommissioning and Rehabilitation activities

Activity: Decommissioning of infrastructure									
Impact Description:	Decommissioning and rehabilitation activities resulting in reduced ecological integrity of freshwater ecosystems due to potential soil compaction, erosion and consequent sedimentation of freshwater resources as well as potential encroachment of alien invasive plant species as a result of habitat fragmentations.								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	The impact will cease after the life of the project.	**Dimension**	Duration	**Rating**	5	The impact will cease after the life of the project has been completed and rehabilitation has taken place.
	Extent		3	Increased erosion and general scouring from sedimentation, as well as compaction from moving machinery and degraded habitat due to water quality deterioration will affect the immediate watercourses.		Extent		2	Impacts will be limited only to the local area and will be rehabilitated accordingly on completion of the decommissioning phase.
	Intensity		3	Due to the flat terrain and nature of the systems (mostly pans), should no management or mitigation measures be employed, activities could result in moderate medium-term impacts.		Intensity		2	Should the appropriate precautions and management or mitigation measures be employed, the project could result in only a minor ecological impact to the wetland systems present.

	Probability		5	Should no precautionary measures be implemented, further impacts to the wetlands present are considered likely.		Probability		4	Should the proposed project proceed, impacts to the ecological integrity of the systems present are still considered probable.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) – 55					**Negligible (negative) – 36**				
Mitigation/Management Actions ▪ Ensure that as far as possible all decommissioned infrastructures are placed outside of freshwater areas and their associated 100 m zone of regulation; ▪ Limit the footprint area of the decommissioning activities to what is absolutely essential to minimise impacts as a result of disturbances to soils, compaction of soils and loss of natural vegetation; ▪ If it is absolutely unavoidable that any of the freshwater areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the freshwater resources present takes place as a result of the proposed decommissioning activities; ▪ All erosion noted within the decommissioning area footprint should be remedied immediately and included as part of the on-going rehabilitation plan; ▪ A suitable AIP control programme must be put in place for both the decommissioning and closure phases so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones; ▪ Permit only essential personnel within the zones of regulation for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ Unnecessary crossing of the freshwater features and their associated buffers should not take place and the substrate conditions of the ephemeral drainage lines and downstream stream connectivity must be maintained; ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream; and ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any freshwater areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the decommissioning area footprint.									

11.1.4 Surface Water

Construction Phase: Clearing of vegetation and excavation on the project site leaves the soils prone to erosion during rainfall events. Runoff from these areas will be expected to be high in suspended solids and potentially cause an increase in turbidity in nearby natural water resources. This could also result from the stockpiled topsoil if not vegetated or well compacted.

Dust generated during the construction activities and increased vehicular movements can also be deposited into the pans and the Mokolo River thereby contributing to the accumulation of suspended solids and siltation of the water resources.

Excavation activities on the streambed and banks leads to alteration of channel geometry and the occurrence of stream-bank erosion, this will change the stream-flow regime and may impact on the surrounding riparian ecosystems. Furthermore, dirty or contaminated runoff emanating from construction sites may potentially contaminate the watercourses if proper stormwater measures are not in place.

Human activity will generate waste which includes general wastes (paper, glass, plastic and cans), biological sewage waste and other hazardous waste that may be exposed during construction. The handling and disposal of these wastes may have an impact on the surrounding streams if not managed appropriately.

Table 11-17: Deterioration of Surface Water Quality due to Siltation

Activity: Site clearing for the establishment of infrastructure									
Impact Description: Siltation of surface water resources due to erosion on bare soil leading to deteriorated water quality of nearby surface water resources.									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	Equal to the duration of the construction phase	**Dimension**	Duration	**Rating**	2	As for post-mitigation
	Extent		2	The impacts will be localized to the nearby water resources from where the silt is being generated and the immediate downstream		Extent		2	The impact may be limited to the site and its immediate surroundings
	Intensity		4	This will have moderate impacts resulting reduction in water quality for local downstream users and aquatic life		Intensity		3	Mitigation will reduce the impacts
	Probability		6	Without appropriate mitigation there will be significant erosion.		Probability		4	Necessary mitigations will reduce the erosion probability significantly
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)

Minor (negative) – 54	Negligible (negative) – 28

Mitigation/Management Actions

- Clearing of vegetation and excavations should be confined within the project footprints, no unnecessary clearing should be permitted;
- If possible, construction activities must be prioritised during the dry months of the year (May-October) to limit mobilisation of sediments during site clearance;
- Re-vegetate the backfilled and reshaped underground pipeline route after installation to minimise erosion and sedimentation of nearby watercourses;
- An appointed Environmental Control Officer (ECO) must always be available during the construction phase to ensure implementation of the recommended mitigation/management measures during construction; and
- Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose of the waste.

Table 11-18: Alteration of stream channel geometry at pipeline river crossing

Activity: Excavation activities on the streambed and banks for the establishment of the water pipeline									
Impact Description: Alteration of stream channel geometry at pipeline river crossing resulting in water quality deterioration									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	7	The impact will remain long after the life of the Project.	**Dimension**	Duration	**Rating**	2	The impact will be short term with a duration of less than 1 year if properly mitigated
	Extent		4	Serious medium term environmental effects. Environmental damage is reversible		Extent		2	Minor effects on biological or physical environment. Environmental damage can be rehabilitated internally with/ without help of external consultants
	Intensity		3	The impact will be local extending across the site and to nearby environments		Intensity		2	Limited to the site and its immediate surroundings
	Probability		4	The impact will likely occur		Probability		2	If mitigation measures are correctly implemented, it will be rare / improbable for this impact to occur.
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)

Minor (negative) – 56	Negligible (negative) – 12
Mitigation/Management Actions ▪ If possible, construction activities must be prioritized during the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearance; ▪ An appointed ECO must always be available during the construction phase to ensure implementation of the recommended mitigation/management measures during construction; and ▪ Water quality and quantity monitoring must be undertaken to detect any changes as a result of the stream crossing. Should any alterations be detected, corrective measures must be investigated and implemented accordingly.	

Operational Phase: There are limited surface water impacts that are anticipated during operational phase of this project. It is noted that contamination related risks such as hydrocarbon spills associated with maintenance activities may occur. These are discussed in Section 11.2 below.

Decommissioning Phase: Similar to the construction phase, the decommissioning and demolition of infrastructure will expose and disturb the soil and leave it prone to erosion which leads to increased sedimentation and possible siltation of nearby watercourses.

Table 11-19: Deterioration of Surface Water Quality due to Siltation

Activity: Decommissioning and demolition of infrastructure									
Impact Description: Siltation of surface water resources leading to deteriorated water quality									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	Siltation impact may occur for as long as the decommissioning takes place	**Dimension**	Duration	**Rating**	2	As for pre-mitigation
	Extent		3	The impacts will be localized to the nearby water resources from where the silt is being generated and the immediate downstream		Extent		2	As for pre-mitigation
	Intensity		4	This will have moderate impacts resulting reduction in water quality for downstream users and aquatic life		Intensity		2	Mitigation will reduce the impacts

	Probability		5	Without appropriate mitigation, it is likely (<65%) that erosion may occur during this phase		Probability		2	Necessary mitigations will reduce the erosion probability significantly
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) – 50					**Negligible (negative) – 12**				
Mitigation/Management Actions ▪ Ensure that the surface profiles of affected sites are rehabilitated to promote free surface runoff drainage and avoid ponding of water within the rehabilitated area; and ▪ Rehabilitated sites should be re-vegetated to reduce erosion and subsequent sedimentation and siltation of nearby watercourses.									

11.1.5 Groundwater

Construction Phase: The main activities during the construction phase that could result in groundwater impacts are associated with the site clearing and construction of the infrastructure. The water table in the project area is approximately 20 m below the ground surface. All activities are expected to take place above this and therefore no impact on the groundwater quality or quantity is envisaged.

Table 11-20: Lowering of the Groundwater Table

Activity: Site clearing for the development of surface infrastructure through the removal of the topsoil and weathered rocks									
Impact Description: Lowering of the water table (should excavation take place below the groundwater table)									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	2	Soil clearing, and development of infrastructure should take place in a relatively short duration.	**Dimension**	Duration	**Rating**	1	Any impact on the groundwater (if any) is expected to recover due to natural processes in a short-time
	Extent		1	Site clearing will only occur within and immediately around the project site		Extent		1	Only the area in the site clearing area will be affected (if at all)

	Intensity		1	No dewatering is anticipated during the construction phase.		Intensity		1	Considering that the construction phase will be for a short period, the intensity will be minimal
	Probability		1	It is highly unlikely that any construction activities will take place below the water table (25 m)		Probability		1	It is highly unlikely that any construction activities will take place below the water table (25 m)
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Negligible (negative) – 4					**Negligible (negative) – 3**				
Mitigation/Management Actions ▪ Avoid constructing below the water table as far as possible; ▪ In the unlikely scenario where the foundation of structures is to be installed below the water level, dewatering of the aquifer to locally lower the water table can be considered. The abstracted water can be utilised for dust suppression, re-vegetation programmes or discharged to the pollution control dams and Temo Mine to be used as process water; and ▪ Install long term monitoring boreholes to detect any impacts to groundwater.									

Operational Phase: All the proposed operations will take place on ground surface with no or limited interaction with the groundwater, which is 20 m below the surface. No impacts are envisaged on groundwater as a result of the operation phase activities.

It is noted that contamination related risks associated with hydrocarbon spills related to maintenance activities or seepage from the water pipeline may occur. The water transfer pipeline will transport water of acceptable quality as it is transported after treatment, hence, any seepage is not expected to have negative environmental impact. These risks are addressed in Section 11.2 below.

Decommissioning Phase: The decommissioning of the rail loop, road, and water pipeline will result in the removal of all infrastructure and therefore no contamination sources are expected for groundwater after closure. A contamination plume or lowering of the water table post-closure is not envisaged.

11.1.6 Air Quality

Construction Phase: Activities associated with the construction of the rail loop and road diversion, namely site clearance and placement of infrastructure, will result in the release of fugitive dust comprising Total Suspended Particulate (TSP), PM_{10} and $PM_{2.5}$. However, impacts are anticipated to be minimal because the construction phase will be medium-term and construction will occur in phases along the infrastructure trajectories.

Table 11-21: Site Clearing resulting in Particulate Matter Emissions

Activity: Site Clearing, Topsoil Removal and Construction of the Rail Loop and Road Diversion									
Impact Description: Particulate matter emissions due to site clearing activities									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	Medium term (1-5 years)	**Dimension**	Duration	**Rating**	1	Medium term (1-5 years)
	Extent		2	Limited to site and immediate surrounding		Extent		1	Impact will be very limited to site and immediate surrounding after mitigation
	Intensity		2	Minor impact during the construction phase activities		Intensity		1	Minimal dust impact anticipated after mitigation
	Probability		3	It is unlikely that impact on air quality will occur		Probability		3	It is unlikely that impact will occur
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Negligible (negative) – 21					**Negligible (negative) – 15**				

Mitigation/Management Actions
▪ Where necessary, wetting agents, dust suppressants or binders must be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Construction should be conducted in phases to minimise extensive disturbance; and ▪ The drop heights when tipping cover materials must be minimised as far as practicable.

Operational Phase: The dust deposition network scattered across the project area (with a network of existing dirt roads and open areas) have shown that deposition rates are very low. It is not anticipated that the operational phase of the rail loop and road will heighten impacts. Wind erosion of any open areas surrounding the ancillary infrastructure established during the construction phase could lead to increased levels of particulate matter, such as TSP, PM_{10} and $PM_{2.5}$ in the surrounding atmosphere, the levels are not expected to exceeding regulatory standards. In addition, gaseous emissions from the train will be minimal as the frequency trip may be limited per week.

Table 11-22: Particulate Matter Emissions during the Operational Phase

Activity: Wind Erosion and Emissions from the use of Rail and Road Infrastructure									
Impact Description:	Nuisance and health effects from exposure to fine particulate matter as a result of operational maintenance activities and/or wind erosion of open areas left during the construction phase								
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	5	Project life	**Dimension**	Duration	**Rating**	2	Impact may occur for the project life
	Extent		2	Limited to site and immediate surrounding		Extent		1	Impact will be very limited to site and immediate surrounding after mitigation
	Intensity		2	Minor impact during the operational phase activities		Intensity		1	Minimal impact anticipated after mitigation

	Probability		3	It is unlikely that impact on air quality will occur		Probability		3	It is unlikely that impact will occur
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Negligible (negative) – 27					**Negligible (negative) – 21**				
Mitigation/Management Actions ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Implement routine maintenance of off-road vehicles and trains to optimise engine performance and minimise gaseous emissions; and ▪ Dust suppression must be implemented on access road if and when necessary.									

Decommissioning Phase: Although activities associated with this phase will result in the release of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$ and release of gaseous emissions from machinery, impacts are anticipated to be minimal because this phase will be short-term and will be conducted in phases.

Table 11-23: Removal/Rehabilitation of Rail Tracks and Road

Activity: Removal/Rehabilitation of Rail Tracks and Road									
Impact Description: Particulate matter emissions due to decommissioning activities									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	2	Short-term (Less than 1 years)	**Dimension**	Duration	**Rating**	2	Short-term (Less than 1 year)
	Extent		2	Limited to site and immediate surrounding		Extent		1	Impact will be very limited to site and immediate surrounding after mitigation
	Intensity		2	Minor impact during the construction phase activities		Intensity		1	Minimal dust impact anticipated after mitigation

	Probability		3	It is unlikely that impact on air quality will occur		Probability		3	It is unlikely that impact will occur
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Negligible (negative) – 27					**Negligible (negative) – 21**				
Mitigation/Management Actions ▪ The area of disturbance must be limited to the decommissioning footprints; ▪ Where necessary, wetting agents, dust suppressants or binders will be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Demolition should be conducted in phases; and ▪ The drop heights when tipping cover materials will be minimised as far as practicable.									

11.1.7 Noise

Construction Phase: In the Noise Assessment undertaken for Temo Mine (Digby Wells, 2016), the noise dispersion model confirmed that construction activities will result in noise disturbance reaching 46 dBA. However, activities associated with the construction of the rail loop and road diversion will not be as intensive, hence, not likely to have significant impact on the background noise levels.

Table 11-24: Noise Generation during the Construction Phase

Activity: Site clearance and vegetation removal; topsoil removal and stockpiling and the establishment of infrastructure									
Impact Description: Noise will emanate from the machinery, pneumatic tools and vehicles operating during the construction activities.									
Without Mitigation/Management					**With Mitigation/Management**				
Dime.	Duration	**Ratin**	3	Medium term (1-5 years)	**Di**	Duration	**Ra**	3	Medium term (1-5 years)

	Extent		2	Limited to site and immediate surrounding		Extent		1	Noise will be very limited to site and immediate surrounding
	Intensity		2	Minor impact during the construction		Intensity		1	Minimal noise impact anticipated during construction
	Probability		3	It is unlikely that noise impact will occur		Probability		3	It is unlikely that noise impact will occur
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Negligible (negative) – 21					**Negligible (negative) – 15**				
Mitigation/Management Actions ▪ Restricting construction activities to daylight hours (06:00 – 18:00) as far as practically possible; ▪ Construction related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Installing broadband reverse hooters to vehicles to minimise the hooter noise propagation; ▪ Switching off equipment when not in use; and ▪ Leave as much natural vegetation where possible to aid in attenuating the noise.									

Operational Phase: In the Noise Assessment undertaken for Temo Mine (Digby Wells, 2016), the noise dispersion model confirmed that operational activities will not measure more than 6 dBA above the existing baseline levels as defined by National Noise Control Regulations. Impacts associated with the proposed ancillary infrastructure operation are not expected to contribute significantly to the background noise level.

Table 11-25: Noise Generation during the Operational Phase

Activity: Sound from the air horn and wheel squeal on rail, sound from off-road vehicles	
Impact Description: Noise will emanate from the train air horn and wheel squeal and vehicles operating during the operational activities.	
Without Mitigation/Management	**With Mitigation/Management**

Dimension	Duration	**Rating**	3	Medium term (1-5 years)	**Dimension**	Duration	**Rating**	3	Medium term (1-5 years)
	Extent		3	Noise will extend only as far as the development site area.		Extent		2	Limited to the development site area.
	Intensity		2	Minor impact anticipated		Intensity		2	Minor impact
	Probability		3	It is unlikely that noise will impact on the surrounding receptors		Probability		3	It is unlikely that noise will impact on the surrounding receptors
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Negligible (negative) – 24					**Negligible (negative) – 21**				
Mitigation/Management Actions ▪ Sound proofing; ▪ Railroad noise barrier; and ▪ Train and vehicles to be serviced to their designed requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers.									

Decommissioning Phase: The impact during the Decommissioning Phase is expected to be lower than both that of the construction and operational phases due to the limited activities; therefore, it is probable that the noise from the decommissioning phase will also not impact on the surrounding receptors.

Table 11-26: Noise Generation during the Decommissioning Phase

Activity: Sound from the air horn and wheel squeal on rail, sound from off-road vehicles									
Impact Description: Noise will emanate from the train air horn and wheel squeal and vehicles operating during the operational activities.									
Without Mitigation/Management					**With Mitigation/Management**				
Dimens ion	Duration	**Rating**	2	Noise produced duration this phase will be short-term	**Dim**	Duration	**Rati**	2	Noise produced duration this phase will be short-term

	Extent		3	Decommissioning phase noise will be limited to the development site area		Extent		2	Decommissioning phase noise will be limited to the development area
	Intensity		2	Noise impacts will have a minor		Intensity		1	Decommissioning phase noise will have minimal impact
	Probability		3	It is unlikely that noise will impact on the surrounding receptors		Probability		2	It is improbable that noise will impact on the surrounding receptors
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Negligible (negative) – 21					**Negligible (negative) – 10**				
Mitigation/Management Actions ▪ Restricting decommissioning activities to daylight hours (06:00 – 18:00) as far as practically possible; ▪ Machines and vehicles to be serviced to the design requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective; and ▪ Switching off equipment when not in use.									

11.1.8 Heritage

No heritage resources were identified within the development footprint and therefore no direct impact to heritage resources is envisaged. Furthermore, no direct impact to heritage resources within the surroundings is envisaged from previously assessments undertaken study area.

No surface outcrops of the palaeontologically significant layers were identified during the pre-disturbance survey, although it must be noted that this survey was not undertaken by a palaeontological specialist. However, the Project is understood to have superficial surface disturbance and is therefore unlikely to impact any palaeontologically-sensitive geological layers.

11.1.9 Socio-economic

Construction Phase: During the construction phase, contractors will be appointed to undertake construction activities. This will result in temporary improvement in livelihoods through employment. Activities within the area will also increase the procurement of goods in the local area which will also positively influence livelihoods of goods suppliers as well as the employed contractors.

The project is likely to result in an influx of job seekers in the area together with the construction contract workers to the local area. Due to the limited extent of the project influx of people to the area is not expected to exceed 150 people. The presence of an outside workforce, although small, may expose local communities' vulnerability and susceptibility to social pathologies, including drug and alcohol abuse, and increased incidence of sex work, teenage pregnancies, crime and domestic violence if not mitigated for adequately.

The presence of the project will also result in pressure to local public services in the local area due to increased economic activity and influx of people to the area. Government services and infrastructure in the project area is already under pressure due to the increasing number of people moving into the area. Construction workers will increase the demand for accommodation and basic services to the construction camp. Lack of potable water, energy and waste management services will increase risks of communicable diseases for workers and to locals if contact under these circumstances results in infection.

Site clearing activities may result in nuisance impacts to nearby receptors. Potential health and safety risks which are associated with the construction phase include pipeline crossings over the road, increase vehicular movement within the vicinity of the project area, increased waste generation and the access to construction sites.

Table 11-27: Influx of Contract Worker and Job Seekers

Activity: All construction activities									
Impact Description: Influx of construction contract workers and job seekers to the area.									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	4	Medium term	**Dimension**	Duration	**Rating**	3	Medium term
	Extent		4	Local area		Extent		4	Local area
	Intensity		4	Expected to be limited to a maximum of 150 people		Intensity		2	Expected to be limited due to the limited extent of the project

	Probability		6	Probable due to the presence of the project and baseline employment rates		Probability		4	Probable due to the presence of the project and baseline employment rates
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) – 72					**Minor (negative) – 36**				

Mitigation/Management Actions

- House non-local construction workers some distance from the project area (i.e. at the Temo mine construction camp if available) to limit movement into surrounding communities;
- Depending on the duration of the work for the different components, contract worker schedules should allow for workers to visit their families at least for one week in every 2 months.
- Develop a code of conduct for construction workers and sensitize them to abide by it so that their behaviour and engagement with local communities does not compromise either party.
- Condoms could be provided free of charge in the construction camp;
- Where possible, construction employees should be locally sourced; and
- Explore opportunities for collaboration with local police with regards safety and security issues relating to Project activities in general and any concerns about contractors.

Table 11-28: Temporary Employment Opportunities

Activity: All construction activities									
Impact Description: Temporary employment resulting in improvements to livelihoods of the workforce									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	Medium term	**Dimension**	Duration	**Rating**	3	Medium term
	Extent		4	Local area		Extent		4	Local area
	Intensity		2	Limited job opportunities due to the limited extent and duration of the project		Intensity		2	Expected to be limited due to the limited extent of the project

	Probability		4	Employment opportunities are definite to execute the project		Probability		4	Probable due to the presence of the project and baseline employment rates
	Nature		Pos	Positive Impact (+)		Nature		Pos	Positive Impact (+)
Minor (positive) + 36					**Minor (positive) + 72**				

Mitigation/Management Actions

- Construction work offered is limited, conducted over a short period of time and carried out by specialised contractors. However, where possible, opportunities for local employment should be considered. For instance, contracts for construction can stipulate that at least 80% of unskilled labour be sourced from surrounding communities and should include the youth as far as possible;
- Skilled, semi-skilled and unskilled construction staff must be retained, where possible, for the subsequent construction of the mine; and
- The Community Liaison Officer could be appointed at this stage, to monitor and address any community queries during the Project and as Temo prepares for construction of the mine.

Table 11-29: Increased Procurement of Local Goods and Services

Activity: All construction activities									
Impact Description: Business opportunities due to an increase in demand for goods and services as a result of increased economic activities									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	Medium term	**Dimension**	Duration	**Rating**	5	Medium term
	Extent		5	Local area		Extent		5	Local area
	Intensity		2	Limited due to the limited extent and duration of the project		Intensity		4	Implementation of enhancement measures will maximise procurement of local goods and services
	Probability		4	Probable		Probability		5	Definite

	Nature		Pos	Positive Impact (+)		Nature		Pos	Positive Impact (+)
Minor (positive) + 40					**Minor (positive) + 70**				
Mitigation/Management Actions ▪ Temo Coal should join local organised business partnerships to discuss any opportunities for procurement for the project. Where goods are services can be sourced locally and Temo Coal is satisfied that it will support the mine to achieve its procurement objectives, including for the SLP of the mine, contracts can be extended for mining activities as relevant.									

Table 11-30: Pressure on Public Services

Activity: All construction activities									
Impact Description: Increase in demand of public services due to increased economic activity and influx of people to the local area for employment.									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	3	Medium term	**Dimension**	Duration	**Rating**	2	Medium term
	Extent		4	Local area		Extent		1	Limited to project area
	Intensity		5	Expect to influence local area		Intensity		1	Expected to be limited due to the limited extent of the project
	Probability		5	Definite		Probability		3	Probable due to the presence of the project
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) - 60					**Negligible (negative) - 22**				
Mitigation/Management Actions ▪ Adequate stormwater management must be implemented and include the construction camps where necessary; ▪ Join partnerships with organised business and government departments to secure access to services such as potable water, energy and healthcare as necessary; and									

- Explore opportunities for collaboration with local police with regards safety and security issues relating to Project activities in general and for contractors in particular.

Table 11-31: Public Health and Safety Associated Risks

Activity: All construction activities									
Impact Description: Increased risk to public health and safety due to increased vehicular movement, waste generation and pipeline crossings in the local area									
Without Mitigation/Management					**With Mitigation/Management**				
Dimension	Duration	**Rating**	4	Medium term	**Dimension**	Duration	**Rating**	2	Medium term
	Extent		5	Local area		Extent		5	Local area
	Intensity		4	Expect to influence local area		Intensity		1	Expected to be limited with the implementation of mitigation measures
	Probability		5	Probable		Probability		3	Probable due to the presence of the project
	Nature		Neg	Negative Impact (-)		Nature		Neg	Negative Impact (-)
Minor (negative) - 65					**Negligible (negative) - 24**				
Mitigation/Management Actions ▪ The area of disturbance must be limited to the infrastructure footprint only. No unnecessary clearing should take place; ▪ Construction should be conducted in phases to minimise extensive disturbance; and ▪ Restrict construction activities to daylight hours (06:00 – 18:00) as far as practically possible; ▪ Construction related machines and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Switch off equipment when not in use; and ▪ Maintenance and inspections of pipelines must be done to minimise compaction and erosion; and									

- Check leakages on the pipelines regularly to avoid major contamination.

Operational Phase: Following the construction of the ancillary infrastructure, it is expected that the related operational and decommissioning activities will be undertaken by the mine workforce as part of the Temo Mine operation.

Procurement for monitoring and maintenance is also expected to be limited and be subjected to procurement processes of the mine. It is also therefore not assessed for significance in this report.

It is noted that risks associated with public health and safety will persist due to the location of infrastructure in publicly accessible areas. The potential risks are discussed further in Section 11.2 below.

11.2 Unplanned Events and Low Risks

Unplanned events may occur during the project that may have potential impacts which will need mitigation and management. Table 11-32 below is a summary of the identified project activities that may pose a risk (an impact at low probabilities). Not all potential unplanned events may be captured herein and this must therefore be managed by Temo Coal throughout all phases.

Table 11-32: Unplanned Events, Low Risks and their Management Measures

Potential Project Risk (Unplanned Occurrences)	Aspect Potentially Impacted	Mitigation / Management / Monitoring
Hydrocarbon spills from vehicles and heavy machinery, hazardous materials or waste storage facilities.	Surface water; Groundwater; Wetlands; Aquatic Ecology; and Soil contamination.	▪ Hydrocarbons and hazardous materials must be stored in bunded areas; ▪ Drip trays should be utilised when refuelling to contain any spillages; ▪ The Material Safety Data Sheets (MSDS) should be kept on site for reference purposes regarding handling, storage and disposal of hazardous materials; ▪ Ensure that oil traps (if present) are well maintained; ▪ Vehicles and heavy machinery should be serviced and checked on a regularly basis to prevent leakages and spills; and ▪ Any hazardous waste generated at construction sites must be disposed of at a licenced hazardous waste facility. Safe disposal certificates must be retained for all hazardous waste removed from site.
Spillages/ leaks from underground water pipeline		▪ Monthly inspections of the pipeline must be undertaken for any leaks; ▪ Seeping pipeline should be sealed; ▪ Ensure that stormwater management structures are put in place to capture all spills; and ▪ If possible leak detection devices should be installed on the pipeline.
Spillages of coal material at rail loop and rail link		▪ Monthly inspections must be carried out along the rail trajectory; ▪ Regular maintenance checks and service of the rail line must be undertaken; ▪ Ensure that stormwater management structures are put in place to capture all spills; and

Potential Project Risk (Unplanned Occurrences)	Aspect Potentially Impacted	Mitigation / Management / Monitoring
		▪ When spillages occur, these must be cleaned up when identified. The coal should be sent back to the Temo Mine and handled appropriately.
Uncontrolled erosion		▪ Erosion control measures must be put in place and provide rehabilitation recommendations.
Failure in the functioning of the clean-dirty water separation and stormwater management plan at construction sites leading to uncontrolled spilling of polluted from the infrastructure areas		▪ The spilling of the contaminant must be stopped immediately and the impacted area remediated. Spill protection berms must be in place as well. An investigation into the spillage must be undertaken where recommendations and mitigation measures are provided.
Community expectations and actions	Socio-economic	▪ Expectations of communities must be managed by informing them what to expect from the project in terms of Local Economic Development (LED) and employment opportunities ▪ Establish grievance mechanism which is accessible to aggrieved members of the surrounding communities.
Public health and safety risks associated with infrastructure in publically accessible areas		▪ A grievance mechanism must be put in place to aggrieved members of the surrounding communities; ▪ Adequate accommodation, waste disposal and ablution facilities must be provided at construction camps to manage pressure placed on public services and infrastructure ▪ Regular inspection and maintenance must be carried out to ensure that potential environmental impacts are avoided

11.3 Cumulative Impacts

Cumulative effects are caused by the accumulation and interaction of multiple stresses affecting the parts and the functions of ecosystems. Of particular concern is the knowledge that ecological systems sometimes change abruptly and unexpectedly in response to apparently small incremental stresses. For purposes of this report, cumulative impacts have been defined as “the changes to the environment caused by an activity in combination with either past, present, and reasonably foreseeable human activities”.

The subsections below generally discuss cumulative impacts to the various environmental aspects, where applicable.

11.3.1 Soils, Land Use and Land Capability

The development of the Temo Mine will trigger a number of other developments in the area such as new, access roads and transmission lines – such as the ancillary infrastructure subject to this application. These developments will result in cumulative changes to the present land uses and perhaps increased pressure as a result of increased population around the mine site. This implies that the cumulative effects in the area will increase. One of the negative impacts associated with long term development is the disturbance of the soil environment, the naturally occurring layers of decomposed rock and accumulations of eroded materials as soil horizons. However, there are existing pipelines and rail line to town along the Steenbokpan road.

11.3.2 Fauna and Flora

The project is associated with the Waterberg Coalfields, which occurs in the layers of the Karoo Super Group between Lephalale and the Limpopo River border and extends westwards into Botswana. Several coal mines and power stations (with associated transmission lines) have been proposed or have already been built within the region, which may result in very large-scale cumulative impacts. The proposed ancillary infrastructure contributes to the overall development of the region which contributes to the fragmentation and changes to biodiversity of the region. However, this is relatively small scale in comparison to existing and proposed future surrounding developments.

11.3.3 Surface Water

The project area covers three quaternary catchments, though most activities will take place at A41E. There are several rivers upstream of the project area that feed into the Limpopo River from South Africa and Botswana side; all these rivers possibly contribute to the quality and quantity of the water in the Limpopo River. It is important to note that several surface waters use upstream of the project area exists, this include irrigation, mining, domestic uses and livestock watering. These existing activities/ land uses could potentially have a risk to the surface water resource quality at downstream reaches.

11.3.4 Groundwater

The pit and associated discard dumps of the Temo Mine are more likely to contaminate the groundwater than the proposed rail loop, diversion road and water pipeline.

11.3.5 Heritage

The construction of the proposed pipeline will add to the existing body of mining-related and transport infrastructure in the area and will contribute to the degradation of the sense of place

of the cultural landscape. Considering the greater development landscape, the effects from the various proposed developments will interact to produce a total greater effect on the cultural landscape and degradation thereof.

11.3.6 Socio-economic

There is rapid development of existing and new coal mines in the areas surrounding the study area because of its rich coal deposits. All impacts associated with project activities will contribute towards cumulative impacts for the coal sector in this area, including impacts from the Temo Mine. The SIA sets a target for contractors to secure at least 80% of their unskilled labour from local communities as far as possible. Temo Mine's SLP will set targets for procurement; its implementation during construction of the ancillary infrastructure could begin to contribute towards meeting these commitments.

With respect to contributing towards improving public infrastructure, Temo Mine will be maintaining the operations of the Lephalale WWTW so that the water delivered by the pipes will be of an acceptable quality. Although not assessed as part of this SIA a spin-off of this activity will be that all water that leaves the WWTW, including that discharged to the river, will be of an acceptable and safe quality.

12 Item 3(g)(vi): Methodology used in Determining and Ranking the Nature, Significance, Consequence, Extent, Duration and Probability of Potential Environmental Impacts and Risks

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = CONSEQUENCE X PROBABILITY X NATURE

Where:

Consequence = intensity + extent + duration

And

Probability = likelihood of an impact occurring

And

Nature = positive (+1) or negative (-1) impact

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in **Table 12-1**. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this EIA report. The significance of an impact is then determined and categorised into one of eight categories (The descriptions of the significance ratings are presented in Table 12-3).

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 12-1: Impact assessment parameter ratings

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or **highly** sensitive environments. Irreplaceable damage to **highly sensitive** cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or **moderate to highly** sensitive environments. Irreplaceable damage to cultural/social resources of **moderate to highly** sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to physical or biological resources or **highly** sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or **moderately** sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources of **low to moderately** sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	**Minor loss and/or effects** to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/Replacability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	**Minimal to no loss** and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 12-2: Probability/consequence matrix

Significance																																				
-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
-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
-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
-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
-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
-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
-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																																				

Table 12-3: Significance rating description

Score	Description	Rating
109 to 147	A very beneficial impact that 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	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. 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 natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact 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 natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact 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. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

12.1 Item 3(g)(vii): The Positive and Negative Impacts that the Proposed Activity (in terms of the initial site layout) and Alternatives will have on the Environment and the Community that may be affected

Section 8 above provides an explanation of the site layout, alternatives and aspects that were considered during the finalisation of the layout. The Impact Assessment detailed in Section 11 describes all identified potential impacts associated with the preferred site layout and planned project activities.

12.2 Item 3(g)(viii): The possible Mitigation Measures that could be applied and the level of risk

Mitigation measures for each identified impact have been proposed and are presented with the impact ratings in Section 11.1 above.

12.3 Item 3(g)(ix): Motivation where No Alternatives Sites were considered

The proposed project is related to ancillary infrastructure for the planned Temo Mine, therefore alternatives related to the general project site were limited. Routing alternatives were considered which considered environmental and social implications as far as possible. These have been detailed in Section 8 above.

12.4 Item 3(g)(x): Statement motivating the Alternative Development Location within the Overall Site

The ancillary infrastructure locations have been informed by the intended activities for the Temo Mine. The alignment of the road diversion of the D175 diverts the road away from the planned open pit area and will not have an impact on other surrounding roads. The rail loop is located outside of the viable coal reserve areas so as to not sterilise viable coal reserves. The rail loop is however still within the Temo Mine MRA which limits disturbance and reduces risks associated with public access. The preferred trajectory for the water pipeline (Option 2) has been deemed the most suitable route as it results in the least disturbance to exist public structures (residential areas in Lephalale and the D1675 road reserve) which is assumed to reduce to likelihood of nuisance impacts associated with the construction and operation of the pipeline.

13 Item 3(h): 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

The identification, assessment and ranking of potential impacts associated with the proposed project were informed by the environmental and technical specialist investigations undertaken.

The determined site sensitivities were also considered in the selection of the preferred project site. The initial site layout that was presented during the Scoping Phase was not changed during the EIA phase.

14 Item 3(i): Assessment of each identified potentially significant impact and risk

Table 14-1 presents an overview of the potential impacts assessed per project activity and per phase as well as their proposed mitigation / enhancement measures.

Table 14-1: Assessment of each Identified Impact as per each Activity

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
1.Site clearing and vegetation removal; 2. Topsoil and subsoil removal and stockpiling; 3. Storage of construction materials, hazardous material, waste and water storage; and 4.Establishment of infrastructure	Soil erosion and soil compaction.	Soil, Land Use and Land Capability	Construction	Moderate (negative)	▪ Minimise through site clearing procedures; ▪ Control through soil management plan; ▪ Minimise through storm-water management plan; and ▪ Minimise through dust Monitoring Programme.	Minor (negative)
	Loss of topsoil resources as a result of construction of pipelines may occur as land is cleared along the pipeline routes.	Soil, Land Use and Land Capability	Construction	Moderate (negative)		Minor (negative)
	Direct loss of 55 ha of natural habitat associated with the rail loop and road diversion and 313 ha associated with the water pipeline	Flora and Fauna	Construction	Moderate (negative)	▪ Minimise through Biodiversity Action Plan; ▪ Control through Alien Management Plan; and ▪ Control through Rehabilitation Plan	Moderate (negative)
	Loss and/or compromised ecological services provided by areas of high sensitivity including the pan vegetation and woodland areas along the water pipeline servitude and rail loop.	Flora and Fauna	Construction	Moderate (negative)	▪ Control through relocation of Red Data flora species; ▪ Minimise through Biodiversity Action Plan; ▪ Control through Alien Management Plan; and ▪ Control through Rehabilitation Plan	Moderate (negative)
	Potential loss of faunal species as a result of destruction of supporting habitat and potential road-kills as a result of increased vehicular movement.	Flora and Fauna	Construction	Moderate (negative)	▪ Minimise through Biodiversity Action Plan; ▪ Control through implementation of speed and noise controls; and ▪ Control through Rehabilitation Plan	Minor (negative)
	Soil erosion and subsequent sedimentation of wetland and river systems leading to reduced ecological integrity of freshwater ecosystems.	Wetlands and Aquatic Ecology	Construction	Minor (negative)	▪ Minimise through soil management programme; and ▪ Minimise through Storm Water Management Plan	Minor (negative)
	Direct loss of wetland habitat due to stockpiling and storage activities within pan habitats	Wetlands and Aquatic Ecology	Construction	Minor (negative)	▪ Control through location of infrastructure outside of wetland areas, ▪ Minimise through soil management programme; and ▪ Minimise through Storm Water Management Plan	Negligible (negative
	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality and adverse impacts on aquatic life and downstream water users.	Surface Water	Construction	Minor (negative)	▪ Minimise through Storm Water Management Plan; and ▪ Control through Dust Management Plan	Negligible (negative)
	Alteration of stream channel geometry at pipeline river crossing as a result of excavation activities on the streambed and banks	Surface Water	Construction	Minor (negative)	▪ Avoid through project designs; and ▪ Minimise through Storm Water Management Plan.	Negligible (negative)
	Lowering of groundwater table.	Groundwater	Construction	Negligible (negative)	▪ Avoid through project designs	Negligible (negative)
	Fugitive dust generation as a result of site clearing activities	Air Quality	Construction	Negligible (negative)	▪ Control through soil management plan; and ▪ Minimise through dust Monitoring Programme.	Negligible (negative)
	Noise disturbance from construction machinery and vehicles	Noise	Construction	Negligible (negative)	▪ Avoid through Vehicle and Machinery Maintenance Plan	Negligible (negative)
	Influx of construction contract workers and job seekers to the area	Socio-economic	Construction	Minor (negative)	▪ Minimise through recruit policies; ▪ Control through services provision for construction camps; and ▪ Control through code of conduct strategies	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	Temporary employment opportunity resulting in improvements to livelihoods of the workforce	Socio-economic	Construction	Minor (positive)	▪ Enhance through recruit policies	Minor (positive)
	Business opportunities for local goods and services providers due to an increase in demand for goods and services as a result of increased economic activities	Socio-economic	Construction	Minor (positive)	▪ Enhance through goods and services procurement strategies and policies	Minor (positive)
	Increase in demand of public services due to increased economic activity and influx of people to the local area for employment.	Socio-economic	Construction	Minor (negative)	▪ Control through services provision for construction camps	Negligible (negative)
	Increased risk to public health and safety due to increased vehicular movement, waste generation and pipeline crossings in the local area	Socio-economic	Construction	Minor (negative)	▪ Avoid through project designs; ▪ Minimise through grievance mechanism; and ▪ Avoid through infrastructure maintenance programme	Negligible (negative)
5. Operation of infrastructure; and 6.Maintenance of infrastructure	Soil erosion and soil compaction	Soils, Land Use and Land Capability	Operational	Moderate (negative)	▪ Minimise through soil management plan; ▪ Minimise through storm-water management plan; and ▪ Minimise through dust Monitoring Programme.	Minor (negative)
	Losses of topsoil resources through erosion and compaction.	Soils, Land Use and Land Capability	Operational	Minor (negative)	▪ Minimise through soil management plan; and ▪ Minimise through dust Monitoring Programme.	Negligible (negative)
	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Flora and Fauna	Operational	Moderate (negative)	▪ Minimise through Biodiversity Action Plan; ▪ Control through Alien Management Plan; and ▪ Control through Rehabilitation Plan	Minor (negative)
	Operational activities resulting in erosion and consequently sedimentation to wetlands and riparian zones. This leads to a deterioration of PES and EIS.	Wetlands and Aquatic Ecology	Operational	Minor (negative)	▪ Minimise through soil management programme; and ▪ Minimise through Storm Water Management Plan	Negligible (negative)
	Reduced ecological integrity and functioning of wetlands as a result of loss of catchment yield and surface water recharge due to stormwater management systems. The establishment of infrastructure and vehicular movement will result in additional hardened surfaces resulting in sheet run-off which could lead to erosion to freshwater ecosystems.	Wetlands and Aquatic Ecology	Operational	Minor (negative)	▪ Minimise through soil management programme; and ▪ Minimise through Storm Water Management Plan	Negligible (negative)
	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality and adverse impacts on aquatic life and downstream water users.	Surface Water	Operational	Minor (negative)	▪ Minimise through Storm Water Management Plan; and ▪ Control through Dust Management Plan	Negligible (negative)
	Nuisance and health effects from exposure to fine particulate matter as a result of operational maintenance activities and/or wind erosion of open areas	Air Quality	Operational	Negligible (negative)	▪ Control through soil management plan; and ▪ Minimise through dust Monitoring Programme.	Negligible (negative)
	Noise disturbance from train air horn and wheel squeal and maintenance vehicles	Noise	Operational	Negligible (negative)	▪ Avoid through Vehicle and Machinery Maintenance Plan	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
7. Demolition and removal of all infrastructure; 8. Storage of hazardous material, waste and water storage; and 9. Rehabilitation of disturbed footprints	Soil erosion and soil compaction if rehabilitation is not done correctly.	Soils, Land Use and Land Capability	Decommissioning and rehabilitation	Moderate (negative)	▪ Minimise through storm-water management plan and rehabilitation plan; and ▪ Minimise through Dust Monitoring Programme.	Minor (negative)
	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Flora and Fauna	Decommissioning and rehabilitation	Moderate (negative)	▪ Minimise through Biodiversity Action Plan; ▪ Control through Alien Management Plan; and ▪ Control through Rehabilitation Plan	Minor (negative)
	Reduced ecological integrity of freshwater ecosystems due to potential soil compaction, erosion and consequent sedimentation of freshwater resources as well as potential encroachment of alien invasive plant species as a result of habitat fragmentations.	Wetlands and Aquatic Ecology	Decommissioning and rehabilitation	Minor (negative)	▪ Minimise through soil management programme; ▪ Control through Alien Management Plan; and ▪ Minimise through Storm Water Management Plan	Negligible (negative)
	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality.	Surface Water	Decommissioning and rehabilitation	Minor (negative)	▪ Minimise through Storm Water Management Plan; and ▪ Control through Dust Management Plan	Negligible (negative)
	Nuisance and health effects from exposure to fine particulate matter as a result of decommissioning activities and/or wind erosion of open areas	Air Quality	Decommissioning and rehabilitation	Negligible (negative)	▪ Control through soil management plan; and ▪ Minimise through dust Monitoring Programme.	Negligible (negative)
	Noise will emanate from the machinery, pneumatic tools and vehicles operating during the decommissioning activities.	Noise	Decommissioning and rehabilitation	Negligible (negative)	▪ Avoid through Vehicle and Machinery Maintenance Plan	Negligible (negative)

15 Item 3(j): Summary of specialist reports

Numerous specialist impact assessments were undertaken for the proposed project. Separate specialist reports were compiled and have been attached as appendices to this report (refer to Table 10-1 above). The specialist input included the baseline environment, potential impacts and the recommended mitigation measures. Table 15-1 provides a summary of the key recommendations of the studies.

Table 15-1: Specialist Studies undertaken for the proposed project

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Soils, Land Use and Land Capability Impact Assessment	▪ Runoff must be controlled and managed by use of proper storm water management facilities; ▪ Fuel and oil spills are common risks. If they occur, hydrocarbon spills should be remediated using commercially available emergency clean up kits; and ▪ Clearing and removal of soils should be done during dry months (May to September) if possible to reduce erosion and compaction on soils.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Soil Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9.
Flora and Fauna Impact Assessment	The project area provides suitable habitat for many species including Red Data and protected species, which are dependent on the present habitat for refuge and resources. Therefore the impact of the proposed construction and operation of a rail loop, road diversion and water pipeline and associated infrastructure will have an immediate and lasting effect on the ecology, on a site based scale. It is recommended that a Biodiversity Action Plan be compiled and implemented to address biodiversity related impacts.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Ecologist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9.
Surface Water Impact Assessment	▪ If possible, construction activities must be prioritized during the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearance. ▪ It is also recommended to re-vegetate the backfilled and reshaped underground pipeline route after installation to minimise erosion and sedimentation of nearby watercourses. ▪ 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.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Hydrologist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9.
Groundwater	The water table in the project area is approximately 20 m below the ground surface. All the proposed activities (rail loop, road, and pipeline) are expected to take place above this and no impact on the groundwater is envisaged as a result. None of the activities will involve excavation to below the water table, hence there is no risk to the groundwater quantity and quality. However, the following are recommended to be implemented: ▪ Pipelines should be monitored for leakage. Cracked pipelines should be sealed; ▪ Diesel or other chemicals should not be spilled, and machinery should be properly maintained; ▪ Fuel and oil reservoirs must be in a bunded area; ▪ If a considerable amount of fluid is accidentally spilled, the contaminated soil should be scraped off and disposed of at an acceptable dumping facility. The excavation should be backfilled with soil of good quality; and	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Hydrogeologist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	▪ Monitoring boreholes located within the environs of the project area have to be monitored for both water level and quality.		
Wetlands and Aquatic Ecology Impact Assessment	Monitoring by a qualified wetland specialist should take place monthly during construction to ensure mitigation measures are adhered to as well as during the decommissioning, rehabilitation and closure phase. The WET-health tool is to be used to re-evaluate PES on an annual basis by a suitably qualified wetland specialist during the operational phase. During the decommissioning phase wetland monitoring should resume on a monthly basis and for a minimum of three years post-closure.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Wetland Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9..
Noise Impact Assessment	The predictive generated to quantify the expected noise levels associated with the project show that there will be a negligible impact and noise disturbance will not impact any nearby receptors. Due to the negligible nature of the potential noise impact, it is not recommended that a noise monitoring programme be implemented from the onset. In the event of a complaint being received however, it is recommended to monitor the noise levels.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Noise Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9.
Air Quality Impact Assessment	Based on the results of the AQIA, the following recommendations should be applied: ▪ Administer mitigation measures in line with current best engineering practice; ▪ Establish codes of practice for good housekeeping with respect to dust management and mitigation for open areas; ▪ Monitor the air quality of the project area to ensure compliance with regulatory standards onsite, and at offsite locations for the life of the project; and ▪ Establish a reporting structure to appraise performance and compliance.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Air Quality Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9.
Socio-economic Impact Assessment	▪ Contracts with construction stipulate that at least 80% of unskilled labour is sourced from surrounding communities, including the youth, as far as possible; ▪ A code of conduct is developed and communicated to construction workers to abide by so that their behaviour and engagement with local communities do not compromise either party; ▪ Access to the Project sites must be strictly controlled to prohibit the public from entering them. ▪ The Traffic Management Plan must include measures to reduce safety risks for vehicles and pedestrians.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Social Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 6 and 7 and the monitoring provided in Section 9.
Rehabilitation, Decommissioning and Financial Provision Assessment	▪ A suitable AIP control programme must be put in place for both the decommissioning and closure phases so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones; and ▪ Monitor all systems for erosion and incision.	X - All recommendations have been considered and included in the EIA report.	All mitigation and management measures included in this report were recommended by the Rehabilitation and Closure Specialist.

16 Item 3(k): Environmental Impact Statement

16.1 Item 3(k)(i): Summary if the Key Findings of the Environmental Impact Assessment

The most significant negative impacts (Moderate Negative significance) identified during the construction phase are associated with site clearing which may result in soil erosion and topsoil loss as well as the loss of habitat within the project footprint. Soil erosion may also subsequently result in sedimentation of nearby water resources, however, these impacts has been rated Minor Negative significance due to the extent of the activities and proximity of water resources to the project footprints. The establishment of the project will result in a direct loss of 55 ha of natural habitat associated with the rail loop and road diversion, and 313 ha associated with the water pipeline between the Lephalale WWTW and Temo Mine. The project area provides suitable habitat for many species including Red Data and protected species, which are dependent on the present habitat for refuge and resources. Therefore the impact of the proposed construction and operation of a rail loop, road diversion and water pipeline and associated infrastructure will have an immediate and lasting effect on the biodiversity and ecological services, on a site based scale.

In terms of socio-economic impacts, the project is expected to result in limited influx of contract workers and job seekers to the project area. This is not expected to exceed 150 people due to the limited extent of the ancillary infrastructure project, therefore this impact is rated of Minor Negative significance. However, it is noted that given the background socio-economic baseline which is characterised by low employment and insufficient public services, the influx of people into the local area increases social vulnerabilities and susceptibility to social ills. The project will result in temporary employment opportunities as well as opportunities for local businesses to supply goods and services particularly during the construction phase. This will positively contribute to the improvement of livelihoods, increase economic activities within the local area and can present opportunity for skills development. It is therefore imperative that employment opportunities and the procurement of goods and services by the project prioritise local people and businesses.

For all potential impacts, mitigation and management measures have been proposed which, if correctly implemented, are likely to reduce the significance of all impacts to minor or negligible significance.

A Rehabilitation and Closure Plan (refer to Appendix 13) has been developed to ensure that following the completion of the proposed project activities, the project area can be adequately rehabilitated and reduce the risks of long-term impacts. Through rehabilitation actions improvements to the project area will be realised and the land will be rehabilitated from an impacted state, however, these areas would have been transformed permanently from the natural state during the construction phase.

16.2 Item 3(k)(ii): Final Site Map

The final proposed infrastructure layout plan is provided in Plan 4, Appendix 1.

16.3 Item 3(k)(iii): Summary of the Positive and Negative Implications and Risks of the Proposed Activity and Identified Alternatives

The key potential positive implications associated with the proposed project are temporary employment opportunities and opportunities for local good and services suppliers which will result in improved livelihoods. At a broader scale, the establishment of the proposed ancillary infrastructure will positively support the planned Temo Mine operation. Through this ancillary infrastructure Temo Mine is ensuring that the project is optimised as far as possible. The diversion of the D175 road will ensure that the targeted coal reserve is accessible to its full extent while also reducing public health and safety risks associated with having the road in proximity to the mining area. Through the establishment of the rail loop and associated rail link, Temo Coal intends to leverage off existing and planned rail infrastructure to effectively and efficiently transport coal to the intended markets. Lastly, the proposed water pipeline between the Lephalale WWTW and Temo Mine will secure a water source for operational activities at the mine which is sustainable in the water scarce region.

The key negative implications associated with establishing the ancillary infrastructure include the loss of topsoil resources as a result of soil erosion and the loss of a total of 363 ha of natural habitat. This, in some parts, includes habitat that supports red data species and SSC.

The potential risks identified as a result of the proposed project include hydrocarbon spills from vehicles, heavy machinery, hazardous materials or waste storage facilities, and leaks from the water pipeline. It is noted that the water from the Lephalale WWTW would have been treated prior to being pumped to the Temo Mine, therefore any leaks will not be of significant environmental impact.

Mitigation and management measures have been proposed for each identified impact. Should these be correctly implemented the significance of all impacts can be reduced to negligible or minor. In terms of the positive implications, enhancement measures have been proposed to ensure that these impacts are realised.

17 Item 3(l): Proposed Impact Management Objectives and the Impact Management Outcomes for Inclusion in the EMPR

The EMP seeks to achieve a required end state and describes how activities that have, or could have, an adverse impact on the environment and surrounding communities will be mitigated, controlled and monitored. The key objectives of the EMP therefore are:

- To minimise the extent of an impact during the life of the project;
- To ensure appropriate restoration of areas affected by the project; and
- To prevent long term environmental degradation.

18 Item 3(m): Final Proposed Alternatives

The alternatives considered and motivations for the preferred alternatives are detailed in Section 8 above.

Ultimately, this project is associated with ancillary infrastructure for Temo Mine which influenced the project location and activity.

19 Item 3(n): Aspects for Inclusion as Conditions of Authorisation

The EAP recommends the following conditions for the DMR to consider for inclusion into the Environmental Authorisation:

- The mitigation / enhancement measures contained in the EMPr must be adhered to for the overall positive implication of the project to be realised;
- An ECO must be appointed for the construction phase;
- A WUL must be obtained prior to operations for pipeline crossings, including an approved IWWMP;
- A recruitment policy must be developed that aims at ensuring that workforce, contractors and suppliers of other goods and services from the local area are prioritised to maximise socio-economic benefits to the local area; and
- Should Temo Coal choose to source water from the MCWAP this EIA and EMPr must be amended accordingly.

The specialist studies and impact assessment have been based on the proposed preferred site layout. Should there be any changes to the project description or site layout plan as provided, the adequacy and accuracy of the work may be affected and additional studies may be required to assess the impacts of these proposed changes.

20 Item 3(o): Description of any Assumptions, Uncertainties and Gaps in Knowledge

The following general assumptions are applicable to this EIA study:

- The areas surveyed for various studies conducted were based on the preliminary infrastructure layout presented by Temo Coal;
- The findings presented are based on professional experience, supported by a literature review, and extrapolated from the data collected at the time of field surveys conducted. Field surveys for all studies were limited to one season surveys; and
- Representative sampling methods were employed for the studies conducted and therefore the possibility of gaps in the data gathered exists.

Table 20-1 below presents the assumptions, uncertainties, limitations and knowledge gaps relevant to the various specialist studies undertaken.

Table 20-1: Specialist Studies Assumptions, Uncertainties and Gaps

Specialist Study	Assumptions, uncertainties and gaps
Wetlands	▪ The largely arid nature of the study area and the lack of notable riverine watercourses within 3 km of the proposed infrastructure (i.e. NFEPA Rivers layer) supports the notion that a desktop-based aquatic ecology study is sufficient for the environmental authorisation process. Nonetheless, a full study was undertaken by Digby Wells Environmental along the Limpopo River in February 2016, thus all relevant and applicable findings will be included as a supplement to this desktop component.
Surface Water	▪ The surface water assessment was undertaken on a desktop level and no field work was undertaken. Based on the scope and available information the specialist deemed a desktop assessment to be efficient; ▪ No water quality data was available for the non-perennial stream that the pipeline crosses; hence water quality assessment was excluded as part of the study.
Noise	▪ The construction of the rail loop and road diversion will be carried out during daylight hours (06:00-18:00) as far as practically possible, despite the aforementioned, night-time scenarios was measured; ▪ No dispersion modelling was conducted for the construction of the rail loop and road diversion as the construction will be conducted in phases and short-term; and ▪ Impacts are not anticipated to exceed background soundscape. It was assumed that the construction of the rail loop and road diversion will have a negligible significance on the overall cumulative impact of the project.
Air Quality	▪ The construction of the road diversion, rail loop and pipelines will occur in phases with minimal impacts anticipated, hence no dispersion model required. Aspect was covered extensively in previous study; and

21 Item 3(p): Reasoned Opinion as to whether the Proposed Activity should or should not be authorised

21.1 Item 3(p)(i): Reasons why the activity should be authorised or not

Various specialist studies were undertaken during the EIA Phase of the project with the objective of identifying and weighing anticipated impacts and risks associated with the proposed project activities.

The findings of the impact assessment have shown that the project will have some moderately significant negative impacts on the receiving environment, namely; the loss of topsoil on cleared land (mainly along the proposed pipeline routes); soil erosion and the permanent loss of natural habitat and alteration of ecological services thereof. The project will have positive implications namely related to socioeconomic aspects including job opportunities and businesses opportunities for local suppliers of goods and services. Furthermore, at a broader scale the project is aimed at optimising the planned Temo Mine operation and therefore proposed ancillary infrastructure will positively contribute to the operation.

Based on the assessment of the potential negative and positive impacts associated with the project, it is concluded that the proposed project should be authorised. No long-term negative impacts are expected to arise from the project-specific activities should the proposed

mitigation measures be correctly implemented. Furthermore, direct environmental and induced social impacts that are positive can be realised.

21.2 Item 3(p)(ii): Conditions that must be included in the authorisation

21.2.1 Specific conditions to be included into the compilation and approval of EMPR

The following specific conditions are proposed:

- All mitigation measures proposed in this report and attached specialist reports should be implemented;
- The mitigation / enhancement measures contained in the EMPr must be adhered to for the overall positive implication of the project to be realised;
- An ECO must be appointed for the construction phase;
- A WUL must be obtained prior to operations for pipeline crossings, including an approved IWWMP;
- A recruitment policy must be developed that aims at ensuring that workforce, contractors and suppliers of other goods and services from the local area are prioritised to maximise socio-economic benefits to the local area;
- The closure cost assessment should be updated and submitted as per the legislative requirements; and
- Should Temo Coal choose to source water from the MCWAP) this EIA and EMPr must be amended accordingly.

21.2.2 Rehabilitation Requirements

A Rehabilitation and Closure Plan (RCP) has been compiled for the proposed project and is appended to this report as Appendix 13. The intent of the RCP is to provide a vision, objectives, targets and criteria for final rehabilitation. Closure and rehabilitation is a continuous series of activities that begin at the commencement of the project and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem.

Table 21-1 provides a summary of rehabilitation and closure actions applicable to the proposed project

Table 21-1: Summary of Rehabilitation and Closure Actions

Target Area	Main Actions
Diversion of road D175	■ To remain after construction.
Proposed Rail Loop	■ Surfaces should be ripped to alleviate compaction; ■ Monitor and maintain vegetation establishment; and

Target Area	Main Actions
	■ Remove alien invasive vegetation.
Proposed Bulk Water Pipeline	■ Option to remove pipeline: ▪ General surface rehabilitation must involve the shaping of the surface topography to match the surrounding landscape, followed by ripping, adding topsoil and re-vegetating; ▪ During the process of shaping the landscape, drainage lines must be properly reinstated into the topography; and ▪ Any heaps of excess material also need to be removed, this all so that effective re-vegetation can take place.
	■ Option for pipeline to remain after construction: ▪ To remain after construction.

22 Item 3(q): Period for which the Environmental Authorisation is required

The LOM for the Temo Mine is 30 years (subject to extension), therefore authorisation of the ancillary infrastructure is required for 30 years in line with the Temo Mine which may be extended based on an extension of the Temo Mine Licence.

23 Item 3(r): Undertaking

Please refer to Part B, Section 12 for the complete undertaking applicable to both the EIA and EMP sections of this report.

24 Item 3(s): Financial Provision

The estimated closure cost required for the rehabilitation and closure of the project is **R 8,081,561.00 (Excl. VAT)**. A contingency of 10% on all infrastructure costs has been allowed for while a 12% allowance has been included for project management fees. These fees account for the costs required to manage the closure and rehabilitation phase as well as provide personnel to monitor and maintain the rehabilitated areas after closure.

A detailed closure cost for proposed ancillary infrastructure is provided in Table 24-1 below.

Table 24-1: Detailed Financial Provision Estimate

	Digby Wells Environmental	
	Temo Coal Mining (Pty) Ltd, Temo Coal - LP30/5/1/2/2/199MR (Ancillary Infrastructure), NAM5339 Revision: 0	
Area and Description	**End of life 2043**	
Infrastructure and Rehabilitation	**Scenario 1: Pipeline and Railway Removed Post-Closure**	**Scenario 2: Pipeline Remains Post Closure, Railway Removed**
Area 1: Rail Loop Extension	R5,856,858	R5,856,858
Area 2: Pipeline	R6,155,463	R74,554
Sub-total	**R12,012,321**	**R5,931,413**
Monitoring and Maintenance		
Monitoring Costs (Vegetation)	R24,811	R23,676
Maintenance Costs (Vegetation)	R898,554	R821,562
Sub-total	**R923,365**	**R845,238**
Project Management (12%)	R1,441,479	R711,770
Contingency (10%)	R1,201,232	R593,141
GRAND TOTAL (Excl. VAT)	**R15,578,397**	**R8,081,561**

24.1 Item 3(s)(i): Explain how the aforesaid amount was derived

The Financial Provision has been calculated in accordance with the Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated on 20 November 2015 (GN R1147) (2015).

The closure cost assessment model was compiled using Microsoft Excel, and comprises of the following:

- An input sheet, containing measurements of the infrastructure;
- A standard rate sheet; and
- A summary sheet, which summarizes the costs for closure.

This model calculates the cost of demolishing, removing and rehabilitating each component of the mining area infrastructure. For ease of reference, the estimates are provided for the components listed below, detailing the infrastructure contained within them:

- Rail Loop;
- Road Deviation; and
- Pipeline

The rates used were from the Digby Wells rates data base, these rates were updated by quotes from demolition and civil contractors and professionals wherever possible. The rate formulations of Digby Wells take into consideration the total labour costs, plant costs, fuel costs and construction costs thus providing a more accurate, defendable rate.

24.2 Item 3(s)(ii): Confirm that this amount can be provided for from operating expenditure

Temo Coal will provide for closure as legally required. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

25 Item 3(t): Deviations from the Approved Scoping Report and Plan of Study

25.1 Item 3(t)(i): Deviations from the methodology used in determining the significance of potential environmental impacts and risks

There were no deviations from the plan of study as stipulated in the Scoping Report.

25.2 Item 3(t)(ii): Motivation for the deviation

There were no deviations from the plan of study as stipulated in the Scoping Report.

26 Item 3(u): Other Information required by the Competent Authority

Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of NEMA the EIA report must include the:-

26.1 Item 3(u)(i)(1): Impact on the socio-economic conditions of any directly affected person

The SIA undertaken for the project is appended as Appendix 12. The project is to create job opportunities and potentially business opportunity for local suppliers of relevant goods and services. People within the vicinity of the project may experience some nuisance impacts (visual, noise and dust) however based on the magnitude of the proposed project, these impacts would be negligible.

26.2 Item 3(u)(i)(2): Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

No heritage resources were identified within the development footprint and therefore no direct impact to heritage resources is envisaged.

27 Item 3(v): Other matters required in terms of Sections 24(4)(a) and (b) of the Act

This section is not applicable to the proposed project.

Part B: Environmental Management Programme Report

1 Item 1(a): Details of the EAP

Digby Wells has been appointed by Temo Coal to facilitate and complete the environmental-legal applications for Authorisations required to construct the road diversion, rail loop and water transfer pipeline. The details of the EAP are included in the table below.

Table 1-1: Contact details of the EAP

Name of Practitioner:	Digby Wells and Associates (South Africa) (Pty) Ltd T/A Digby Wells Environmental Sanusha Govender
Telephone:	011 789 9495
Fax:	011 069 6801
Email:	sanusha.govender@digbywells.com

2 Item 1(b): Description of the aspects of the activity

Refer to Part A: Section 10 for the list of environmental and social aspects associated with the proposed project which have been assessed.

3 Item 1(c): Composite Map

The Composite Map is attached as Plan 27, Appendix 1.

4 Item 1(d): Description of Impact management objectives including management statements

4.1 Item 1(d)(i): Determination of closure objectives

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental outcome, but it will also reduce the financial burden of closure and rehabilitation. The following points outline the main objectives for rehabilitation and closure of the proposed ancillary infrastructure:

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Utilise approved sites for the safe disposal of all waste either onsite or off site;
- Follow a process of closure that is progressive and integrated into the short and long term plans, and that will assess the closure impacts proactively at regular intervals throughout project life;
- Rehabilitation should strive to rehabilitate the soil and land capability to emulate pre-disturbance land capability;

- Minimise negative impacts and maximise positive benefits on the local community;
- Maintain and monitor all rehabilitated areas following re-vegetation and, if this monitoring shows that the objectives have been met, make an application for closure;
- Prevent soil and surface/groundwater contamination by managing all water on site to acceptable and agreed standards;
- Comply with local, district and national regulatory requirements;
- Promote active partnerships with local communities, where possible;
- Monitoring of key environmental variables (i.e. soils, erosion, vegetation, groundwater, surface water and air quality) to demonstrate stability of rehabilitated areas, this will be done for two years after closure or up until such a time all areas create a sustainable cover and ecosystem;
- Maintain or restore biodiversity at levels that are sustainable in the long term; and
- Follow a comprehensive consultation and communication process with all stakeholders.

4.2 Item 1(d)(ii): The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

An Environmental Response Plans/Procedures must be developed for handling unintended environmental damage or pollution. These plans/procedures must be aimed at rapidly and effectively managing emergency situations that may arise at the mine.

Personnel associated with the project must be trained on these plans/procedures and copies must be made accessible. Figure 4-1 provides a general overview of the Emergency Response Procedure.

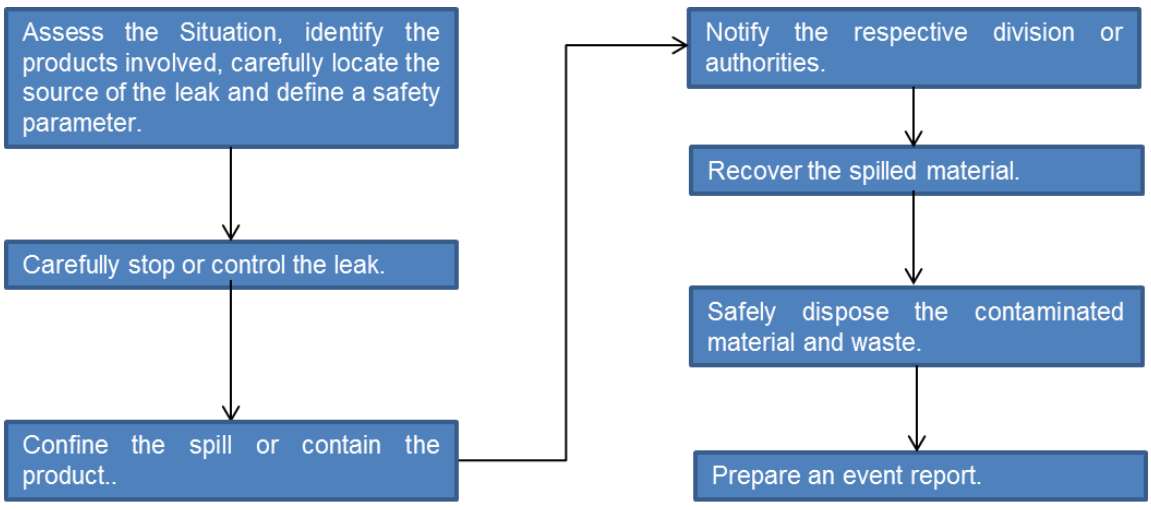


Figure 4-1: Emergency response procedure overview

4.3 Item 1(d)(iii): Potential risk of Acid Mine Drainage

The potential risk for Acid Mine Drainage is not applicable to the proposed project.

4.4 Item 1(d)(iv): Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

The potential risk for Acid Mine Drainage is not applicable to the proposed project.

4.5 Item i(d)(v): Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

The potential risk for Acid Mine Drainage is not applicable to the proposed project.

4.6 Item 1(d)(vi): Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

The potential risk for Acid Mine Drainage is not applicable to the proposed project.

4.7 Item 1(d)(vii): Volumes and rate of water use required for the mining, trenching or bulk sampling operation

Water for construction activities will be sourced from the Lephalale WWTW. The volumes required will be determined as part of the IWULA.

4.8 Item 1(d)(viii): Has a water use licence has been applied for

The environmental-legal process for the proposed project includes an application for IWULA from DWS as per the requirements of the NWA.

5 Item 1(d)(ix): Impacts to be mitigated in their respective phases

The proposed mitigation measures and its compliance with the relevant standards are presented in **Table 5-1**.

Table 5-1: Impacts to be mitigated

Activity	Aspect Affected	Potential Impact	Phase	Size and scale of disturbance	Mitigation Type	Compliance with standards	Time period for implementation
1.Site clearing and vegetation removal; 2. Topsoil and subsoil removal and stockpiling; 3. Storage of construction materials, hazardous material, waste and water storage; and 4.Establishment of infrastructure	Soil, Land Use and Land Capability	Soil erosion and soil compaction	Construction	Infrastructure footprint (101.6 ha)	▪ Only clear vegetation when and where necessary; ▪ Only remove topsoil when and where necessary ; ▪ Topsoil removed must be stockpiled and preserved for rehabilitation purposes ▪ Only the designated access routes are to be used; ▪ If erosion occurs, corrective actions must be taken to minimise any further erosion from taking place; and ▪ Ensure proper storm water management designs are in place. ▪ Effective monitoring and management of topsoil areas for compaction, erosion and compaction.	Minerals Council South Africa Guidelines	Design and Construction Phase
		Loss of topsoil resources					
	Flora and Fauna	Direct loss of 55 ha of natural habitat associated with the rail loop and road diversion and 313 ha associated with the water pipeline and consequent loss / compromised ecological services from these habitats	Construction	Infrastructure footprint (101.6 ha)	▪ Limit degradation and destruction of natural environment to designated project areas; ▪ Re-vegetate open areas to limit erosion, which will also aid in water infiltration and flood attenuation; ▪ Avoid sensitive landscapes such as riparian areas, and wetland areas that were encountered on site as far as possible. A 100 m buffer must be employed from these habitats; ▪ Applications for permits for removal of certain plants, where required by provincial authorities; ▪ If plants of SSC are to be removed, they should be either translocated to a similar habitat to the donor site or relocated to a nursery; and ▪ If alien vegetation is encountered, these species should be removed in the correct way and timeously.	NEMA; and NEMBA.	Construction Phase
		Potential loss of faunal species as a result of destruction of supporting habitat and potential road-kills as a result of increased vehicular movement			▪ Limit degradation and destruction of natural environment to designated project areas; ▪ Re-vegetate open areas to immediate following construction; ▪ Avoid sensitive landscapes such as riparian areas, and wetland areas that were encountered on site as far as possible. A 100 m buffer must be employed from these habitats; ▪ Ensure that construction sites are fenced off to limit the ingress of animal and plant species into the construction areas; ▪ No poaching or lighting of fires or feeding of fauna must be permitted; and ▪ Speed limits must be controlled through a Vehicle Management System.		
	Wetlands and Aquatic Ecology	Soil erosion and subsequent sedimentation of wetland and river systems leading to reduced ecological integrity of freshwater ecosystems	Construction	Local	▪ Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ The disturbed footprint must be limited to what is absolutely essential; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place; ▪ Active rehabilitation, re-sloping, and re-vegetation of disturbed areas immediately after construction must be undertaken; ▪ All soils compacted as a result of construction activities should be ripped/scarified (<300mm) and profiled in accordance with the guidelines set out in the Soils, Land Use and Land Capability Report (Appendix 4); ▪ Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified;	Section 19 of the NWA NEM:BA NEMA DWAF guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA et al., 2013).	Design and construction phase
		Potential direct loss of wetlands due to stockpiling and storage activities within pan habitats		Local			

Activity	Aspect Affected	Potential Impact	Phase	Size and scale of disturbance	Mitigation Type	Compliance with standards	Time period for implementation
					▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No unnecessary crossing of the freshwater features and their associated buffers should take place and the substrate conditions of the ephemeral drainage lines and downstream stream connectivity must be maintained; ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any freshwater areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the construction footprint.		
	Surface Water	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality and adverse impacts on aquatic life and downstream water users.	Construction	Local	▪ Clearing of vegetation and excavation should be limited as far as possible; ▪ For any required soil stockpiles, these should be compacted and the slopes should be kept at minimal/low to avoid erosion; ▪ Dust suppression measures must be undertaken on the cleared areas during construction if necessary to prevent wind erosion; ▪ Runoff from this area should be diverted away from the construction sites and minimal dirt water areas should be established; ▪ No water should be abstracted from streams for construction; and ▪ All hazardous material storage areas should be appropriately bunded and spill kits should be in place.	NWA	Design and construction phase
		Alteration of stream channel geometry at pipeline river crossing as a result of excavation activities on the streambed and banks	Construction	Local	▪ If possible, construction activities must be prioritized during the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearance; ▪ An appointed ECO must always be available to ensure implementation of the recommended mitigation/management measures during construction; and ▪ Water quality and quantity monitoring must be undertaken to detect any changes as a result of the stream crossing. Should any alterations be detected, corrective measures must be investigated and implemented accordingly	NWA	Design and construction phase
	Groundwater	Lowering of the water table (should excavation take place below the groundwater table)	Construction	Local	▪ Avoid constructing below the water table as far as possible; ▪ In the unlikely scenario where the foundation of structures is to be installed below the water level, dewatering of the aquifer to locally lower the water table can be considered. The abstracted water can be utilised for dust suppression, re-vegetation programmes or discharged to the pollution control dams and Temo Mine to be used as process water; and ▪ Install long term monitoring boreholes to detect any impacts to groundwater.	NWA	Design and construction phase
	Air Quality	Generation of fugitive dust	Construction	Local	▪ The area of disturbance must be limited to the infrastructure footprint only. No unnecessary clearing should take place; ▪ Where necessary, wetting agents, dust suppressants or binders must be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Construction should be conducted in phases to minimise extensive disturbance; and ▪ The drop heights when tipping cover materials must be minimised as far as practicable.	NEMAQA	Construction Phase
	Noise	Noise generation from the machinery, pneumatic tools and vehicles operating during the construction activities	Construction	Local	▪ Restrict construction activities to daylight hours (06:00 – 18:00) as far as practically possible; ▪ Construction related machines and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Install broadband reverse hooters to vehicles to minimise the hooter noise propagation; ▪ Switch off equipment when not in use; and	NEMA	Construction Phase

Activity	Aspect Affected	Potential Impact	Phase	Size and scale of disturbance	Mitigation Type	Compliance with standards	Time period for implementation
					▪ Leave as much natural vegetation where possible to aid in attenuating the noise.		
	Soils; Surface Water; Groundwater; and Freshwater ecosystems	Potential contamination of soils and water resources as a result of hazardous substance spillages	Construction	Infrastructure footprint (101.6 ha)	▪ All hazardous material storage areas should be appropriately bunded for the containment of spillage occurring in the bunded area and spill kits should be in place; ▪ Ensure correct storage systems are used for the storage of hazardous products when constructing. ▪ A dedicated waste disposal site is to be established; at the construction sites; ▪ All storage areas (fuels, paints, oils) used at the construction camp should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ All hydrocarbon spills should be immediately cleaned up and treated accordingly; ▪ Drip trays should be utilised when refuelling to contain any spillages; ▪ MSDS's should be kept on site for reference purposes regarding handling, storage and disposal of materials; ▪ Vehicles and heavy machinery should be serviced and checked on a regularly basis to prevent leakages and spills; and ▪ Appropriate sanitary facilities must be provided for the duration of the construction activities and all waste must be removed to an appropriate waste facility. ▪ Safe waste disposal certificates must be obtained and made available on request.	NEMA	Construction Phase
	Socio-economic	Influx of construction contract workers and job seekers to the area	Construction	Local	▪ House non-local construction workers some distance from the project area (i.e. at the Temo mine construction camp if available) to limit movement into surrounding communities; ▪ Depending on the duration of the work for the different components, contract worker schedules should allow for workers to visit their families at least for one week in every 2 months. ▪ Develop a code of conduct for construction workers and sensitize them to abide by it so that their behaviour and engagement with local communities does not compromise either party. ▪ Condoms could be provided free of charge in the construction camp; ▪ Where possible, construction employees should be locally sourced as they will live with their families; and ▪ Explore opportunities for collaboration with local police with regards safety and security issues relating to Project activities in general and any concerns about contractors	NEMA	Construction Phase
		Temporary employment opportunity resulting in improvements to livelihoods of the workforce	Construction	Local	▪ Where possible, opportunities for local employment should be considered. For instance, contracts for construction can stipulate that at least 80% of unskilled labour be sourced from surrounding communities and should include the youth as far as possible; ▪ Skilled, semi-skilled and unskilled construction staff must be retained, where possible, for the subsequent construction of the mine; and ▪ The Community Liaison Officer could be appointed at this stage, to monitor and address any community queries during the Project and as Temo prepares for construction of the mine.	NEMA	Construction Phase

Activity	Aspect Affected	Potential Impact	Phase	Size and scale of disturbance	Mitigation Type	Compliance with standards	Time period for implementation
		Business opportunities for local goods and services providers due to an increase in demand for goods and services as a result of increased economic activities	Construction	Local	▪ Temo Coal should join local organised business partnerships to discuss any opportunities for procurement for the project. Where goods are services can be sourced locally and Temo Coal is satisfied that it will support the mine to achieve its procurement objectives, including for the SLP of the mine, contracts can be extended for mining activities as relevant.	NEMA	Construction Phase
		Increase in demand of public services due to increased economic activity and influx of people to the local area for employment.	Construction	Local	▪ Adequate stormwater management must be implemented and include the construction camps where necessary; ▪ Join partnerships with organised business and government departments to secure access to services such as potable water, energy and healthcare as necessary; and ▪ Explore opportunities for collaboration with local police with regards safety and security issues relating to Project activities in general and for contractors in particular.	NEMA	Construction Phase
		Increased risk to public health and safety due to increased vehicular movement, waste generation and pipeline crossings in the local area	Construction	Local	▪ The area of disturbance must be limited to the infrastructure footprint only. No unnecessary clearing should take place; ▪ Construction should be conducted in phases to minimise extensive disturbance; and ▪ Restrict construction activities to daylight hours (06:00 – 18:00) as far as practically possible; ▪ Construction related machines and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ minimise the hooter noise propagation; ▪ Switch off equipment when not in use; and ▪ Maintenance and inspections of pipelines must be done to minimise compaction and erosion; and ▪ Check leakages on the pipelines regularly to avoid major contamination. If possible leak detection devices should be installed on the pipeline.	NEMA	Construction Phase
5. Operation of infrastructure; and 6.Maintenance of infrastructure	Soils, Land Use and Land Capability	Soil erosion and soil compaction from maintenance activities Loss of topsoil resources	Operational	Infrastructure footprint (101.6 ha)	▪ Ensure designed storm water management plans are in place; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; ▪ Stockpiled topsoil should be preserved for rehabilitation purposes.	Minerals Council South Africa Guidelines	Throughout Operational Phase
	Fauna and Flora	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Operational	Infrastructure footprint (101.6 ha)	▪ Ensure that a Biodiversity Action Plan is implemented; ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented. ▪ Ensure continuous environmental awareness training takes place.	NEMA; and NEMBA.	Operational Phase

Activity	Aspect Affected	Potential Impact	Phase	Size and scale of disturbance	Mitigation Type	Compliance with standards	Time period for implementation
	Wetlands and Aquatic Ecology	Soil erosion and subsequent sedimentation of wetland and river systems leading to reduced ecological integrity of freshwater ecosystems	Operational	Local	▪ Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ The disturbed footprint must be limited to what is absolutely essential; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place; ▪ Active rehabilitation, re-sloping, and re-vegetation of disturbed areas immediately after construction must be undertaken; ▪ A suitable AIP control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones; ▪ All soils compacted as a result of construction activities should be ripped/scarified (<300mm) and profiled in accordance with the guidelines set out in the Soils, Land Use and Land Capability Report (Appendix 4); ▪ Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No unnecessary crossing of the freshwater features and their associated buffers should take place and the substrate conditions of the ephemeral drainage lines and downstream stream connectivity must be maintained; ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any freshwater areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the construction footprint.	Section 19 of the NWA NEM:BA NEMA DWAF guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA et al., 2013).	Operational phase
		Reduced ecological integrity and functioning of wetlands as a result of loss of catchment yield and surface water recharge due to stormwater management systems. The establishment of infrastructure and vehicular movement will result in additional hardened surfaces resulting in sheet run-off which could lead to erosion to freshwater ecosystems.			▪ Limit the footprint area of the operational activities to what is absolutely essential in order to minimise impacts as a result of any potential vegetation clearing and compaction of soils (all areas but critically so in freshwater areas); ▪ Ensure that no incision and canalisation of the freshwater features present takes place as a result of the proposed operational activities; ▪ Dirty water areas must be kept to a minimum and clean water must be diverted away from infrastructure areas as far as possible; ▪ All erosion noted within the operational footprint as a result of any potential surface activities should be remedied immediately and included as part of the on-going rehabilitation plan; ▪ Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No unnecessary crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; and ▪ Monitor all systems for erosion and incision.		
	Surface Water	Siltation of surface water resources due to erosion on bare soil leading to deteriorated water quality of nearby surface water resources.	Operational	Local	▪ Clearing of vegetation and excavations should be confined within the project footprints, no unnecessary clearing should be permitted; ▪ If possible, construction activities must be prioritised during the dry months of the year (May-October) to limit mobilisation of sediments during site clearance; ▪ Re-vegetate the backfilled and reshaped underground pipeline route after installation to minimise erosion and sedimentation of nearby watercourses; ▪ An appointed ECO must always be available to ensure implementation of the recommended mitigation/management measures during construction; and	NWA	Operational phase

Activity	Aspect Affected	Potential Impact	Phase	Size and scale of disturbance	Mitigation Type	Compliance with standards	Time period for implementation
					▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose of the waste.		
		Alteration of stream channel geometry at pipeline river crossing			▪ If possible, construction activities must be prioritized during the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearance; ▪ An appointed ECO must always be available to ensure implementation of the recommended mitigation/management measures during construction; and ▪ Water quality and quantity monitoring must be undertaken to detect any changes as a result of the stream crossing. Should any alterations be detected, corrective measures must be investigated and implemented accordingly.	NWA	Operational phase
	Air Quality	Nuisance and health effects from exposure to fine particulate matter as a result of operational maintenance activities and/or wind erosion of open areas	Operational	Local	▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Implement routine maintenance of off-road vehicles and trains to optimise engine performance and minimise gaseous emissions; and ▪ Dust suppression must be implemented on access road if and when necessary.	NEMAQA	Operational Phase
	Noise	Noise disturbance from train air horn and wheel squeal and maintenance vehicles	Operational	Local	▪ Sound proofing must be implement if excessive noise is experience / compliments are received from receptors; ▪ Railroad noise barrier must be installed; and ▪ Train and vehicles must be serviced to their designed requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers.	NEMA	Operational Phase
7. Demolition and removal of all infrastructure; 8. Storage of hazardous material, waste and water storage; and 9. Rehabilitation of disturbed footprints	Soils, Land Use and Land Capability	Soil erosion and soil compaction if rehabilitation is not done correctly.	Decommissioning and rehabilitation	Infrastructure footprint (101.6 ha)	▪ Rehabilitate according to the rehabilitation plan; ▪ Return the land conditions capable of supporting prior land use or uses equal to/ better than prior land use; ▪ Plant native vegetation to prevent erosion and encourage a self-sustaining productive ecosystem; and ▪ Remove buildings to foundation level. Demolished rubble must be disposed of in accordance with Rehabilitation Plan.	Minerals Council South Africa Guidelines	Throughout Decommissioning and Rehabilitation Phase
	Fauna and Flora	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Decommissioning and rehabilitation	Infrastructure footprint (101.6 ha)	▪ Re-vegetation should be undertaken in accordance with the developed Closure and Rehabilitation Plan (Appendix 13); ▪ Ensure that a Biodiversity Action Plan is implemented; ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented; and ▪ Ensure continuous environmental awareness training takes place.	NEMBA	Throughout Decommissioning and Rehabilitation Phase
	Wetlands and Aquatic Ecology	Reduced ecological integrity of freshwater ecosystems due to potential soil compaction,	Decommissioning and rehabilitation	Local	▪ All erosion noted within the decommissioning and rehabilitation area footprint should be remedied immediately; ▪ All soils compacted as a result of decommissioning activities should be ripped/scarified (<300mm) and profiled;	NWA	Throughout Decommissioning and Rehabilitation Phase

Activity	Aspect Affected	Potential Impact	Phase	Size and scale of disturbance	Mitigation Type	Compliance with standards	Time period for implementation
		erosion and consequent sedimentation of freshwater resources as well as potential encroachment of alien invasive plant species as a result of habitat fragmentations.			▪ Permit only essential personnel within the 100m zones of regulation for all freshwater features identified; ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream; ▪ Wetlands and their associated zones of regulation are to be clearly demarcated and avoided wherever possible; ▪ Ongoing wetland rehabilitation is necessary both within and in the vicinity of the proposed decommissioning, rehabilitation and closure footprint.	DWAF guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA et al., 2013).	
	Surface Water	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality.	Decommissioning and rehabilitation	Local	▪ Ensure that the surface profiles of affected sites are rehabilitated to promote free surface runoff drainage and avoid ponding of water within the rehabilitated area; and ▪ Rehabilitated sites should be re-vegetated to reduce erosion and subsequent sedimentation and siltation of nearby watercourses.	NWA	Throughout Decommissioning and Rehabilitation Phase
	Air Quality	Nuisance and health effects from exposure to fine particulate matter as a result of decommissioning activities and/or wind erosion of open areas	Decommissioning and rehabilitation	Local	▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Implement routine maintenance of off-road vehicles and trains to optimise engine performance and minimise gaseous emissions; and ▪ Dust suppression must be implemented on access road if and when necessary.	NEMAQA	Throughout Decommissioning and Rehabilitation Phase
	Noise	Noise will emanate from the machinery, pneumatic tools and vehicles operating during the decommissioning activities.	Decommissioning and rehabilitation	Local	▪ Sound proofing must be implement if excessive noise is experience / compliments are received from receptors; ▪ Railroad noise barrier must be installed; and ▪ Train and vehicles must be serviced to their designed requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers.	NEMA	Throughout Decommissioning and Rehabilitation Phase
	Soils; Surface Water; Groundwater; and Freshwater ecosystems	Potential contamination of soils and water resources as a result of hazardous substance spillages	Decommissioning and Rehabilitation	Infrastructure footprint (101.6 ha)	▪ All hazardous material storage areas should be appropriately bunded and spill kits should be in place; ▪ Drip trays must be used when refuelling to contain any spillages; ▪ MSDS's should be kept on site for reference purposes regarding handling, storage and disposal of materials; ▪ Vehicles and heavy machinery should be serviced and checked on a regularly basis to prevent leakages and spills; ▪ Appropriate sanitary facilities must be provided for the duration of the operational activities; ▪ All waste must be temporarily stored separately; ▪ All waste removed from site must be recorded. All hazardous waste must have safe disposal certificates; ▪ Waste must be recycled as far as possible. If it cannot be recycled it must be disposed of at an appropriate waste facility.	NEMA	Throughout Decommissioning and Rehabilitation Phase

6 Item 1(e): Impact Management Outcomes

A description of the objectives and outcomes of the EMPr is outlined in Table 6-1.

Table 6-1: Objectives and outcomes of the EMP

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Standard to be achieve
1.Site clearing and vegetation removal; 2. Topsoil and subsoil removal and stockpiling; 3. Storage of construction materials, hazardous material, waste and water storage; and 4.Establishment of infrastructure	Soil, Land Use and Land Capability	Soil erosion and soil compaction	Construction	▪ Minimise through site clearing procedures; ▪ Control through soil management plan; ▪ Minimise through storm-water management plan; and ▪ Minimise through dust Monitoring Programme.	Soil Management in terms of the Minerals Council South Africa for Rehabilitation; and To prevent the loss of top soil as a resource
		Loss of topsoil resources			
	Flora and Fauna	Direct loss of 55 ha of natural habitat associated with the rail loop and road diversion and 313 ha associated with the water pipeline and consequent loss / compromised ecological services from these habitats	Construction	▪ Minimise through Biodiversity Action Plan; ▪ Control through Alien Management Plan; ▪ Control through Rehabilitation Plan; and ▪ Control through relocation of Red Data flora species;	To minimise the loss of habitat and loss of red data species; To prevent further encroachment of alien plant species and limit fragmentation
		Potential loss of faunal species as a result of destruction of supporting habitat and potential road-kills as a result of increased vehicular movement			
	Wetlands and Aquatic Ecology	Soil erosion and subsequent sedimentation of wetland and river systems leading to reduced ecological integrity of freshwater ecosystems	Construction	▪ Minimise through soil management programme; ▪ Minimise through Storm Water Management Plan; and ▪ Control through location of infrastructure outside of wetland areas	To prevent unnecessary impacts on wetlands and encroachment of alien plant species
		Potential direct loss of wetlands due to stockpiling and storage activities within pan habitats			
	Surface Water	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality and adverse impacts on aquatic life and downstream water users.	Construction	▪ Minimise through Storm Water Management Plan; and ▪ Control through Dust Management Plan	To prevent siltation of surface water resources
		Alteration of stream channel geometry at pipeline river crossing as a result of excavation activities on the streambed and banks	Construction	▪ Avoid through project designs; and ▪ Minimise through Storm Water Management Plan.	To prevent siltation of surface water resources
	Groundwater	Lowering of the water table (should excavation take place below the groundwater table)	Construction	▪ Avoid through project designs	To prevent excavation below the water table
	Air Quality	Generation of fugitive dust	Construction	▪ Control through soil management plan; and ▪ Minimise through dust Monitoring Programme.	To minimise fugitive dust
	Noise	Noise generation from the machinery, pneumatic tools and vehicles operating during the construction activities	Construction	▪ Avoid through Vehicle and Machinery Maintenance Plan	To minimise noise levels
	Soils; Surface Water; Groundwater; and Freshwater ecosystems	Potential contamination of soils and water resources as a result of hazardous substance spillages	Construction	▪ Minimise through Stormwater Management Plan; ▪ Avoid through Vehicle and Machinery Maintenance Plan; and ▪ Minimise through spill procedures	To avoid spillages of hazardous substance into the natural environment
	Socio-economic	Influx of construction contract workers and job seekers to the area	Construction	▪ Minimise through recruit policies; ▪ Control through services provision for construction camps; and ▪ Control through code of conduct strategies	To minimise social ills as a result of influx
		Temporary employment opportunity resulting in improvements to livelihoods of the workforce	Construction	▪ Enhance through recruit policies	To maximise benefits to local communities

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Standard to be achieve
		Business opportunities for local goods and services providers due to an increase in demand for goods and services as a result of increased economic activities	Construction	▪ Enhance through goods and services procurement strategies and policies	To maximise benefits to local communities
		Increase in demand of public services due to increased economic activity and influx of people to the local area for employment.	Construction	▪ Control through services provision for construction camps	To avoid further pressure on public services as a result of influx
		Increased risk to public health and safety due to increased vehicular movement, waste generation and pipeline crossings in the local area	Construction	▪ Avoid through project designs; ▪ Minimise through grievance mechanism; and ▪ Avoid through infrastructure maintenance programme	To avoid public health and safety risks
5. Operation of infrastructure; and 6.Maintenance of infrastructure	Soils, Land Use and Land Capability	Soil erosion and soil compaction from maintenance activities	Operational	▪ Minimise through soil management plan; ▪ Minimise through storm-water management plan; and ▪ Minimise through dust Monitoring Programme.	Soil Management in terms of the Minerals Council South Africa for Rehabilitation; and To prevent the loss of top soil as a resource
		Loss of topsoil resources			
	Fauna and Flora	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Operational	▪ Minimise through Biodiversity Action Plan; ▪ Control through Alien Management Plan; and ▪ Control through Rehabilitation Plan	To minimise the loss of habitat and Red Data species
	Wetlands and Aquatic Ecology	Soil erosion and subsequent sedimentation of wetland and river systems leading to reduced ecological integrity of freshwater ecosystems	Operational	▪ Minimise through soil management programme; and ▪ Minimise through Storm Water Management Plan	To prevent deterioration of wetlands loss of aquatic habitats
		Reduced ecological integrity and functioning of wetlands as a result of loss of catchment yield and surface water recharge due to stormwater management systems. The establishment of infrastructure and vehicular movement will result in additional hardened surfaces resulting in sheet run-off which could lead to erosion to freshwater ecosystems.		▪ Minimise through soil management programme; and ▪ Minimise through Storm Water Management Plan	
	Surface Water	Siltation of surface water resources due to erosion on bare soil leading to deteriorated water quality of nearby surface water resources.	Operational	▪ Minimise through Storm Water Management Plan; and ▪ Control through Dust Management Plan	To prevent siltation of surface water resources
		Alteration of stream channel geometry at pipeline river crossing			To prevent alterations of surface watercourses or loss of aquatic habitat
	Air Quality	Nuisance and health effects from exposure to fine particulate matter as a result of operational maintenance activities and/or wind erosion of open areas	Operational	▪ Control through soil management plan; and ▪ Minimise through dust Monitoring Programme.	To minimise fugitive dust
	Noise	Noise disturbance from train air horn and wheel squeal and maintenance vehicles	Operational	▪ Avoid through Vehicle and Machinery Maintenance Plan	To minimise noise levels
7. Demolition and removal of all infrastructure; 8. Storage of hazardous material, waste and water storage; and 9. Rehabilitation of disturbed footprints	Soils, Land Use and Land Capability	Soil erosion and soil compaction if rehabilitation is not done correctly.	Decommissioning and rehabilitation	▪ Minimise through storm-water management plan and rehabilitation plan; and ▪ Minimise through Dust Monitoring Programme.	Soil Management in terms of the Minerals Council South Africa for Rehabilitation; and To prevent the loss of top soil as a resource
	Fauna and Flora	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Decommissioning and rehabilitation	▪ Minimise through Biodiversity Action Plan; ▪ Control through Alien Management Plan; and ▪ Control through Rehabilitation Plan	To minimise the loss of habitat and Red Data species

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Standard to be achieve
	Wetlands and Aquatic Ecology	Reduced ecological integrity of freshwater ecosystems due to potential soil compaction, erosion and consequent sedimentation of freshwater resources as well as potential encroachment of alien invasive plant species as a result of habitat fragmentations.	Decommissioning and rehabilitation	▪ Minimise through soil management programme; ▪ Control through Alien Management Plan; and ▪ Minimise through Storm Water Management Plan	To prevent deterioration of wetlands loss of aquatic habitats
	Surface Water	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality.	Decommissioning and rehabilitation	▪ Minimise through Storm Water Management Plan; and ▪ Control through Dust Management Plan	To prevent siltation of surface water resources
	Air Quality	Nuisance and health effects from exposure to fine particulate matter as a result of decommissioning activities and/or wind erosion of open areas	Decommissioning and rehabilitation	▪ Control through soil management plan; and ▪ Minimise through dust Monitoring Programme.	To minimise fugitive dust
	Noise	Noise will emanate from the machinery, pneumatic tools and vehicles operating during the decommissioning activities.	Decommissioning and rehabilitation	▪ Avoid through Vehicle and Machinery Maintenance Plan	To minimise noise levels
	Soils; Surface Water; Groundwater; and Freshwater ecosystems	Potential contamination of soils and water resources as a result of hazardous substance spillages	Decommissioning and Rehabilitation	▪ Minimise through Stormwater Management Plan; ▪ Avoid through Vehicle and Machinery Maintenance Plan; and ▪ Minimise through spill procedures	To avoid spillages of hazardous substance into the natural environment

7 Item 1(f): Impact Management Actions

A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in Sections 5 and 6 (Part B) will be achieved in Table 7-1.

Table 7-1: Impact management actions

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Compliance with standards
1.Site clearing and vegetation removal; 2. Topsoil and subsoil removal and stockpiling; 3. Storage of construction materials, hazardous material, waste and water storage; and 4.Establishment of infrastructure	Soil, Land Use and Land Capability	Soil erosion and soil compaction Loss of topsoil resources	Construction	▪ Only clear vegetation when and where necessary; ▪ Only remove topsoil when and where necessary ; ▪ Topsoil removed must be stockpiled and preserved for rehabilitation purposes ▪ Only the designated access routes are to be used; ▪ If erosion occurs, corrective actions must be taken to minimise any further erosion from taking place; and ▪ Ensure proper storm water management designs are in place. ▪ Effective monitoring and management of topsoil areas for compaction, erosion and compaction.	Minerals Council South Africa Guidelines
	Flora and Fauna	Direct loss of 55 ha of natural habitat associated with the rail loop and road diversion and 313 ha associated with the water pipeline and consequent loss / compromised ecological services from these habitats	Construction	▪ Limit degradation and destruction of natural environment to designated project areas; ▪ Re-vegetate open areas to limit erosion, which will also aid in water infiltration and flood attenuation; ▪ Avoid sensitive landscapes such as riparian areas, and wetland areas that were encountered on site as far as possible. A 100 m buffer must be employed from these habitats; ▪ Applications for permits for removal of certain plants, where required by provincial authorities; ▪ If plants of SSC are to be removed, they should be either translocated to a similar habitat to the donor site or relocated to a nursery; and ▪ If alien vegetation is encountered, these species should be removed in the correct way and timeously.	NEMA; and NEMBA.
		Potential loss of faunal species as a result of destruction of supporting habitat and potential road-kills as a result of increased vehicular movement		▪ Limit degradation and destruction of natural environment to designated project areas; ▪ Re-vegetate open areas to immediate following construction; ▪ Avoid sensitive landscapes such as riparian areas, and wetland areas that were encountered on site as far as possible. A 100 m buffer must be employed from these habitats; ▪ Ensure that construction sites are fenced off to limit the ingress of animal and plant species into the construction areas; ▪ No poaching or lighting of fires or feeding of fauna must be permitted; and ▪ Speed limits must be controlled through a Vehicle Management System.	
	Wetlands and Aquatic Ecology	Soil erosion and subsequent sedimentation of wetland and river systems leading to reduced ecological integrity of freshwater ecosystems	Construction	▪ Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ The disturbed footprint must be limited to what is absolutely essential; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place; ▪ Active rehabilitation, re-sloping, and re-vegetation of disturbed areas immediately after construction must be undertaken; ▪ All soils compacted as a result of construction activities should be ripped/scarified (<300mm) and profiled in accordance with the guidelines set out in the Soils, Land Use and Land Capability Report (Appendix 4); ▪ Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No unnecessary crossing of the freshwater features and their associated buffers should take place and the substrate conditions of the ephemeral drainage lines and downstream stream connectivity must be maintained; ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any freshwater areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the construction footprint.	Section 19 of the NWA NEM:BA NEMA DWAF guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA et al., 2013).
		Potential direct loss of wetlands due to stockpiling and storage activities within pan habitats			

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Compliance with standards
	Surface Water	The impact of siltation, caused by soil erosion, resulting in the deterioration of water quality and adverse impacts on aquatic life and downstream water users.	Construction	▪ Clearing of vegetation and excavation should be limited as far as possible; ▪ For any required soil stockpiles, these should be compacted and the slopes should be kept at minimal/low to avoid erosion; ▪ Dust suppression measures must be undertaken on the cleared areas during construction if necessary to prevent wind erosion; ▪ Runoff from this area should be diverted away from the construction sites and minimal dirt water areas should be established; ▪ No water should be abstracted from streams for construction; and ▪ All hazardous material storage areas should be appropriately bunded and spill kits should be in place.	NWA
		Alteration of stream channel geometry at pipeline river crossing as a result of excavation activities on the streambed and banks	Construction	▪ If possible, construction activities must be prioritized during the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearance; ▪ An appointed ECO must always be available to ensure implementation of the recommended mitigation/management measures during construction; and ▪ Water quality and quantity monitoring must be undertaken to detect any changes as a result of the stream crossing. Should any alterations be detected, corrective measures must be investigated and implemented accordingly	NWA
	Groundwater	Lowering of the water table (should excavation take place below the groundwater table)	Construction	▪ Avoid constructing below the water table as far as possible; ▪ In the unlikely scenario where the foundation of structures is to be installed below the water level, dewatering of the aquifer to locally lower the water table can be considered. The abstracted water can be utilised for dust suppression, re-vegetation programmes or discharged to the pollution control dams and Temo Mine to be used as process water; and ▪ Install long term monitoring boreholes to detect any impacts to groundwater.	NWA
	Air Quality	Generation of fugitive dust	Construction	▪ The area of disturbance must be limited to the infrastructure footprint only. No unnecessary clearing should take place; ▪ Where necessary, wetting agents, dust suppressants or binders must be applied on the exposed areas (including excavated material and open areas); ▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Construction should be conducted in phases to minimise extensive disturbance; and ▪ The drop heights when tipping cover materials must be minimised as far as practicable.	NEMAQA
	Noise	Noise generation from the machinery, pneumatic tools and vehicles operating during the construction activities	Construction	▪ Restrict construction activities to daylight hours (06:00 – 18:00) as far as practically possible; ▪ Construction related machines and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Install broadband reverse hooters to vehicles to minimise the hooter noise propagation; ▪ Switch off equipment when not in use; and ▪ Leave as much natural vegetation where possible to aid in attenuating the noise.	NEMA
	Soils; Surface Water; Groundwater; and Freshwater ecosystems	Potential contamination of soils and water resources as a result of hazardous substance spillages	Construction	▪ All hazardous material storage areas should be appropriately bunded for the containment of spillage occurring in the bunded area and spill kits should be in place; ▪ Ensure correct storage systems are used for the storage of hazardous products when constructing. ▪ A dedicated waste disposal site is to be established; at the construction sites; ▪ All storage areas (fuels, paints, oils) used at the construction camp should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ All hydrocarbon spills should be immediately cleaned up and treated accordingly; ▪ Drip trays should be utilised when refuelling to contain any spillages; ▪ MSDS's should be kept on site for reference purposes regarding handling, storage and disposal of materials; ▪ Vehicles and heavy machinery should be serviced and checked on a regularly basis to prevent leakages and spills; and ▪ Appropriate sanitary facilities must be provided for the duration of the construction activities and all waste must be removed to an appropriate waste facility.	NEMA

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Compliance with standards
				▪ Safe waste disposal certificates must be obtained and made available on request.	
	Socio-economic	Influx of construction contract workers and job seekers to the area	Construction	▪ House non-local construction workers some distance from the project area (i.e. at the Temo mine construction camp if available) to limit movement into surrounding communities; ▪ Depending on the duration of the work for the different components, contract worker schedules should allow for workers to visit their families at least for one week in every 2 months. ▪ Develop a code of conduct for construction workers and sensitize them to abide by it so that their behaviour and engagement with local communities does not compromise either party. ▪ Condoms could be provided free of charge in the construction camp; ▪ Where possible, construction employees should be locally sourced as they will live with their families; and ▪ Explore opportunities for collaboration with local police with regards safety and security issues relating to Project activities in general and any concerns about contractors	NEMA
		Temporary employment opportunity resulting in improvements to livelihoods of the workforce	Construction	▪ Where possible, opportunities for local employment should be considered. For instance, contracts for construction can stipulate that at least 80% of unskilled labour be sourced from surrounding communities and should include the youth as far as possible; ▪ Skilled, semi-skilled and unskilled construction staff must be retained, where possible, for the subsequent construction of the mine; and ▪ The Community Liaison Officer could be appointed at this stage, to monitor and address any community queries during the Project and as Temo prepares for construction of the mine.	NEMA
		Business opportunities for local goods and services providers due to an increase in demand for goods and services as a result of increased economic activities	Construction	▪ Temo Coal should join local organised business partnerships to discuss any opportunities for procurement for the project. Where goods are services can be sourced locally and Temo Coal is satisfied that it will support the mine to achieve its procurement objectives, including for the SLP of the mine, contracts can be extended for mining activities as relevant.	NEMA
		Increase in demand of public services due to increased economic activity and influx of people to the local area for employment.	Construction	▪ Adequate stormwater management must be implemented and include the construction camps where necessary; ▪ Join partnerships with organised business and government departments to secure access to services such as potable water, energy and healthcare as necessary; and ▪ Explore opportunities for collaboration with local police with regards safety and security issues relating to Project activities in general and for contractors in particular.	NEMA
		Increased risk to public health and safety due to increased vehicular movement, waste generation and pipeline crossings in the local area	Construction	▪ The area of disturbance must be limited to the infrastructure footprint only. No unnecessary clearing should take place; ▪ Construction should be conducted in phases to minimise extensive disturbance; and ▪ Restrict construction activities to daylight hours (06:00 – 18:00) as far as practically possible; ▪ Construction related machines and vehicles must be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ minimise the hooter noise propagation; ▪ Switch off equipment when not in use; and ▪ Maintenance and inspections of pipelines must be done to minimise compaction and erosion; and ▪ Check leakages on the pipelines regularly to avoid major contamination. If possible leak detection devices should be installed on the pipeline.	NEMA
5. Operation of infrastructure; and 6.Maintenance of infrastructure	Soils, Land Use and Land Capability	Soil erosion and soil compaction from maintenance activities	Operational	▪ Ensure designed storm water management plans are in place; ▪ If any erosion occurs, corrective actions must be taken to minimise any further erosion from taking place; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction; ▪ Stockpiled topsoil should be preserved for rehabilitation purposes.	Minerals Council South Africa Guidelines
		Loss of topsoil resources			

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Compliance with standards
	Fauna and Flora	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Operational	▪ Ensure that a Biodiversity Action Plan is implemented; ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented. ▪ Ensure continuous environmental awareness training takes place.	NEMA; and NEMBA.
	Wetlands and Aquatic Ecology	Soil erosion and subsequent sedimentation of wetland and river systems leading to reduced ecological integrity of freshwater ecosystems	Operational	▪ Ensure soil management programme is implemented and maintained to minimise erosion and sedimentation; ▪ The disturbed footprint must be limited to what is absolutely essential; ▪ If it is absolutely unavoidable that any of the wetland areas present will be affected, disturbance must be minimised and suitably rehabilitated; ▪ Ensure that no incision and canalisation of the wetland features present takes place; ▪ Active rehabilitation, re-sloping, and re-vegetation of disturbed areas immediately after construction must be undertaken; ▪ A suitable AIP control programme must be put in place so as to prevent further encroachment as a result of disturbance to the surrounding terrestrial zones; ▪ All soils compacted as a result of construction activities should be ripped/scarified (<300mm) and profiled in accordance with the guidelines set out in the Soils, Land Use and Land Capability Report (Appendix 4); ▪ Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No unnecessary crossing of the freshwater features and their associated buffers should take place and the substrate conditions of the ephemeral drainage lines and downstream stream connectivity must be maintained; ▪ No vehicles or heavy machinery may be allowed to drive indiscriminately within any freshwater areas and their associated zones of regulation. All vehicles must remain on demarcated roads and within the construction footprint.	Section 19 of the NWA NEM:BA NEMA DWAF guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA et al., 2013).
		Reduced ecological integrity and functioning of wetlands as a result of loss of catchment yield and surface water recharge due to stormwater management systems. The establishment of infrastructure and vehicular movement will result in additional hardened surfaces resulting in sheet run-off which could lead to erosion to freshwater ecosystems.		▪ Limit the footprint area of the operational activities to what is absolutely essential in order to minimise impacts as a result of any potential vegetation clearing and compaction of soils (all areas but critically so in freshwater areas); ▪ Ensure that no incision and canalisation of the freshwater features present takes place as a result of the proposed operational activities; ▪ Dirty water areas must be kept to a minimum and clean water must be diverted away from infrastructure areas as far as possible; ▪ All erosion noted within the operational footprint as a result of any potential surface activities should be remedied immediately and included as part of the on-going rehabilitation plan; ▪ Permit only essential personnel within the 100 m zone of regulation for all freshwater features identified; ▪ All areas of increased ecological sensitivity should be designated as “No-Go” areas and be off limits to all unauthorised vehicles and personnel; ▪ No unnecessary crossing of the wetland features and their associated buffers should take place and the substrate conditions of the wetlands and downstream stream connectivity must be maintained; and ▪ Monitor all systems for erosion and incision.	
	Surface Water	Siltation of surface water resources due to erosion on bare soil leading to deteriorated water quality of nearby surface water resources.	Operational	▪ Clearing of vegetation and excavations should be confined within the project footprints, no unnecessary clearing should be permitted; ▪ If possible, construction activities must be prioritised during the dry months of the year (May-October) to limit mobilisation of sediments during site clearance; ▪ Re-vegetate the backfilled and reshaped underground pipeline route after installation to minimise erosion and sedimentation of nearby watercourses; ▪ An appointed ECO must always be available to ensure implementation of the recommended mitigation/management measures during construction; and	NWA

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Compliance with standards
				▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to properly dispose of the waste.	
		Alteration of stream channel geometry at pipeline river crossing		▪ If possible, construction activities must be prioritized during the dry months of the year (May-October) to limit mobilization of sediments or hazardous substances during site clearance; ▪ An appointed ECO must always be available to ensure implementation of the recommended mitigation/management measures during construction; and ▪ Water quality and quantity monitoring must be undertaken to detect any changes as a result of the stream crossing. Should any alterations be detected, corrective measures must be investigated and implemented accordingly.	NWA
	Air Quality	Nuisance and health effects from exposure to fine particulate matter as a result of operational maintenance activities and/or wind erosion of open areas	Operational	▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Implement routine maintenance of off-road vehicles and trains to optimise engine performance and minimise gaseous emissions; and ▪ Dust suppression must be implemented on access road if and when necessary.	NEMAQA
	Noise	Noise disturbance from train air horn and wheel squeal and maintenance vehicles	Operational	▪ Sound proofing must be implement if excessive noise is experience / compliments are received from receptors; ▪ Railroad noise barrier must be installed; and ▪ Train and vehicles must be serviced to their designed requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers.	NEMA
7. Demolition and removal of all infrastructure; 8. Storage of hazardous material, waste and water storage; and 9. Rehabilitation of disturbed footprints	Soils, Land Use and Land Capability	Soil erosion and soil compaction if rehabilitation is not done correctly.	Decommissioning and rehabilitation	▪ Rehabilitate according to the rehabilitation plan; ▪ Return the land conditions capable of supporting prior land use or uses equal to/ better than prior land use; ▪ Plant native vegetation to prevent erosion and encourage a self-sustaining productive ecosystem; and ▪ Remove buildings to foundation level. Demolished rubble must be disposed of in accordance with Rehabilitation Plan.	Minerals Council South Africa Guidelines
	Fauna and Flora	Habitat loss and continual pressure exerted by the operations on the ecosystem can lead to pressure on the populations of threatened species or could lead to direct loss of individuals.	Decommissioning and rehabilitation	▪ Re-vegetation should be undertaken in accordance with the developed Closure and Rehabilitation Plan (Appendix 13); ▪ Ensure that a Biodiversity Action Plan is implemented; ▪ Ensure that the controls of noise, dust, waste generation, vehicle speed limits, food waste disposal, hazardous waste disposal, human interaction with the ecology are monitored regularity and controls to prevent adverse conditions arising from the activities which are likely to affect fauna are updated and implemented; and ▪ Ensure continuous environmental awareness training takes place.	NEMBA
	Wetlands and Aquatic Ecology	Reduced ecological integrity of freshwater ecosystems due to potential soil compaction, erosion and consequent sedimentation of freshwater resources as well as potential encroachment of alien invasive plant species as a result of habitat fragmentations.	Decommissioning and rehabilitation	▪ All erosion noted within the decommissioning and rehabilitation area footprint should be remedied immediately; ▪ All soils compacted as a result of decommissioning activities should be ripped/scarified (<300mm) and profiled; ▪ Permit only essential personnel within the 100m zones of regulation for all freshwater features identified; ▪ Wherever possible, restrict decommissioning activities to the drier winter months to avoid sedimentation of the freshwater resources further downstream; ▪ Wetlands and their associated zones of regulation are to be clearly demarcated and avoided wherever possible; ▪ Ongoing wetland rehabilitation is necessary both within and in the vicinity of the proposed decommissioning, rehabilitation and closure footprint.	NWA DWAF guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA et al., 2013).
	Surface Water	The impact of siltation, caused by soil erosion,	Decommissioning and rehabilitation	▪ Ensure that the surface profiles of affected sites are rehabilitated to promote free surface runoff drainage and avoid ponding of water within the rehabilitated area; and	NWA

Activity	Aspect Affected	Potential Impact	Phase	Mitigation Type	Compliance with standards
		resulting in the deterioration of water quality.		▪ Rehabilitated sites should be re-vegetated to reduce erosion and subsequent sedimentation and siltation of nearby watercourses.	
	Air Quality	Nuisance and health effects from exposure to fine particulate matter as a result of decommissioning activities and/or wind erosion	Decommissioning and rehabilitation	▪ A Vehicle Management System based on procedures and applicable codes of conduct must be implemented to ensure that vehicle movement avoids excessive dust generation; ▪ Implement routine maintenance of off-road vehicles and trains to optimise engine performance and minimise gaseous emissions; and ▪ Dust suppression must be implemented on access road if and when necessary.	NEMAQA
	Noise	Noise will emanate from the machinery, pneumatic tools and vehicles operating during the decommissioning activities.	Decommissioning and rehabilitation	▪ Sound proofing must be implement if excessive noise is experience / compliments are received from receptors; ▪ Railroad noise barrier must be installed; and ▪ Train and vehicles must be serviced to their designed requirements to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers.	NEMA
	Soils; Surface Water; Groundwater; and Freshwater ecosystems	Potential contamination of soils and water resources as a result of hazardous substance spillages	Decommissioning and Rehabilitation	▪ All hazardous material storage areas should be appropriately bunded and spill kits should be in place; ▪ Drip trays must be used when refuelling to contain any spillages; ▪ MSDS's should be kept on site for reference purposes regarding handling, storage and disposal of materials; ▪ Vehicles and heavy machinery should be serviced and checked on a regularly basis to prevent leakages and spills; ▪ Appropriate sanitary facilities must be provided for the duration of the operational activities; ▪ All waste must be temporarily stored separately; ▪ All waste removed from site must be recorded. All hazardous waste must have safe disposal certificates; ▪ Waste must be recycled as far as possible. If it cannot be recycled it must be disposed of at an appropriate waste facility.	NEMA

8 Financial Provision

8.1 Item (i)(1): Determination of the amount of Financial Provision

Section 41 (1) of the MPRDA has been repealed and in terms of Section 24(P) in the NEMA as amended, which provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. In addition to Section 24(P), the Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated on 20 November 2015.

Regulation 11 of the Financial Provision Regulations, 2015 requires a holder of a Mining Right to determine the quantum of the financial provision through detailed itemisation of all activities and costs, calculated based on the actual costs of implementation of the measures required for:

- Annual rehabilitation as reflected in the Annual Rehabilitation Plan (ARP) as per the minimum content prescribed by Appendix 3 as per the Regulations;
- Final rehabilitation, decommissioning and closure as reflected in the RCP as per the minimum content prescribed by Appendix 4 as per the Regulations; and
- The remediation of latent or residual environmental impacts including but not limited to the pumping and treatment of polluted or extraneous water, as reflected in an Environmental Risk Assessment Report (ERR), as per the requirements of Appendix 5 as per the Regulations.

8.1.1 Item (i)(1)(a): 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

The rehabilitation and closure objectives have been set out in Section 4.1 (Part B) above. The overarching objective for closure is to ensure that impacted land is rehabilitated in a manner that allows it to be ceded for other sustainable land uses.

8.1.2 Item (i)(1)(b): Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

The RCP is available for public review and comment together with this Draft EIA and EMP Report (please refer to Appendix 13). All comments received that pertain to the RCP will be record in the final EIA and EMP report.

8.1.3 Item (i)(1)(c): 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

A summary of the rehabilitation plan is presented in Table 21 1 (Part A) above. Please refer to Appendix 13 for the complete RCP associated with the project.

8.1.4 Item (i)(1)(d): Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The RCP has been compiled in support of the primary closure objectives which are to remove unwanted infrastructure and rehabilitate the land to a suitable sustainable land use which provides a safe and stable environment for surrounding receptors.

8.1.5 Item (i)(1)(e): Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The estimated closure cost required for the rehabilitation and closure of the project is **R 8,081,561.00 (Excl. VAT).** A contingency of 10% on all infrastructure costs has been allowed for while a 12% allowance has been included for project management fees. These fees account for the costs required to manage the closure and rehabilitation phase as well as provide personnel to monitor and maintain the rehabilitated areas after closure.

A detailed closure cost for proposed ancillary infrastructure is provided in Table 24-1 (Part A) above.

8.1.6 Item (i)(1)(f): Confirm that the financial provision will be provided as determined

Temo Coal will provide for closure as legally required. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

9 Monitoring compliance with and performance assessment

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including:

9.1 Item 1(g): Monitoring of impact management actions

Temo Coal will be responsible for the implementation of all monitoring, mitigation and management measures, as well as compliance with the EMPr.

The key environmental aspects that need to be monitored for the project include:

- Soil erosion, compaction and erosion;
- Vegetation cover;

- Alien vegetation establishment and weed management; and
- Noise levels (if complaints are received).

Further detail of the monitoring requirements is provided in Table 9-1 below.

9.2 Item 1(h): Monitoring and reporting frequency

Table 9-1, below, discusses the monitoring and reporting frequency in detail.

9.3 Item 1(i): Responsible persons

The roles and responsibilities associated with the monitoring programme are set out in Table 9-1, below.

9.4 Item 1(j): Time period for implementing impact management actions

Table 9-1 below captures the time period for implementing impact management actions.

9.5 Item 1(k): Mechanism for monitoring compliance

Table 9-1 sets out the monitoring and management programme of environmental impacts for the project.

Table 9-1: Monitoring and Management of Environmental Impacts

Source Activity	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
All activities throughout the project	Flora and Fauna	Vegetation clearing at the project area must be monitored to ensure no unnecessary disturbance is taking place. This should be done on a weekly basis during the construction phase.	Environmental Specialist/ ECO	Monthly
		The encroachment of alien invasive plant species should be monitored within the project area on a monthly basis and appropriate corrective measures must be undertaken on a monthly basis.	Environmental Specialist/ ECO	Monthly
		Annual monitoring of general biodiversity and ensuring sustainable populations of both fauna and flora persist until closure. This includes impacts on vegetation structure and health; impacts on faunal populations and numbers; and Red Data Listed fauna and flora species (should it be recorded going forward).	Terrestrial Ecologist	Annually
	Soil erosion	Site inspection will be undertaken fortnightly by the site manager to ensure that all soil erosion mitigation measures are in place and implemented adequately.	Environmental Specialist/ ECO	Fortnightly
	Groundwater	Groundwater level and groundwater quality should be monitored on a quarterly basis at the established boreholes (if available) within the vicinity of project area to detect any impacts which may be associated with the project.	Environmental Specialist/ ECO	Quarterly
	Wetlands	Wetland which are directly affected should be monitored monthly during construction and decommissioning phase to ensure mitigation measures are adhered to. Wetland monitoring should include all associated impacts including uncontrolled erosion, hydrocarbon spills etc. and remediated where needed	Environmental Specialist/ ECO	Monthly (during construction and decommissioning phase);
	Fugitive dust and noise	Dust suppression must be implemented at the project sites. Furthermore, heavy machinery and vehicles must be maintained and serviced regularly and, if possible, a silencing system should be fitted. The project activities must only take place during daylight hours as far as practically possible.	Environmental Specialist/ ECO	As and when required
	Use of hydrocarbons	Daily inspections of machinery must be undertaken and spill trays will be placed under the machinery to collect any hydrocarbon leaks and spillages in the event it is required. Should spillages occur, the soil must be cleared and treated utilising bioremediation techniques. Should the soil not be adequately treated on site, the soil must be removed from the sites and disposed of at a waste handling facility.	Environmental Specialist/ ECO	Daily
	Ablution facilities	Ablution facilities will be provided at the construction sites and all waste must be disposed at an appropriate facility at regular intervals.	Environmental Specialist/ ECO	As and when required
	Domestic waste	Bins will be placed at the construction sites to collect the domestic waste and will be disposed of at a registered waste handling facility.	Environmental Specialist/ ECO	Weekly

10 Item 1(l): Indicate the frequency of the submission of the performance assessment report

In accordance with the NEMA EIA Regulations (2014), as amended, an external independent Environmental Audit will be undertaken every two years. The Environmental Audit Report will be submitted to the DMR and other relevant authorities where required.

11 Item 1(m): Environmental Awareness Plan

11.1 Item 1(m)(1): Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

The purpose of an Environmental Awareness Plan is to outline the methodology that will be used to inform employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with to avoid contamination or the degradation of the environment.

The environmental awareness plan is primarily a tool to introduce and describe the requirements of the range of environmental and social plans for the proposed project during the life of the project.

The environmental awareness plan ensures that training needs are identified and appropriate training is provided. The environmental awareness plan should communicate:

- Importance of conformance with the environmental policy, procedures and other requirements of good environmental management;
- The significant environmental impacts and risks of an individual's work activities and the environmental benefits of improved performance;
- Individual's roles and responsibilities in achieving the aims and objectives of the environmental policy; and
- The potential consequences of not complying with environmental procedures.

The objective of this Environmental Awareness Plan is to:

- Inform employees and contractors of any environmental risks which may result from their work; and
- Inform employees and contractors of the manner in which the identified possible risks must be dealt with to prevent degradation of the environment.

In general, the purpose of implementing an Environmental Awareness Plan is to optimise the awareness of those partaking in all project activities which have the potential to impact negatively on the environment and in doing so, promote the global goal of sustainable development.

Methods of environmental awareness training of employees and contractors must be developed. Health, Safety and Environmental training will be carried out and applicable for all personnel partaking in the project.

11.2 Item 1(m)(2): Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Methods for the internal communication between the various levels and functions of the organisation, and receiving, documenting and responding to relevant communication from I&APs must be established for the project.

Communication is a management responsibility. All line supervisors are responsible for effective communication within their own sections. Environmental risks will continue to be dealt with through training and communication to ensure minimal degradation of the environment.

12 Item 1(n): Specific information required by the Competent Authority

The financial provision for the environmental rehabilitation and closure requirements of mining operations is governed by NEMA, as amended, which provides in Section 24P that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision will be reviewed annually.

13 Item 2: Undertaking

The EAP herewith confirms:-

(a) the correctness of the information provided in the reports

(b) the inclusion of comments and inputs from stakeholders and I&APs ;

(c) the inclusion of inputs and recommendations from the specialist reports where relevant; and

(d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

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Appendix 1: Plans

Appendix 2: EAP CV and Qualifications

Appendix 3: Public Participation

Appendix 4: Soils, Land Use and Land Capability Assessment

Appendix 5: Flora and Fauna Assessment

Appendix 6: Wetland and Aquatic Ecology Assessment

Appendix 7: Surface Water Assessment

Appendix 8: Groundwater Assessment

Appendix 9: Air Quality Assessment

Appendix 10: Noise Assessment

Appendix 11: Heritage Assessment

Appendix 12: Socio-economic Assessment

Appendix 13: Rehabilitation and Closure Liability Assessment