Goedehoop Colliery, Hope No. 4 Seam Project

A Division of Anglo Operations (Pty) Limited

Draft Environmental Impact Report (EIR) and Environmental Management Programme (EMPr)

Compiled in terms of Appendix 3 and Appendix 4 of the Environmental Impact Assessment Regulations, 2014 (Government Notice No. R 982) (EIA Regulations, 2014) and Submitted as contemplated in Regulation 23 of Chapter 4 of the EIA Regulations, 2014)

For

The application for an Environmental Authorization and a Waste Management Licence in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), Environmental Impact Assessment Regulations 2014, Government Notice R983 - Listing Notice 1 of 2014, Government Notice R984 - Listing Notice 2 of 2014, Government Notice R985 - Listing Notice 3 of 2014 and Government Notice R921 – List of Waste Management Activities

DMR Reference No.: MP 30/5/1/2/2/1 (122) EA

NOVEMBER 2015

Environmental Impact Report (EIR) and Environmental Management Programme (EMPr)

Anglo Operations (Pty) Limited:

Goedehoop Colliery, Hope No. 4 Seam Project

DRAFT EIR AND EMPr FOR THE HOPE NO. 4 SEAM PROJECT

(COPY FOR REVIEW BY INTERESTED AND AFFECTED PARTIES)

November 2015

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EXECUTIVE SUMMARY

Goedehoop Colliery, a Division of Anglo Operations (Pty) Limited, is an operational mine located 25 km south east of Witbank (eMalahleni) in the Mpumalanga Province. Goedehoop Colliery is comprised of three sections i.e. Hope, Vlaklaagte and Springbok sections. Mining operations at the Springbok and Vlaklaagte sections commenced in 1945. The Hope Sections commenced mining in 1983. Both underground and opencast mining methods were conducted on the mined coal seam horizons. The Springbok and Hope sections are currently not producing coal. Coal is currently produced only from the Vlaklaagte section via underground mining. Goedehoop Colliery is composed of a number of decommissioned and operational satellite shafts. The coal products from the mine are targeted solely for the export market with approximately 5.5-6 million tonnes being produced annually. Coal is processed on site using a Dense Medium Separation (DMS) coal washing plant, with washed coal being railed from the Rapid Loading Terminal (RLT) to Richards Bay Coal Terminal. Arising mineral residue from the coal washing process during the life of mine have resulted in 6 mineral residue deposit facilities on the property of which only one facility is still active. Goedehoop Colliery is operated under a mining right granted by the DMR (DMR Ref. No.: MP 30/5/1/2/2/122 MR) and an approved EMPR (DMR Ref. No.: MP 30/5/1/2/2/1 (122) EM). The approved EMPR has been amended and the amended EMPR is still pending approval.

An assessment was undertaken by the mine on the current tonnage profile for the coal reserves within Goedehoop Colliery to determine the future profile of the mine tonnage. The profile indicated that the coal reserves at Goedehoop Colliery will facilitate economic coal mining up to 2018. From there, underground coal mining becomes un-economic due to rising unit costs attributable to decreased throughput. This has thus resulted in a significant shortening of the Goedehoop Colliery life of mine. In view of the above, an option identification analysis was initiated to identify possible replacement projects to extend the Goedehoop Colliery life of mine. These options were ranked based on value adding potential. The proposed Hope No. 4 seam project was identified as the most feasible replacement project to supplement the current life of mine production profile.

In view of the above, Anglo Operations (Pty) Limited proposes to extend its current underground mining operations at its Goedehoop South Colliery (Hope Section) on several portions of the farms Goedehoop 46 IS, Wilmansrust 47 IS, Bultfontein 187 IS, Geluk 26 IS, Haasfontein 28 IS and Komati Power Station 56 IS, namely the Hope No. 4 Seam Project. The proposed project entails mining of the No. 4 coal seam underground reserves by conventional bord and pillar underground mining methods. Access to the targeted coal reserves will be via an incline shaft/box cut. The proposed Hope No. 4 Seam Project occurs to the southeast of Goedehoop South Colliery mining right area.

The commencement of the proposed Hope No. 4 Seam project will results in the undertaking of activities that are considered as listed activities in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as amended (NEMA) and waste management activities in terms of the National Environmental Management: Waste Act, 1998 (Act 107 of 1998) NEMWA. In terms of the above-mentioned legislation, an application for an environmental authorisation must be submitted to the competent authority which application must be granted before the commencement of the proposed listed activities and waste management activities. In addition to the above, an environmental impact assessment must be undertaken in support of the environmental authorisation application for the proposed listed and waste management activities. In view of the above, Anglo Operations (Pty) Limited appointed Geovicon Environmental (Pty) Limited, an independent environmental consulting company, to undertake and manage the environmental authorisation application and the environmental impact assessment for the proposed Hope No. 4 Seam project. An application for an

environmental authorisation for the proposed Hope No. 4 Seam project has been submitted to the Department of Mineral Resources, Mpumalanga Regional Office (Competent Authority) for their consideration. The application has ever since been acknowledged and a Scoping Report compiled in terms of the requirements of the EIA Regulations, 2014 has been submitted to the competent authority after it was subjected to the required public participation.

This document (draft EIR and EMPr, inclusive of the specialist reports), which concerns assessment of environmental impacts and a programme for management of the impacts for the proposed activities at the Hope No. 4 Seam project, was compiled and is submitted in terms of the EIA Regulations, 2014 for review by interested and affected parties including the competent authority. The environmental impacts assessment, which result thereof is detailed in this report, was undertaken in compliance with the accepted plan of study describe in the above-mentioned Scoping Report.

Environmental baseline data used in this report has been obtained through various agencies, pertaining to surface water quantities and qualities, geohydrological data and modelling, topographical analyses, soil surveys, vegetation surveys, wetland surveys and geological conditions, visual impact assessment, noise impact assessment, heritage surveys and the socio-economic impact assessments. Weather data was acquired from the Goedehoop Colliery rainfall station as well as from the South African Weather Service. Historic land use was determined through available data and by visual observations made during various field studies. Additional specialists' studies were conducted over the area to be impacted by the proposed activities, which has been summarised in this document. The data accumulated and analysed is therefore deemed sufficient to gain a baseline indication of the present state of the environment. The use of this baseline data for impact assessments is thus justified, and reliable conclusions could be made. The impacts that could arise during and after the proposed activities at the Hope No. 4 Seam project were determined and ranked according to their significance. Based on the impact assessment, recommendations were made for the mitigation of significant negative environmental impacts that will result from the proposed project.

SECTION ONE

Introduction

1. INTRODUCTION

1.1 WHO IS DEVELOPING THE EIR AND EMPR?

1.1.1 Name and contact details of the EAP who prepared the EIR and EMPr

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1.1.2 Expertise of the EAP who prepared the EIR and EMPr

Geovicon Environmental (Pty) Limited is a geological and environmental consulting company. The company was formed during 1996, and currently has nineteen years' experience in the geological and environmental consulting field. Geovicon Environmental (Pty) Limited has successfully completed consulting projects in the Mining sector (coal, gold, base metal and diamond), Quarrying sector (sand, aggregate and dimension stone), Industrial sector and housing sector. Geovicon Environmental (Pty) Limited has undertaken contracts within all the provinces of South Africa, Swaziland, Botswana and Zambia. During 2001 Geovicon Environmental (Pty) Limited entered the field of mine environmental management and water monitoring.

Geovicon Environmental (Pty) Limited is a Black Economically Empowered Company with the BEE component owning 60% of the company. Geovicon Environmental (Pty) Limited has three members i.e. O.T Shakwane, J.M. Bate and T.G Tefu.

Mr. O.T Shakwane obtained his BSc (Microbiology and Biochemistry) from the University of Durban Westville in 1994, and completed his honours degree in Microbiology in 1995. Mr O.T Shakwane has also completed short courses on environmental law and environmental impact assessment with the University of North West's Centre for Environmental Management. He has worked with the three state departments tasked with mining and environmental management i.e. Department of Water and Sanitation (Gauteng and Mpumalanga Region), Department of Mineral Resources (Mpumalanga Region) and Department of Agriculture, Conservation and Environment (Gauteng Region). Mr. Shakwane has been in the consulting field since 2004 and has completed various projects similar to the proposed Hope No. 4 Seam project as an environmental assessment practitioner. Mr Shakwane is the environmental assessment practitioner for the environmental impact assessment for the proposed Hope No. 4 Seam project.

Mr. T.G. Tefu is geologist. He obtained his BSc. in geology at the University of Witwatersrand. He worked with several mining companies and was also employed by the then Department of Mineral Resources' Environmental Management directorate.

Mrs R. Bate obtained her BSc Degree in 1982 and BSc (Honns) (Entomology) in 1983 from the University of Pretoria. She obtained her MSc Degree from the University of Stellenbosch in 1986. She worked for the Agricultural Research Council, Grain Crops Institute as a Researcher for fourteen years, where she deliveredpapers at different congresses of the Entomological Society as well as the Crop Production Society.She is the author of five scientific papers as well.

Mr. Bate, founder of Geovicon Environmental (Pty) Limited, is used by the company on an ad hoc (consultancy) basis. He is also a qualified geologist. Mr. Bate is appointed as the chairman for the board of the company. He is a qualified geologist.

He obtained his BSc (geology) from the Potchefstroom University for CHE in 1993, and completed his honours degree (cum Laude) in geology in 1994. He obtained his MSc (cum Laude) in 1995.

Over the past years Geovicon Environmental (Pty) Limited has formalised working relationships with companies that offer expertise in the following fields i.e. Geohydrology, Civil and Geotechnical Engineering, Geotechnical Consultancy, Survey and Mine Planning and Soil & Land Use Consultancy.

Geovicon Environmental (Pty) Limited is an independent consulting company, which has no interest in the outcome of the decision regarding the Goedehoop Colliery's Hope No. 4 Seam environmental impact assessment.

1.2 WHO WILL EVALUATE AND APPROVE THE EIR AND EMPR?

Before the proposed project can proceed, an Environmental Assessment Practitioner (EAP) must compile an application for an environmental authorisation for the proposed project. An environmental impact assessment must be undertaken in support of the application for an environmental authorisation. The environmental impact assessment will determine the potential environmental impacts that may result from the proposed project and an environmental management programme will be compiled to provide measures for mitigation against the identified impacts. The above-mentioned application must be made to the competent authority and in terms of section 24D (1) of NEMA, the Minister responsible for mineral resources is the responsible competent authority for this application. In view of the above, the application for the environmental authorisation for the proposed Hope No. 4 Seam project was submitted to the Department of Mineral Resources (DMR), eMalahleni Regional Office for their consideration and decision making.

In the spirit of co-operative governance and in compliance with the requirements of NEMA and the MPRDA, the competent authority will, during the processing for the environmental authorisation application, consult with other organs of state that administers laws that relate to matters affecting the environment relevant to this application.

The organs of state that are to be consulted may include the following:

- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA)
- Mpumalanga Tourism and Parks Agency (MTPA)
- Department of Water and Sanitation (DWS)

- National Department of Agriculture, Forestry and Fisheries (NDA)

Note however that this list is not exhaustive as more organs of state may be identified by the competent authority.

1.3 DETAILS OF THE APPLICANT

1.3.1 Name of the Applicant

Anglo Operations (Pty) Limited

1.3.2 Name of the Mine

Goedehoop Colliery

1.3.3 Name of the Project

Hope No. 4 Seam Project

1.3.4 Postal Address of Mine

Goedehoop Colliery

Private Bag X 410

Vandyksdrift 2245

MPUMALANGA

Tel: +27 (0) 13 687-5300

Fax: +27 (0) 13 687-54262

1.3.5 General Manager

Mr. Erik Becht

1.3.6 Contact Person

Ms. Cindy Smith

Email: Cindy.Smith@angloamerican.com

1.4 DESCRIPTION OF THE PROPERTY (LOCATION OF THE PROJECT)

1.4.1 Regional Setting

Refer to Figure 1 for the regional setting for Goedehoop Colliery.

1.4.2 Physical Address and Farm Name of the Mine

Anglo Operations (Pty) Limited, Goedehoop Colliery (Administration Building)

Portion 12 of the farm Koornfontein 27 IS

1.4.3 Magisterial District & Regional Services Council

Middelburg, Mpumalanga

District Municipality: Nkangala District Municipality

Local Municipality: Steve Tshwete Local Municipality

1.4.4 Direction and Distance to Nearest Towns

Table 1: Direction and Distance to Nearest Towns.

TOWN	DIRECTION	DISTANCE (KM)
Middelburg	North East	52 km
Witbank	North West	25 km
Bethal	South	40 km
Kriel	South West	35 km

1.4.5 Land Tenure of Immediate and Adjacent Land

Land tenure for the properties covered by the proposed Hope No. 4 Seam project is indicated on Figure 2 and described in Table 2. The land on which the proposed project will be undertaken is owned by Anglo Operations Proprietary Limited and a number of private farmers. Land use within the proposed project areas and immediately adjacent to the proposed project areas include agricultural activities (crop cultivation, grazing and vacant land), mining (underground workings and associated infrastructure), residential (old and demolished farmsteads, existing farmsteads, existing and demolished mine villages and informal settlements), Industrial (Eskom substations) and vacant land with no specific land use. Table 3 gives details of the landowners within the proposed Hope No. 4 Seam project area.

Table 2: Schedule of properties listing surface ownership within Hope No. 4 Seam Project Area

FARM NAME AND NUMBER	21 DIGIT SURVEYOR GENERAL CODE	DESCRIPTION OF SUB-DIVISION	SURFACE OWNER
HAASFONTEIN 28 IS	T0IS0000000002800027	1) Portion 27	Rudolf Schoeman Landgoed
WILMANSRUST 47 IS	T0IS0000000004700006	1) Portion 6	Anglo Operations (Pty) Limited
WILMANSRUST 47 IS	T0IS0000000004700007	2) Portion 7	Anglo Operations (Pty) Limited
WILMANSRUST 47 IS	T0IS0000000004700010	3) Portion 10	W.A De Klerk Familietrust
WILMANSRUST 47 IS	T0IS0000000004700011	4) Portion 11	W.A De Klerk Familietrust
GOEDEHOOP 46 IS	T0IS 0000000004600000	1) R.E. of farm	Anglo Operations (Pty) Limited
GOEDEHOOP 46 IS	T0IS 0000000004600001	2) Portion 1	D.M Erasmus
GOEDEHOOP 46 IS	T0IS 0000000004600002	3) Portion 2	Anglo Operations (Pty) Limited

FARM NAME AND NUMBER	21 DIGIT SURVEYOR GENERAL CODE	DESCRIPTION OF SUB-DIVISION	SURFACE OWNER
GOEDEHOOP 46 IS	T0IS 0000000004600003	4) Portion 3	Anglo Operations (Pty) Limited
GOEDEHOOP 46 IS	T0IS 0000000004600004	5) Portion 4	P.J. Honeyborne
GOEDEHOOP 46 IS	T0IS 0000000004600005	6) Portion 5	Anglo Operations (Pty) Limited
GOEDEHOOP 46 IS	T0IS 0000000004600006	7) Portion 6	Jacob Harmse Trust
GOEDEHOOP 46 IS	T0IS 0000000004600007	8) Portion 7	J.J.J Harmse Trust
GOEDEHOOP 46 IS	T0IS 0000000004600008	9) Portion 8	Anglo Operations (Pty) Limited
GOEDEHOOP 46 IS	T0IS 0000000004600009	10) Portion 9*	Anglo Operations (Pty) Limited
KOORNFONTEIN 27 IS	T0IS 0000000002700012	1) Portion 12	Anglo Operations (Pty) Limited
BULTFONTEIN 187 IS	T0IS 00000000187 00001	1) Portion 1	WA Trust
BULTFONTEIN 187 IS	T0IS 0000000018700002	2) Portion 2	W.A De Klerk Familietrust
GELUK 26 IS	T0IS 00000000026 00007	Portion 7	J.D.M. De Klerk
KOMATI POWER STATION 56 IS	T0IS 00000000056 00000	Remaining Extent	Eskom Holdings

Table 3: Details of the proposed project's immediate and adjacent property owners

FARM	PORTION	SURFACE OWNER	CONTACT PERSON	CONTACT NUMBER	E-MAIL ADDRESS	DIRECT / ADJACENT
Goedehoop 46 IS	0	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Goedehoop 46 IS	1	Dorothy Maria Erasmus	Elardus Erasmus	082 388 3108	islardu@telkomsa.net	Direct & Adjacent
Goedehoop 46 IS	2	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Goedehoop 46 IS	3	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Goedehoop 46 IS	4	Petrus Johannes Honeyborne	Pieter Honeyborne	082 388 3220	appeldoring@vodamail.co.za	Direct & Adjacent
Goedehoop 46 IS	5	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Goedehoop 46 IS	6	Jaco Harmse Trust	Jaco Harmse	082 388 3077	No e-mail	Direct & Adjacent
Goedehoop 46 IS	7	J J J Harmse Trust	Jaco Harmse	082 388 3077	No e-mail	Direct & Adjacent
Goedehoop 46 IS	8	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct
Goedehoop 46 IS	9	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Koornfontein 27 IS	12	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Geluk 26 IS	7	Johanna Dina Maria de Klerk	WA. de Klerk	082 413 3820	wadeklerk@mweb.co.za	Direct & Adjacent
Bultfontein 187 IS	1	W A Trust	WA. de Klerk	082 413 3820	wadeklerk@mweb.co.za	Direct & Adjacent
Bultfontein 187 IS	2	W A De Klerk Familie Trust	WA. de Klerk	082 413 3820	wadeklerk@mweb.co.za	Direct & Adjacent

FARM	PORTION	SURFACE OWNER	CONTACT PERSON	CONTACT NUMBER	E-MAIL ADDRESS	DIRECT / ADJACENT
Wilmansrust 47 IS	6	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Wilmansrust 47 IS	7	Anglo Operations (Pty) Ltd	Dawie Smit	+27 11 6382316	dawie.smit@angloamerican.com	Direct & Adjacent
Wilmansrust 47 IS	10	W A De Klerk Familie Trust	WA. de Klerk	082 413 3820	wadeklerk@mweb.co.za	Direct & Adjacent
Wilmansrust 47 IS	11	W A De Klerk Familie Trust	WA. de Klerk	082 413 3820	wadeklerk@mweb.co.za	Direct & Adjacent
Haasfontein 28 IS	27	Isabel Schoeman Landgoed cc	Schoeman Rudolph	082 388 3105	csmpy@lantic.net	Direct & Adjacent
Komati Power Station 56 IS	RE	Eskom Holdings	Tinky Höll	011 800 4443	Hollk@eskom.co.za	Direct & Adjacent

1.4.6 Locality Plan

Refer to Figure 3 for the locality plan of Goedehoop Colliery

1.4.7 Servitudes

The table below describes all surface servitudes listed within Goedehoop Colliery Mining Right area.

Table 4: Table of Surface Servitudes within Hope No. 4 Seam Project Area

FARM	PORTION	SERVITUDE
KOORNFONTEIN 27 IS	Portion 12	Railway Track and Blinkpan Station
GOEDEHOOP 46 IS	Portion 1	Block 8 overland conveyor
GOEDEHOOP 46 IS	Portion 4	Block 8 overland conveyor
GELUK 26 IS	Portion 7	Nooitgedacht dam Water Pipe Line
KOMATI POWER STATION 56 IS	RE of the farm	Nooitgedacht dam Water Pipe Line
WILMANSRUST 47 IS	Portion 7	Block 15 D/C Shaft

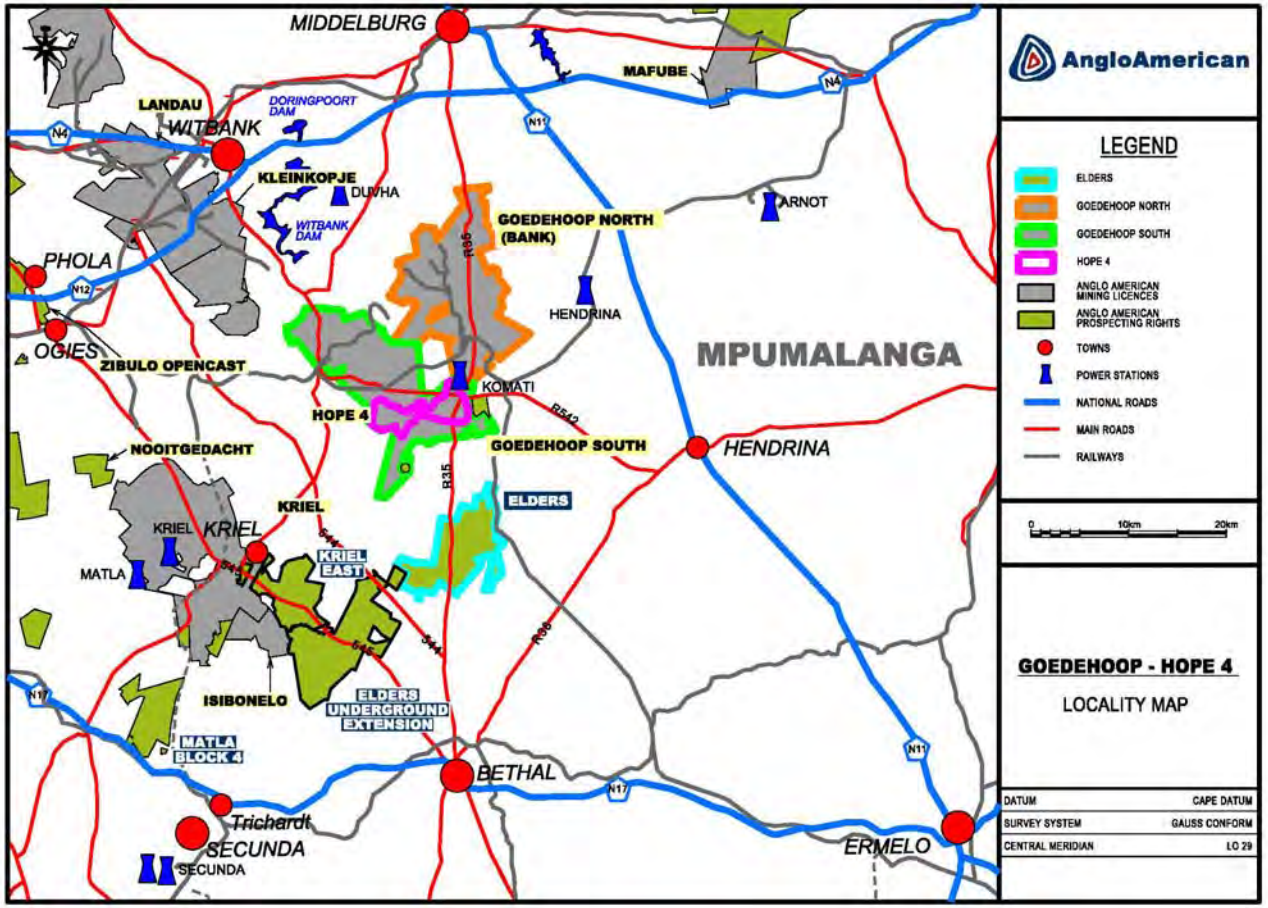


Figure 1: Regional Setting for Goedehoop South Colliery

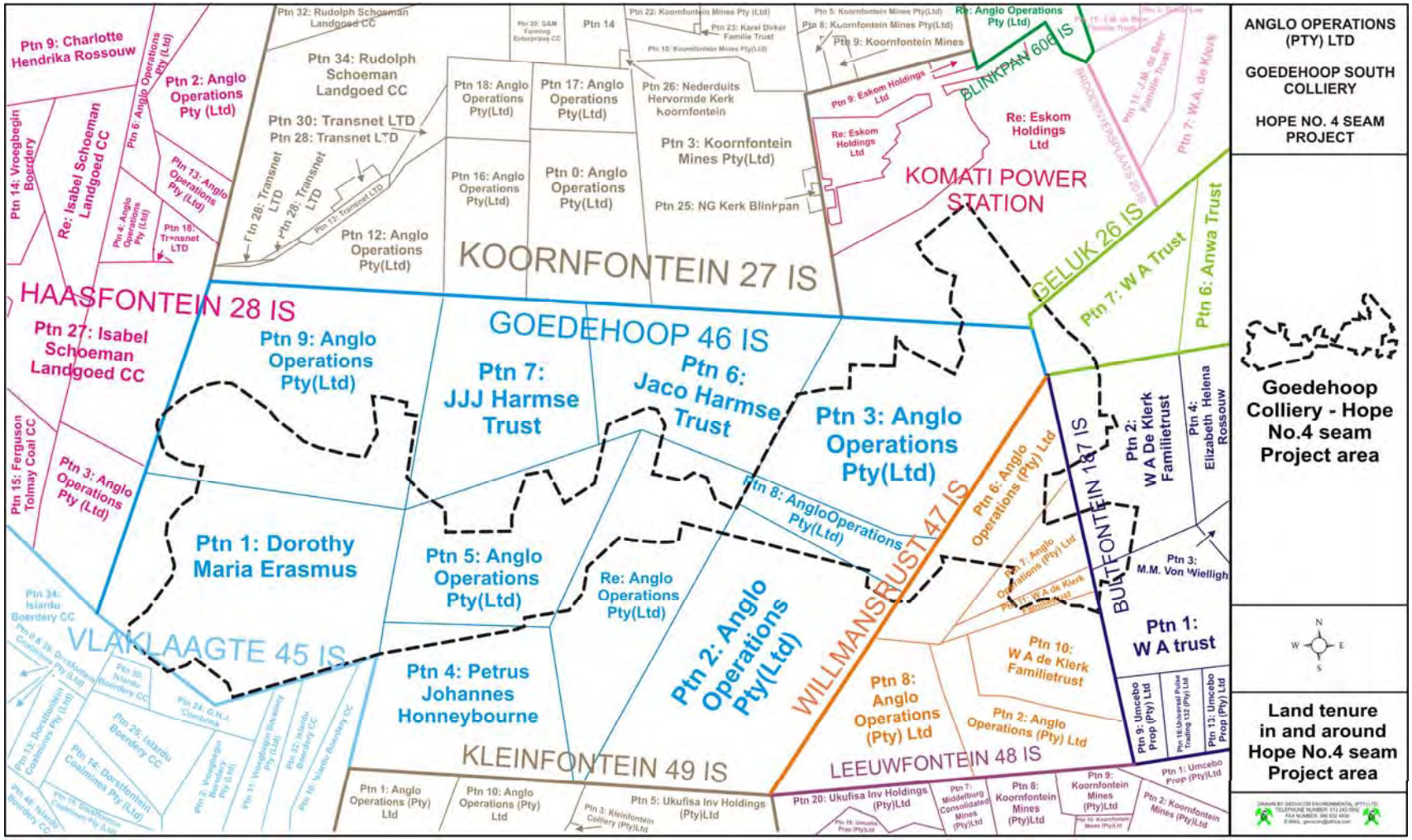


Figure 2: Land Tenure Plan for the Hope No. 4 Seam Project Area

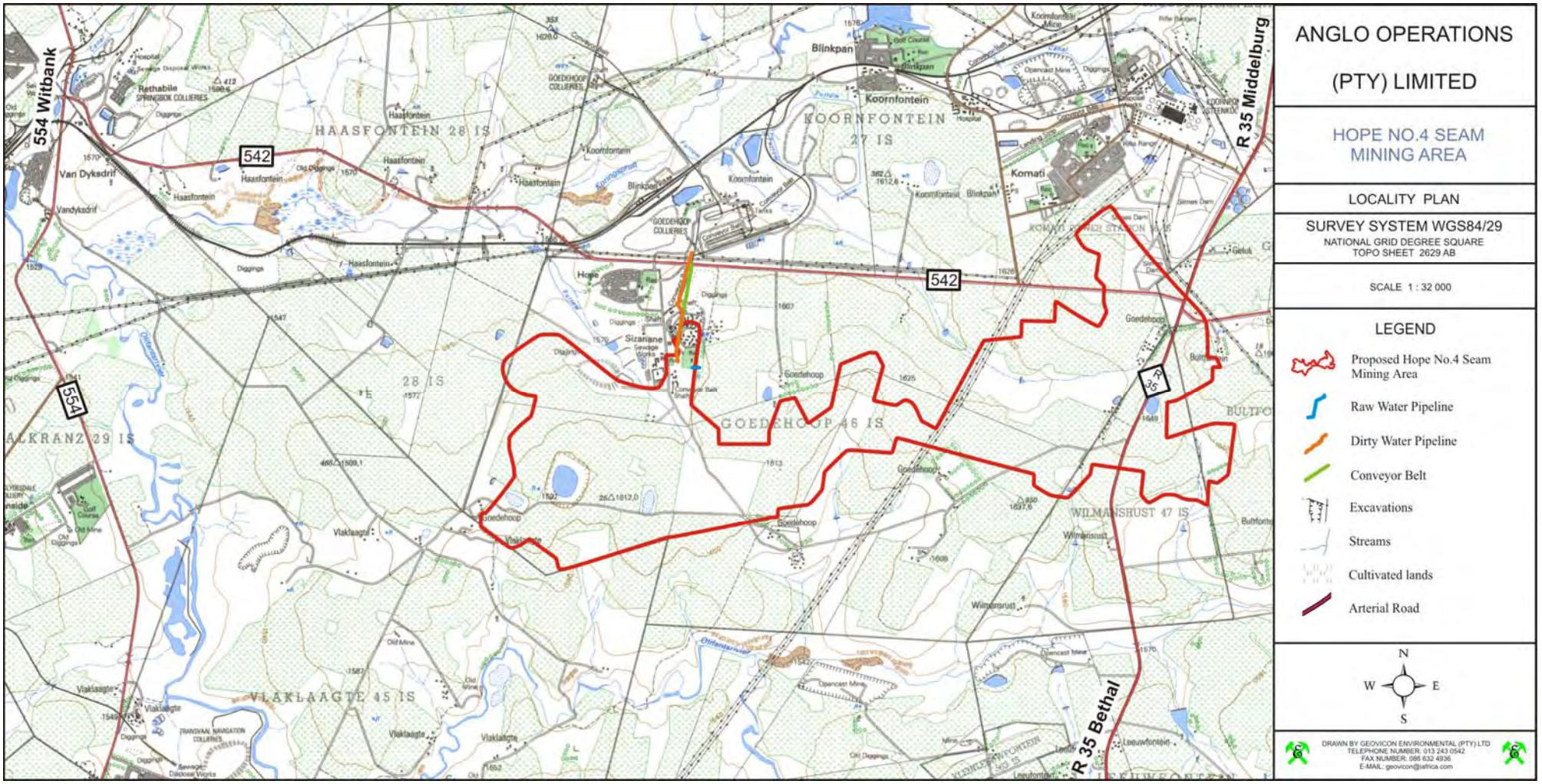


Figure 3: Locality Plan

SECTION TWO

Description of the Scope of the proposed Project

2 DESCRIPTION OF THE SCOPE OF THE PROPOSED PROJECT

2.1 LISTED ACTIVITIES AND SPECIFIED ACTIVITIES

Anglo Operations (Pty) Limited proposes to extend its underground mining operations at its Goedehoop Colliery on several farms within the Middelburg magisterial district, namely the Hope No. 4 Seam Project. The proposed project entails mining of the No. 4 coal seam underground reserves by conventional bord and pillar underground mining methods. Access to the workings will be via an access incline shaft and box cut to be established on site. The proposed Hope No. 4 Seam Project occurs to the southeast of the Goedehoop South Colliery mining right area.

Before the proposed Hope No. 4 Seam project can be commenced with, an environmental authorisation must be obtained by Anglo Operations (Pty) Limited. In view the above, Anglo Operations (Pty) Limited has applied for an environmental authorisation for listed activities within the proposed Hope No. 4 Seam project area at Goedehoop Colliery. This section will indicate the activities that were included in this environmental authorisation application. Table 5 is compiled as prescribed by the DMR EIR and EMPr template and reflect all Hope No. 4 Seam project activities applied for.

2.2 DESCRIPTION OF THE PROPOSED HOPE NO. 4 SEAM PROJECT

Goedehoop Colliery, a Division of Anglo Operations (Pty) Limited, is an operational mine located 25 km south east of Witbank in the Mpumalanga Province. Goedehoop Colliery is comprised of three sections i.e. Hope, Vlaklaagte and Springbok sections. Anglo Operations (Pty) Limited proposes to further extend its underground mining operations at its Goedehoop South Colliery (Hope Section) on several portions of the farms Goedehoop 46 IS, Koornfontein 27 IS, Komati Power Station 56 IS, Wilmansrust 47 IS, Bultfontein 187 IS, Geluk 26 IS and Haasfontein 28 IS, namely the Hope No. 4 Seam Project. The proposed project entails mining of the No. 4 coal seam underground reserves by conventional bord and pillar underground mining methods. Access to the workings will be by an access shaft to be constructed on site. The proposed Hope No. 4 Seam Project occurs to the southeast of Goedehoop South Colliery mining right area.

Table 5: Proposed Hope No. 4 Seam and Goedehoop Colliery Activities

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
PROPOSED HOPE NO. 4 SEAM PROJECT LISTED AND SPECIFIC ACTIVITIES			
NATIONAL ENVIRONMENTAL MANAGEMENT ACT			
The construction of a dirty water pipeline and an overland conveyor belt within 32 meters from the edge of a seepage wetland. The dirty water pipeline will be used for the transportation of dirty water from the workings dirty water sump to the existing return water dam and the conveyor belt will be used to transport runoff mine coal from the access shaft to the existing main runoff mine (R.O.M) coal stockpiling area. The re-routing of a power line will be undertaken within a temporary wetland of the Hope Spruit.	The dirty water pipeline will cover an area of approximately 178 m^2. The overland conveyor belt infrastructure will cover an area of approximately 1161 m^2. The route of the new power line will cover an area of approximately 336 m^2.	Activity 12 of Listing Notice 1: The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 1200 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; (xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs-	GNR 983

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		(a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;- excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	
The excavation, removal and moving of soil and rock of more than five cubic meters from a wetland for the construction of the dirty water pipeline, an overland conveyor belt infrastructure (including the service road) and re-routing of a power line. The dirty water pipeline and overland conveyor belt will be used for the transportation of dirty water and run off mine coal from the access shaft, respectively.	The dirty water pipeline excavation, removal and moving of wetland soils will cover an area of approximately 114 m^2. The overland conveyor belt excavation, removing and moving of wetland soils will cover an area of approximately 693 m^2. The power line re-routing excavation, removing and moving of wetland soils will cover an area of approximately 336 m^2. *More than 5 m^3 of soils will be removed during the construction of the above-mentioned infrastructure.*	Activity 19 of Listing Notice 1: The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; (ii) the seashore; or (iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater- but excluding where such infilling, depositing, dredging, excavation,	GNR 983

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or falls within the ambit of activity 21 in this Notice, in which case that activity applies.	
Decommissioning of the borrow pits constructed for the proposed Hope No. 4 Seam project in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	The extent of the borrow pits to be determined, which will not be more than 5 hectares each.	Activity 22 of Listing Notice 1: The decommissioning of any activity requiring - (i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002); or (ii) a prospecting right, mining right, mining permit, production right or exploration right, where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure.	GNR 983
The construction and operation of access roads for accessing the proposed borrow pit areas.	The extent of the access roads to be determined.	Activity 24 of Listing Notice 1: The development of- (i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding- (a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or (b) roads where the entire road falls within an urban area.	GNR 983

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
The clearance of indigenous vegetation for the development of the proposed Hope No. 4 Seam project shaft, borrow pits and associated infrastructure, which will be used for accessing the proposed Hope No. 4 Seam underground mining area.	The land to be cleared of indigenous vegetation for the development of the shaft, borrow pits and associated infrastructure will cover an area of approximately 47 hectares. The extent of the borrow pit areas to be determined and will not exceed 5 hectares, each.	Activity 27 of Listing Notice 1: The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	GNR 983
The decommissioning of existing infrastructure (New Town Village) to be used as infill material during the construction phase of the proposed Hope No. 4 Seam project.	The extent of the area to be decommissioned to be determined	Activity 31 of Listing Notice 1: The decommissioning of existing facilities, structures or infrastructure for- (i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (iii) any development and related operation activity or activities and expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (iv) any phased activity or activities for development and related operation activity or expansion or related operation activities listed in this Notice or Listing Notice 3 of 2014; or (v) any activity regardless the time the activity was commenced with, where such activity: (a) is similarly listed to an activity in (i), (ii), (iii), or (iv) above; and (b) is still in operation or development is still in progress; excluding where-	GNR 983

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		(aa) activity 22 of this notice applies; or (bb) the decommissioning is covered by part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies.	
The change and upgrading of the existing batching plant to include a facility for the storage of underground backfilling mixture material. This material used as backfill may include fly ash, coal discard, discard slump and a mixture of the above-mentioned material with concrete. The activity will require a water use licence for the storage of the material that may have detrimental impact on the water resources.	The fly ash storage area will cover an area of 0.50 hectares.	Activity 34 of Listing Notice 1: The expansion or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution, excluding- (i) where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (ii) the expansion of or changes to existing facilities for the treatment of effluent, wastewater or sewage where the capacity will be increased by less than 15 000 cubic metres per day.	GNR 983
The development of an overburden stockpiling area, septic tank, dirty water collection sump, fly ash containment facility and the backfilling of the mined out No. 2 coal seam with material that may potentially have detrimental impacts on the groundwater. The above activities will require an integrated water use licence in terms of the National Water Act, 1998 (Act 36 of 1998).	The activities applied for will cover an area of approximately 47 hectares	Activity 6 of Listing Notice 2: The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding- (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management:	GNR 984

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		Waste Act, 2008 applies; or (iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.	
The development of infrastructure for the crushing & screening of ROM coal for easy transportation along the conveyor belt. The development of infrastructure for the crushing and screening of rock material to be used for the construction of access and service roads.	The coal crushing and screening facility will cover an area of approximately 0.05 hectares. The rock crushing and screening facility will cover an area of approximately 1 hectares.	Activity 21 of Listing Notice 2: Any activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing but excluding the smelting, beneficiation, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.	GNR 984
The development of access and haul roads within the proposed Hope No. 4 seam project shaft complex, including roads to the borrow pits.	The access and haul roads within the shaft complex, which will have a maximum width of seven (7) meters, will be constructed. These roads will cover an area of approximately 1.5 hectares. Extent of the roads to be used for accessing the borrow pits to be determined.	Activity 4 of Listing Notice 3: The development of a road wider than 4 metres with a reserve less than 13,5 metres. (a) <u>In Free State, Limpopo, Mpumalanga and Northern Cape provinces:</u> (i) In an estuary; (ii) Outside urban areas in: (aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas as identified in systematic biodiversity	GNR 985

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas.; or (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or (iii) In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or (cc) Seawards of the development setback line or within urban protected areas.	
Clearance of indigenous vegetation for the construction of the dirty water pipeline, raw water pipeline, overland conveyor belts (with service roads), access shaft/box cut complex and the borrow pits with associated access roads.	The land to be cleared of indigenous vegetation will cover an area of approximately 47 hectares. Extent of borrow pit roads to be determined, but will not be more than 5 hectares, each.	Activity 12 of Listing Notice 3: The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. <u>(c) in Mpumalanga</u> (i) within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. within critically biodiversity area identified in bioregional plans; iii. within the littoral active zone or 100 metres inland from high water mark of the sea or an estuarine functional zone; whichever	GNR 985

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		distance is the greater, excluding where such removal will occur behind the development setback line on erven in urban areas iv. on land, where, at the time of the coming into effect of this Notice or thereafter such land was zone open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA.	
The construction of the dirty water pipeline, overland conveyor belts (with service roads) and new (re-routed) power line within 32 meters of a wetland.	The construction of the pipeline and overland conveyor belt infrastructure will cover an area of approximately 1339 m^2. The re-routed power line will cover approximately 336 m^2.	Activity 14 of Listing Notice 3: The development of- (i) canals exceeding 10 square metres in size ; (ii) channels exceeding 10 square metres in size; (iii) bridges exceeding 10 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area exceeds 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size; (vi) bulk storm water outlet structures exceeding 10 square metres in size; (vii) marinas exceeding 10 square metres in size; (viii) jetties exceeding 10 square metres in size; (ix) slipways exceeding 10 square metres in size; (x) buildings exceeding 10 square metres in size; (xi) boardwalks exceeding 10 square metres in size; or (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs (a) within a watercourse;	GNR 985

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		(b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. <u>(a) In Free State, Limpopo, Mpumalanga and Northern Cape:</u> i. In an estuary; ii. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an International Convention; (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (gg) Core areas in biosphere reserves; (hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; (ii) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or	

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
		(iii) In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, zoned for a conservation purpose; or (cc) Areas seawards of the development setback line.	
The extraction of a mineral resource (No. 4 coal seam), including associated activities by means of underground mining methods.	The proposed underground mining covers an area of approximately 1800 hectares.	Not applicable	Not applicable
The construction and operation of the Hope No. 4 Seam project access shaft/box cut	The access shaft complex, which include the shaft ramp, box cut, soil berms around the shaft and access shaft portals will cover an area of approximately 2.5 hectares.	Not applicable	Not applicable
The construction and operation of the dirty water collection sump at the shaft box cut.	The capacity of the dirty water collection sump has been designed to cover approximately 0.1 hectares.	Not applicable	Not applicable
The construction of storm water management structures (berms, channels and trenches) at the Hope No. 4 Seam project access shaft complex.	The storm water management structures will cover an area of approximately 0.12 hectares.	Not applicable	Not applicable
The construction and operation of water supply infrastructure (pipelines, service and fire water tanks and pump stations) for the water supply to the access shaft and pumping of water from the access shaft area to the Goedehoop Colliery return water dam.	The area used for the service and fire water tanks and associated pumping infrastructure will cover an area of approximately 0.4 hectares.	Not applicable	Not applicable

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
The construction and operation of power supply infrastructure (power lines, arrestor beds, transformer beds and pcf yard) for the supply of electricity to the shaft complex.	The area used for the power supply infrastructure will cover an area of approximately 0.36 hectares.	Not applicable	Not applicable
The construction of an overland conveyor belt infrastructure for the conveyance of run off mine coal from the shaft to the existing Goedehoop Colliery coal stockpiling area. The conveyor belt will be equipped with a coal crushing and screening unit.	The proposed overland conveyor belt will cover an area approximately 9026 m^2.	Not applicable	Not applicable
The construction of the ventilation facilities at the Hope No 4 Seam project area.	The ventilation facilities will cover an area of approximately 0.07 hectares. Note that these facilities will be installed within the shaft box cut hence will form part of the box cut area.	Not applicable	Not applicable
The construction of access control infrastructure (security fence, livestock fence and a guard house). The guard house will be equipped with a septic/conservancy tank for sewage handling.	The area will not cover more than 0.008 hectares. The security fence will cover a distance of 3451 meters.	Not applicable	Not applicable
The construction of access and haul roads for access to the Hope No. 4 Seam project access shaft complex.	The road has been designed by a civil engineer and will cover an area of approximately 1.5 hectares.	Not applicable	Not applicable
The construction and operation of the stone dust silo, which will be used for the storage of stone dust to be used during the proposed underground mining.	The stone dust silo will cover an area of approximately 0.1 hectares.	Not applicable	Not applicable
The establishment of borrow pits	The borrow pits will not cover an area beyond 20 hectares.	A Mining permit application will be submitted to the Department of Mineral Resources for the proposed borrow pits	Not applicable

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
The establishment of underground backfilling sites for the backfilling of the mined out No. 2 coal areas. This will include all infrastructure necessary for the backfilling of the underground workings.	The five proposed sites (Block 29, 30, 34, 51B, 34 ALT) for the underground backfilling will cover an area of approximately 41 hectares.	Not applicable	Not applicable
The re-instating of the existing batching plant site. This will include the refurbishment of the site to include a batching plant and raw material storage facilities. The storage facilities will include the facility for the storage of material to be used during the mixture of the underground backfilling material. This material used as backfill may include fly ash, coal discard, discard slump and a mixture of the above-mentioned material with concrete.	The batching plant site covers an area of approximately 0.18 hectares. The fly ash storage facility within the batching plant site will cover an area of approximately 0.025 hectares.	Not applicable	Not applicable
NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT			
The decommissioning of existing infrastructure to be used as infill material during the construction phase.	The volumes of material to be used and extent of the construction area where the material will be used will be determined. Note however that the threshold of 25 000 tons indicated in the regulations will be exceeded.	Activity 9 under category A: The disposal of inert waste to land in excess of 25 tons but not exceeding 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation.	GNR 921
The establishment and maintenance of the overburden stockpile. The backfilling of underground workings with material that may have a detrimental effect on the groundwater quality. This material used as backfill may include fly ash, coal discard, discard slump and a mixture of the above-mentioned material with concrete.	The overburden stockpiling area covers an area of not more than 8 hectares. An area of approximately 41hectares will be used for the underground backfilling of the mined No. 2 coal seam.	Activity 7 under category B: Disposal of any quantity of hazardous waste on land (This activity will be applicable if it can be proven that the material applied is considered as hazardous waste.)	GNR 921

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
The establishment and maintenance of the overburden stockpile. The backfilling of underground workings with material that may have a detrimental effect on the groundwater quality. This material used as backfill may include fly ash, coal discard, discard slump and a mixture of the above-mentioned material with concrete.	The overburden stockpiling area covers an area of not more than 8 hectares. An area of approximately 41 hectares will used for the underground backfilling of the mined No. 2 coal seam.	Activity 9 under category B: Disposal of inert waste on land in access of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation. (This activity will be applicable if it can be proven that the material applied is considered inert.)	GNR 921
The establishment and maintenance of the overburden stockpile. The backfilling of underground workings with material that may have detrimental effects on the groundwater quality. This material used as backfill may include the fly ash, coal discards, discard slump and the mixture of the above-mentioned material with concrete mix.	The overburden stockpiling area covers an area of not more than 8 hectares. An area of approximately 41 hectares will used for the underground backfilling of the mined No. 2 coal seam.	Activity 11 under category B: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	GNR 633
The establishment and maintenance of the fly ash/coal discards/discards slump storage facility within the batching plant site.	The storage facility will cover an area of approximately 0.025 hectares.	Activity 2 under Category C: The storage of hazardous waste at a facility that has the capacity to store in excess of 80m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.	GNR 921

2.2.1 Target Mineral

2.2.1.1 Mineral Deposit

Bituminous coal found in the No. 4 coal seam of the Witbank Coal field.

2.2.1.2 Mine Product

Coal from the No. 4 seam horizon will be mined at the proposed Hope No. 4 Seam project. The mined coal will be beneficiated at the existing Goedehoop Colliery's coal washing plant. The washed coal from the 4 seam horizon produces coal for the export market.

2.2.1.3 Estimated Coal Reserves

Estimated run off mine coal reserve within the proposed Hope No. 4 Seam project is approximately 24.1 Mt.

2.2.2 Mining Method Used at the Hope No. 4 Seam Project

The proposed Hope No. 4 Seam project area will be mined using the underground bord and pillar mining methods, using continuous miners ("CMs"). In the bord and pillar mining method, parallel roads will be developed in the mining direction. Perpendicular roads, called splits, will be developed at predetermined intervals to the parallel roads. These roads interlink, creating pillars. The roads that are mined concurrently will be determined by the size of the pillars required to support the overburden above the coal seam and the length of the production equipment's trailing cables. The pillar size is determined by the safety factor formula that results in the pillar strength divided by the pillar load (mass of the overburden carried by the pillar). The safety factors are estimated using the Salamon method. Based on the geology of the area and the experience gained from mining within the same area, it was determined that the average safety factor will be 1.6. This will be sufficient to ensure long-term stability of the strata overlying the target coal seam.

2.2.2.1 Planned Production Rate

Based on the determined coal reserves within the Hope No. 4 Seam project area, on average 1.9 million tons of coal will be mined annually.

2.2.2.2 Planned Life of Mine

The current estimated life of the proposed Hope No. 4 Seam project is 19 years.

2.3 Hope No. 4 Seam Project Surface Infrastructure Description

Major existing and anticipated proposed surface infrastructure for the proposed Hope No. 4 Seam project is shown on the surface layout plan attached as GOEDE/HOPE4/01 under plans.

Below is the description of the surface infrastructure for the proposed Hope No. 4 Seam project.

2.3.1 Access Shaft/Box cut

Assessment of the coal reserves to be exploited through the proposed Hope No. 4 Seam project has indicated that a new access shaft development will be required to access the target coal seam. Design parameters compliant to the Anglo Operations (Pty) Limited's design criteria will be used for the excavation of the incline shaft.

2.3.2 Access Roads

There are various main & minor roads passing over the proposed Hope No. 4 Seam project area. Some of these roads will be used to access the proposed Hope No. 4 Seam project area. All existing and new roads to be used for the proposed project are described below.

i) Two existing roads, each approximately 5 km long, leading off the R542. These roads link the mine surface infrastructure, and link the mine to the main road (R542). Both roads are tarred and have road markings. These roads will be used as access roads for the proposed Hope No. 4 Seam project. During the construction phase, whilst the overland conveyor is being constructed, these roads will be used for the transportation of the run off mine coal from the shaft to the existing Goedehoop Colliery main run off mine coal stockpiling area.

ii) An existing access road connects the existing Hope Shaft area to the above-mentioned access road. This is a tarred access road and will be used for accessing the Hope Shaft administration buildings, lamp room and workshop complex that will be used to service the proposed Hope No. 4 Seam project.

iii) A new access road will be constructed to connect to the above-mentioned access road at the existing Hope Shaft. The new road will be constructed to be approximately seven meters wide and will be a surfaced road. This road runs past the existing administration building and lamp room, proposed stone dust silo, over the overland conveyor belts up to the bottom of the break test ramp. From the break test ramp the road will continue down the incline to the shaft portal.

iv) Internal six meter wide gravel roads will be constructed at the proposed shaft complex. These include roads to the substation, overburden stockpiling area, brake test ramp by-pass, CM/fire reservoirs and CM off-loading area.

v) A five meter wide gravel maintenance road will be constructed along the overland conveyor belt terminating on either side of the access road.

vi) Access roads will be required should borrow pits be required for sourcing material to be used during the construction of the shaft complex.

2.3.3 Power line Infrastructure

Below is the description of the power lines (existing and new) that will be used for the supply of electricity for the proposed Hope No. 4 Seam project.

i) A power line will be constructed to connect the Hope No. 4 Seam substation to the existing Hope Shaft substation. Positions of this power line are indicated in the Hope No. 4 Seam project surface infrastructure plan.

ii) The existing power line that crosses the proposed shaft ramp will be re-routed around the southern boundary of the shaft complex.

2.3.4 Water Supply Infrastructure

Various water pipelines used by Goedehoop Colliery pass through the proposed Hope No. 4 Seam project area. These pipelines include both the raw and potable water pipelines. Goedehoop Colliery abstracts its raw water from the Komati Power Station and from the Komati Usutu Government water supply schemes. Raw water is pumped directly from both Komati supply schemes and temporarily stored in raw water dams. Water from the raw water dams is either supplied to several sections at the mine as process water or treated at the individual water treatment plants and supplied to the sections of the mine as potable water.

Water will be required at the proposed Hope No. 4 Seam project area for the purpose of supplying service water, potable water and fire protection water. Service water will be required for the operation of continuous miners, dust suppression and for wash down purposes. Potable water supply will be required for domestic water use within the administration buildings, workshops and underground workings. Fire water will be required for fire fighting purposes. Below is the description of how water will be supplied to the proposed Hope No. 4 Seam project for the above-mentioned requirements.

2.3.4.1 Service Water Supply

A new raw water pipeline will be constructed to connect to the existing raw water pipeline that supplies raw water to Block 20 shaft. This new raw water pipeline will supply raw water to the service water tanks at the Hope No. 4 Seam shaft complex. Water from the service water tank will supply water to the dust suppression reticulation system and areas where wash-down is required. Water from the service water tank will also be supplied to the underground workings for operation of continuous miners. Service water will be stored in a 700 m^3 service water tank, which will be replenished with raw water from the Block 20 raw water supply line.

<u>Continuous Miners Water Supply</u>

Water to the continuous miners will be pumped via pipelines supported on a pipe rack down the incline. The pipe line will be connected to a pump station containing two electrical pumps (one duty and one standby). A jockey pump will sustain the reticulation under pressure during low demands on the service reticulation.

<u>Dust Suppression and Wash Down Water Supply</u>

Water from the service tank will be supplied via pipelines to all dust suppression and wash down points at the conveyor belts. Standpipes will be provided for wash down purposes at suitable locations.

On bowser point is sited close to the start of the incline shaft. Bowser will use this pint to fill up water for dust suppression on the gravel roads. The bowser point will be supplied with water from the service water tank.

2.3.4.2 Potable Water Supply

Goedehoop Colliery processes its raw water stored at the raw water dam at the Hope Water Treatment Plant. Potable water from the Hope Water Treatment Plant is then fed to appropriate sections, which include the existing Hope Shaft complex, Hope village and community services (i.e. the Hope Clinic). The existing potable water supply infrastructure to the existing Hope Shaft complex will be used for the supply of potable water at the proposed Hope No. 4 Seam project area. Elevated water tanks will be used for the storage and supply of potable water to the Hope No. 4 Seam project

complex. Where pipelines are not available (guard house and underground workings), potable water will be transported in suitable containers.

2.3.4.3 Fire Water Supply

The above-mentioned new raw water pipeline that will be connected to the existing raw water pipeline supplying the raw water to Block 20 shaft will supply raw water to the fire water tan at Hope No. 4 Seam shaft complex. Water from the fire water tank will be supplied to all surface infrastructure and underground workings for fire protection purposes

A 500 m^3 storage tank, which will be divided into two compartments and will have a pumping system, will be used for the supply of fire water at the Hope No. 4 Seam shaft complex. The fire water reticulation system will comprise of pipelines connected to the underground workings and surface infrastructure, including all buildings on terraces and the conveyor belt.

2.3.5 Overland Conveyor Belt Infrastructure

The proposed Hope No. 4 Seam project access shaft will be equipped with a new conveyor belt for the transportation of run off mine coal from the underground workings to the Goedehoop Colliery main run off coal stockpiles. The conveyor belt will be routed from the underground workings to the shaft box cut. The belt will thereafter be routed along the shaft ramp into a transfer point that will be fitted with a coal crushing and screening plant. From the transfer point the belt will feed directly to an existing coal silo.

2.3.6 Crushing and Screening Plant

Crushing and screening plants will be installed at the Hope No. 4 Seam overland conveyor belt transfer point. The crushing and screening plant will be used for the sizing of the run off mine coal from the underground workings. The purpose of sizing the run off mine coal will be for easy transportation of the run off mine coal along the overland conveyor belt to the existing coal silo.

In addition to the above-mentioned crushing and screening plant, a mobile crusher will be used for the crushing of stone from the overburden material removed from the box cut. The crushed stone material will be used during the construction roads and terraces at the Hope No. 4 Seam project complex. This plant will be located within the overburden stockpile area.

2.3.7 Workshops and Buildings

The existing Hope Shaft complex is equipped with an administration building, lamp room and workshop facility. These facilities do not currently have any surface implications except for the generation of waste, which is disposed of in the surface waste disposal system. An existing 27 000 Litre diesel storage tank is located at the Hope section workshops (on surface). The existing workshop will be used for repairs to machinery, vehicles and materials. Appropriate oil and contaminated water and waste management systems are also in place. Where necessary, the existing infrastructure will be replaced, refurbished and upgraded to ensure their ability to cater for the proposed Hope No. 4 Seam project requirements.

2.3.8 Waste Management

According to NEMWA, waste is defined as any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance,

material or object can be re-used, recycled or recovered and includes all waste as defined in Schedule 3 of NEMWA. Schedule 3 of NEMWA further divides waste into hazardous and general waste. Both hazardous and general waste will be generated from the Hope No. 4 Seam project. Identification of waste to be generated from the Hope No. 4 Seam project was conducted in terms of Schedule 3 of NEMWA and all identified waste and their management is described below.

2.3.8.1 Waste Identification

Hazardous Waste

Hazardous waste to be generated includes mineral residue stockpiles and deposits and business waste. Business waste will include waste from a thermal process (not generated on site), oil waste, waste of liquid fuels, unspecified waste, construction waste and waste from the waste management facilities.

Mineral residue stockpiles will include overburden material removed during the construction of the shaft box cut, mineral waste (muds and drilling chips) generated during the drilling of the backfilling boreholes and coal discard to be stored at the batching plant site.

Regarding waste from a thermal process, fly ash generated from a nearby power station will be transported and stored at the batching plant site. This will be used as a constituent for the underground backfilling mixture.

Oil waste and waste of liquid fuels include used oils from mine machinery and vehicles and diesel/petrol waste. Oil waste will be generated from the existing workshops/infrastructure, proposed underground workings, new surface infrastructure.

Unspecified waste will include waste that may be generated from electrical substations and all discarded batteries.

Construction waste, where possible, will include all contaminated metals, soils and demolishing waste.

Waste from waste management facilities include sewage waste generated from the new and existing conservancy tanks and waste generated from the existing sewage treatment plant.

General Waste

General waste to be generated from the proposed project area includes building and demolishing waste, domestic waste and inert waste.

Building and demolishing waste will include the builders rubble to be generated during the demolishing of the mine village (New Town Village) buildings and building waste (concrete, bricks, tiles, ceramics, and scrap metal) generated during the construction of the new infrastructure. Waste under this category will also include any plastic, wood, glass etc.

Domestic waste will include old food, polystyrene, old stationary, garden waste, discarded PPE and old clothing.

Inert waste will include all uncontaminated builders' rubble that will be generated from the demolishing of old structures and from the construction of new infrastructure.

2.3.8.2 Waste Management Facilities

Solid Waste Management

In a bid to ensure that waste generated at Goedehoop Colliery is managed accordingly and in compliance with legal and other requirements, a Waste Management Procedure (Appendix 1) was compiled for the mine. This procedure will be revised to be in line with the requirements of NEMWA. Waste management at the Hope No. 4 Seam project will be conducted to be in compliance with the above mentioned procedure.

Goedehoop Colliery uses a contractor to transport general waste from the Hope Shaft complex to the Witbank, Middelburg and Kriel Municipal dumping sites for disposal. The existing Hope Shaft area is equipped with waste collection skips and paper recycling cages. All general waste excluding paper and cardboard are disposed of at the waste collection skips and the paper and cardboard are disposed of at the paper recycling cages. The waste is then transported to the solid waste disposal sites and the paper/cardboard waste is send for re-cycling in Middelburg.

Hazardous waste (defined under the mine's waste management procedure as material that will result in serious contamination and poisoning of the environment should it not be disposed of correctly) arising from the surface infrastructure at Goedehoop Colliery is collected in a different waste collection system and disposed of by a contractor at a registered hazardous waste site. Recyclable waste such as batteries, tyres, old conveyor belting, used oil drums and waste metal collected around the mine is transported to the Goedehoop Scrap Yard and sorted. The waste is then sold through the Goedehoop Colliery Stores Department to scrap and recycling companies.

Hazardous waste bins are stored on concrete floors and under roof. No hazardous waste is stored on site for a period longer than 90 days.

The above-mentioned waste management system and infrastructure will be used for the management of waste from the Hope No. 4 Seam project. Where possible, waste generated from the new infrastructure will either be stored temporarily before being transported to the above-mentioned existing waste management facilities or waste will be directly transported from the site to the existing mine waste management facilities.

Liquid Waste Management

Existing Hope Shaft workshop and office complexes, which are equipped with its own ablution facilities and a sewage treatment plant and a number of conservancy tanks will be used to service the Hope No. 4 Seam project.

A new conservancy tank will be used for handling sewage from the site guard house. The conservancy tank will be emptied on a regular basis by a competent waste collector. Once emptied, the removed sewage waste will be disposed at the nearest sewage treatment plant. Goedehoop Colliery operates a sewage treatment plant in close proximity to the proposed guard house i.e. the Hope Sewage Treatment plant.

A septic tank equipped with a French drain will be used for the collection and treatment of sewage waste generated from the underground working's ablution facilities.

Sewage Management will be conducted in compliance with the Goedehoop Colliery Sewage Management Standard Procedure and the mine's relevant water use license conditions.

2.3.9 Water Management

2.3.9.1 Dirty Water Management Facilities

Goedehoop Colliery operates on the strategy of maximising the utilisation of “dirty water” in the coal beneficiation process and has a policy of zero discharge of contaminated water. In order to achieve this goal, Goedehoop Colliery has a number of pollution control dams on the property. These are all inter linked by varying diameter pipe work and pump sizes in each section of the mine. The return water dam is central to all the dams as it collects dirty water from all the dams. Water from the return water dam is used as process water within the mine.

Dirty water generated from the Hope No. 4 Seam project will include mine affected seepage water from the underground workings and dirty run off water from the shaft box cut and ramp, conveyer belt transfer points, existing Hope Shaft complex and the batching plant site. Dirty water from the underground workings will be stored in underground storage dams and only pumped out when the dams are full. Water Diversion trenches and berms will be used for the collection of dirty run off water. Silt traps will be installed at the outlet of the storm water drains, which will be used for the removal of any silt collected and accumulated along the diversion drains. Collected silt will be emptied and disposed of at the existing mineral residue deposit on a regular basis.

The Hope No. 4 Seam shaft box cut will be equipped with a dirty water collection sump. The dirty water collection sump will be equipped with a silt trap and a drying bed. This facility will be used for the collection of dirty water runoff from the Hope No. 4 Seam shaft ramp and box cut area, Hope No. 4 Seam and Elders Colliery conveyor belt transfer points and existing batching plant site. Since the dirty water collection sump will be constructed on the floor of the shaft box cut, which is on hard rock, no lining will be installed on the sump floor and side walls. The sump has been designed to have a capacity of 2 200 m^3, which is enough to cater for the storm water runoff from the dirty water areas of the proposed project. The dirty water collection sump has also been designed to cater for water generated from the 1:100 year flood event.

A pipeline (dirty water pipeline) will be used to pump and convey water from the underground workings, water collected in the dirty water sump and runoff water for the workshops (wash bays). This pipeline has been designed to discharge the above-mentioned water to the existing Goedehoop Colliery return water dam via an existing diversion trench.

The existing Goedehoop Colliery return water dam has been designed to have a capacity for a 1:50 year flood event (with 0.8 m freeboard), which complies with GN704 stipulating a minimum capacity to contain (over and above the operating level) water from a 1:50 year rainfall event with a minimum 0.8 m freeboard. Assessment of the return water dam has however indicated that the dam will not have enough capacity to handle additional water from the Hope No. 4 seam project during flood events. Should a situation occur where the dam capacity is exceeded, additional water from the dam will either be pumped to the existing No. 2 seam underground workings or pumping of water from a section that will be decommissioned with the commissioning of the Hope No. 4 seam project will be stopped, which will create capacity at the return water dam. The above will prevent the spilling of mine affected water from the return water dam to the surrounding environment.

The above-mentioned facilities have been depicted in the water balance diagram for the proposed project attached as Figure 4.

2.3.9.2 Clean Water Management Facilities

The proposed Hope No. 4 Seam shaft complex is situated within the catchment of the Hope Spruit and therefore has a potential to have an impact on the Hope Spruit. The proposed shaft complex is also situated within the existing Hope Shaft complex storm water management system.

In view of the above and in order to protect the surrounding water resources from potential pollution from the shaft complex, the proposed project area will be equipped with a designed and properly constructed storm water management system. Storm water drains and berms are placed around the Hope Shaft complex and will be placed around the proposed Hope No. 4 Seam shaft complex (overburden stockpile, topsoil berms/stockpiles, unused catchment area, haul and access roads, water tanks, electrical substations) in order to divert clean storm water from these areas away from polluted areas back into the surrounding environment. Silt traps will be installed at the outlets of the storm water drains or berms for the removal of silt collected and accumulated along the storm water system. Discharge points of the storm water diversion structures is designed and will be constructed to have erosion protection structures, which will ensure that storm water discharged into the surrounding environment does not result in the erosion and degradation of the surrounding water resources. The above-mentioned structures are designed to have capacity to contain a 50 year storm with freeboard and will have suitably sized spillways. These structures will be cleaned on a regular basis in order to maintain their capacity.

In some areas, the storm water diversion structures have been designed to connect to the existing Hope Shaft storm water system to the north of the proposed shaft complex and will discharge to the Hope Spruit south of the proposed shaft complex.

The above-mentioned facilities have been depicted in the water balance diagram for the proposed project attached as Figure 4.

2.3.9.3 Disturbance of Water Resources

The proposed Hope No. 4 Seam shaft complex will be situated within 100 meters from the edge of the Hope Spruit wetlands. A number of wetlands, streams and pans will also be undermined by the proposed Hope No. 4 Seam project underground mining operation within the catchment of the Hope Spruit.

The above-mentioned proposed undermining of water resources and occurrence of the mine activities in close proximity of the water resources does not adhere to the requirements of the GN 704. In view of the above, an application for an exemption to comply with the requirements of the GN704 and a water use licence for undertaking activities within 500 meters of a number of wetlands was submitted to the Department of Water and Sanitation. The above activities will not be undertaken before the above-mention GN704 exemption and integrated water use licence are granted to Anglo Operations (Pty) Limited.

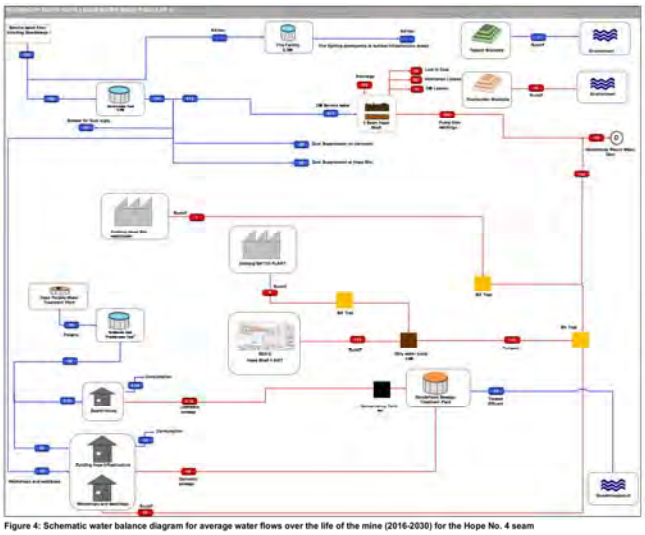


Figure 4: Water Balance for the proposed Hope No. 4 Seam Project

2.4 HOPE NO. 4 SEAM PROJECT METHOD STATEMENT

In terms of DMR EIR and EMPr template, Anglo Operations (Pty) Limited must describe the methods and technology to be employed for the proposed project. In view of the above, a method statement for each phase of the proposed project has been provided. This identifies all actions, activities or processes associated with the proposed mining operation.

The identified actions, activities and processes are supported by a surface layout plan together with a mining layout plan showing the location and aerial extent of all activities associated with the proposed project, including the proposed mining operation. This plan, which was compiled for the above purpose has been attached as GOEDE/HOPE4/01 (Goedehoop Colliery Hope No. 4 Seam Project). Civil designs for all surface infrastructure described below are attached as Appendix 2.

2.4.1 Construction Phase

2.4.1.1 Excavation of the Access Shaft

The following will be conducted during the excavation of the access shaft. The access shaft box cut will be sited as depicted in the surface layout plan.

Topsoil from the access shaft area will be stripped to a depth as specified by the soil specialist and will be removed to the relevant topsoil stockpile. Subsoil from the access shaft area will be stripped and stockpiled at the overburden stockpile.

Non carbonaceous hard overburden material from the initial box cuts will be drilled, blasted and removed to the overburden stockpile. All carbonaceous hards will be drilled, blasted and transported to the existing mineral residue deposit. Finally all coal material will be drilled, blasted, removed to the main R.O.M. coal stockpile either by dump trucks (construction phase) or overland conveyor belt (operational phase).

The open cut for the portal shall be excavated to ensure slope stability by the provision of benches and appropriate wall slopes based on the properties of the in-situ material.

The access ramp shall be set along an 8º incline and terminate at the portal which shall be so that there is approximately 5m of reasonable competent material above the portal hanging wall.

The shaft box cut will be constructed to have a box cut which will have enough space for the necessary infrastructure. This will include the dirty water collection sump (to be excavated), ventilation fans, water supply infrastructure (pipelines and pumps) and conveyor belt. The surface of the access shaft box cut and access ramp will be concrete lined. The surface of the box cut and access ramp will be sloped such that drainage of dirty water is towards the dirty water collection sump.

2.4.1.2 Construction of Access and Haul Roads

The Hope No. 4 Seam project access shaft area is designed to have the main access road, internal roads and service roads. The main access road will be used for accessing the shaft complexes (Hope Shaft and Hope No. 4 Seam Shaft) and will mainly consist of the existing road. The internal roads include new roads from the existing administration building complex to the Hope No. 4 Seam

mine shaft. Additional roads will be constructed for accessing the underground backfilling sites and borrow pits. The service roads will be used to access the conveyor belts, electrical substations and water pipelines during maintenance. The service and internal roads will be gravel roads.

The following will be undertaken during the construction of the roads. Approximately 150mm topsoil will be stripped to topsoil stockpiles or topsoil berms around the edge of the access shaft box cut. All loose material will be removed and stockpiled. The soil layer below the stripped topsoil will be constructed to design specifications detailed in the design drawings attached as Appendix 2.

2.4.1.3 Storm Water Management:

Clean water drains will be gravel surfaced, however, drains with gradients exceeding 1:50 will be concrete lined to prevent erosion. A system of berms and drains will be used to divert clean water away from the 'dirty water' areas and discharged into the nearest natural water course. All drains and cut off berms will be either grassed or Hydro seeded to prevent erosion.

All dirty water generated at the shaft complex will be directed in concrete lined drains to the shaft box cut (dirty water collection sump). Dirty water generated underground and storm water that accumulates in box cut (accumulated in the dirty water collection sump at the bottom of the inclined shaft ramp) will be pumped via a pipeline to the Goedehoop Colliery Return Water Dam.

During the construction of the above-mentioned storm water management structures, topsoil will be removed and stockpiled at the topsoil berms or topsoil stockpiles. Soils below the topsoil layer will be excavated to a depth as specified in the design specifications. The removed soils will be stockpiled at the overburden stockpiling area. Once excavated, all dirty and clean water trenches will be constructed in according to the design specification attached as Appendix 2.

2.4.1.4 Terrace Bulk Earthworks

All new surface infrastructures will be constructed on engineered terraces. The terraces will be formed through a cut and fill operation. Removal of topsoil will form part of the site clearance activities. Removed topsoil will be stockpile either at the berm round the shaft and box cut or at the topsoil stockpile. Material for the construction of the terraces will be selected from the incline shaft and box cut. If material from the box cut is not suitable for construction, identified borrow pits material will be used or the construction.

The terraces will be constructed to be in accordance with design specifications attached as Appendix 2.

2.4.1.5 Fire and Service Water Tanks

An engineered terrace will be provided for the ground level fire and service water tanks and their pump station. The tanks will be steel structures and the pump station will be a brick building. The fire water will be supplied to infrastructure that will require water for firefighting. The fire water tank will have a capacity of 500 m^3 and a pump station will be provided as one unit. The service water tank will have a capacity of 700 m^3 and a pump station will also be provided as one unit. The fire and service water will be filled with raw water from the existing Goedehoop Colliery's raw water dams via a new pipeline connected to the existing raw water pipeline.

2.4.1.6 Electrical Supply:

Power will be distributed from a new 11 kV Hope 4 Seam substation. This will feed the infrastructure buildings at the shaft box cut, conveyor belt water supply system and the underground workings.

The new substation will be constructed over a terrace that will be similar to the one mentioned above. The cables will be laid into cable trenches.

2.4.1.7 Topsoil and overburden stockpiling area:

The positions of the topsoil and overburden stockpiling areas are indicated in the Mine surface infrastructure layout plans (GOEDE/HOPE4/01). Note that topsoil will be removed from the overburden stockpiling area prior to formation of the stockpile. The depth of the stripped topsoil will be in accordance with the soil specialist recommendations.

Topsoil removed from the shaft area will be used to form a berm around the shaft area. The berm will be constructed not to exceed three meters. Any excess topsoil removed from the construction of the shaft complex will be stockpiled at the dedicated topsoil stockpile.

The rest of the overburden material (softs and hards) will be removed to an overburden stockpiling area. The overburden will cover an area of not more than 8 hectares and will be sited north east of the shaft. Since the material to be stockpiled at the overburden will be non-carbonaceous, this material is considered to be a type 4 material, requiring a class D liner. Anglo Operation (Pty) Limited is currently in the process of classifying the overburden material. If the classification results indicates the material to be type 3, either a class C liner instead of the preferred class D liner will be used for the overburden stockpile or a motivation will be provided for the use of a Class D liner for the overburden stockpiling.

Before construction of the lining, topsoil to a depth specified by the soil specialist and unusable soil to the depth determined by an engineer will be removed either to the topsoil berms/stockpile and overburden stockpile for storage.

2.4.1.8 Overland Conveyor Belt:

The Hope No. 4 Seam project will be equipped with its own conveyor belt for the transportation of run off mine coal from the proposed underground workings to the existing mine's main run off mine coal stockpiling area. In addition to the above, a separate overland conveyer belt (Elders conveyor belt) will be constructed to run parallel to the proposed Hope No. 4 Seam project conveyor belt. This overland conveyor belt will be used for the transportation of run off mine coal from the proposed Elders Colliery to the existing Goedehoop Colliery coal washing facility for the beneficiation of the run off mine coal. **The Elders Conveyor belt forms part of a separate environmental application, DMR Reference number: MP 30/5/1/2/2/10117MR.**

The withdrawal conveyor from Hope No. 4 Seam shaft will feed into a transfer point, which will be equipped with a crushing and screening plant. The conveyor from the transfer point will feed into a conveyor belt that will in turn feed into an existing coal silo. From the silo the coal is fed into an existing overland conveyor belt. This existing conveyor, is fed from the silo and delivers coal to the R.O.M. coal stockpile at the Goedehoop Colliery washing plant. These conveyors run in a servitude which are generally 25m wide. Within the servitude the belt will be located on plinths and gantries. The transfer bin will be located on a dedicated terrace which accommodates a bunded concrete

foundation. Wash down together with silt will drain into a sump from which a submersible pump delivers dirty water to the dirty water collection sump.

Culverts at right angles to the conveyor shall be provided to ensure storm water passes under the conveyor from the high side to the low side. This will only be constructed along the shaft ramp. Vegetation within the servitude shall need to be cut or cleared regularly, particularly in the winter season to prevent the occurrence of fire which could destroy the conveyor. Strategically placed fire breaks shall also need to be maintained. Within the servitude and along most of its entire length, a 4m wide gravel service road is provided to give maintenance crews access to the conveyor. This road will need regular grading and watering to suppress dust.

During the construction of the overland conveyor belt the following activities that may have impacts on the environment will be conducted i.e. clearing of natural vegetation and stripping of topsoil, scarification of in-situ material and compaction of the conveyor belt sites, construction of conveyor belt foundations, erection of the overland conveyor belts and the transfer point, construction of the service roads along the conveyor belts and construction of storm water diversion trenches. Where concrete foundations will be needed, a layer of concrete mix will be poured into the foundation to form a base for the infrastructure.

Overland conveyor supports along the conveyor servitude, at the transfer point and intermediate transfer point will be constructed on terraces. The terraces will be constructed as per construction methodology describe under the fire and service water tanks construction.

2.4.1.9 Crushing and Screening Plant

The crushing and screening plant will be constructed within the conveyor transfer point. The conveyor transfer point together with the crushing and screening plant will be located on a dedicated terrace which accommodates a bunded concrete foundation. The construction of the terrace will be similar to that of the service and fire water tanks.

2.4.1.10 Ventilation Fans:

Terraces will be shaped to ensure effective storm-water management by the draining water around the terraces to the dirty water collection sump. The surface will be shaped to discourage water ponding. Terraces, which will be similar to those provided above, will generally be constructed between above natural ground level to facilitate surface water drainage.

2.4.1.11 Pipelines

The proposed Hope No. 4 Seam project will have pipelines (raw and dirty water pipelines) for the supply of raw water (process water) and transportation of dirty water to the existing Goedehoop Colliery return water dam. The raw water is clean water from the mine's raw water storage dams and dirty water constitute dirty water (underground seepage and dirty runoff water) emanating from the proposed project. The pipelines will either be on surface, buried or attached to the conveyor belt. The pipelines will have strategically positioned air valves, gate valves and scour valves to evacuate air or isolate zones or assist in the maintenance of the pipeline. These valve fittings shall be housed in chambers constructed out of brick and mortar for security.

The construction methodology of the pipelines will include the following i.e. marking of the pipeline routes, clearing of vegetation and removal of topsoil, construction of access roads where necessary, assembling of the pipe (stringing, welding and testing of joints), for buried pipelines excavation of pipeline trench where necessary (excavated material will be heaped on the side of the trench), for construction of a pipe bedding layer at the base of the trench, lowering of the pipe into the trench and backfilling, levelling and reseeding of the trench. Where above ground pipelines will be constructed, the pipelines will be attached to the overland conveyor belts and where the pipelines will not be attached to belts, foundation plinths will be constructed along regular intervals for supporting and stabilising the pipelines.

2.4.1.12 Stone Dust Silo:

Engineered terraces will be provided to support the required stone dust silo. The construction of the terrace will comprise the removal of topsoil and unsuitable material to a depth of between 600mm – 750mm and replacing with suitable backfill. Backfill may be obtained from the shaft excavation if suitable, approved borrow pits or commercial source and will be provided up to the underside of the wearing course level. The 150mm wearing course will comprise a 65/35 blend by volume of blast furnace slag and G7 backfill or other suitable material to provide an all-weather surface.

Terraces will be shaped to ensure effective storm-water management by the separation of clean and dirty water and the prevention of ponding. Terraces will generally be constructed between 150mm – 300mm above natural ground level to facilitate surface water drainage.

2.4.1.13 Fencing:

Where a fence is to be erected, the fence will be constructed by erecting down posts at regular interval along the fence route. Suitable holes will be drilled within which the base of the post will be encased in concrete. Once the posts are erected then stringers and fencing will be attached which is largely a manual operation.

2.4.1.14 Underground Backfilling Operation

The No. 2 seam areas within the Hope No. 4 Seam project area with low factors of safety and areas where middling is of insufficient thickness for floor stability during mining of the No. 4 coal seam will require stabilisation in order to safely mine the proposed Hope No. 4 Seam coal reserve. Backfilling of these areas with suitable material will be used to stabilise the above-mentioned areas. The stabilisation of the underground workings will also ensure that the undermined water resources are protected from the potential damage that could be caused by the possible surface subsidence.

The following activities will be undertaken during the backfilling of the underground areas:

Preparation of the backfilling material

An existing batching plant area will be used for the preparation of the backfilling material. The raw backfilling material will be transported to the batching plant site. The raw material to be used will contain either fly ash, coal discard, discard slump or a mixture of the above-mentioned material. This material will be stored on bunded areas. Conveyor belts will be used for the transportation of the raw material to the batching plant. The material will then be mixed and blended at the batching plant site

to form a backfill product that complies with the pre-determined backfill material mix designs. The backfill material product will then be loaded into trucks to the backfilling sites.

Preparation of the backfilling sites

The preparation of the backfilling sites will involve the drilling and preparation of the backfilling boreholes.

The backfilling boreholes will be drilled using a percussion drill rig. The boreholes will be drilled from surface to intercept the coal seam to be backfilled. The length of the boreholes will be approximately one hundred (100 m) from surface. Approximately 147 boreholes will be drilled for the underground backfilling purposed. These boreholes will be situated within hundred meters from the nearby water resources but outside thirty two meter from the wetlands.

Backfilling of the underground workings

Ready mix trucks with a capacity to hold up to 9m^3 of backfill product will be used for the transportation of the backfill product to the backfilling boreholes. The backfill product will either be pumped or gravity fed into the underground workings via the drilled boreholes.

Areas with flooded workings may be encountered during the backfilling exercise. Where possible, water must be displaced before backfilling. This will be accomplished by either pumping the water out of the workings (not always feasible) or by pumping the backfill product into a selected area. This will be conducted in such a manner that the water will be displaced around the backfilling area in a controlled manner. No decant will be caused by the pumping of backfilling material into the mine workings.

The backfilling will be monitored via cameras, which will assist in destemming the areas with water and the extent of the backfilling product. Backfilling will be conducted until it can be ascertained that enough backfill material is placed to ensure stability of the backfilled mined out workings.

2.4.2 Operational Phase

2.4.2.1 Systematic Removal of economic coal from the No. 4 Coal Seam by underground mining (bord & pillar mining)

Bord and pillar mining using continuous miners was selected as the primary extraction method. In this type of mining method, parallel roads will be developed in the mining direction. Perpendicular roads, called splits, will be developed at predetermined intervals to the parallel roads. These roads will interlink, creating pillars. The roads that will be mined concurrently will be determined by the size of the pillars required to support the overburden above the coal seam and the length of the production equipment's trailing cables. The pillar size will be determined by the safety factor formula that results in the pillar strength divided by the pillar load (mass of the overburden carried by the pillar). The safety factors are estimated using the Salamon method.

The Hope 4 seam mining area is divided into blocks based on geological isolated areas as a result of secondary intrusions. Due consideration was given to individual block access to ensure safe, efficient and continuous mining operations. Separate developments will be required to access these prospective target areas. Drill and blast mining methods may be required in this additional development.

2.4.2.2 Underground Backfilling of the Mined No. 2 Coal Seam Workings

The current proposed plan for mining the No. 4 coal seam includes mining over areas with low factor of safety. To ensure safe mining of these areas, backfilling of the no. 2 coal seam workings within these areas will be necessary.

Ready mix trucks with a capacity to hold up to $9m^3$ of backfill product will be used for the transportation of the backfill product from the batching plant to the backfilling boreholes. The backfill product will either be pumped or gravity fed into the underground working via the drilled boreholes.

Where areas with flooded workings are encountered during the backfilling exercise, where possible, water must be displaced before backfilling. This will be accomplished by either pumping the water out of the workings (not always feasible) or by pumping the backfill product into a selected area. This will be conducted in such a manner that the water will be displaced around the backfilling area in a controlled manner.

The backfilling will be monitored via cameras, which will assist in destemming the areas with water and the extent of the backfilling product. Backfilling will be conducted until it can be ascertained that enough backfill material is placed to ensure stability of the backfilled mined out workings.)

2.4.2.3 Transportation and Stockpiling of R.O.M. coal

R.O.M coal generated from the Hope No. 4 Seam access shaft will be transported via the access shafts/ramps and overland conveyor belts to the main R.O.M. coal stockpiling area at Goedehoop Colliery washing plant area. The proposed Hope No. 4 Seam project will not have a coal stockpiling area at its access shaft hence coal will be conveyed straight from the workings to the existing run off mine coal stockpiling area. The crushing and screening will be used for sizing of the run off mine coal for the easy transportation of the run of mine coal.

The proposed conveyor belt will connect to the existing Goedehoop Colliery coal silo and existing network of overland conveyor belts that conveys coal to the main run off mine coal stockpiling area. This coal transportation and stockpiling infrastructure has over the years been improved to handle all the coal generated from each shaft area, hence the facilities has the capacity to handle coal from the Hope No. 4 Seam and Elders Colliery shafts.

2.4.2.4 Use of Mine Surface Infrastructure and associated Access and Haul Roads

The constructed mine surface infrastructure include the following:

<u>Workshops and other Buildings</u>

The Hope No. 4 Seam project will use the existing Hope Shaft complex for its administrative buildings. Some of the buildings are permanent structures, while others are semi-permanent ("Porta- Cabins"), and can be moved to a new location should they no longer be required. These semi-permanent buildings will also service any future shafts. Where necessary the existing buildings will be upgraded or replaced.

The existing Hope Shaft complex has a surface workshop area where minor repairs are performed to machinery, vehicles and materials. The workshop is equipped with diesel tanks that are used for the

refuelling of the mine vehicles. The existing Hope Shaft workshops will be used to service the proposed Hope No. 4 Seam shaft operations.

Maintenance of constructed infrastructure

During the operational phase all constructed infrastructure will require maintenance, which include the following:

- Cleaning and maintenance of the conveyor belts, the drains and culverts at strategic points along the conveyor belts.
- Cutting and clearing of vegetation within the used mine servitudes. This will be particularly conducted in the winter season to prevent the occurrence of fire, which could destroy the infrastructure. The firebreaks shall also need to be maintained.
- Maintenance of gravel roads will be provided to give maintenance crews access to the infrastructure. The roads will need regular grading and watering to suppress dust.
- The servitudes will be totally enclosed with stock fencing with access gates at the strategic points. These fences will need regular inspection for damage and deterioration and repairs as required.
- Buried and surface pipelines in the servitudes and in the mine infrastructure require periodic inspection of the fitted air valves, scour valves, isolation valves and non-return valve that are essential for the proper functioning of the systems.
- Regular inspection and pump testing of the mine's pump stations.
- Regular cleaning of silt traps' drying beds, oil traps and the dirty water dams.

2.4.2.5 Waste Management

Solid Waste Management

All waste generated from the Hope No. 4 Seam project area will be collected in temporary bins/containers (new infrastructure) and existing bins/containers (existing infrastructure). Waste generated and collected from the new infrastructure areas will be transported to the existing Hope Shaft complex. Since Goedehoop Colliery operates an efficient waste management system, all waste generate from the proposed project will be managed within the above-mentioned Goedehoop Colliery waste management systems.

A Contractor transports general waste from Goedehoop Colliery to the Witbank, Middelburg and Kriel Municipal dumping sites for disposal. Prior to disposal by the contractor, the domestic waste is sorted, and paper and cardboard are separated and send for re-cycling in Middelburg.

Hazardous waste is collected in a different waste collection system and disposed of by a contractor at a registered hazardous waste site. Hazardous waste bins are stored on concrete floors and under roof. No hazardous waste is stored on site for a period longer than 90 days.

Batteries, tyres, old conveyor belting, used oil drums and waste metal are collected around the mine and transported to the Goedehoop Scrap Yard and sorted. The waste is then sold through the Goedehoop Colliery Stores Department to scrap and recycling companies.

Sewage management

Goedehoop Colliery operates a licenced sewage treatment plant at the Hope Shaft complex. The plant is managed by external contractors who are responsible for ensuring that the plant runs efficiently and that the effluent is of a suitable quality to facilitate discharging into streams occurring on

the mine property. Goedehoop Colliery will ensure that the sewage treatment plant has sufficient capacity to handle additional load from the proposed project. Where necessary the facilities will be upgraded to handle additional load.

A number of septic tanks connected to conservancy tanks are used at the Hope Shat complex. A new conservancy tank will be constructed at the Hope No. 4 Seam project guard house. These conservancy tanks are, and will be emptied by contractors to the nearby sewage treatment plant on a regular basis.

2.4.2.6 Water Management

Dirty Water Management

Goedehoop Colliery has a number of existing pollution control dams on the mining right property, all inter linked by varying diameter pipe works and pump sizes. This forms a complex network of water containment structures, which are the Goedehoop Colliery Water Balance. A dirty water collection sump will be used for the collection of water from the proposed project area. All dirty water generated from the proposed project area will be connected to the current dirty water management network via new trenches, dirty water sumps, pipelines and pumping systems.

Goedehoop Colliery has developed a water balance based on their reticulation flow meter readings. The water balance is divided into two main sections that are interlinked. These sections of the water balance are known as the Hope and Springbok sections. This has been updated to include the proposed Hope No. 4 Seam project.

In the Goedehoop Colliery contaminated water reticulation system, the key dam in the water reticulation network is the Goedehoop Colliery Return Water Dam. This dam receives water from a number of sources on the mine, which will include the proposed Hope No. 4 Seam project area.

Clean Storm Water Management

Storm water drains, i.e. clean water cut-off drains, are placed around all the dirty water areas. These measures are taken to divert clean storm water away from polluted areas. The storm water systems for key areas of Goedehoop Colliery are briefly described in this report.

2.4.3 Decommissioning/Closure Phase

2.4.3.1 Sealing of Shaft and underground workings

A double brick wall bulk head filled with concrete will be constructed approximately 10 metres in bye of the shaft collar.

The upper portion of the shaft (box cut) will be backfilled as much as possible with rubble, from demolished structures around the shaft and the overburden material, stockpiled during the construction phase will be used to backfill the shaft void. The void will be filled to surface and shaped to ensure that the area is free draining.

The shaped area will be topsoiled and re-vegetated with a recommended seed mix or as per the land use requirements of the Goedehoop Closure Objectives.

2.4.3.2 Dismantling/demolishing and removal of the silos, conveyors and other infrastructure

All erected structures such as the conveyors, buildings and silos will be dismantled, demolished or removed (mobile). Waste rubble from demolishing will be used as shaft backfill material. Any industrial waste from the dismantling will be recycled (sold) or disposed of properly. All conveyors will be dismantled and sold as scrap.

Rehabilitation of roads and overland conveyor belt areas

All hardened areas that will not be used after mining will be ripped, to a depth of 250mm to reduce compaction. The area will then be covered with a layer of topsoil before it will be seeded.

Rehabilitation of overburden stockpile areas

After the removal of overburden material for backfilling of the final voids, the stockpile areas will be ripped to 100mm and covered with a layer of topsoil. Sections used to access the areas will be ripped to 250 mm before being covered with topsoil for seeding.

Seeding of rehabilitated areas

Following mechanical rehabilitation of the area, a recommended seed mix will be applied to all rehabilitated areas to accelerate vegetation establishment. A suitably qualified person will be employed to determine the most appropriate seed mix for the seeding of the rehabilitation areas.

Maintenance and monitoring of rehabilitated and surrounding environments

All rehabilitated areas will be monitored for cracks, erosion and settlements. All cracks, erosion gullies and settlement depressions will be repaired.

Data gathered from the above maintenance and from a monitoring programme will be used for the application of a closure certificate.

SECTION THREE

Policy and legislative context

3 POLICY AND LEGISLATIVE CONTEXT

3.1 CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA (ACT NO. 108 OF 1996)

Section 24 of the Constitution of the Republic of South Africa (Act No.108 of 1996) states that everyone has the right:

a) to 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.

In terms of Section 24 of the Constitution of the Republic of South Africa (Act No.108 of 1996), everyone has the right to an environment that is not harmful to their health or well-being. In addition, people have the right to have the environment protected, for the benefit of present and future generations, through applicable legislations and other measures that prevent pollution, ecological degradation and promote conservation and secure ecological sustainable development through the use of natural resources while prompting justifiable economic and social development. The needs of the environment, as well as affected parties, should thus be integrated into the overall project in order to fulfil the requirements of Section 24 of the Constitution. In view of the above, a number of laws pertaining to environmental management were promulgated to give guidance on how the principles set out in section 24 of the Constitution of the Republic of South Africa (Act No.108 of 1996) would be met. Below are laws applicable to the proposed project that were promulgated to ensure that section 24 of the Constitution of the Republic of South Africa (Act No.108 of 1996) is complied with.

3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT

Section 24(1) of the NEMA states:

"In order to give effect to the general objectives of integrated environmental management laid down in this Chapter [Chapter 5], the potential consequences for or impacts on the environment of listed activities or specified activities must be considered, investigated, assessed and reported on to the competent authority or the Minister of the Department of Mineral Resources, as the case may be, except in respect of those activities that may commence without having to obtain an environmental authorisation in terms of this Act."

In order to regulate the procedure and criteria as contemplated in Chapter 5 of NEMA relating to the preparation, evaluation, submission, processing and consideration of, and decision on, applications for environmental authorisations for the commencement of activities, subjected to environmental impact assessment, in order to avoid or mitigate detrimental impacts on the environment, and to optimise positive environmental impacts, and for matters pertaining thereto, Regulations (EIA Regulations, 2014) were promulgated. These Regulations took effect from the 4th of December 2014.

In addition to the above, Section 28 of the NEMA includes a general "Duty of Care" whereby care must be taken to prevent, control and remedy the effect of significant pollution and environmental degradation. This section stipulates the importance to protect the environment from degradation and pollution irrespective of the operations taking places or activities triggered / not triggered under GN983, GN984 and GN985.

In view of the above, an EIA is being undertaken to comply with the requirements of the NEMA and the NEMA EIA Regulations, 2014. The NEMA EIA Regulations of December 2014 determines requirements to be met in order to obtain an environmental authorisation. This report has therefore been compiled in compliance with the above regulations.

3.3 NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT

The National Environmental Management: Air Quality Act (Act No.39 of 2004) (NEM:AQA) focuses on reforming the law regulating air quality in South Africa in order to protect the environment through the provision of reasonable measures protecting the environment against air pollution and ecological degradation and securing ecological sustainable development while promoting justifiable economic and social developments. This Act provides national norms and standards regulating air quality management and control by all spheres of government. These include the National Ambient Air Quality Standards (NAAQS) and the National Dust Control Regulations (NDCR). The standards are defined for different air pollutants with different limits based on the toxicity of the pollutants to the environment and humans, number of allowable exceedances and the date of compliance of the specific standard.

On 22 November 2013 the list of activities which result in atmospheric emissions which have or may have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage was published under GN R893 in Governmental Gazette No 37054, in terms of Section 21(1)(b) of the NEM:AQA.

The proposed will not trigger any of the activities listed under the above-mentioned Regulations, however Goedehoop Colliery must ensure that emissions from their activities complies with the standards as set in the above-mentioned regulations.

3.4 THE NATIONAL HERITAGE RESOURCES ACT

The National Heritage Resources Act (Act No. 25 of 1999) (NHRA) focuses on the protection and management of South Africa's heritage resources. The governing authority for this act is the South African Heritage Resources Agency (SAHRA). In terms of the NHRA, historically important features such as graves, trees, archaeology and fossil beds are protected as well as culturally significant symbols, spaces and landscapes. Secction 38 of the NHRA stipulates the requirements a developer must undertake prior to development. In terms of Section 38 of the NHRA, SAHRA can call for a Heritage Impact Assessment (HIA) where certain categories of development are proposed.

A Heritage Impact Assessment (HIA) is the process to be followed in order to determine whether any heritage resources are located within the area to be developed as well as the possible impact of the proposed development thereon.

The Act also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is deemed adequate, a separate HIA is not required. A Heritage Impact Assessment has been undertaken for the proposed project.

3.5 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT (ACT 10 OF 2004) (NEMBA)

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA) provides for the management and protection of South Africa's biodiversity within the framework established by NEMA. The Act aims to legally provide for biodiversity conservation, sustainable, equitable access and benefit sharing and provides for the management and control of alien and invasive species to prevent or minimize harm to the environment and indigenous biodiversity. The Act imposes obligations on landowners (state or private) governing alien invasive species as well as regulates the introduction of genetically modified organisms. The Act encourages the eradication of alien species that may harm indigenous ecosystems or habitats. The NEMBA ensures that provision is made by the site developer to remove any aliens which have been introduced to the site or are present on the site.

The NEMBA also provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected. The purpose of listing protected ecosystems is primarily to conserve sites of exceptionally high conservation value.

The Act supports South Africa's obligations under sanctioned international agreements regulating international trade in specimens of endangered species, and ensures that the utilization of biodiversity is managed in an ecological sustainable way.

The EIR and EMPr has been complied to ensure that all applicable requirements prescribed in the NEMBA are complied with.

3.6 MPUMALANGA NATURE CONSERVATION ACT (ACT 10 OF 1998)

The Mpumalanga Nature Conservation Act, No. 10 of 1998, aims to consolidate and amend the laws relating to nature conservation within the Province and to provide for matters connected therewith. Provincial legislation relevant to biodiversity conservation comprises of two Provincial Acts, the Mpumalanga Nature Conservation Act (Act 10 of 1998) and the Mpumalanga Tourism and Parks Agency Act (Act 5 of 2005). In relation to nature conservation, the Province has developed the Mpumalanga Biodiversity Sector Plan (MBSP). This plan has been jointly developed by the Mpumalanga Tourism and Parks Agency (MTPA) and the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA). The MBSP takes its mandate from the South African Constitution, the National Biodiversity Act (10 of 2004) and the Mpumalanga Nature Conservation Act 10 of 1998. Areas identified under the MBSP as sensitive were identified and where applicable measures will be proposed for ensuring that the areas are not degrade by the proposed project activities.

3.7 MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (MPRDA)

The Department of Mineral Resources (DMR) is responsible for regulating the mining and minerals industry to achieve equitable access to the country's resources and contribute to sustainable development. The Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA) requires that an EIA be conducted and that the EMP be drafted for the mitigation of impacts identified during the environmental impact assessment for a mining project. During December 2014, the "One Environmental System" was implemented by Government which initiated the streamlining of the licensing processes for mining, environmental authorisations and water use. Under the One

Environmental System, The Minister of Mineral Resources, will issue environmental authorisations and waste management licences in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), and the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)(NEMWA), respectively, for mining and related activities. The Minister of Environmental Affairs will be the appeal authority for these authorisations. In view of the above the application for the environmental authorisation for the Hope No. 4 Seam project will be submitted to the Department of Mineral Resources as the competent authority.

3.8 NATIONAL WATER ACT (NWA)

The National Water Act (Act No. 36 of 1998) (NWA) is the primary regulatory legislation, controlling and managing the use of water resources as well as the pollution thereof in South Africa. The NWA recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The NWA presents strategies to facilitate sound management of water resources, provides for the protection of water resources, and regulates use of water by means of Catchment Management Agencies, Water User Associations, Advisory Committees and International Water Management. 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. Further, an industry can only be entitled to use water if the use is permissible under the NWA. The enforcing authority on water users is the Department of Water and Sanitation (DWS).

Further, Regulation 704 of the NWA deals with the control and use of water for mining and related activities aimed at the protection of water resources.

An integrated water use licence application and an application for an exemption to comply with some of the requirements under the GN704 will be submitted to the Department of Water and Sanitation for their consideration.

3.9 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT (ACT NO. 59 OF 2008)

The National Environmental Management: Waste Act (NEMWA) requires that all waste management activities must be licensed. According to Section 44 of the NEMWA, the licensing procedure must be integrated with an EIA process in terms of the NEMA.

The objectives of NEMWA involve the protection of health, wellbeing and the environment. The NEMWA provides measures for the minimisation of natural resource consumption, avoiding and minimising the generation of waste, reducing, recycling and recovering waste, and treating and safely disposing of waste.

Waste management activities are triggered by the proposed project, hence an application in terms of the NEMWA was submitted to the Department of Mineral Resources.

3.10 EIA GUIDELINES

A number of national and provincial EIA guidelines were published by different departments. These guidelines are mainly aimed at assisting relevant stakeholders by providing information and guidance and giving recommendations on a number of aspects relating to the environmental impact assessment process. The guidelines can be used by the competent authority, applicant and the EAP

during the EIA process. It is therefore important that the EAP and the person compiling a specialist report must have relevant expertise when conducting the environmental impact assessments.

A number of guidelines were consulted during the compilation of this report and these include amongst them the following i.e. Guidelines on the Need and Desirability, Department of Environmental Affairs and Tourism Integrated Environmental Management Guidelines, Department of Water and Sanitation's Best Practice Guidelines and the Western Cape Provincial Department of Environmental Affairs and Development Planning Guidelines on Public Participation.

SECTION FOUR

Need and desirability of the proposed activities

4 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

In terms of the EIA Regulations the need and desirability of any development must be considered by the relevant competent authority when reviewing an application. The need and desirability must be included in the reports to be submitted during the environmental authorisation application processes. The section of the EIR and EMPr will indicate the need and desirability for the proposed Hope No. 4 Seam Project, which was compiled in terms of the 2010 guideline on need and desirability, integrated environmental management guideline series 9, Department of Environmental Affairs.

Anglo Operations (Pty) Limited's Goedehoop Colliery is situated within the Steve Tshwete Local Municipality in the Mpumalanga Province. An Environmental Impact Assessment (EIA) for the proposed project has been undertaken and results thereof (EIR and EMPr) will be submitted to the Department of Mineral Resources as the competent authority. As part of the requirements of the compilation of the EIR and EMPr, the applicant must determine the Need and Desirability of the proposed project. This section of the EIR and EMPr was therefore compiled in order to comply with the requirements of the guideline on need and desirability promulgated on the 20th of October 2014 under Government Notice 891 of 2014, which in turn will comply with the requirements of the EIA Regulations, 2014.

To undertake the 'needs and desirability assessment' the following were considered in accordance with the NEMA Environmental Impact Assessment Regulations; Guideline and Information Document Series; Guideline on Need and Desirability (2014).

- The spatial development framework plans for the Steve Tshwete Local Municipality
- The integrated Development Plans for the Steve Tshwete Local Municipality
- Where possible the environmental management framework for the Steve Tshwete Local Municipality
- Existing industrial and commercial development and the anticipated impact on other similar developments in reasonable proximity within Goedehoop Colliery
- Specialist Studies' outcome for the proposed Hope No. 4 Seam project

The need and desirability determination for this project will hence be structured such that it determines how the ecological attributes of the area, spatial development of the area, socio-Economic profile of the communities within the study area and the project's financial viability fits together in ensuring that the proposed project becomes a success for the region.

4.1 ECOLOGICAL INTEGRITY

4.1.1 Considerations of the ecological integrity

Threatened ecosystems

The proposed Hope No. 4 seam project underground coal mining area is situated in the Eastern Highveld grassland vegetation type (Gm 12) in the Mesic Highveld Grassland bioregion. This vegetation unit is vulnerable, Figure 5.

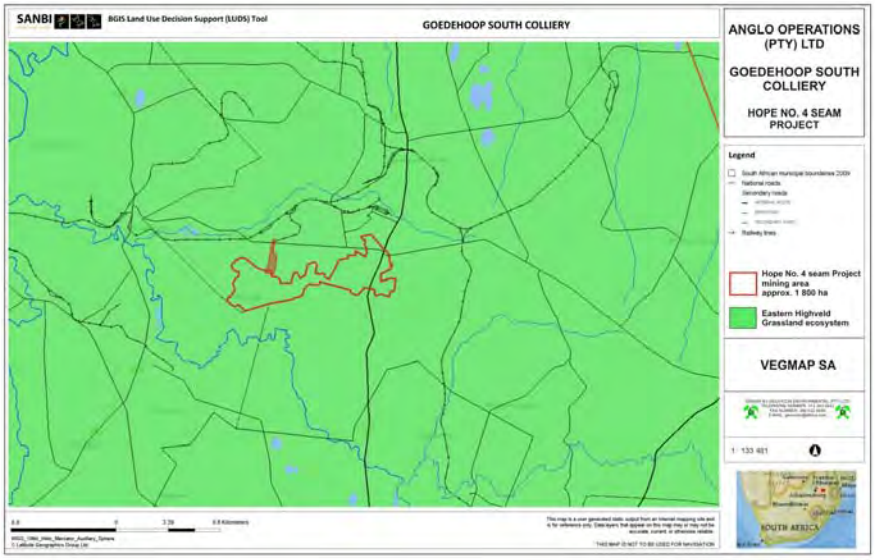


Figure 5: VEGMAP SA for the proposed Hope No. 4 Seam Project Area

Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure

The proposed Hope No. 4 seam project underground coal mining area includes wetland areas adjacent to a couple of small streams and several pans. It is however not situated in a National Freshwater Ecological Priority Area (NFEPA), Figure 6.

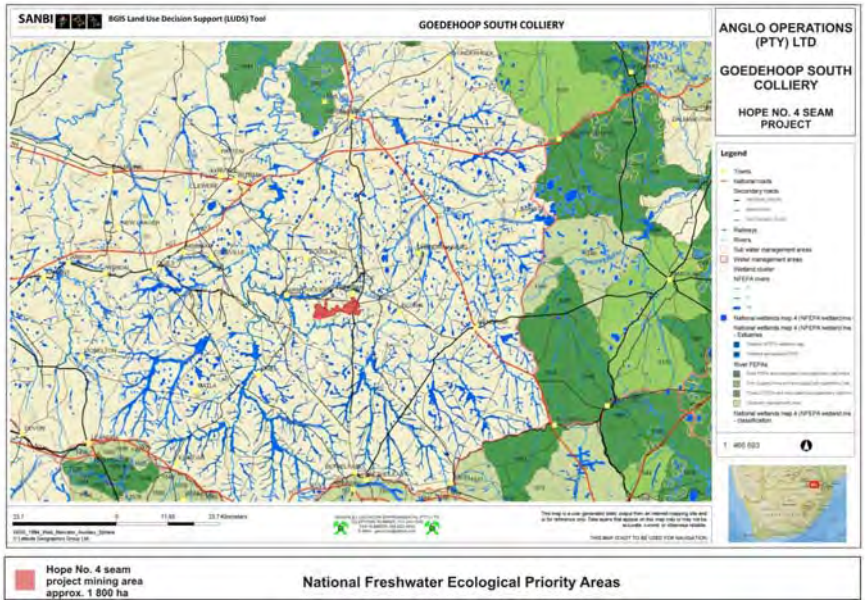


Figure 6: Position of the Hope No. 4 Seam Project Area in relation to the National Freshwater Ecological Priority Areas

According to the National Wetlands Inventory, the Hope No. 4 seam project underground coal mining area includes a number of wetland types, falling into the Mesic Highveld Grassland, Group 4, wetland ecosystem type, see Figure 7.

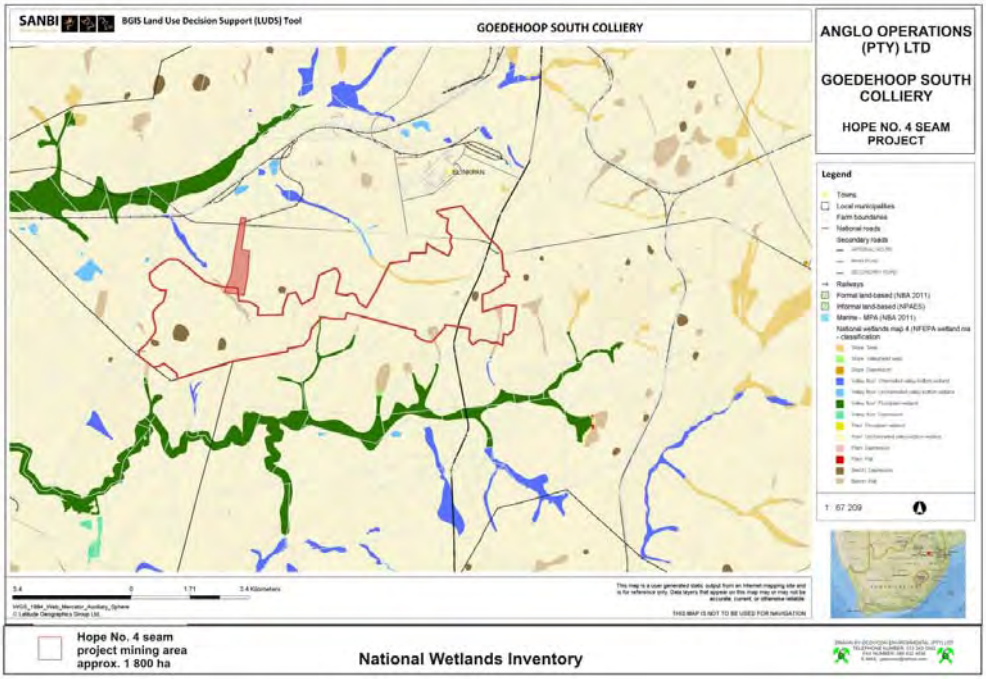


Figure 7: Position of the Hope No. 4 Seam Project Area in relation to the National Wetland Inventory Map

Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)

According to the Mpumalanga Biodiversity Sector Plan GIS-based electronic application (Mpumalanga Tourism and Parks Agency (MTPA), 2013), the proposed Hope No. 4 seam project underground coal mining area is situated outside the terrestrial assessment categories of "Critical Biodiversity areas (CBA) – Optimal", Other Natural Areas (ONAs)", "Modified – Old lands" ABD and "Modified". See Figure 8.

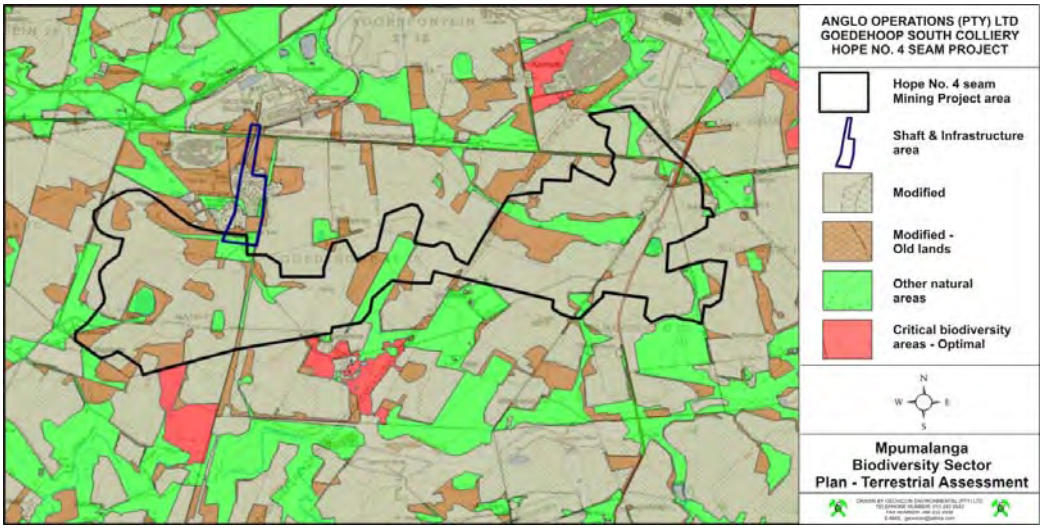


Figure 8: Position of the Hope No. 4 Seam Project Area in relation to the Mpumalanga Biodiversity Sector Plan – Terrestrial Assessment

"Critical Biodiversity areas (CBA) – Optimal" means areas that are optimally located to meet the various biodiversity conservation targets while avoiding high cost areas as much as possible; with

"Other Natural Areas (ONAs)", meaning areas that are not identified to meet biodiversity pattern or process targets; "Modified – Old lands" means areas which were modified within the last 80 years but were at some point abandoned, including old mines and old cultivated lands, collectively termed "old lands"; and "Modified", meaning areas that are currently transformed and where biodiversity and ecological function has been lost to the point that it is not worth considering for conservation at all.

According to the Mpumalanga Biodiversity Sector Plan GIS-based electronic application (Mpumalanga Tourism and Parks Agency (MTPA), 2013) (Figure 9), the proposed Hope No. 4 seam project underground coal mining area is primarily situated in freshwater assessment categories of "Ecological Support Areas (ESA) – Wetlands" meaning areas that support the hydrological functioning of rivers, water tables, freshwater biodiversity as well as providing a host of ecosystem services through their ecological infrastructure. They need to be maintained in a healthy condition; "Other natural Areas (ONAs)", meaning areas that are not identified to meet biodiversity pattern or process targets; "Heavily Modified/Transformed" meaning areas that have experienced a form of land use that has resulted in the near complete loss of biodiversity and a degree of loss of ecological function; and "Dams" meaning artificial water bodies which may have impacted on wetlands or river systems. These areas may, however, still have a recharge effect on wetlands, groundwater, and river systems. They may also support wetland or river dependent fauna, such as water birds. The edges of dams may also support wetland vegetation, and their constituent fauna and flora.

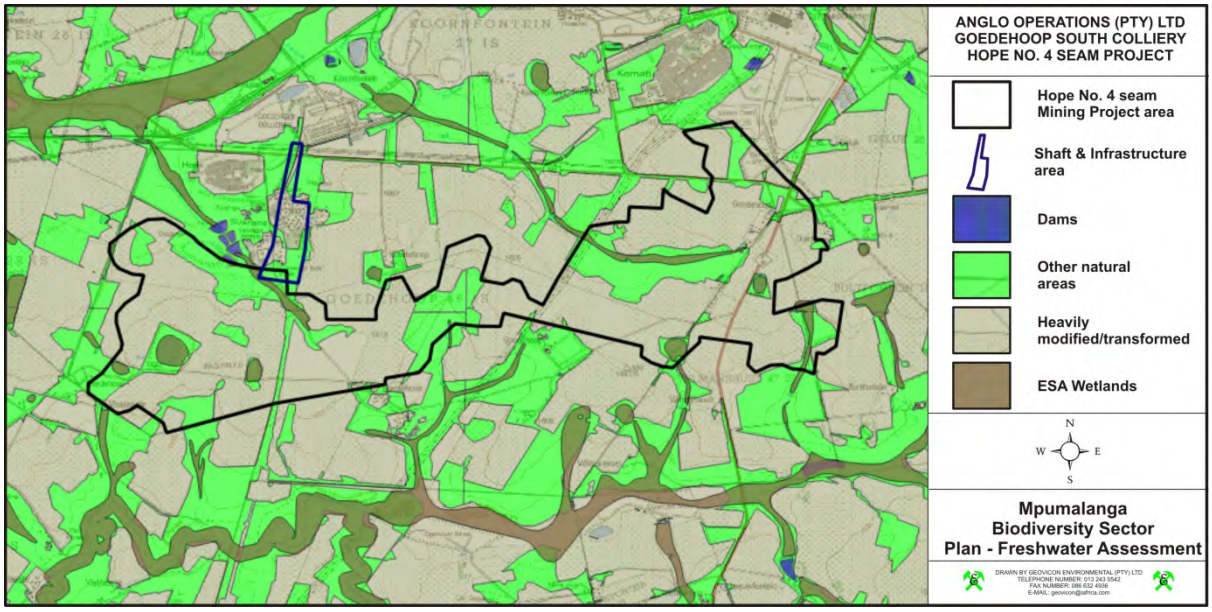


Figure 9: Position of the Hope No. 4 Seam Project Area in relation to the Mpumalanga Biodiversity Sector Plan – Freshwater Assessment

According to the Mpumalanga Biodiversity Sector Plan GIS-based electronic application (Mpumalanga Tourism and Parks Agency (MTPA), 2013), (Figure 10) the proposed Hope No. 4 seam project underground coal mining area is situated in the vicinity of the following wetland types in Mpumalanga *viz.* depressions, seeps, channelled valley bottom wetlands and floodplain wetlands.

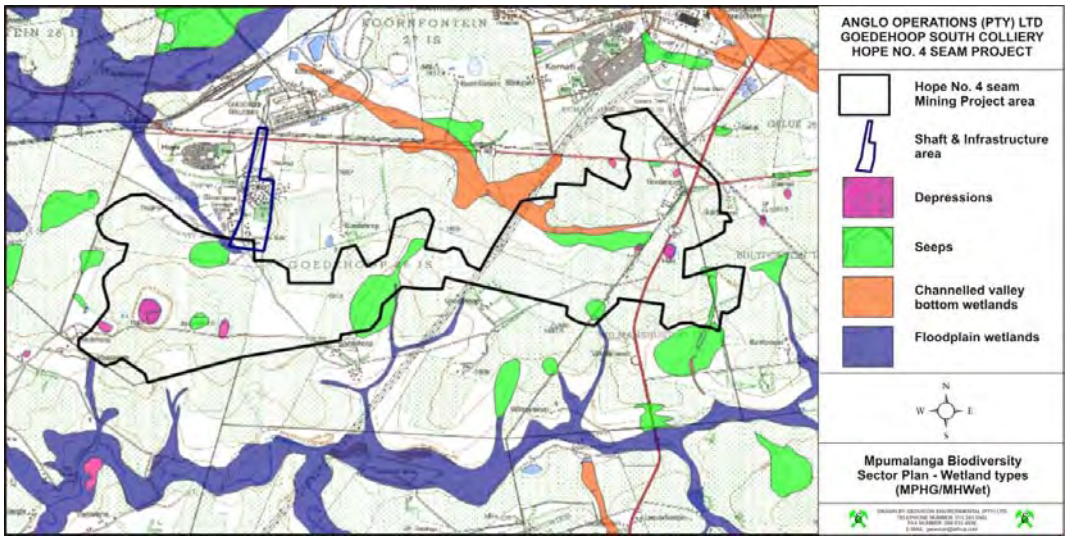


Figure 10: Position of the Hope No. 4 Seam Project Area in relation to the Mpumalanga Biodiversity Sector Plan – Wetland Types

Conservation targets

According to the Mpumalanga Biodiversity Sector Handbook the Eastern Highveld grassland vegetation type is poorly protected. The conservation target is 24 % of which the proportion of target protected is 12.99 %. It is near-endemic in Mpumalanga. This vegetation unit occurs still in a natural state (excluding old lands) on 47.98 % of surface area in Mpumalanga.

Ecological drivers of the ecosystem

According to the Mpumalanga Biodiversity Sector Handbook the most important ecological drivers in Mpumalanga are built infrastructure, cultivation, mining, prospecting and residential areas. The proposed Hope No. 4 seam project underground coal mining area is situated in the Nkangala District Municipality with the percentages for the different ecological drivers as a percentage of the surface area of Mpumalanga as:

Built infrastructure – 14.3 %

Cultivation – 1.8 %

Mining – 39.9 %

Prospecting – 75.6 %

Residential – 8 %

Environmental Management Framework

The Mpumalanga Biodiversity Sector Plan (MTPA 2013) is the Environmental Management Framework for Mpumalanga and provides for the sustainable use of natural resources in Mpumalanga by means of utilising the most recent and best quality spatial biodiversity information to inform land use and development planning, environmental assessments and authorisations and natural resource management.

Spatial Development Framework

The Steve Tshwete Local Municipality utilises its Spatial Development Framework for land use planning. Based on the above-mentioned special development framework, the proposed project is

situated within an already developed area and will hence not conflict with the municipality's spatial development framework regarding preservation of the ecological integrity of the area.

4.1.2 Consideration of the disturbance or enhancement of the ecosystems and/or result in the loss or protection of biological diversity

Only the shaft and infrastructure area of the Hope No. 4 seam project underground coal mining area will disturb the ecosystem and result in the loss of biological diversity because the area will be stripped of all vegetation and topsoil. This negative impact cannot be avoided since this is the only area where the shaft and infrastructure area will have the least environmental impact since the area is already disturbed by historic mining related infrastructure. The negative impact will be remedied by keeping the footprint of the development as small as possible and post mining, by means of rehabilitation and re-vegetation according to best practises.

4.1.3 Consideration of pollution and degradation of the biophysical environment

The Hope No. 4 seam project underground coal mining area may pollute or degrade the biophysical environment with polluted mine water (in the surface and groundwater), coal dust, alteration of surface runoff water quantity, velocity and patterns, soil compaction and invasion of declared invader species. This negative impact cannot be avoided since this is the area where the coal reserve is situated.

The negative impact will be remedied by keeping the footprint of the development as small as possible, by the separation of dirty and clean water, containing all mine polluted water in a pollution control dam, dust suppression, routing clean water around the mining area to report to the stream, keeping the footprint of all stockpiles as small as possible and to implement an eradication programme for declared invader species.

4.1.4 Waste to be generated by the proposed development and their management

Hazardous and general waste will be generated from the proposed project. Hazardous waste to be generated include mineral residue stockpiles and business waste. Business waste will include waste from a thermal process (not generated on site), oil waste, waste of liquid fuels, unspecified waste, construction waste and waste from the waste management facilities (sewage treatment plant). Mineral residue stockpiles will include overburden material removed during the construction of the shaft box cut, mineral waste (muds and drilling chips) generated during the drilling of the backfilling boreholes and coal discard to be stored at the batching plant site.

General waste to be generated from the proposed project area will include building and demolishing waste, domestic waste and inert waste.

Goedehoop Colliery uses a contractor to transport general waste from the existing Hope Shaft complex to the Witbank, Middelburg and Kriel Municipal dumping sites for disposal. The existing Hope Shaft area is equipped with waste collection skips and paper recycling cages. All general waste excluding paper and cardboard are disposed of at the waste collection skips and the paper and cardboard are disposed of at the paper recycling cages. The waste is then transported to the solid waste disposal sites and the paper/cardboard waste is send for re-cycling in Middelburg.

Hazardous waste arising from the surface infrastructure at Goedehoop Colliery is collected in a different waste collection system and disposed of by a contractor at a registered hazardous waste

site. Recyclable waste such as batteries, tyres, old conveyor belting, used oil drums and waste metal collected around the mine is transported to the Goedehoop Scrap Yard and sorted. The waste is then sold through the Goedehoop Colliery Stores Department to scrap and recycling companies.

A sewage treatment plant and a new conservancy tank will be used to service the Hope No. 4 Seam project.

4.1.5 Consideration of the disturbance or enhancement of landscape

Only the shaft and infrastructure area of the Hope No. 4 seam project underground coal mining area may disturb sites that constitute the nation's cultural heritage since the shaft and infrastructure area will be stripped of all vegetation and topsoil. This negative impact cannot be avoided since this is the only area where the shaft and infrastructure area will have the least impact since the area is already disturbed by historic mining related infrastructure. As part of the EIA specialist studies conducted during this EIA, an archaeological investigation was conducted to determine if there will be a negative impact on sites that constitute the nation's cultural heritage.

4.1.6 Consideration of the impacts on non-renewable natural resources

The Hope No. 4 seam underground coal mining project will exploit the coal reserve in this area. The coal reserve will only be exploited in an area where the coal is economically viable. This will keep the footprint of the project as small as possible. The consequence of the depletion of the non-renewable natural resource will be a positive impact on the community. The company extracting the coal will make a profit and a part of the profit will be used for community projects. This negative impact cannot be avoided since this is the area where the coal reserve is situated. The negative impact will be remedied by rehabilitation and re-vegetation, especially of the shaft and infrastructure area, according to best practises.

4.1.7 Consideration of the impacts on renewable natural resources

4.1.7.1 Increment of the project's dependency on resources to maintain economic growth

The proposed Hope No. 4 seam underground coal mining project will reduce resource dependency since the non-renewable natural resource (coal) will be totally extracted.

4.1.7.2 Use of natural resources

Since South Africa is still dependant on coal for energy, and it is seen as a strategic mineral by the government, the proposed use of the natural resource constitutes the best use thereof. The use is justifiable since South Africa is currently still dependent on coal for energy because the use of alternative methods for energy is still too expensive in South Africa. It is also justifiable since intra-generational equity is still not balanced, thus certain communities are dependent on the community projects that are generated with the profits from the coal mining companies. Coal will probably not be used by future societies as an energy resource since alternative energy resources will become cheaper in future. The coal resource will thus not be needed by future societies and thus do not need to be justifiable. Energy generation is the most important priority for which the resource can be used.

4.1.7.3 Promotion of reduced dependency on resources

The proposed Hope No. 4 seam project underground coal mining area is situated within the existing Mining Right area of Goedehoop South Colliery. It is also surrounded by several collieries. If the coal in this location is thus extracted, it will promote a reduced dependency on the resource since the non-renewable natural resource (coal) will be totally extracted.

4.1.8 Application of risk-averse and cautious approach

4.1.8.1 Knowledge Gaps

The limits of current knowledge are the fact that most of the environmental investigations that were conducted, concentrated on the Goedehoop South Colliery Mining Right area and the Hope No. 4 seam project underground coal mining area. The soil, groundwater and wetland investigations are the only studies that included areas adjacent to the mining right area.

4.1.8.2 Level of risk associated knowledge gaps

The level of risk is the fact that cumulative impacts can thus not be addressed on a larger scale.

4.1.8.3 Application of the risk-averse and cautious approach to the proposed project

A risk-averse and cautious approach was applied by means of the different environmental investigations, including impact assessments, which were conducted for the Hope No. 4 seam project underground coal mining area.

4.1.9 Consideration of people's environmental rights

4.1.9.1 Negative impacts on people's environmental rights

There are commercial farmers and communities situated within or immediately adjacent to the Hope No. 4 seam project underground coal mining area, that may be negatively impacted regarding the above-mentioned negative impacts. This negative impact cannot be avoided since this is the area where the coal reserve is situated. The negative impact will be remedied by keeping the footprint of the development as small as possible and post mining, by means of rehabilitation and re-vegetation, especially of the shaft and infrastructure area, according to best practises.

4.1.9.2 Positive impacts on people's environmental rights

The positive impact will only be socio-economically. The company will spend a part of their profits for community projects.

4.1.10 Description of the linkages and dependencies between human wellbeing and ecosystem services

The proposed Hope No. 4 seam project underground coal mining area is situated within the existing Mining Right area of Goedehoop South Colliery. It is also surrounded by several collieries. There are

commercial farmers and communities situated within or immediately adjacent to the Hope No. 4 seam project underground coal mining area. Thus, there may be a linkage between human wellbeing, livelihoods and ecosystem services. The development's ecological impact will result in positive socio-economic impacts because it will increase the life of mine of Goedehoop South by 19 years. Certain employees and contractors will thus be certain of a monthly income for another 19 years from the inception of the development. The company will also spend a part of their profits for community projects.

4.1.11 Impacts of the proposed project on ecological integrity objectives/targets/considerations of the project area

The proposed Hope No. 4 seam project underground coal mining activities will negatively impact on ecological integrity objectives/targets/considerations during mining. The negative impact will be remedied to an extent by keeping the footprint of the development as small as possible and post mining, by means of rehabilitation and re-vegetation, especially of the shaft and infrastructure area, according to best practises.

4.1.12 Consideration of the need to secure ecological integrity and a healthy biophysical environment

This negative impact cannot be avoided since this is the area where the coal reserve is situated. No alternatives can be considered since this is the area where the coal reserve is situated.

4.1.13 Description of cumulative ecological/biophysical impacts

No information regarding other planned developments in the area is available. The proposed Hope No. 4 seam project underground coal mining area is situated within the existing Mining Right area of Goedehoop South Colliery and between existing surrounding collieries. The negative cumulative ecological/biophysical impacts of the Hope No. 4 seam project underground coal mining activities may be high since it is situated in the vicinity of some wetland areas.

4.2 SOCIO-ECONOMIC CONTEXT OF THE AREA

4.2.1 IDP and other strategic plans

The local municipality has developed their integrated development plan for 2015 to 2016 (IDP). The municipality has also developed a local economic development plan and a spatial development framework, which both forms part of the above-mentioned IDP. Copies of this plans and framework area available in the municipality's website.

The aim of the IDP for the Govan Mbeki Local Municipality is the principal strategic planning instrument which guides and informs all planning, budgeting, management and decision making processes in the municipality.. The intention of the IDP is to link, integrate and co-ordinate development plans for the municipality which is compatible with national, provincial and district development plans and planning requirements binding on the municipality in terms of legislation.

The Spatial Development Framework (SDF) is municipal spatial planning tool that indicates future areas for expansion of residential, community facilities, industrial, business, resort development and other activities. It also indicates the urban edge and provides guidance with respect to areas of highest impact and priority projects. According to the Municipal Systems Act, 2000, the SDF forms a core component or a sector plan of an Integrated Development Plan (IDP) and should provide for basic guidelines for a land use management system for the municipality. Therefore all land

development related IDP projects, which include the proposed Hope No. 4 Seam project, should be informed by the SDF and be spatially referenced in an endeavour to achieve the desired spatial pattern of a municipality.

4.2.2 Spatial priorities and desired patterns

According to the Steve Tshwete Local Municipality spatial development framework the local municipality has broad settlement patterns that distinguishes between urban and rural development. Steve Tshwete Local Municipality is a primarily rural area with a number of towns situated within it. The spatial framework for the municipality has a number of settlements areas, which include urban areas (Middleburg, Hendrina and Kwazamokuhle), holiday towns, towns associated with mines and power stations and agri-villages. Goedehoop Colliery falls within the towns associated with mines and power stations.

Villages such as Rietkuil, Pullen's Hope, Komati/ Blinkpan/ Koornfontein etc. are third level towns providing housing for Eskom and mining employees. Other un-proclaimed villages such as Bank, Naledi and Lesedi provide accommodation to mine employees. It should be noted that many of the above mentioned towns and villages have also been identified to host Multi Purpose Service/Community Centres as proposed by the Nkangala SDF (2008).

From the above, the below listed priority areas were identified for the Steve Tshwete Local Municipality. Some of the above are relevant to the Goedehoop Colliery area but are not competing with the proposed project.

- Branding and development of the Steve Tshwete Tourism Precinct and associated Cultural Historic Sites.
- Development of the Thusong/Multi-Purpose Community Centres earmarked in the Steve Tshwete municipal area, and development of Rural Nodes at Mafube, Kwamakalane and Doornkop
- Township establishment on all land pockets earmarked for development.
- Bulk service upgrading to serve the future residential and business developments in Middelburg
- Road Access Management Plans along all the major activity routes in order to maintain the required mobility levels and provide sufficient access to surrounding land uses.
- Expansion/upgrading of bulk infrastructure in Middelburg and Hendrina to serve business, commercial and industrial precincts.
- Marketing campaign (and incentive program) for municipal area to highlight development opportunities, with specific focus on agri-processing industries.
- Branding of the N4 Development Corridor.
- Proper environmental management guidelines to conserve the natural assets of the municipal area (to promote tourism) and to prevent pollution, sinkhole formation

4.2.3 Spatial characteristics

The Steve Tshwete Municipality has Middelburg and Hendrina functioning as the Primary and Secondary nodes, respectively. A number of smaller settlements are dispersed throughout the municipal area, mainly south of the N4 towards Hendrina.

Middelburg is situated almost central in terms of a north – south orientation within the Municipality and Hendrina is situated on the south-western border of the municipality.

The municipal area is characterised by the coal mining industry, operating mainly in the southern part of the municipal area, south of the N4 national road. The N4 traverses the municipal area in an east – west alignment. Conflictingly, the southern area is also the area in which the highest agricultural potential is found, comprising of arable land under irrigation. The north western region is characterized by mountainous terrain with lower agricultural potential, which largely accommodates game farms. Conflicts between high potential agricultural land/mountainous natural area and mining were noted to exist in the SDF

The municipal area comprises the following nodes:

Primary Node (Urban)

- Middelburg;

Secondary Node (Urban)

- Hendrina and Kwazamokuhle

Tertiary Nodes (Rural)

- Rietkuil (Arnot Power Station)
- Mafube Rural Village
- Pullen's Hope (Hendrina Power Station);
- Komati Power Station/Blinkpan/Koornfontein;
- Thokoza;
- Lesedi;
- Naledi;
- Doornkop;
- Kwamakalane Village;
- Presidentsrus; and
- Kranspoort

Goedehoop Colliery occurs within the Komati Power Station/Blinkpan/Koornfontein tertiary node

4.2.4 Municipal Economic Development Strategy

The two main influential IDPs of the surrounding area of Goedehoop Colliery are the Nkangala District Municipality and Steve Tshwete Local Municipality IDPs. Together, these form the basis of social upliftment and the LED (Local Economic Development) in the area. The Nkangala District Municipality LED strategy focuses primarily on regional needs and priorities. The LED is one of the strategic pillars of the municipality. The focus on the LED as a strategic pillar is in the need to enhance economic development, job creation and poverty alleviation through formulation of District-wide Local Economic Development strategies, planning and co-ordinating government socio-economic development strategies and initiatives, diversification of the economy by promoting Agriculture, tourism and SMME development; establishing LED programme structures which include the District

and Local Municipalities so as to co-ordinate and co-operate on policies, structures and LED initiatives; and to collect and disseminate economic information so as to assist Local Municipalities with LED interventions.

The Steve Tshwete Local Municipality LED strategy, on the contrary, is more locally specific and has identified a number of issues that should be prioritised, which include:

- The rendering of affordable, accessible, efficient and quality services
- The maximising of infrastructural development through the utilisation of all available resources
- The implementation of effective systems and procedures
- The creation of an enabling environment for local economic development
- Effective co-operation with relevant stakeholders

Goedehoop Colliery will through its implementation of the Social and Labour plan ensure that the local economic development programme is aligned to the LED of the district and local municipalities.

4.2.5 Socio-economic impacts

Through forums such as the Chief Executives Officers' (CEOs) Forum constituent of CEOs of companies in Nkangala District, which was launched in June 2012 the municipalities are provided with opportunities to re-orientate their focus and approach toward mining activities happening within the area of its jurisdiction. Mining has a greater impact on the local economic development of communities surrounded by mining and mining-related industries. These can be used in creating economic value for communities and society at large that will endure long after mining operations have ceased. The municipalities are continually monitoring the Social Labour Plans (SLP) and the Corporate Social Investment plans of the mining companies to ensure that the above is achieved.

Goedehoop Colliery has developed and implemented its local economic development under their mining right to complement the desired socio-economic initiatives of the local and district municipalities. Strategic pillars within the municipal LED programme that are supported by the Goedehoop Colliery LED include human resource and community development; industrial and big business development; SMME and cooperatives development and support; and sustainable environmental development. The proposed extension project will form part of the current programme developed at Goedehoop Colliery. The above illustrates the commitment Anglo Operations (Pty) Limited has on ensuring that the environmental resources are exploited to the benefit of the public interests.

4.2.6 Location of the development

The proposed project is an extension of an existing mining operation, hence the location of the project is determined by the presence of the resources to be exploited and the jurisdiction of the Goedehoop Colliery mining right. The area in where the proposed activity will be undertaken has in the past been used for mining purposes hence it will not compete with a space earmarked for community based development. As much as possible, existing Hope Shaft infrastructure will be used for the proposed project. The project team has also ensured that all sensitive landscapes in close proximity of the project area are not affected by the proposed development.

Anglo Operations (Pty) Limited promotes home ownership with the long-term goal of meeting the Mining Charter's requirement that all employees live in sustainable human settlements. The mine wishes to move away from housing provision entirely and want to ensure that employees are

accommodated in their own formal accommodation located within the metropolitan frameworks of the regions where new and existing operations are based. As such a Housing and Community Allowance is paid to employees. In view of the above, no new residential facilities will be developed for the proposed project. All new employees will be housed in the surrounding residential areas. The area has sufficient accommodation for new employees from the proposed project.

Anglo Operations (Pty) Limited will limit the transportation of employees and goods needed for the proposed project to be within the surrounding towns and residential nodes. Only scares skills and goods that are not found within the surroundings will be sourced outside the region. Public roads in close proximity to the mine and proposed project will be used for access to the public. Employees outside the nearby residential area will be transported by available public transport to the proposed project area.

4.2.7 Risk-averse and cautious approaches applied in terms for soci-ecominc impacts

Desktop studies and literature review, primary data, consultation and fieldwork were used to gather data for the determination of the socio-economic impacts from the proposed project. These included various secondary data sources for the extrapolation of information to determine and analyse the social and economic characteristics of the study area. A site visit was undertaken and interviews conducted with relevant stakeholders and interested and affected parties to assists in establishing the baseline environment, social fabric, as well as the key economic activities of the core communities and approved EMPR were also used to gather information and social issues. Information gathered in terms of the above approaches are deemed sufficient to determine the current socio-economic situation and the impacts from the proposed project.

4.2.8 Impacts on people's environmental rights

The environmental rights contained in section 24 of the Constitution provide that everyone is entitled to an environment that is not harmful to his or her well-being. In the context of the proposed Hope No. 4 Seam project, this requires a determination of what level of pollution and degradation to the environment from the project is harmful to well-being. The general approach of the common law is to define an acceptable level of impacts which a reasonable person can be expected to tolerate in the particular circumstances. The subjectivity of this approach can be problematic which has led to the development of environmental guidelines and noise standards.

Several studies were conducted over the project area, which included studies on biophysical and social aspects of the environment. The outcomes of the studies were used to identify possible impacts from the proposed project. All significant impacts identified from the proposed project will be avoided and if they cannot be avoided they will be mitigated to ensure that they are within acceptable levels as determined by the applicable environmental guidelines and standards. In view of the above and if the mitigation measures are strictly adhered to, the people's environmental rights as stipulated in section 24 of the Constitution will not be affected by the commencement and operation of the proposed project.

During the operation of the proposed project, monitoring of the environment will be ongoing and the results from the monitoring will be regularly reported to the responsible organs of state. Compliance to the measures recommended in the EIR and EMPr will also be undertaken on an annual basis or as determined in the authorisations. Reports from the above monitoring and compliance assessment are made available to the public for their perusal and commenting. The above illustrate the commitment

Anglo Operations (Pty) Limited has on the ensuring that the environment is held in public trust for the people.

4.2.9 Public participation

A process that ensured that consultation with interested and affected parties for the project has been undertaken. The process was conducted to provide all interested and affected parties with an opportunity to comment on the project. Platforms such as public meetings and public commenting opportunities were offered to the interested and affected parties. Anglo Operations (Pty) Limited further commits to ensure their contribution to environmental education, to their employees and the nearby communities during the Goedehoop Colliery life of mine.

The employees are made aware of work that may be harmful to their health and the environment and of any work posing danger. This is undertaken in terms of the Mine Health and Safety Act, 1999 (Act 25 of 1999) and their regulations, which gives the employees the right to refuse work that is dangerous. Anglo Operations (Pty) Limited will respect decisions of employees regarding the above and is committed to the protection of employees against any dangerous working environment.

All issues raised by the interested and affected parties were recorded and are addressed in the EIR and EMPr.

Anglo Operations (Pty) Limited has developed a local economic development plan, as part of their Social and Labour Plan, which will encourage the participation of the community in the opportunities rendered by Goedehoop Colliery.

In terms of employment opportunities, the proposed project will use current employees at Goedehoop Colliery. Temporary employees will be limited to the construction activities and will be in compliance to all relevant laws governing temporary employment. As much as possible, available skills within the nearby communities will be used for new employment opportunities. Available platforms will be used for the identification and selection of skills to be used in the proposed project.

4.2.10 Intergovernmental co-ordination

Before the proposed project can proceed, an environmental authorisation must be applied for and issued. The above-mentioned application must be made to the competent authority, which in this case is the DMR.

In the spirit of co-operative governance and in compliance with the NEMA, the competent authority will, during the processing for this application, consult with other organs of state that administer laws that relate to a matter affecting the environment relevant to this application.

The organs of state that will be consulted may include the following:

Department of Mineral Resources (DMR)

Mpumalanga Tourism and Parks Agency (MTPA)

Department of Water and Sanitation (DWS)

National Department of Agriculture, Forestry and Fisheries (NDA)

Note however that this list is not exhaustive as more organs of state may be identified by the competent authority.

Aside from the NEMA environmental authorisation and the waste management licence, an integrated water use licence will be required for the new water uses in the extension project area. The

application processes will, where possible, be merged in order to save time and reduce confusing the interested and affected parties.

In view of the above, Anglo Operations (Pty) Limited believes that sufficient intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to environment were undertaken. No conflicts of interests between organs of state are therefore anticipated in the application.

4.2.11 Environmental considerations

In the interest of the public and in bid to ensure that the environment is used to the interest of the public, environmental baseline data was obtained through various independent agencies and used in the EIR and EMPr. The data accumulated and analysed is deemed sufficient to gain a baseline indication of the present state of the environment. The use of this baseline study for impact assessments is thus justified, and reliable conclusions could be made. The impacts that could arise during and after the proposed activities were determined and ranked according to their significance. Based on the impact assessment, recommendations were made for the mitigation of significant negative environmental impacts that will result from the proposed project. Note that the previous assessment has not been removed but rather new impacts that were not identified in the previous impact assessment were added together with their mitigation and management measures.

The proponent will also make sufficient financial provision for remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects through a bank guarantee for closure costs and by making funds available from their operational costs during the operational phase of the mine.

SECTION FIVE

Motivation for the preferred development footprint

5 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT

5.1 CONSIDERATION OF ALTERNATIVES

The National Environmental Management Act 107 of 1998, Environmental Impact Assessment Regulations, 2014 requires an EIR and EMPr to identify alternatives for projects applied for. In terms of the above-mentioned regulations an alternative in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to the (a) the property on which or location where it is proposed to undertake the activity; (b) the type of activity to be undertaken; (c) the design or layout of the activity;(d) the technology to be used in the activity;(e) the operational aspects of the activity; and (f) the option of not implementing the activity.

Anglo Operations (Pty) Limited proposes to extend its current mining operation to include a new underground section together with its shaft and associated infrastructure i.e. Hope No. 4 Seam project. The proposed activity will include the mining of the No. 4 coal seam together with the construction and operation of the infrastructure associated to the proposed mining operation. The associated activities/infrastructure will include, an access shaft with its associated infrastructure, which include the following i.e. water management facilities, overland conveyor belts, underground backfilling site, ventilation facilities, a stone dust silo, access and haul roads, site access control structures, overburden stockpiles, sewage treatment facilities (septic tank), water and electrical supply infrastructure. Material required for the construction of the foundations, will be sourced from either existing borrow pits or new borrow pits to be sited and established within Goedehoop South Colliery's mining right area. In addition to the above, Goedehoop South Colliery will undertake underground backfilling of the mined out No. 2 coal seam areas with lower safety factors where the No. 4 coal seam will be mined. The backfilling of the No. 2 coal seam will result in ensuring that areas with the risk of subsidence are made safer.

5.1.1 Location Alternatives

The location alternative considered for the proposed Hope No. 4 Seam project include the mining area and associated incline shaft location. The location alternatives were selected based on a number of criteria, which include the environmental considerations (how sensitive is the area in terms of soils, wetlands, groundwater etc.), sensitive receptors (proximity to communities and farmsteads) and the dependency to targeted coal reserves, mine design target areas and existing mine infrastructure.

5.1.1.1 Coal Reserves

Regarding the coal reserve, no alternatives in terms of the location were considered since the proposed project is dependent on the coal reserves which cannot be relocated. In addition to the above, the coal reserve to be mined occurs within Anglo Operations (Pty) Limited's Goedehoop Colliery mining right area. Anglo Operations (Pty) Limited are therefore limited by the boundaries of their mining right and cannot mine outside the boundaries.

5.1.1.2 Location of the Access Shaft

Regarding the location of the access point to the target coal reserves, two shaft positions were identified during the scoping of the project. These alternatives were selected based on the mining design target areas, which were selected to ensure the maximisation of the access to the mine design target areas from the single access point. It must be noted here that due to the presence of geological intrusions (sills and faults) the coal reserves over the proposed mining area has been divide into three mining blocks i.e. eastern, central and western block with the central block being the biggest. In view of the above, access through the central block is the most feasible option of accessing the targeted coal reserves.

The first access shaft location alternative was sited on portion 4 of the farm Kleinfontein 49 IS. This alternative was approximately one kilometre from one of the farmsteads (Mr Honeybourne's residence). The site was also located within a seasonal/temporary wetland that has indication signs of wetland vegetation, which is most probably a functional wetland. The site was also sited within an area with a high groundwater level. The assessment of this alternative in terms of the environmental considerations and the sensitive receptors was identified as a site with high environmental and social risks. In addition to the above the nearest existing Goedehoop Colliery surface infrastructure, which could be used to service the proposed shaft is located approximately four kilometres away. In view of the above, the shaft complex at this site would need to have all the necessary infrastructure, which will result in a much larger shaft footprint. This will have even more negative impacts on the affected wetland, surrounding farmsteads and the surrounding areas. In view of the above, this alternative was discarded in favour of the second alternative, which is the preferred site. The preferred site is located on portion 9 of the farm Goedehoop 49 IS. The nearest community from the site is an informal settlement and a mine village. Studies conducted over these communities has shown that with strict implementation of the recommended mitigation measures, these communities will not be detrimentally affected by the development of this site. Regarding the environmental considerations, the site is situated in close proximity to a wetland. This wetland has been assessed to be highly impacted by the current land uses and therefore has been greatly modified. The designs of the shaft layout were revised by the project team to ensure that the shaft is at least more than 32 meters away from the edge of the identified wetland. Due to the existing Goedehoop Colliery's Hope shaft existing surface infrastructure being so close to the preferred site, which has allowed the project team to use the existing infrastructure to service the proposed shaft, the footprint of the shaft complex has been lessened considerably.

5.1.2 Design/Layout Alternatives

The design and layout alternatives for the proposed project involved the determination of the best possible surface infrastructure.

Regarding the mining designs, the coal reserve delineation was used to determine the preferred mining design option. Based on the geological investigation, the reserve was delineated into low and indicated measured, indicated and inferred underground and opencast reserves. All reserves delineated as indicated and measured underground reserve were declared as mineable reserves (mine design target areas) for the proposed project. The other design options were discarded due to geotechnical considerations associated with the mined out no. 2 and no. 5 seam areas and the depth of the coal seam below surface. The decision on the underground mining layout designs took into consideration all constraints such as lease boundaries, surface structures, environmentally sensitive areas, geotechnical aspects and old workings. Mining recovery was optimised by ensuring that safety factors are kept as close as possible to the required minimum of 1.6 and layouts were designed to cover as much of the reserve area as practically possible to reduce layout losses. The determination

of the safety factors also took into consideration the areas where wetlands, pans and streams will be undermined. All major streams such as the Koring Spruit and the Olifants River will not be undermined.

Regarding the surface infrastructure layout, two layout alternatives were identified i.e. shaft only and shaft with a box cut layout. The box cut layout option was decided against the shaft only option. The box cut option was decided upon based on the resulting environmental impacts associated with the location of the associated infrastructure on the surface rather in the box cut. When infrastructure associated with the shaft complex is placed on surface, impacts from noise (ventilation shaft), air quality, water pollution and social aspects are much higher. This result in the risk to the environment is to be much higher as well. On the other hand, the shaft with a box cut option will result in most of the structures (water management structures and the ventilation facilities), that would have had higher impacts on the environment, being placed at the bottom of the box cut, which would result in a reduced significance of the impacts that they would have had on the environment should they have been placed on surface. It must also be noted that the siting of the infrastructure has been optimised to minimise risk to the environment and the risk of sterilisation of coal.

5.1.3 Technology Alternatives

Based on the policies of the Department of Water and Sanitation, the local municipalities and the mine itself, it was determined that the only feasible technological way of undertaking the proposed activities would be to use energy currently available to the mine, water from the current underground workings, Goedehoop Colliery water purification plant or recycled water from the coal beneficiation plant and existing waste management facilities for the operation of the proposed project. In view of the above, no technology alternatives were considered for this project.

5.1.4 Input Material Alternatives

As mentioned above, current water sources used by the mine and currently available energy will be used for the operation of the proposed project. In view of the above, no alternatives were considered for this project. Note that no new building facilities will be constructed at the extension site since existing facilities (Hope Shaft office and workshop) will be used for the proposed project.

5.1.5 Operational Alternatives

5.1.5.1 Mining methods

Regarding the mining methods, two mining methods were investigated for the proposed project i.e. opencast and underground mining methods.

Mining using underground mining methods were decided against the opencast mining method. The opencast mining method was ruled out due to the following:

- Extensive historic mining of the No. 2 and No. 5 coal seams;
- Changing mining methods is undesirable as it requires capital investment on opencast equipment making the opencast mining option uneconomic. The size and lower quality coal of the coal added to the option not being economical;
- The resource insufficient to warrant this change;
- The opencast mining option will limit the utilisation of existing skills base;
- There is limited area with favourable strip ratios; and

- The opencast mining option compromised by environmental (wetlands) constraints.

Regarding the underground mining methods, alternative methods for accessing the targeted coal reserves were considered which included access through the previously mined no. 2 seam infrastructure, access via opencast operations and surface access points.

The no. 2 seam access option was discarded on the basis that the current incline infrastructure does not intersect the no. 4 seam horizon and additional development in the old worked out areas would be required. Geotechnical challenges with associated excavation support costs and time impacts are expected on the no. 2 seam coal horizon.

The access option through surface mining operations was discarded mostly due to the limited identified delineations of areas with economic opencast potential. This option was further limited by environmental constraints and surface infrastructure restrictions and as a result eliminated as a viable access option.

In view of the above, access through a surface point (shaft) was decided on. Note however that a box cut option was decided upon for this option as described in the design and layout option.

5.1.5.2 Transportation of coal product

Regarding transportation of the mined coal, the use of an overland conveyor belt or haul roads were investigated. However the option of using an overland conveyor belt works best since Goedehoop Colliery already has extensive conveyor belt systems that can be connected to the new belt. The option of using the road for coal transportation was also ruled out due to the possible disruption on the existing private and provincial road infrastructure in close proximity to the proposed shaft area. These roads are currently extensively used for staff and Hope village residents' movement and additional constraints on these roads over a long period may have undesired effects on the road users. The above-mentioned impact was one of the significant social impacts identified during the social impact assessment undertaken for the preferred site.

No staff transport alternatives were considered for the proposed project. This was due to the fact that existing facilities which are already serviced by existing roads will be used for the Hope No. 4 Seam project. A new access road to the shaft complex will be routed to connect to these existing roads.

5.1.6 No Go Option

Goedehoop Colliery operations produces coal from their underground mine with a number of continuous miner sections. Goedehoop Colliery currently mines and processes the coal at the coal washing plant to produce export coal product. The current tonnage profile indicates that coal reserves at Goedehoop Colliery will facilitate economic coal mining up to 2018. From there, underground coal mining becomes un-economic due to rising unit costs attributable to decreased output. In view of the above, an option identification analysis was initiated to identify possible replacement projects to extend to life of mine ("LOM"). These options were ranked based on value adding potential. The Hope 4 seam project was identified as a potential replacement project to supplement the current LOM production profile for Goedehoop Colliery. The proposed Hope No. 4 Seam project will therefore achieve Anglo Operations (Pty) Limited's Goedehoop Colliery's Life of Mine date. This will ensure that the current labour force has continued employment for the life of mine and that local businesses are continued to be supported by the mine. **If** the mine cannot continue with the Hope No. 4 Seam project, the mine will come to a premature closure, which will affect the labour force employed at Goedehoop Colliery and local businesses supported by the mine.

Goedehoop Colliery, through its Social and labour plan is also embarking on an upliftment programme for the previously disadvantaged persons residing within the jurisdiction. If the mine cannot proceed with the proposed Hope No. 4 Seam project, the mine will come to a premature end, which will result in the discontinuing of the social upliftment programme affecting all beneficiaries of the projects.

Anglo Operations (Pty) Limited due to the mining right they hold over the proposed mining area, is the only company that can exploit the coal reserve. The presence and intended use of the existing plant and other infrastructure for the efficient operation of the proposed extension project will also result in the proposed project having the least environmental damage. Anglo Operations (Pty) Limited has shown their commitment in the lessening of the environmental damage by undertaking the pre-mining environmental investigation that is being carried out using independent specialists and consultants. Further, due to the existing infrastructure situated on Goedehoop Colliery, this mine can exploit the coal reserves with a minimum capital outlay.

Goedehoop Colliery has current supply contracts for the type of coal that is available in these reserves, hence the value of the reserve can be shown.

Accordingly, the consequences of not proceeding with the proposed project will have a detrimental impact on the current and future labour force, the surrounding previously disadvantaged communities, the owners of the mine, and the domestic and export coal market. This may ultimately have an impact on the region as a whole, due to a loss of revenue and taxes.

5.2 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED AND RESULTS THEREOF

Public participation is the cornerstone of the EIA process. The principles of the NEMA govern many aspects of EIA's, including public participation. The general objectives of integrated environmental management laid down in the NEMA include to "ensure adequate and appropriate opportunity for public participation in decisions that may affect the environment". The National Environmental Management Principles include the principle that "The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity necessary to achieve equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured", which basically means that the person responsible for the application (EAP) must ensure that provision of sufficient and transparent information on an ongoing basis to stakeholders are made to allow them to comment, and to ensure that the participation of previously disadvantaged people like women and the youth are undertaken.

In terms of the EIA Regulations, 2014, when applying for environmental authorisation, the Environmental Assessment Practitioner managing the application must conduct at least a public participation process where all potential or registered interested and affected parties, including the competent authority, are given a period of at least 30 days to submit comments on each of the basic assessment reports, EMPr, scoping report and environmental impact assessment report, and where applicable the closure plan. In this case a Scoping Report is considered.

This section of the EIR and EMPr will give an explanation of the public participation process taken so far in order to comply with the above-mentioned requirements. A number of public participation guidelines were published in a bid to assist persons responsible for the environmental authorisation applications. As much of the available guidelines were used in determining the public participation process, in guiding the public participation process of the proposed project.

Anglo Operations (Pty) Limited is applying for an environmental authorisation for the proposed Hope No. 4 Seam project. The application for the environmental authorisation is undertaken in terms of the process as laid out in part 3 of Chapter 4 under the NEMA EIA Regulations, 2014. The abovementioned regulations requires that an applicant for an environmental authorisation submit a Scoping Report and an EIR and EMPr report to the competent authority after having subjected the reports to a public participation process.

In view of the above, a public participation process was initiated for the proposed Hope No. 4 Seam project. The public participation process for the proposed project is designed to provide sufficient and accessible information to interested and affected parties (I&APs) in an objective manner to assist them to:

- raise issues of concern and make suggestions for enhanced benefits;
- contribute local knowledge and experience;
- verify that their issues have been captured;
- verify that their issues have been considered in the technical investigations; and
- comment on the findings of the EIA.

The following are and will be taken in undertaking of the public participation process for the proposed project.

5.2.1 Registration Phase

The public participation process commenced by providing potential Interested and affected parties (I&AP's) 30 days to register as interested and affected parties. The registration process started on the 11th of August 2015 and ended on the 10th of September 2015.

5.2.1.1 Notification of potential interested and affected parties

The following methods of notification were used to notify the potential interested and affected parties of the opportunity to register during the public participation process for the proposed project:

- On the 11th of August 2015, notices were fixed at three sites i.e. 1) boundary fence of one of the properties affected by the project, 2) at a public place conspicuous to and accessible by the public and 3) at the site where the shaft for the proposed project will be constructed (Hope No. 4 Seam shaft area). These sites include a boundary fence close to the Mahlatini informal settlement, a grocery store at Komati village and a boundary fence at the Hope No. 4 Seam project shaft area. The notices were compiled in compliance with the requirements of Regulation 41(3) of the EIA Regulations, 2014.
- Written notices were sent to all surface owners and lawful occupiers of the land on which the proposed project will be undertaken, owners/lawful occupiers of land immediately adjacent to the proposed project area, the municipal councillors of the ward in which the proposed project is situated and the municipality which has jurisdiction over the proposed project area (Steve Tshwete Local Municipality). The written notices were compiled to comply with the requirements of Regulation 41(3) of the EIA Regulations, 2014. Note that landowners (including lawful occupiers) within the proposed project area and immediately surrounding settlements (Mahlatini informal settlement and Hope Village) are automatically registered as interested and affected parties.

- Notices inviting the public to register as interested and affected parties were placed in two local newspapers (Middleburg Observer and Witbank News) on the 7th of August 2015. The newspaper notices were published in both English and Afrikaans. The notices were also compiled to comply with the requirements of Regulation 41(3) of the EIA Regulations, 2014.

5.2.1.2 Registered Interested and Affected Parties

The following are currently registered as interested and affected parties for the Hope No. 4 Seam project:

- Department of Mineral Resources, Mpumalanga Regional Office (Competent Authority),
- Department of Water and Sanitation, Mpumalanga Regional Office (Commenting Authority)
- Department of Agriculture, Rural Development, Land and Environmental Affairs, Mpumalanga Provincial Office (Commenting Authority)
- National Department of Agriculture, Forestry and Fisheries, Mpumalanga Regional Office (Commenting Authority)
- Mpumalanga Tourism and Parks Agency (Commenting Authority)
- South African Heritage Resources Agency (Commenting Authority)
- SANRAL
- Eskom Holdings Limited
- Steve Tshwete Local Municipality
- Ward 4 and 6 Ward Councillor (Steve Tshwete Local Municipality)
- Hope No. 4 Seam Project area land owners and lawful occupiers
- Mahlatini Informal settlement
- Hope Village, Komati Village, Blinkpan Village & Mabona community
- Power Steel Fabricators
- Bathlakoane Ba Manzimnyama Clan

5.2.1.3 Proof of Consultation

Proof of the above-mentioned consultation is available on request.

5.2.1.4 Finalisation of Interested and Affected Party Database

On expiry of registration period, the database of interested and affected parties was finalised. All parties who indicated the interest of being registered as interested and affected parties were added to the list of interested and affected parties.

Note: All organs of state, which have jurisdiction in respect of any aspect of the proposed project and the competent authority are automatically registered interested and affected parties.

5.2.2 Scoping Phase

The draft Scoping report was made available for comment to all relevant stakeholders during the above-mentioned registration phase of the Hope No. 4 Seam project public participation process.

5.2.2.1 Notification of potential and registered interested and affected parties

The following methods of notification were used to notify the potential and registered interested and affected parties of the opportunity to comment on the draft Scoping Report during the public participation process for the proposed project:

- All fixed notices as described under the registration phase of this public participation were used to invite comments from the potential interested and affected parties on the draft Scoping Report.
- Written notices sent during the registration phase of this public participation process to all surface owners and lawful occupiers of the land on which the proposed project will be undertaken, owners/lawful occupiers of land immediately adjacent to the proposed project area, the municipal councillors of the ward in which the proposed project is situated and the municipality which has jurisdiction over the proposed project area (Steve Tshwete Local Municipality) were used to invite comments on the draft Scoping Report from the potential and registered interested and affected parties.
- The notices for inviting the public to register as interested and affected parties were also used to invite comments on the Scoping Report from the public.
- The draft Scoping report was submitted to all the commenting authorities for their comments.
- A copy of the draft Scoping Report was placed in two libraries (Middelburg and Witbank public Libraries) and at the Goedehoop Colliery environmental offices.
- Three public meetings were held during the registration and scoping phases. These meetings were advertised in two local newspapers (Middelburg Observer and Witbank News) and registered and potential interested and affected parties were invited to attend.
- During the proceedings of the above-mentioned public meetings, the attendants were invited to comment on the draft Scoping Report. Methods of commenting on the draft Scoping Report were explained to the attendants during the meetings.

5.2.2.2 Proof of Consultation

Proof of all the above-mentioned consultation are available on request.

5.2.2.3 Comments, Issues and Responses on the Draft Scoping Report

On lapsing of the commenting period, all comments and issues received from the interested and affected parties were recorded and responses to the comments made. All reactions to the responses to the comments and issues raised were recorded.

The comments and issues raised by the interested and affected parties, their responses and reaction to the response are presented in Table 6.

5.2.3 EIA Phase

The draft EIR and EMPr is made available for comment to all registered and potential interested and affected parties during the EIA phase of the proposed Hope No. 4 Seam project.

5.2.3.1 Notification of potential and registered interested and affected parties

The following methods of notification were used to notify the registered and potential interested and affected parties of the opportunity to comment on the draft EIR and EMPr during the EIA Phase public participation process for the proposed project:

- Written notices inviting comments on the draft EIR and EMPr were sent to all registered interested and affected parties. The written notices were compiled to comply with the requirements of Regulation 41(3) of the EIA Regulations, 2014.
- Notices inviting potential and registered interested and affected parties to comment on the draft EIR and EMPr are placed in two local newspapers i.e. Middelburg Observer and Witbank News. The newspaper notices are published in both English and Afrikaans. The notices are compiled to comply with the requirements of Regulation 41(3) of the EIA Regulations, 2014.
- The draft EIR and EMPr was submitted to the relevant commenting authorities for their comments.
- A copy of the draft EIR and EMPr is placed at two public libraries (Middelburg and Witbank public libraries) and the Goedehoop Colliery environmental offices. The published newspaper notices has indicated the availability of the draft EIR and EMPr at the above-mentioned places and has invited the public to comment of the draft EIR and EMPr.
- Two public meetings will be arranged and held during the EIA Phase. The meetings will be advertised in two local newspaper (Middelburg Observer and Witbank News) where registered and potential interested and affected parties will be invited to attend. The meeting will be used to present the specialist findings for the project and to collect any comments and issues that may be raised by the interested and affected parties.

5.2.3.2 Comments, Issues and Responses on Draft EIR and EMPr

Once the commenting period lapses, all comments and issues received will be recorded and responses to the comments made. All reactions to the responses to the comments and issues raised will be recorded.

The comments and issues raised by the interested and affected parties, their responses and reaction to the response will be presented in a table as prescribed by the DMR EIR and EMPr template.

All proof of consultation for the project will be attached in the final EIR and EMPr as an attachment for submission to the DMR.

Table 6: Comments and responses to the comments raised by the interested and affected parties.

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
Landowners	**X**				
SANRAL	X	13 May 2015	SANRAL raised a concern regarding traffic impacts associated with the proposed project on R35 national road. A traffic impact study over the road was requested.	In response to the concern, an e-mail explaining the proposed project was sent. It was explained in the email that the proposed project will not impact on the R35 since the project will not make use of R35, hence not needing a traffic impact study. SANRAL responded by concurring with the assessment.	Finalised
Eskom Holdings SOC Limited	X	08 June 2015	Eskom objected to the extension of the underground mining operations onto the Remaining Extent of the Farm Komati Power Station 56 IS. The objection was based on the following i.e., the property is currently being used for the Komati Power Station and its associated infrastructure, Komati Power Station was declared a National Key Point on 30 June 2010 and that the area affected by the proposed underground mining is being developed for the extension of the existing ash disposal facility of the power station, which doesn't allow for any underground mining activities.	Anglo Operations (Pty) Limited has taken note of the objection and is in communication with Eskom Holding SOC Limited regarding the objection. Anglo Operations (Pty) Limited had a meeting with the Eskom representative regarding undermining the ash disposal facility. It was agreed that Anglo Operations (Pty) Ltd may undermine the ash dump based on the safety factor that Anglo Operations (Pty) Limited had presented to Eskom. The National Key Points were not included in the mining layout plan, only the area next to the ash dump facility was included in the mining layout plan.	Finalised
Pieter Honeyborne	X	11 August 2015	I would just like to thank you for the opportunity to comment on the new Hope 4	Noted. Not related to the proposed project. Anglo Operations (Pty) Ltd's Goedehoop Colliery Engineering manager (Mr.	Finalised

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
			Seam project that is taking place. I have a few concerns, namely water supply, Safety fences and the servitude area at Block 8 & Block 20. Goedehoop Colliery is aware of my concerns, as I have discussed it with the Engineering Manager, Mr. Rowan Youell. I fully support this project that will have a positive effect on creating sustainable jobs in our community.	Rowan Youell) will meet with Mr. Pieter Honeyborne to discuss a way forward in addressing his concerns. To be addressed in the mine forum as it is not related to the proposed project.	
Landowners or lawful occupiers on adjacent properties	**X**				
Gert.H..J. Combrink	X	3 September 2015 Scoping Phase Surface owner meeting	Mr. Gert Combrink asked if the coal product will be sold to the export market.	Yes the coal product will be sold to the export market.	Finalised
			Mr. Combrink mentioned that there is a fountain on his property (Portion 24 of the farm Vlaklaagte)	His concern has been noted. The groundwater specialist was consulted to determine if there will be any potential impacts on the fountain. Impacts on the fountain is contained in the groundwater report.	Ongoing
Ronel Bekke (Islardu Boerdery)	X	3 September 2015 Scoping Phase Surface owner meeting	Ms. Ronel Bekke asked as to when the project will start.	The construction phase will start third quarter 2016 until 2017. First coal will start first quarter 2018.	Finalised
Communities	**X**				
Bathlakoane Ba	X	27 May 2015	To inform the applicant of the application for a	Anglo Operations (Pty) Limited wrote a letter to the clan	Ongoing

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
Manzimnyama Clan			land claim that the clan has submitted in terms of the recently passed Restitution of Land Rights Amendment Act to have their land rights restored against certain portions of farm Goedehoop 46 IS and or surrounds. It was also noted that the application was formally accepted by the Regional Land Claims Commissioner of Mpumalanga	representative requesting more information and a meeting with the clan representative to discuss the issues raised by the clan. The clan accepted the invitation to the meeting which has been scheduled for the 27th of August 2015. Based on the outcome of the above mentioned meeting, the Bathlakoane Ba Manzimnyama Clan will go ahead to lodge the High Court Interdict against Anglo Operations (Pty) Limited. This has been handed over to the Anglo Legal Department.	
Bathlakoane Ba Manzimnyama Clan	X	27 May 2015	An issue on family graves and possible ruins of their grandfather present on the farm where the mine is conducting its operations were also mentioned. Removal of graves were objected to.		
Bathlakoane Ba Manzimnyama Clan	X	27 May 2015	The clan requested relevant documentation to familiarise themselves with the possible impact and implications of the prospective operations on their claim.		
Bathlakoane Ba Manzimnyama Clan	X	29 May 2015	The proposed area might affect their land claim, with possible removal of family graves and homestead ruins further damaged that are key to our claim being successful.		
Bathlakoane Ba Manzimnyama Clan	X	29 May 2015	Should the proposed project be where their family graves and homestead ruins are, a written assurances that such family graves and homestead ruins will not be removed was requested. An inspection in loco to satisfy		

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
			themselves was also requested.		
Bathlakoane Ba Manzimnyama Clan	X	20 July 2015	A concern regarding an apparent conduct of Anglo American Coal at the Goedehoop Colliery premises (behind the old Hope Shaft Offices) was raised. The issues raised included general neglect of the property, breakdown of security and easy access to the property, scavenging of building material (SOWETO village and surrounds), stripping of copper, possible mushrooming of squatters in the property and possibility of illegal mining and rise of gangsters. A concern regarding the non-implementation of the mine's EMP where old mines were converted into Game reserves. Due to the above concern a meeting with Anglo Operations (Pty) Limited was requested by the clan to discuss the mattes raised.	To be addressed in the mine forum as it is not related to the proposed project	Finalised
Mahlathini Community	X	17 August 2015 Mahlathini Community Scoping Phase Meeting Michael Thuhloane	Mr Michael Thuhloane first applauded Anglo for giving the community an opportunity to raised comments regarding Goedehoop Colliery and its new projects. He also thanked the Mine for providing the community with water and requested the mine to continue with the good gesture.	Thank you for your comment.	Finalised

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
			His main concern was that the mine employs people from afar and disregards the Mahlathini Community. Hence, theft from the Mahlathini Community is rife.	In order to be employed by a mine, skills are important and legislation stipulates that a specific level of training is required in order to work for a mine. Anglo Operations (Pty) Ltd are unable to guarantee jobs to the Mahlathini community, however Anglo Operations (Pty) will liaise with the Ward Councillor to understand the skills set of community members for potential jobs opportunities in the future. This will also form part of the overall Goedehoop SEP, SLP, and SEAT, which will be managed by Goedehoop Colliery.	Finalised
			He requested to know the commencement date of the project.	The construction phase will start third quarter 2016 until 2017. First coal will start first quarter 2018.	Finalised
Mahlathini Community	X	17 August 2015 Mahlathini Community Scoping Phase Meeting Xolani Pikwa	Mr Xolani Pikwa's main concern was that there is nepotism at the mine, he has relevant qualifications but cannot be employed. The mine is looking for experienced employees and stated that how will people learn how to use machines as there are no such machines at home.	The training will depend on the skills set required to use the machinery. Anglo Operations will take Mahlathini, along with other communities, into consideration for all potential training opportunities. Anglo Operations (Pty) Ltd will engage continuously with all stakeholders on employment and training opportunities should they arise. This will also form part of the overall Goedehoop SEP, SLP, and SEAT, which will be managed by Goedehoop Colliery.	Finalised.
Mahlathini Community	X	17 August 2015 Mahlathini Community Scoping Phase Meeting Johanna Ndlovu	Ms. Johanna Ndlovu's was concerned about the route of the Elders project conveyor belt as it may physically affect certain houses at Mahlathini Village.	Anglo Operations (Pty) Ltd has conducted an investigation to determine if any houses at Mahlathini will be impacted upon physically. Based on the route of the proposed Elders conveyor belt, it was confirmed that none of the houses from the Mahlathini community will be physically affected. The outcome was communicated to the community in the Scoping	Finalised.

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
				Phase public meeting conducted on the 3rd September 2015.	
			Ms. Johanna Ndlovu stated further that the gravel road at the Mahalthini village is used by the school bus to pick up school children. During the rainy season the school bus cannot drive on the gravel road, so there is an alternative bus stop close to the Goedehoop Colliery Kom Saam Saal Community Hall. Ms. Johanna Ndlovu was concerned about the impact of the proposed projects on this arrangement.	Anglo Operations (Pty) Ltd conducted an investigation to determine the route of the conveyor belt in relation to the roads in order to determine if the alternative bus stop will be affected. Based on the route of the proposed Elders conveyor belt, it was confirmed that the new conveyor route (from Elders) will not impact the bus route.	Finalised.
Mahlathini Community	X	17 August 2015 Mahlathini Community Scoping Phase Meeting Nicholas Morokong	Is a concerned member of the Mahlathini community stated that there are a number of people at Mahlathini Village without South African identity documents (ID) and suggested that, that may be the reason why crime is very high in the Village.	Not related to the proposed project. The responsible Ward Councillor will address the issue with the community.	Finalised
Mahlathini Community	X	17 August 2015 Mahlathini Community Scoping Phase Meeting Novageli Mayifele	Some people at the community do not have schooling but have ID documents. How will the project benefit these people?	The training will depend on the skills set required. Anglo Operations (Pty) Ltd will take Mahlathini, along with other communities, into consideration for all potential training opportunities. Anglo Operations (Pty) Ltd with engage continuously with all stakeholders on employment and training opportunities should they arise. This will also form part of the overall Goedehoop SEP, SLP, and SEAT, which will be managed by Goedehoop Colliery.	Finalised
TNC and Mabona	X	17 August 2015	Mr. Simphiwe Vilikazi representing	Noted. Anglo Operations (Pty) Ltd will take Mahlathini, along	Finalised.

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
Communities		Mahlathini Community Scoping Phase Meeting Simphiwe Vilikazi	communities surrounding the mine (TNC, Mabona and others) and feels that they are left out. He suggested that the mine start a training centre to assist people in mining related skills so that people can go and look for employment elsewhere not necessarily at Goedehoop Colliery.	with other communities, into consideration for all potential training opportunities. Anglo Operations with engage continuously with all stakeholders on employment and training opportunities should they arise. This will form part of the overall Goedehoop SEP, SLP, and SEAT, which will be managed by Goedehoop Colliery.	
Bathlakoane Ba Manzimnyama Clan	X	3 September 2015 Scoping Phase Public meeting John Mokoena	Mr. John Mokoena stated that his question was covered during the presentation, and did not raise any further questions.	Noted.	Finalised
Mahlathini Community	X	3 September 2015 Scoping Phase Public meeting Michael Thuhloane	Mr Michael Thuhloane main concern was that the mine employs people from afar and disregards the Mahlathini Community. He stated that 80% of the employed must be from the surrounding communities and 20% of the employed should be from surrounding towns.	In order to be employed by a mine, skills are important and legislation stipulates that a specific level of training is required in order to work for a mine. Anglo Operations (Pty) Ltd are unable to guarantee jobs to the Mahlathini community, however Anglo Operations (Pty) will liaise with the Ward Councillor to understand the skills set of community members for potential jobs opportunities in the future. This will also form part of the overall Goedehoop SEP, SLP, and SEAT, which will be managed by Goedehoop Colliery.	Finalised
			He also requested to know the commencement date of the two projects (Elders & Hope No. 4 Seam project).	Construction of the proposed projects will commence at the end of 2016 through 2017. The Hope No. 4 Seam project's operational phase will commence first quarter 2018, whereas the proposed Elders operational phase will commence third quarter 2018.	Finalised

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
TNC and Mabona Communities	X	3 September 2015 Scoping Phase Public meeting Simphiwe Vilikazi	Mr. Simphiwe Vilikazi stated that Anglo supplies water to Mr. Pieter Honeyborne (adjacent farmer), which his community also uses. He is concerned about the quality of the water as the storage tank does not get cleaned.	Anglo Operations (Pty) Ltd stated that this is an operational issue and is not related to the proposed Hope No. 4 Seam project, hence the Anglo Goedehoop Colliery Complaints & Grievances procedure as indicated in the meeting presentation should be followed by Mr. Simphiwe Vilikazi.	Finalised
Mahlathini Community	X	3 September 2015 Scoping Phase Public meeting Lindelwa Buneli	Ms. Lindelwa Buneli stated that some people at the community are unskilled and asked as to how the proposed project will benefit these people.	Training opportunities offered will depend on the skills set required. Anglo Operations (Pty) Ltd will take Mahlathini, along with other communities, into consideration for all potential training opportunities. Anglo Operations (Pty) Ltd with engage continuously with all stakeholders on employment and training opportunities should they arise. This will form part of the overall Goedehoop SEP, SLP, and SEAT, which will be managed by Goedehoop Colliery.	Finalised.
Municipal Councillor	**X**				
Steve Tshwete Local Municipality Ward 4	X	17 August 2015 Mahlathini Community Scoping Phase Meeting Steve Tshwete Local Municipality Ward 4 Councillor Edward Nyambi	The proposed Elders project conveyor belt runs over two municipalities (not related to the proposed Hope No. 4 Seam project), hence there are also other communities that may need assistance. He will communicate with surrounding communities to understand holistically what is currently going on within those communities	Noted. Not related to the proposed project.	Finalised
			Regarding the ID documents, Anglo cannot provide ID documents and suggested the community must compile a list of people	Not related to the proposed project, The responsible Ward Councillor will address the issue with the community.	Finalised

Interested & Affected Party	Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
		without ID's and forward the list to him. After which he will communicate with the Department of Home Affairs and if there is a need the Department will arrange for a mobile facility to visit the Mahlathini Village in order for people to apply for an ID. People must have all relevant documents to apply for an ID.		
		Regarding the employment/unemployment issue, the ward committee will gather information from the community to assess the skills available at the community, although the ward committee will not be responsible for employment.	Noted.	Awaiting response from the responsible Ward Committee.
		Councillor Edward Nyambi proposed that the mine considers a 10 km radius for job opportunities. If the mines proposes to employ 10 people, at least 6 people should be employed from within the 10km radius.	Anglo Operations (Pty) Ltd acknowledges that all communities need to receive fair job opportunities. The proposed project falls within fixed municipal boundaries and all communities within those boundaries will be considered as part of the Mine's SEP / Procurement procedures.	Ongoing
		The Mahlathini community proposes to engage with the municipality and the mine to acquire land to establish a human settlement for the Mahlathini community. This settlement will also be serviced by the municipality.	To be addressed in the mine forum as it is not related to the proposed project.	Finalised.

Interested & Affected Party		Date Comments Received	Issues Raised	EAP's Responses to Issues Raised	Consultation Status (Consensus dispute, not finalised, etc.)
Steve Tshwete Local Municipality Ward 4	X	3 September 2015 Scoping Phase Public meeting Steve Tshwete Local Municipality Ward 4 Councillor Edward Nyambi	He stated that in the next public meeting, the minutes to the previous meetings should be made available in order for the public to ensure that all issued raised have been addressed.	Noted.	Consensus
			He also stated that a committee will be established in order to take care of the interests of the residents in the surrounding communities in terms of employment.	Noted.	Consensus
			He further stated that Anglo Operations (Pty) Ltd should give local communities an opportunity to tender for provision of services for the proposed Hope No. 4 Seam project.	Noted. Anglo Operations (Pty) Ltd acknowledges that all communities need to receive fair job opportunities. The proposed project falls within fixed municipal boundaries and all communities within those boundaries will be considered.	Finalised

5.3 ENVIRONMENTAL ATTRIBUTES (BASELINE INFORMATION)

5.3.1 Geology

5.3.1.1 Regional Geology

Coal deposits in South Africa are hosted by the Karoo Super group that was deposited in a Gondwana basin comprising parts of Africa, Antarctica, India, South America and Australia. Coalfields in the RSA can be subdivided into three main basins i.e. the Main Karoo Basin, the Eastern Sub-basins and the Northern Sub-basins.

The Main Karoo Basin which was formed on a stable cratonic platform, is commonly subdivided into a south-western and north-eastern facies, and comprises of the known coalfields at Witbank, Free State, Vereeniging-Sasolburg, South Rand, Highveld, Ermelo (Eastern Transvaal), Klip River, Utrecht, Vryheid, and Molteno-Indwe.

The Eastern Sub-basins (north-eastern Kwa Zulu-Natal-Lebombo) formed in fault-bounded rift basins and comprise the known coalfields at Nongoma, Somkele and Kangwane.

The Northern Sub-basins also formed in fault-bounded rift basins and comprise known coalfields at Tuli (Limpopo), Ellisras (Waterberg), Mopane (western Soutspansberg), Tshipise (central Soutpansberg), Pafuri (eastern Soutpansberg) and Springbok Flats.

Goedehoop Colliery falls within the Witbank Coalfield.

5.3.1.2 Local Geology

The Goedehoop Colliery mining area is situated in the central block of the Witbank Coalfield. A typical stratigraphic column for this area is presented in Figure 11. The stratigraphic sequence typically comprises sediments of the Dwyka Group and the Vryheid Formation of the Ecca Group, which rest unconformably on an uneven floor of basement rocks comprised of gabbro diabase and felsites of the Bushveld Igneous Complex. The Dwyka sediments are typically diamictite and grit, while the Vryheid Formation consists of sandstone, siltstone, interlaminated sand/siltstone, shale and coal seams. Seven coal seams exist, numbered from the base up as nos. 1, 2, 3, 4, 4 upper, 4A and 5 respectively. Nos. 1, 3, 4A upper and 4A seams are either thin or of poor quality and are not considered mineable. Nos. 2, 4 and 5 seams are exploited by the mine. Typical coal seam sections for mined mining areas at Goedehoop Colliery are presented in Figure 12. The disposition of the various seams and geological structure are shown in the generalised geological profile Figure 13. The proposed No. 4 Seam project will be exploiting the No. 4 coal seam within the Goedehoop Colliery coal reserve.

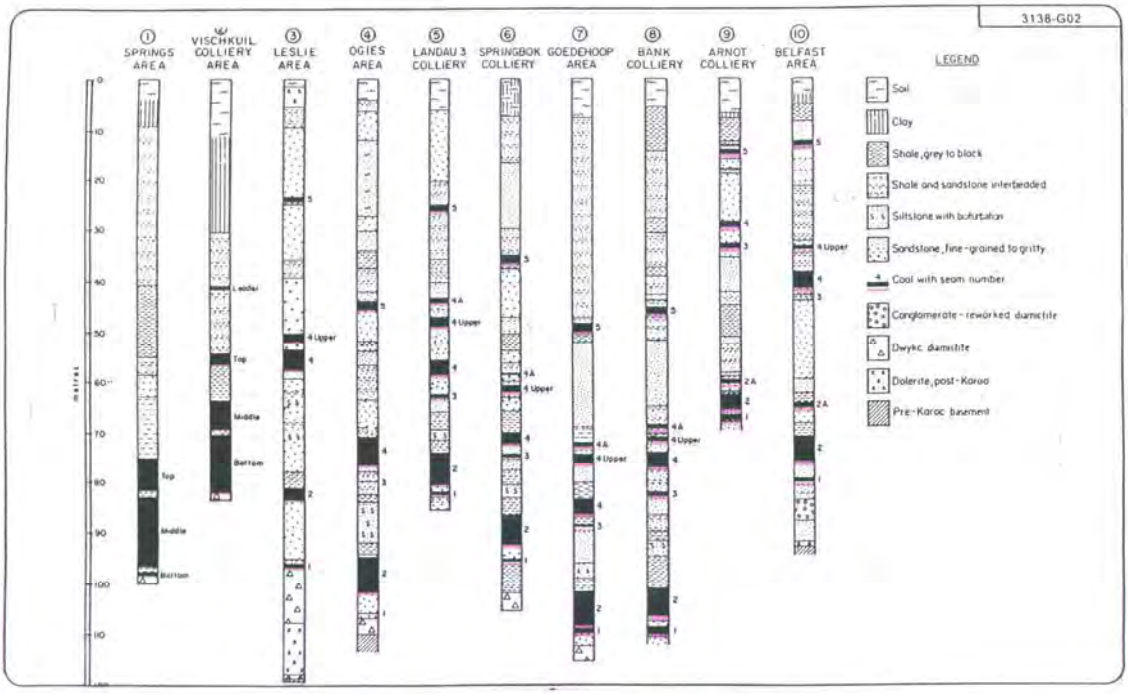
5.3.1.2.1 No. 4 Seam Geology

Hope No. 4 Seam scheduled in Goedehoop Life of Mine is classified as an Additional Measured and Additional Indicated Resources according to the SAMREC Code. The No. 4 Seam at Goedehoop Hope 4 Seam Project is the only coal on offer. The No. 2 and 5 coal seams have been mined out in the majority of the area. The No. 4 Seam at Goedehoop Colliery is developed over virtually the entire area. It averages 2.73 metres in thickness and lies at a depth of between 20 and 100 metres. Occasional areas of thicker coal (up to 3.3metres) occur mainly towards the north west of the resource. The No. 4 coal seam itself normally exhibit gentle undulations.

5.3.1.3 Presence of Dykes, Sills and Faults

The coal seam topography and area distribution within the Goedehoop Colliery Mining Right area are controlled by pre-karoo topography, interactions of present day surface topography and a number of dolerite transgressions. Dolerite intrusions have had a marked effect on the structure, and as a consequence of a transgressive dolerite sill, many of the seams have been displaced into blocks with elevation differences of up to 25 metres. Large areas of burnt coal are associated with each of these sills.

In addition to the dolerite transgressions, numerous dolerite dykes of between 0,5m and 3m are encountered within the mining blocks. These have been encountered on a regular basis with an average spacing of between 300 and 500 metres within the workings. These geological structures extend beyond the mine boundaries; however no information outside the mine boundary is available to Goedehoop Colliery. The presence of dolerite dykes and sills within the proposed Hope No. 4 Seam project area are shown in Figure 14 below.



Typical stratigraphic columns through the Witbank Coalfields

Figure 11: General Stratigraphic Column – Witbank Coalfield

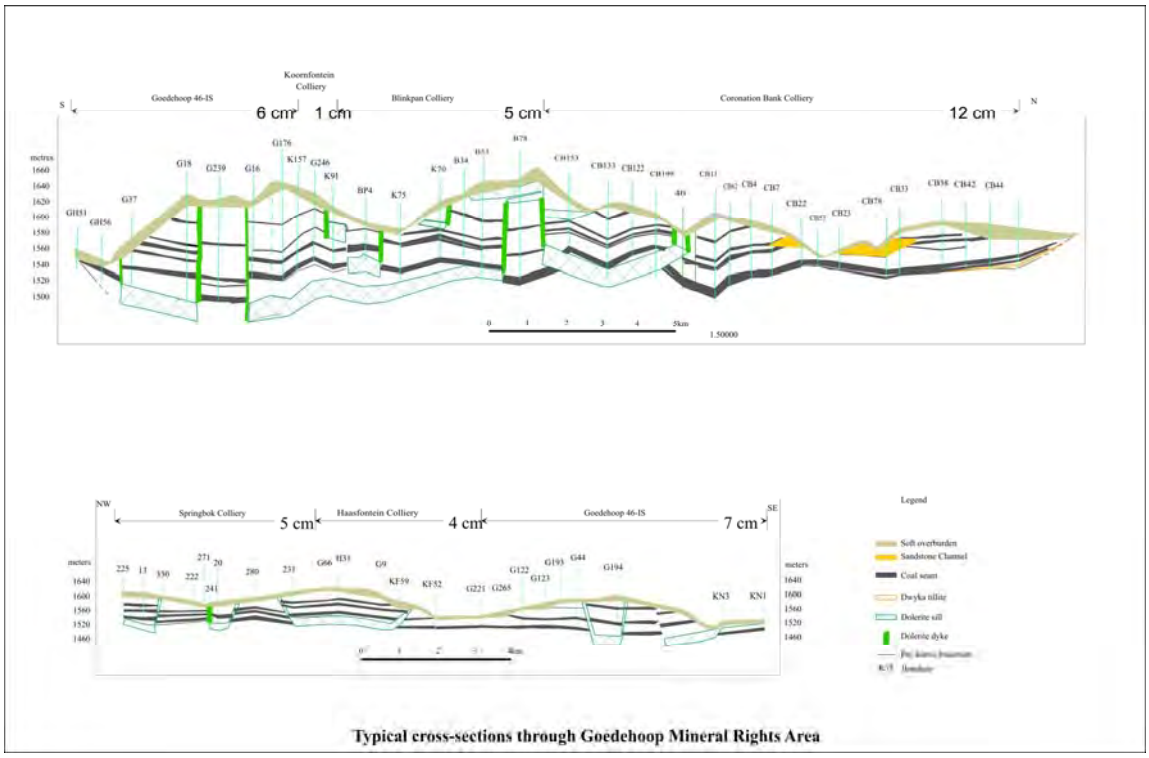


Figure 12: Typical Sections through Goedehoop Colliery Mining Right Area

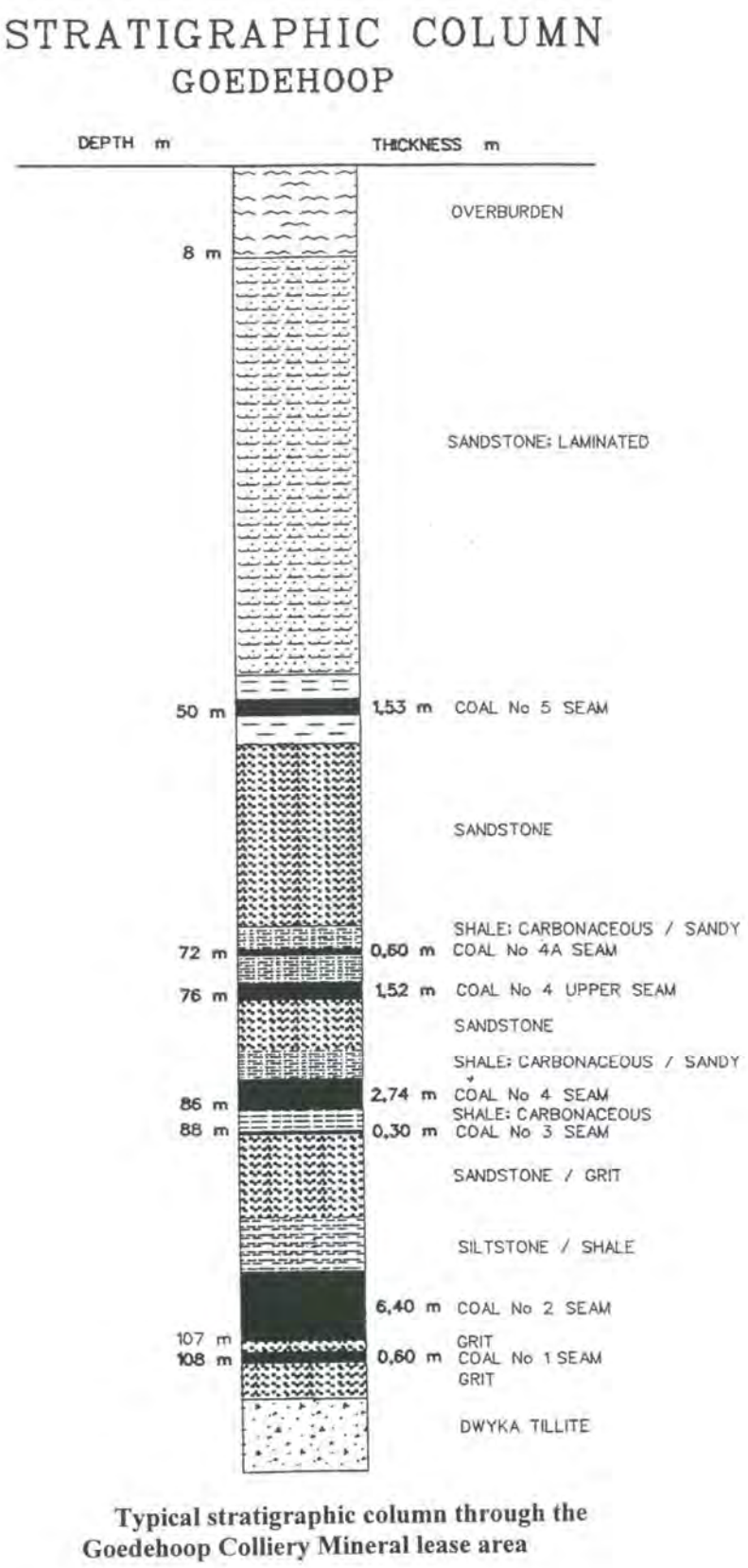


Figure 13: Typical Stratigraphic Column – Goedehoop Colliery

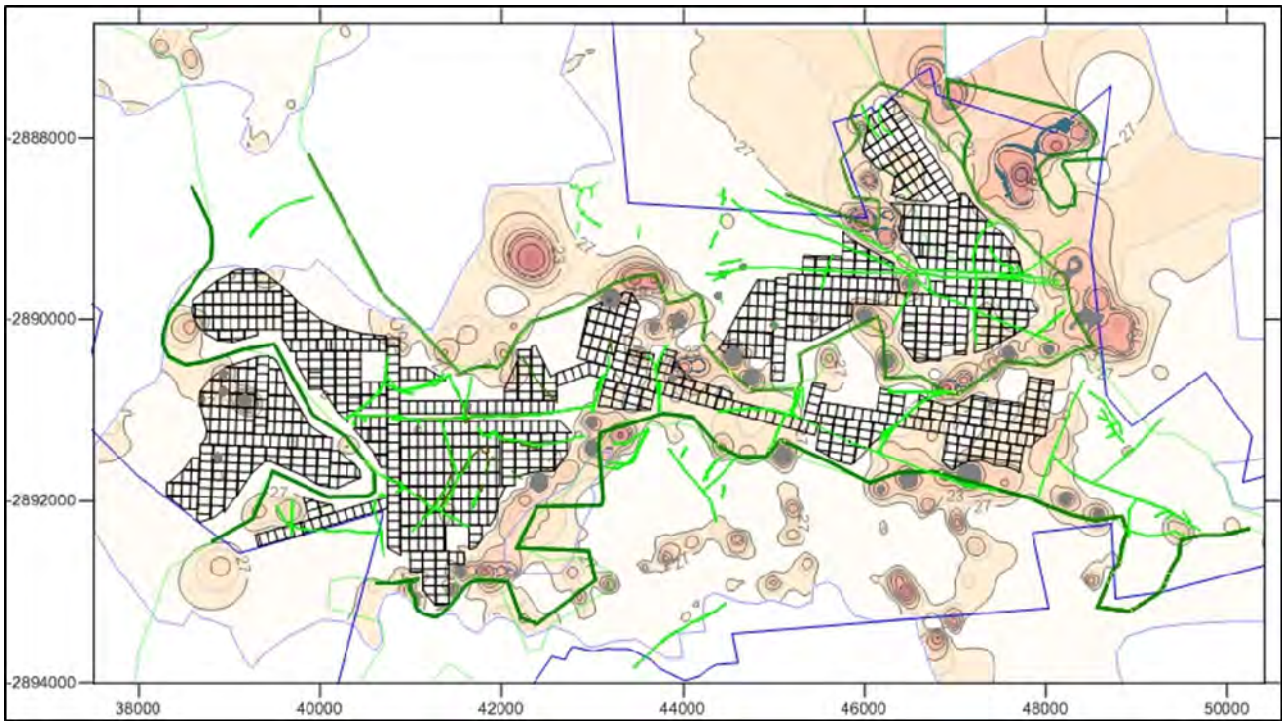


Figure 14: Dolerite dykes and sills within the proposed No. 4 Seam project area

5.3.2 Climate

5.3.2.1 Regional Climate

Goedehoop Colliery is located in the Mpumalanga Province of South Africa and the Eastern Plateau Highveld climate zone. The province is characterised by a mild to warm summer rainfall climate and cool to cold winters. Sharp frost is a common occurrence during winter. The hottest months in the region have been measured in December and January, whilst the coldest months are June and July. The days during summer are generally warm, but a substantial drop in temperature occurs the winter nights.

5.3.2.2 Mean Monthly Rainfall and Evaporation

The mean annual precipitation of the site is 687 mm. The mean annual evaporation of the site is 1522 mm (S-Pan). The monthly average rainfall, rainfall days, and evaporation rates are presented in Table 7. The Mpumalanga Highveld has distinct wet and dry seasons. 91% of the Colliery's mean annual rainfall falls between October and April inclusively. 68% of the area's mean annual evaporation occurs in this period (Midgley et al., 1990).

5.3.2.3 Climatic Water Balance

The Department of Water and Sanitation requires that a climatic water balance that incorporates a list of years which have the wettest six months of the year, either November to April or May to October be provided. In this case November to April is wetter than May to October. The ten wettest six months between November and April are listed in Table 8.

Table 7: Mean monthly rainfall, rain days and evaporation data for the site

Month	Ave Rainfall (mm)	Ave rain days	Ave Evaporation (mm S-Pan)
October	67.8	7.0	164.1
November	112.6	10.4	154.8
December	110.6	10.3	170.5
January	116.5	10.4	167.4
February	96.3	7.8	139.6
March	74.8	7.1	137.7
April	42.8	4.5	105.9
May	16.3	2.1	89.2
June	7.6	1.2	72.4
July	6.6	0.9	79.3
August	6.9	1.0	105.0
September	24.2	2.8	136.1
Mean Annual	**687***		**1522**

Table 8: Wettest years between November and April

Rating	Year	Total rainfall between November and April (mm)
Wettest year	1955	975.4
2nd wettest year	1975	913
3rd wettest year	2000	880.1
4th wettest year	1939	875.8
5th wettest year	1946	777.9
6th wettest year	1952	762.5
7th wettest year	1967	754.6
8th wettest year	1949	721.4
9th wettest year	1980	717.3
10th wettest year	1959	708.8

5.3.2.4 Peak Rainfall Data

Daily rainfall data was sourced from the CCWR (Computing Centre for Water Research, Natal University) rainfall database (gauge number 0478546 – van Dyksdrift), as well as data from the South African Weather Service (SAWS) for the same gauge. The gauge is located approximately 11 km west of the proposed Hope No. 4 Seam project.

5.3.2.4.1 Maximum Monthly Rainfall Data

The maximum monthly rainfall data is presented in Table 9.

Table 9: Maximum monthly rainfall data (mm)

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
202.7	205.7	308	360.5	345.9	184	144.5	143.8	104.1	75.7	37.8	135.5

5.3.2.4.2 Peak 24-hr Rainfall Data

The peak 24-hr rainfall depths are presented in Table 10.

Table 10: Peak 24-hr rainfall depths for the site.

Recurrence Interval (year)	24 hour rainfall depth (mm)
2	52
10	79
20	94
50	116
100	136
200	160

5.3.2.5 Mean monthly temperature

The mean maximum and minimum temperatures, extrapolated from the Pretoria, Middelburg, Belfast and Carolina weather stations are presented in Table 11.

Table 11: Mean monthly temperature data for 0515320 (Witbank)

MONTH	DAILY MAX. °C	DAILY MIN. °C	DAILY MEAN. °C
January	27,2	13,7	20,5
February	26,8	13,4	20,1
March	26,0	11,4	18,7

April	23,9	7,4	15,7
May	21,3	2,2	11,7
June	18,5	-1,8	8,3
July	18,4	-1,7	8,3
August	21,4	0,8	11,1
September	24,0	5,3	14,7
October	26,0	10,1	18,0
November	26,2	11,8	19,0
December	27,1	13,2	20,1

5.3.2.6 Wind Direction and Speed at the Mine

During the summer months the wind direction is generally northerly and easterly, at speeds ranging from 5 to 25km/h. During July (winter conditions), the winds are somewhat more southerly and westerly at speeds ranging from 5 to 48km/h. The period August to November is the period when wind speeds are at their greatest (aside from the periods associated with local thunderstorms), with wind speeds in excess of 40 km/hr having been recorded (Table 12).

Table 12: Average Wind Speed and Direction

Month	N		NE		E		SE		S		**SW**		**W**		**NW**	
	n	v	n	v	n	v	n	V	n	v	n	v	n	v	n	v
Jan	67	4.3	124	4.0	119	4.5	92	5.1	40	4.6	47	4.3	45	3.8	149	3.8
Feb	48	4.1	108	3.8	139	4.1	135	4.9	61	4.5	48	3.9	41	3.5	91	3.7
Mar	53	3.9	99	3.7	16	3.7	99	4.5	50	4.1	56	4.1	43	3.5	111	3.9
Apr	50	4.0	88	3.5	94	4.0	55	4.2	45	4.3	71	4.4	71	4.5	129	4.0
May	54	4.4	66	3.7	61	3.9	62	4.5	47	4.2	79	4.5	67	4.7	116	4.1
Jun	48	4.1	47	3.7	59	4.1	42	4.8	46	4.7	99	4.5	76	4.3	115	4.3
Jul	43	4.1	66	3.7	64	4.1	62	4.9	54	4.6	84	4.5	57	4.2	121	4.1
Aug	80	4.9	96	4.4	97	4.3	33	5.6	35	4.9	75	4.9	65	4.9	192	4.7
Sept	115	4.8	134	4.8	101	5.0	48	5.7	32	4.1	53	5.1	59	5.0	203	4.8
Oct	115	4.5	139	4.7	116	5.4	58	5.6	41	4.9	54	4.7	47	4.8	223	4.8
Nov	105	4.4	135	4.4	110	5.0	56	5.3	37	4.9	45	4.6	55	4.3	229	4.7
Dec	91	4.2	138	4.1	102	4.8	55	4.9	35	4.5	47	4.9	55	4.2	194	4.2
Avg	**72**	**4.4**	**103**	**4.1**	**98**	**4.4**	**66**	**4.9**	**44**	**4.5**	**64**	**4.5**	**57**	**4.4**	**156**	**4.4**

5.3.2.7 Mean Monthly Evaporation

The mean monthly evaporation for the region obtained from Bethal is presented in Table 13. The gross average “A” pan evaporation recorded amounts to 1774 mm, with the maximum evaporation occurring during the summer months, from October to January, due to high summer temperatures. If

the mean annual rainfall is compared to the mean annual evaporation there is a net monthly deficit throughout the year. This results in an annual water deficit of approximately 1102 mm.

Table 13: Mean Monthly Evaporation for the Region

MONTH	EVAPORATION (MM)
January	192
February	64
March	164
April	122
May	113
June	94
July	107
August	149
September	190
October	202
November	181
December	196
TOTAL	**1774**

5.3.2.8 Extreme weather conditions

Hail: Occurs 4 to 7 times per year

Drought: ± every 6 years

Frost: Can occur from end of April to September

5.3.3 Topography

Goedehoop Colliery is situated in the Eastern Highveld region of Mpumalanga, which is characterised by a gentle undulating plateau with fairly broad to narrowly incised valleys such as the Olifants River valley. Typically these ridges are associated with surface water features such as rivers, streams and pans.

The topography of the proposed Hope No. 4 Seam project area slopes mainly in a southerly direction towards the Olifants River. The topography of the north eastern portion of the proposed Hope No. 4 Seam underground mining area slopes westerly following the drainage of the Goedehoop Spruit. The topography of the north western portion of the proposed underground mining area and the shaft area slopes northerly and westerly towards the Hope Spruit.

5.3.4 Soils

Goedehoop Colliery consists of both opencast and underground mining area with the latter covering the majority the mining activities area. The land at Goedehoop Colliery is impacted on through the presence of shafts, mini pits, beneficiation plant, coal mineral residue deposit, roads, rail tracks, coal stockpiles, soil stockpiles and mine related infrastructure such as housing, workshops, office buildings, overland conveyor belts and coal stockpile yards.

In order to determine the baseline of the soils within the Goedehoop Colliery's Hope No. 4 Seam project, Anglo Operations (Pty) Limited appointed Rehab Green cc to undertake soil a survey over areas covered by the proposed Hope No. 4 Seam project. The report is also attached in Appendix 3. Information from the above reports was used to compile this section of the amended EIR and EMPr. The study was used to determine the baseline soil condition, the physical and chemical characteristics, land capability and current land uses over the proposed Hope No. 4 Seam project area.

5.3.4.1 Dominant Soil Types Identified

According to the Rehab Green cc soil survey, a total of 26 homogeneous soil units were identified during field observations at the Hope No. 4 Seam project area. These were symbolized as Hu1, Hu2, Hu-C, Hu-D, Cv1, Cv2, Av2, Av3, Av4, Gc1, Gc2, Pn, Wb1, Wb2, Wb-D, Av-D, Lo/Kd, Lo1, Wo, Se/Wo, Rg-D, Rg1, Ka/Wo, Rg-P, Rg2 and RD. Two land classes were included in the soil legend which were symbolized as AD and Exc which represent the Eskom ash dump and excavated areas respectively. The homogeneous units are referred to as soil types and are shown in Figure 15 which contains an abbreviated soil legend. A comprehensive soil legend is provided in the Soil Report.

5.3.4.2 Soil Chemical and Physical Properties

Soil analyses were conducted for each of the soils identified within the Hope No. 4 Seam project. The soil analytical results of representative samples are shown in Table 14 below.

Table 14: Chemical Analysis Results.

Samp Point	Soil Form	Hor	Depth	K	Ca	Mg	Na	*Titr.Acid	*Acid saturat.	Resis-tance	P (Bray1) mg/kg	pH (H_2O)
				mg/kg	mg/kg	mg/kg	mg/kg					
				Ammonium acetate				cmol(+)/kg	%	ohm		
AP25	Av2100	A	0-250	80	269	90	12.6	1.08	32.0697	830	29.2	4.47
AW27	Av2100	A	0-250	64	106	37	10.5	0.87	46.5950	2030	26.1	4.69
AX30	Hu2100	A	0-250	68	236	62	10.4	0.37	16.5782	1400	24.7	5.18
AX36	Gc2100	A	0-250	38	366	53	14.5	-	-	2670	28.5	6.2
AY23	Av2100	A	0-250	52	368	95	38.5	0.15	5.1703	800	26.4	5.42
BC34	Gc2100	A	0-250	45	299	67	11.5	-	-	1920	24.4	5.86
BG39	Av/Gc2 100	A	0-250	70	309	78	6.3	-	-	1400	22.9	6.2
BP17	Av2100	A	0-250	125	484	77	10.1	-	-	1990	20.2	6.42

BQ34	Hu2100	A	0-250	99	774	176	7.8	-	-	870	23.4	6.54
BQ41	Hu2100	A	0-250	97	470	76	8.6	-	-	1390	40.1	6.41
BV25	Cv2100	A	0-250	67	241	40	9.3	-	-	1550	30.2	6.07
BX28	Hu2100	A	0-250	100	237	44	10.2	0.13	6.7339	1570	23.9	5.44
BZ17	Av2100	A	0-250	129	664	118	12.2	-	-	1030	24.1	6.6
CB22	Av2100	A	0-250	78	327	47	8.3	-	-	2230	29.5	6.24
CD12	Av2100	A	0-250	116	261	63	12.4	-	-	1230	30.9	5.89
CI15	Av2100	A	0-250	125	301	80	12.9	-	-	1270	28.6	6.4
Average				**84.6**	**357**	**75.2**	**12.2**			**1511**	**27.1**	**5.88**
*Analysis conducted when pH is below 5.5												

The averages of the base cations (K, Ca, Mg, Na) as well as phosphorus, pH and resistance were compared to general fertility guidelines (Fertilizer Association of South Africa, 2003) in Table 15 to determine the fertility status of the soils found in the Hope No. 4 Seam project area.

Table 15: Soil fertility compared to broad fertility guidelines

	Guidelines (mg/kg)						**Fertility rating**	
Element or measurement	**Low**			**High**			Average calculated in mg/kg	Rating
Potassium (K)	<40			>250			84.6	Moderate
Calcium (Ca)	<200			>3000			357.0	Moderate
Magnesium (Mg)	<50			>300			75.2	Moderate
Sodium (Na)	<50			>200			12.2	Low
Phosphorus (P)	<5			>35			27.1	Moderate to high
Resistance (R_S)	<200			>300			1511	High
pH(H_2O)	Very acid	Acid	Slightly acid	neutral	Slightly alkaline	Alkalin e		
	<4	5-5.9	6-6.7	6.8-7.2	7.3-8	>8	5.88	Acid

Based on the above, the averages of base cations (K, Ca and Mg) are moderate and reflect a well build-up fertility status considering the general low natural fertility status (uncultivated) of soils on the eastern Highveld. The average sodium (Na) content of 12.2 mg/kg is low, which is positive and indicates an absence of sodic soil conditions. The average pH value of 5.88 indicates acid soil conditions but is close to the range classified as slightly acid. The average phosphorus content of the A-horizons of 27.1 mg/kg is moderate to high and indicates a very well build-up status by fertilizers. The average resistance value of 1511 ohm is high and indicates a moderate leached status which correlates with the low pH values.

5.3.4.3 Land Capability

Land capability is determined by a combination of soil, terrain and climate features. Land capability classes reflect the most intensive long term use of land under rain-fed conditions. An indication is simultaneously given about the permanent limitations associated with the different land use classes.

A detailed survey on the land capability over the proposed project area were determined through the assessment of the current soils study. The land capability of the study area are summarized in Table 16, which shows the soil types grouped into each land capability class, the number of units per land capability class and the area and percentage comprised by each land capability class.

The location and extent of land capability classes within the Hope No. 4 Seam project soil study area are shown in Figure 16.

Table 16: Land Capability for Soils as Hope No. $ Seam Project Area

LEGEND: LAND CAPABILITY					
Land Capability Code	**Land Capability Class**	**Unit Count**	***Soil types**	**Area (ha)**	**Area (%)**
A	Arable	7	Hu1, Hu2, Hu-C, Hu-D, Cv1, Cv2, Av2, Av3, Gc1	2029.05	63.87
G	Grazing	19	Av4, Gc2, Pn, Wb1, Wb2	209.93	6.62
TS-D	Temporary to seasonal wetland (Very disturbed)	2	Wb-D, Av-D, Rg-D,	39.89	1.26
TS	Temporary to seasonal wetland	47	Lo/Kd, Lo1, Wo, Se/Wo, Rg1	779.07	24.55
S	Seasonal wetland	6	Ka/Wo, Rg-P	22.37	0.71
P	Permanent wetland	1	Rg2	3.68	0.12
W	Wilderness	8	RD, AD, Exc	92.90	2.93
		90		**3176.89**	**100.0**

5.3.4.3.1 Wetland and Riparian Delineations

Land capability was assessed in categories of arable land, grazing land, wetlands and wilderness land. Wetlands were therefore delineated as part of the soil and land capability assessment based on guidelines described in the Practical Field Procedure of DWAF, 2005. Auger observations were made systematically towards wetland zones in order to locate the point where soil properties reflect signs of wetness within 500 mm from the surface or where soil, topography or vegetation indicate the boundary of the riparian zone.

The soil types associated with wetlands are summarized in the soil report and the locality and extents are shown on the land capability map Figure 16.

5.3.4.3.2 Agricultural Potential

The agricultural potential of the soil in the proposed Hope No. 4 Seam project area depends on the soil type in combination with the landscape position. The agricultural potential of the deep well drained soils in the crest landscape and mid slop positions is high. The agricultural potential of the soils in the foot slope positions is low due to the presence of less well drained soils. The agricultural potential of soils in the valley bottom landscape positions is low due to the presence of waterlogged soils.

Arable crop yield potential depends on soil properties as well as climate and crop type. The average rainfall in the area is ample to produce crops. The project area is dominated by arable commercial agriculture.

The estimated dry land crop production potential and potential crop yields (based on soil properties) of soil types within the Soil Study area are summarised in Table 17.

Table 17: Estimated dry land crop potential and long term potential yields

*Soil Type (Code)	Estimated dry land crop production potential class	Estimated potential long term yields for maize (t/ha/a)	Estimated potential long term yields for soybeans (t/ha/a)	Estimated grazing capacity for cattle on non-cultivated areas (ha/lsu)
Hu1, Hu2, Hu-C, Cv1, Cv2, Av2, Av3, Gc1	Moderate to high	4-6	1.5-2	5-8
Av4, Gc2, Pn, Wb1, Wb2	Moderate to low	2-3	0.5-1	
Wb-D, Av-D, Lo/Kd, Lo1, Wo, Se/Wo, Rg-D, Rg1	Low to very low	Not recommended	Not recommended	
RD, AD, Exc	Very low to none	Not suitable	Not suitable	

5.3.5 Land Use

5.3.5.1 Current Land Use

The land over the proposed project area is mainly used for agricultural purposes (cultivation, grazing and pasture) with the remaining areas being areas with wilderness land uses (pans, streams, rivers and wetland areas) and areas used by the mine and land owners for infrastructure such as roads (including farmers and provincial roads), farmers workshop complexes, farm laborers' residences, Hope dump, the Hope shaft complex and other mining associated infrastructure. See Figure 17 for the depiction of the current land use over the proposed project area.

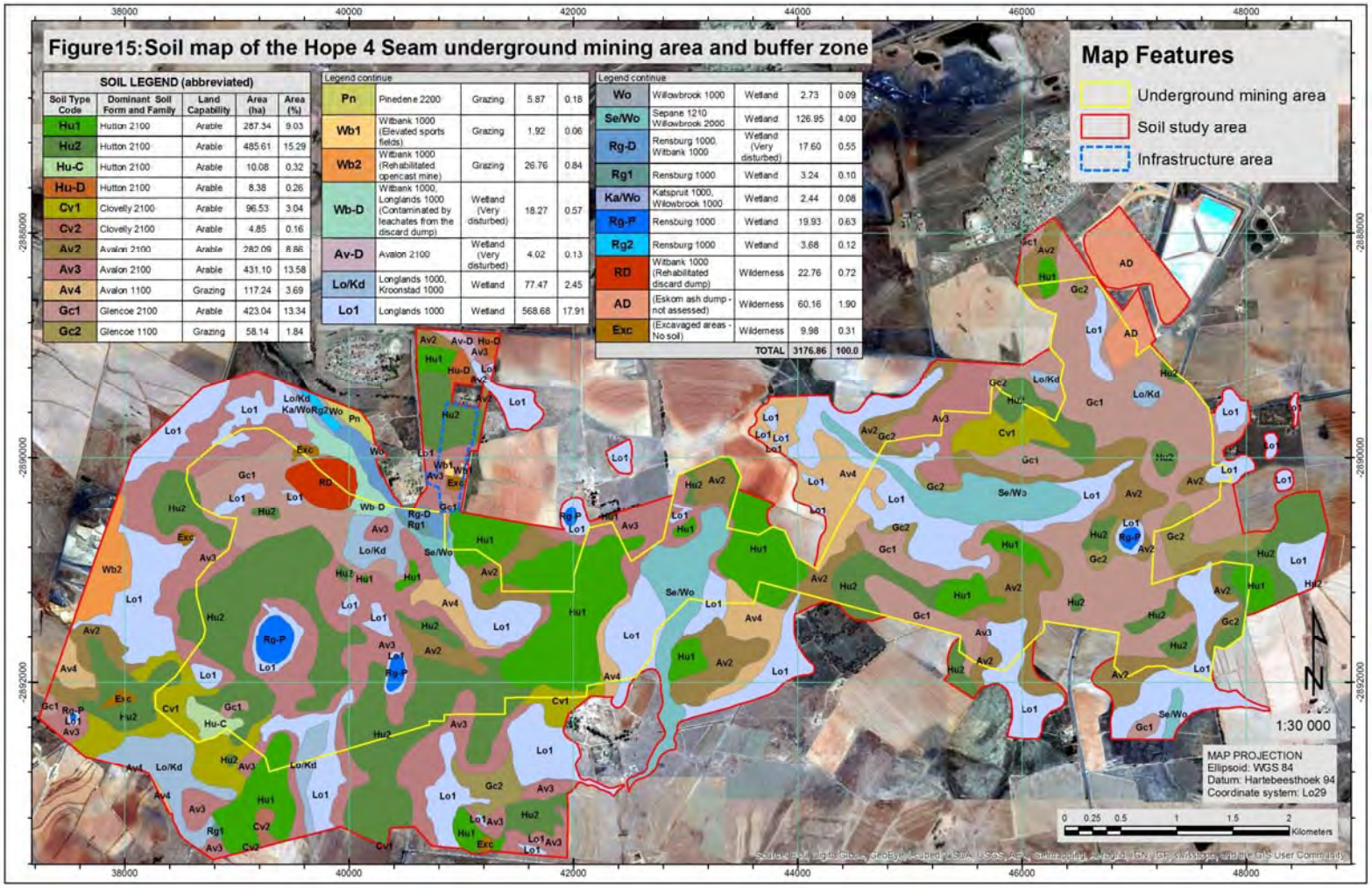
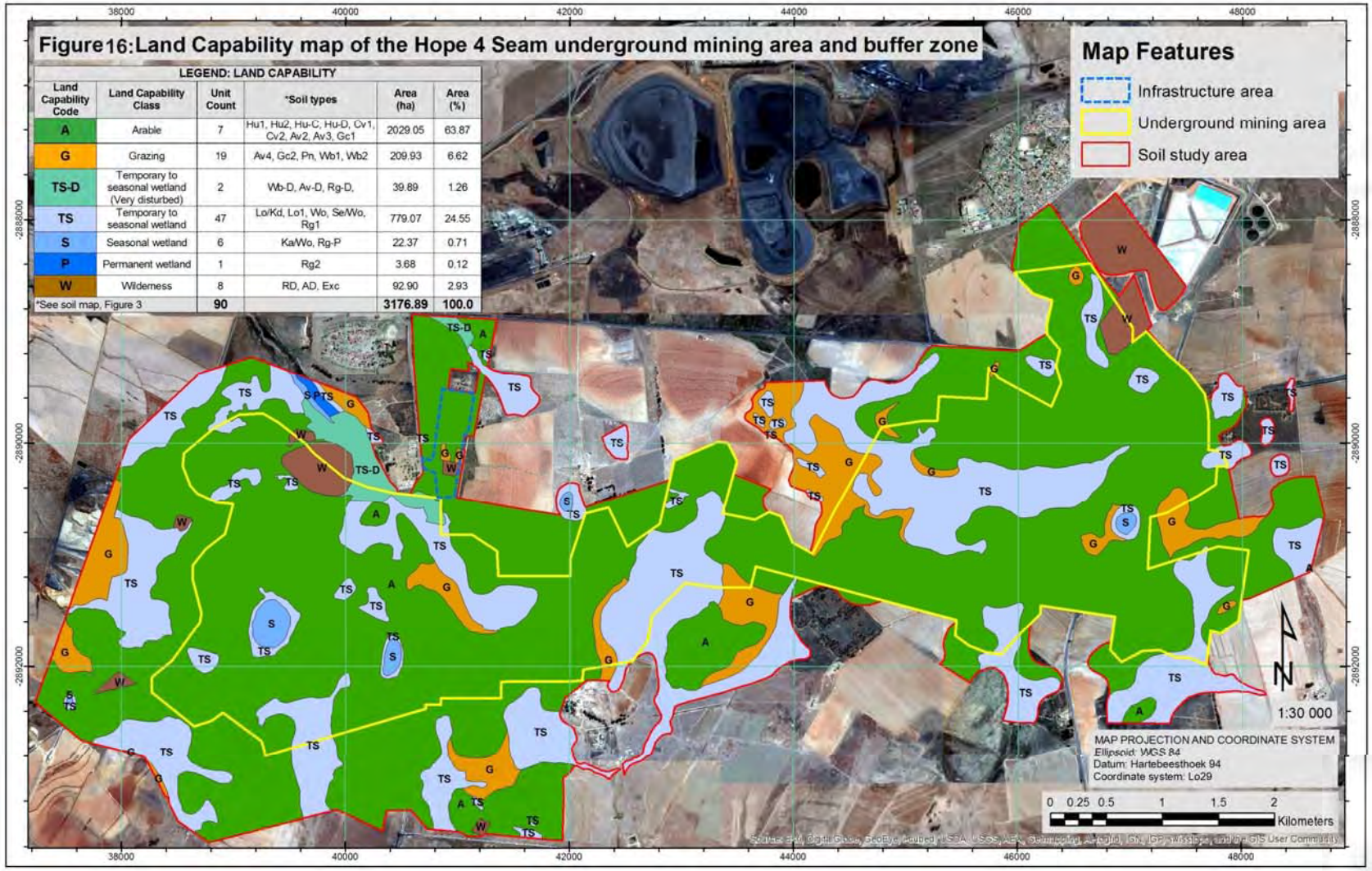


Figure 15: Soil Map for the proposed Hope No. 4 Seam Project Area.



LEGEND: LAND CAPABILITY

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G	Grazing	19	Av4, Gc2, Pn, Wb1, Wb2	209.93	6.62
TS-D	Temporary to seasonal wetland (Very disturbed)	2	Wb-D, Av-D, Rg-D,	39.89	1.26
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P	Permanent wetland	1	Rg2	3.68	0.12
W	Wilderness	8	RD, AD, Exc	92.90	2.93
*See soil map, Figure 3		90		3176.89	100.0

Figure 16: Land Capability Classes for the proposed Hope No. 4 Seam Project Area

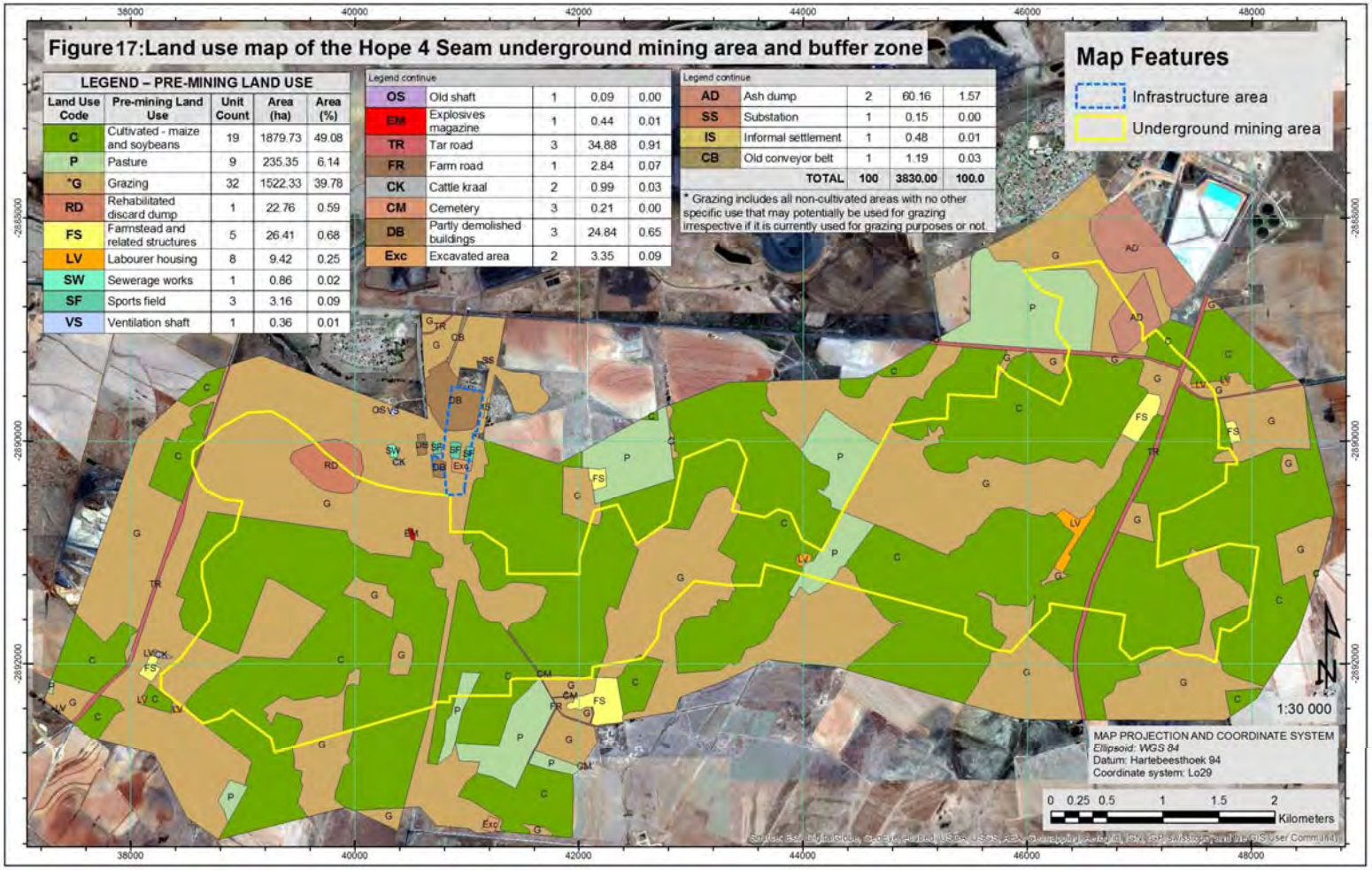

Figure 17: Land Use Map for the proposed Hope No. 4 Seam project.

5.3.6 Natural Vegetation/Plant Life

Anglo Operations (Pty) Limited has, in a bid to establish an overall status of the natural vegetation at Goedehoop Colliery, appointed Digby Wells Environmental (an independent consulting company) to conduct an integrated flora re-assessment for the Goedehoop Colliery. This specialist study consisted of the identification of flora species of concern (Red Data, endemic, protected and keystone species) as well as sensitive areas of conservation value associated with the mining operation, which included the proposed Hope No. 4 Seam project area. A copy of the Report for the study is attached as Appendix 4.

Mucina et al., (2006) which is the most recent vegetation map for South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006), describes the study area as 'Eastern Highveld Grassland'. This vegetation type is endemic to Mpumalanga, where it occurs on slightly to moderately undulating plains with some low hills and pan depressions. The climate is temperate with strongly seasonal summer rainfall and very dry, cold winters.

According to Driver *et al*. (2004) an important aspect of South Africa's approach to biodiversity planning is a focus on ecosystems and the single biggest cause of loss of biodiversity is the loss or degradation of natural habitat or ecosystems. The Biodiversity Act includes a list of threatened and protected ecosystems for South Africa that are divided into categories, namely: critically endangered ecosystems, endangered ecosystems, vulnerable ecosystems and protected ecosystems.

Findings from this specialist study were incorporated into a Biodiversity and Land Management Plan (BLMP) for Goedehoop Colliery. See Figure 18 for the Goedehoop Colliery vegetation map.

5.3.6.1 Local Natural Environment

According to Acocks (1988) the area of interest falls within the False Grassveld vegetation biome and the veld type is known as Bankenveld, (type no. 61). Three variations are recognised, namely: the Central, Eastern and Western Variations. The area of interest falls within the Eastern Variation which has sandy plains and is wetter than the Western Variation. A more recent classification of the vegetation types of South Africa by Low and Rebelo (1996) calls this the "Moist Sandy Highveld Grassland" (type no. 38) and lists "North-eastern Sandy Highveld" (A57) and "Eastern Bankenveld" (A61c) as synonyms. According to Mucina and Rutherford (2006) the area of interest falls within the Eastern Highveld Grassland.

5.3.6.2 Habitat/Vegetation Types

A total of seven habitat units were delineated for the project area, topographic features were the primary consideration for the delineation of the various units. These features included the location of the habitat type in the landscape, influence of available soil type, influence of available moisture, gradient and aspect. The above mentioned factors have an effect on the habitat type in isolation and in conjunction with each other.

Secondly, anthropogenic activities were also considered to assist with the delineation of vegetative and/or habitat types. Owing to the presence of maize farming activities within the area together with exotic tree areas and homesteads the landscape has been altered to such an extent that obvious divisions are noticeable. As is the case with natural factors, anthropogenic factors could have an

effect in isolation or in conjunction with other factors. Assessment of the Hope No. 4 Seam project are has shown that all habitat/vegetation types are encountered in the proposed project area.

Below is the summary of the types of habitat encountered at the study area:

5.3.6.2.1.1 Primary Grassland

This habitat type exhibited the least effected biota with regards to anthropogenic activities and was found to be the natural vegetation type from which the remaining habitat types were formed. Impacts such as fencing accompanied by grazing, unplanned burning and agriculture were responsible for the formation of secondary grasslands, alien trees and human induced habitats. The remaining natural areas within this habitat type were providing refuge to plant species.

- Habitat type is declining because of anthropogenic impacts
- Conservation efforts should concentrate on this habitat type
- Management for smaller areas (fenced) will be needed

5.3.6.2.1.2 Secondary Grassland

The secondary grasslands are the areas where the impacts on the natural grasslands can be seen. These areas are currently being utilised for agricultural activities, predominantly grazing and maize plantations.

- These areas still have remnants of natural grassland that make up their composition; these areas must be conserved and rehabilitated.

5.3.6.2.1.3 River and Riparian

The habitat type had variances within the study area. These were seasonal marsh wetlands and pan wetlands.

Seasonal Marsh Wetlands: The seasonal marsh wetlands were found in the valley bottoms where the water runoff accumulates.

- These areas are excellent for the creation of corridors, however the livestock will have to be excluded from utilising the areas, at least temporarily by means of rotational grazing.
- These areas are sought after for agricultural activities due to the nutrient rich soil, and must be conserved before it they get over exploited.
- The pan wetlands areas found on the Goedehoop Colliery mining right area had high water levels due to the recent rain. This meant the vegetation that will be visible when the water level is low, is not visible and the vegetation associated with the specific pans will be similar to the surrounding vegetation type.
- These areas are sought after for agriculture, these areas must be protected from overutilization.

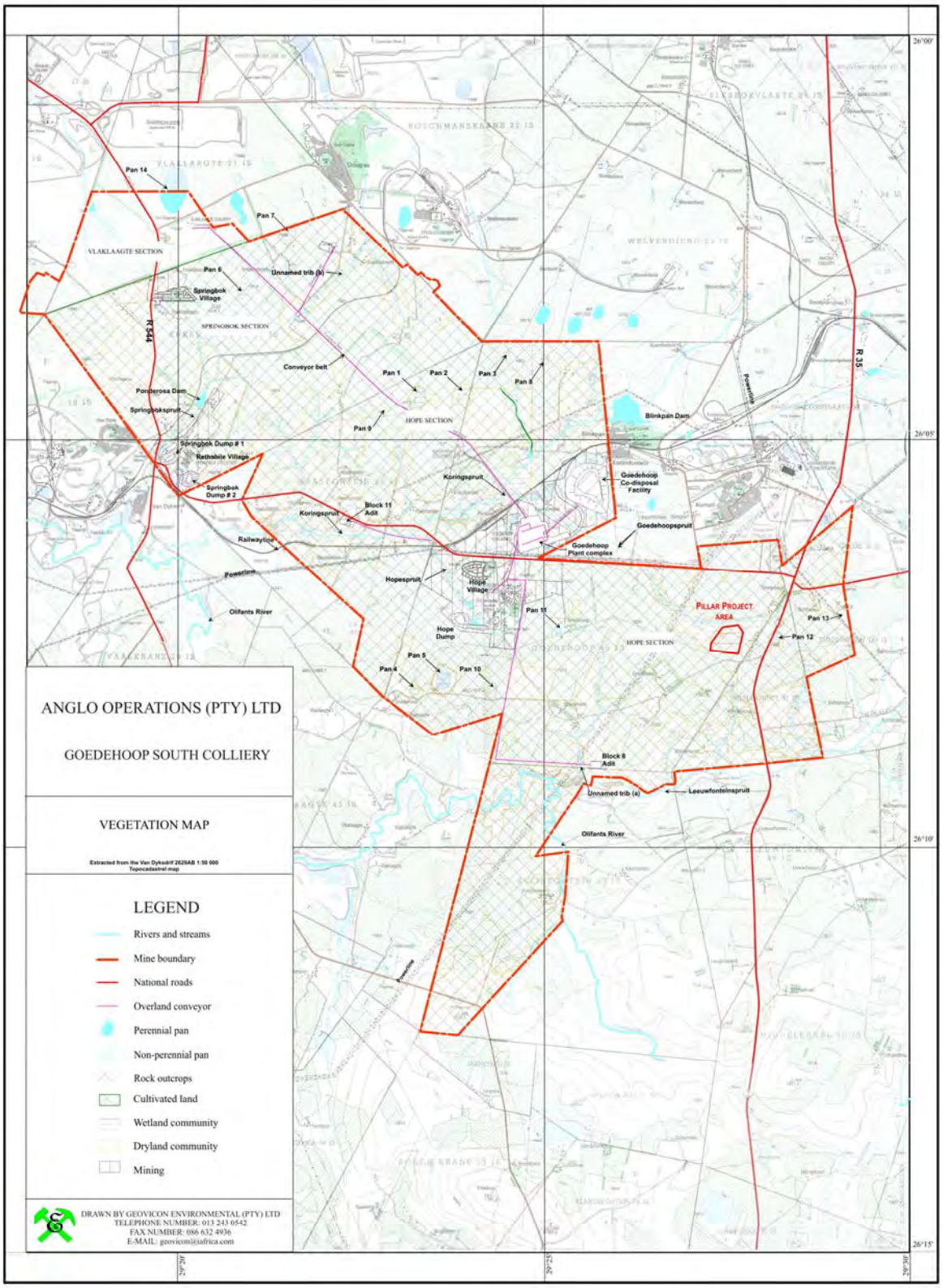

Figure 18: Vegetation Map for Goedehoop Colliery

5.3.6.2.1.4 Rocky Habitats

The rocky habitat areas were few in comparison with other natural areas. These areas were not impacted on by agriculture directly due to its unsuitable nature for ploughing. However unplanned burning and over grazing still play a part in the current condition. This area provides refuge to plant species.

- These are very limited areas and not suitable for agriculture
- Because of the small size conservation efforts must be applied immediately

5.3.6.2.5 Alien trees/plantations

Alien trees that were encountered during the field survey were found in a variety of habitat types, however the extent of the infestation allows for a separate habitat type to be addressed. The alien trees were found in large numbers in the secondary grassland areas as well as the primary grassland areas. Evidence of previous effort of eradication was evident in certain areas however these attempts were un-successful due to various factors.

- These areas pose a massive threat to the natural vegetation type, the aggressive nature of these plants means they will colonise new areas.
- Follow up programs must be implemented to ensure eradication procedures were successful.

5.3.6.2.6 Human-induced habitats

The human induced habitats were areas where natural habitat was removed to accommodate buildings and infrastructure, a process which opens up areas for alien vegetation infestation. These areas are of no value from a biodiversity aspect.

- These areas were found to be areas where alien invasive species could readily establish themselves due to open and un-colonised ground being present.
- Monitoring and aftercare in the form of re-planting must be applied

5.3.6.3 Plant Species Recorded

During the field surveys, plant species were recorded (See Appendix 4 for a list). These species included three tree, six shrub, one reed, six sedge, 28 grass and five herb or bulb species.

From a grass perspective six decreaser grasses were observed in the area. Six grasses are increaser I species, with 12 climax grasses occurring in the project area, these are known to occur in underutilised veld (van Oudtshoorn, 1999). Furthermore, nine Increaser II grasses were recorded in the area, these species are abundant in over utilised veldt and therefore increase with excessive grazing. There was one Increaser III grasses species observed in the area.

Three grasses recorded in the area were exotics, weed or alien invasive. During the dry season field survey it was found that a fire has moved through the area and burnt a substantial amount of the grassland and riparian vegetation types.

5.3.6.4 Endangered or rare species

A number of red data species were encountered at the Goedehoop Colliery mining right area. These include the *Boophane disticha* and the *Hypoxis hemerocallidea.*

Boophane disticha Declining (Raimondo et al. (2009) or Poison Bulb: This extremely toxic bulb is used extensively throughout Africa for traditional medicine, and its medicinal uses have been extensively documented. It is very popular in the muthi markets and amongst urban and rural healers. The bulbs are usually VERY large and always present in the muthi markets. Threat: Harvesting.

Hypoxis hemerocallidea Declining (Raimondo et al. (2009) or Star flower: Thecorm is consistently heavily harvested for the medicinal plant trade throughout the country. Threat: Harvesting

The above mentioned two plant species were encountered in the Primary Grassland and Secondary Grassland vegetation types. The footprint of the proposed Hope No. 4 Seam project does not occur within any of the identified protected red data plant species.

5.3.6.5 Declared invader plant species

According to the Conservation of Agricultural Resources Act, six declared invader species were observed in the vegetation list of the Floral Assessment for Goedehoop Colliery by Digby Wells Environmental *viz.*

Pampas grass	*Cortaderia selloana* Category 1 declared invader)
Thorn apple	*Datura stramonium* (Category 1 declared invader
Red river gum	*Eucalyptus camaldulensis* (Category 2 declared invader)
Patula pine	*Pinus patula* (Category 2 declared invader)
Grey poplar	*Populus x canescens* (Category 2 declared invader)

Weeping willow *Salix babylonica* (Category 2 declared invader)

Cat. 1 = Category 1 declared weeds and invader plants. These plants shall not occur on any land or on any inland water surface. Such plants shall be eradicated (Regulation 15 and 16 of the Conservation of Agricultural Resources Act – Act 43 of 1983).

Cat. 2 = Category 2 declared weeds and invader plants. These plants may only occur or may be established on areas demarcate for that purpose *viz.* plantations. The spreading of seed or any other propagating material must be reduced. If category 2 invader plants occur on any land or water surface outside the demarcate areas, they will be eradicated. (Regulation 15 and 16 of the Conservation of Agricultural Resources Act – Act 43 of 1983).

5.3.7 Animal Life

The fauna of the region is typical of the Highveld in its currently developed state, in that there are regionally limited species and numbers. A list of animals, reptiles and birds was compiled on the basis of field visits during 2012 (Appendix 5). These field visits included the area on which the proposed projects will be undertaken, hence would be relevant. Findings from this survey were also used to develop the Biodiversity Management Plan for Goedehoop Colliery.

5.3.7.1 Commonly Occurring Species

During the survey fourteen areas of concern were identified over the study area. Identified animal species were divided into mammals, avifauna and herpetofauna. A total of eleven, fifty two and two mammalian, avifauna and herpetofauna species that commonly occur were identified. These are listed in Appendix 5.

5.3.7.2 Endangered or Rare Species

None of the mammals or reptiles observed on the Goedehoop Colliery constitutes South African Red Data Book species.

Grass Owl, a Red Data species was confirmed to occur on the project area. The Lesser Flamingo that has a Near Threatened status as identified by IUCN was also confirmed to occur at the project area.

None of the herpetofauna species observed at Goedehoop Colliery constitutes South African Red Data Book species.

The red data mammal species that may occur within the Witbank Region are listed in Appendix 5.

5.3.8 Surface Water

In view of the potential negative impacts mining activities has on the surface water environment, it is imperative that before any mining activity can commence, a surface water baseline assessment should be conducted to determine the state of surface water quality before commencement of the mining activity.

Goedehoop Colliery is an existing mining operation, hence the surface water environment, unlike in a new mining project, would have already been influenced by the existing mining operations. In view of the above, Goedehoop Colliery had commissioned Golder Associates to compile an Integrated Water and Waste Management Plan for Goedehoop Colliery (revised by by Geovicon Environmental (Pty) Limited to include Hope No. 4 Seam project), which looked into the impacts of the current mining operation on the water resources and details the surface water management around the current mining operations. In addition to the above, iLanda Water Services cc was appointed to undertake a hydrological study was conducted for the proposed Hope No. 4 Seam project. A copy of the study is attached as Appendix 6. The objectives of these study was to undertake the following:

- Baseline hydrological analysis for the proposed Hope No. 4 Seam project
- Surface water impact assessment for the proposed Hope No. 4 Seam project
- Floodline analysis for the streams within the proposed Hope No. 4 Seam project area
- Review and comment on baseline water quality.

Outcomes of the above-mentioned hydrological study and the integrated water and waste management plan were used to inform this section of the amended EIR and EMPr.

5.3.8.1 Catchment description

Goedehoop Colliery is located within the upper Olifants River catchment upstream of the Witbank Dam within the B11B, B11f and B11G quaternary drainage regions. Goedehoop Colliery and the

proposed Hope No. 4 Seam project occurs on the upper Olifants River catchment upstream of the Witbank Dam, which encloses an area of approximately 3 256 Km^2 with a mean annual runoff (under virgin conditions) of 125.1 x 106 m3 per annum. The upper Olifants River catchment upstream of the Witbank Dam forms one of the two major drainage valleys into the Witbank Dam. The receiving water body at Goedehoop Colliery is the Olifants River, which receives water from the Koring Spruit, Springbok Spruit, Leeuwfontein Spruit and the Kleinshaft Spruit, which are all tributaries passing through or initiating within the Goedehoop Colliery mining right area.

The proposed Hope No. 4 Seam Project is situated within the Koring Spruit and Leeuwfontein Spruit sub-catchments. The position of the proposed Hope No. 4 Seam Project area within the drainage regions, extent of the proposed project within the affected sub-catchment and positions of the affected streams and pans within the study area are depicted in Figure 19, Figure 20 and Figure 21, respectively.

5.3.8.1.1 The Koring Spruit Sub-Catchment (MU3)

The Koring Spruit flows through the Goedehoop mining right area. Its headwaters are located within the colliery. The Komati Power Station, Blinkpan siding, Makoya truck stop and Koornfontein Collieries and a number of agricultural land are some of the surface activities that occur within the Koring Spruit-catchment. The Blinkpan dam, located upstream of Goedehoop Colliery surface infrastructure area in the Koring Spruit, was constructed by Blinkpan Colliery. Subsequent to this, a small farm impoundment was constructed in the stream, below the Mineral Residue Deposit facility. The Koring Spruit consists of a clearly defined, incised channel throughout the length of the stream. Stream discharge upstream of Goedehoop Colliery vary on a seasonal basis but has an average flow less than 0.01 m^3/s during winter with storm flows up to, and exceeding 0.05 m^3/s. Discharges downstream of the colliery are low (<0.03 m3/s) but may exceed 4 m.s-1 during peak rainfall events.

The confluence of the Koring Spruit and the Olifants River is located a few kilometres downstream of the Goedehoop Colliery mining area. Vandyksrift Colliery, South African Railways (Spoornet), a defunct open pit coal mine (Frigate Colliery), the New Clydesdale Colliery opencast pit, and agricultural land occur in the lower reaches of the Koring Spruit downstream of Goedehoop Colliery.

There are two tributaries that feed into the Koring Spruit from within the Goedehoop mining right area i.e. the Goedehoop Spruit and the Hope Spruit. A portion of the proposed Hope No. 4 Seam project sit falls within the Goedehoop Spruit (underground workings) and Hope Spruit (access shaft complex and underground workings) catchments.

The Goedehoop Spruit has its origin within the Goedehoop Colliery mining right area. The stream catchment covers approximately 13 km^2. The catchment is mostly undeveloped and consists mostly of dry-land cropping and some livestock agriculture and impacted grasslands. Portions of the Goedehoop Colliery and neighbouring colliery's mineral residue deposits fall within the catchment. The Goedehoop Spruit is dammed by small farm dams in a few locations. The Goedehoop Spruit flows under the R542 provincial road prior to entering the proposed project study area. The Goedehoop Spruit follows a defined channel that is well vegetated with reeds and other riparian vegetation. The floodplain is ill-defined and consists of some riparian vegetation and impacted grasslands.

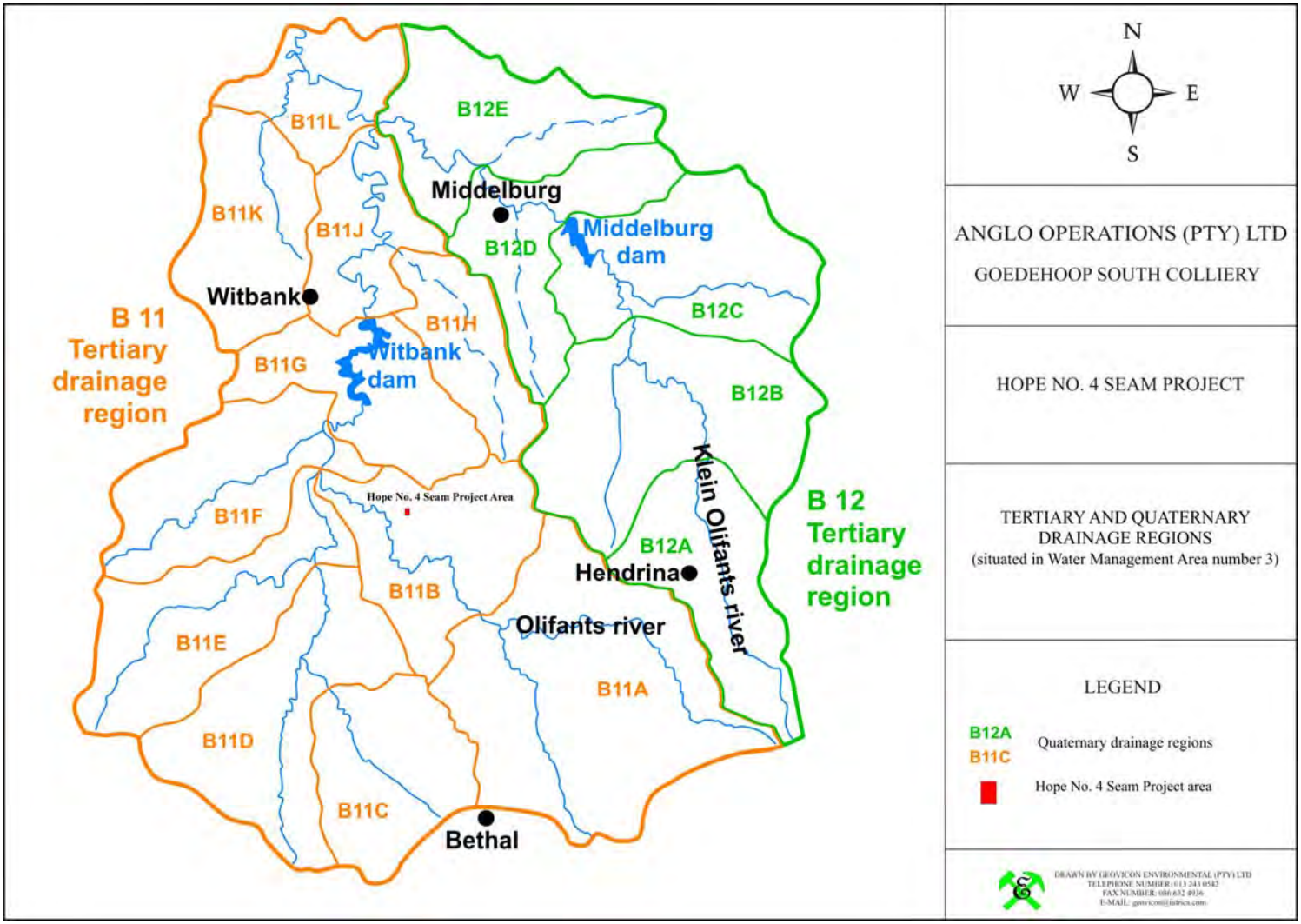

Figure 19: Location of the proposed Hope No. 4 Seam Project within the DWS Drainage Regions

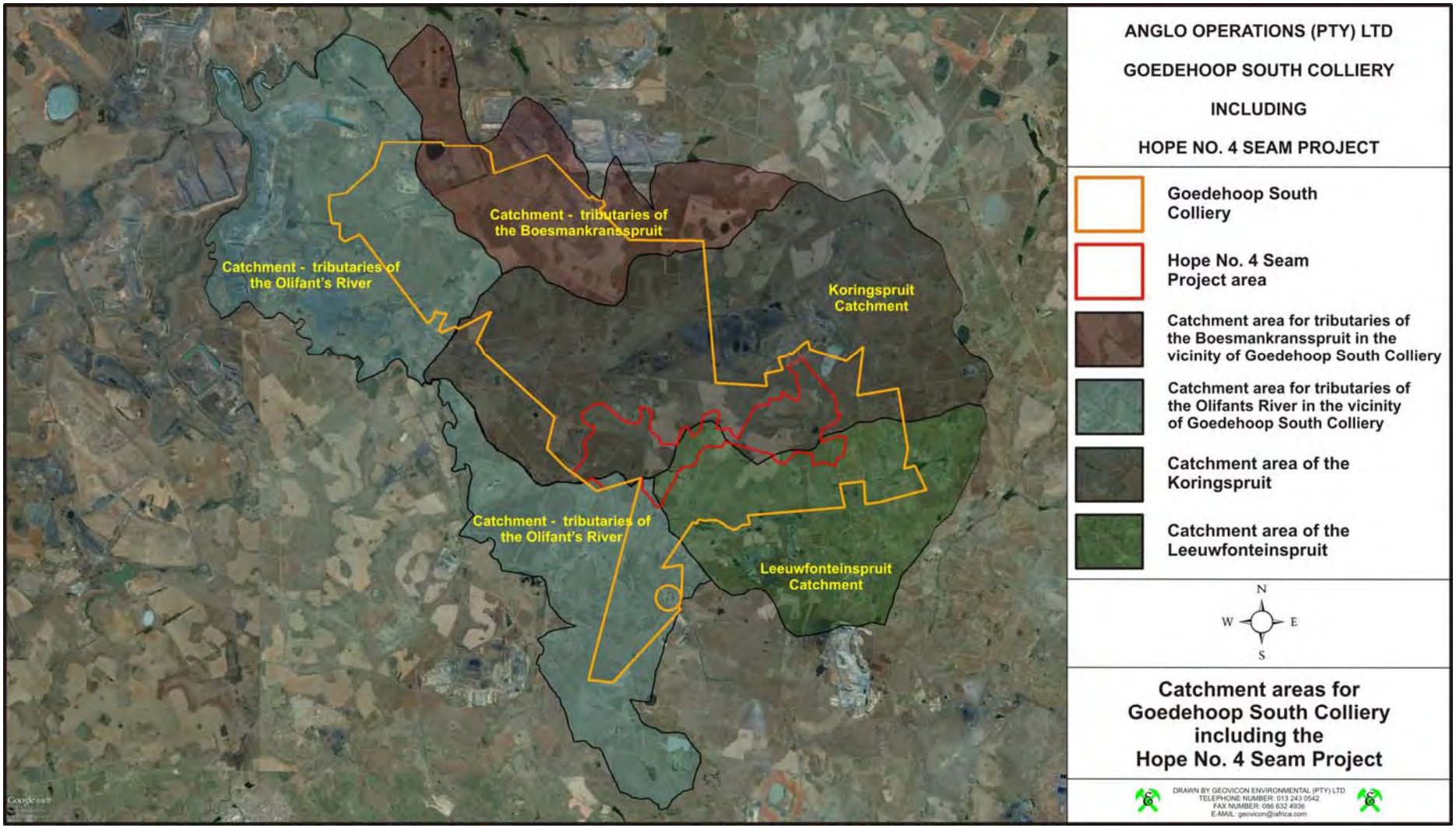

Figure 20: Catchments and natural streams within the Hope No. 4 Seam Project Area

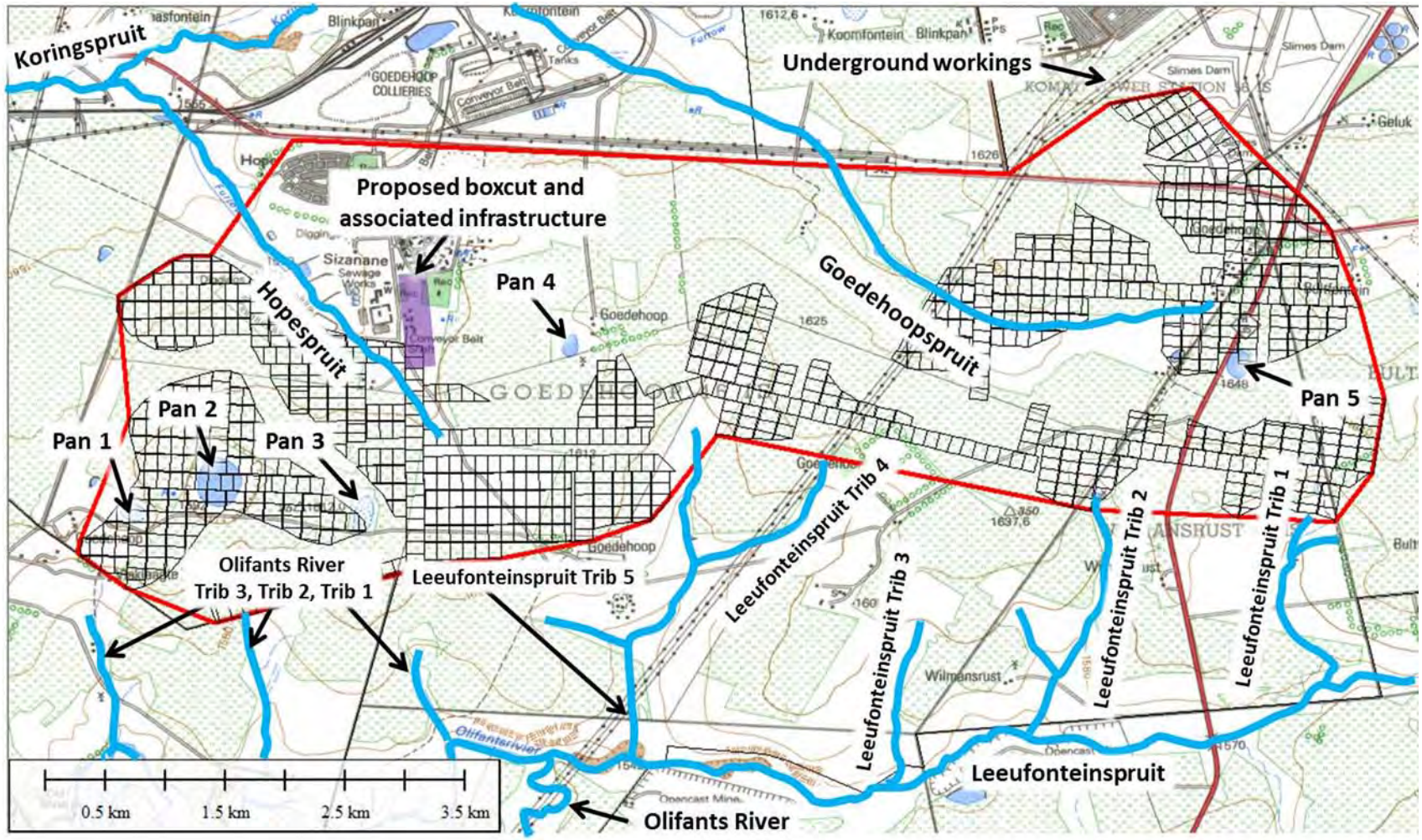

Figure 21: Streams and pans on the proposed Hope No. 4 Seam project area

The Goedehoop Spruit has also been diverted along its stretch upstream of the Goedehoop Colliery mineral residue deposit. The river diversion structure consists of a rock-clad earth embankment with a side channel exit into an unlined, but relatively well vegetated trapezoidal channel. The channel is excavated into the natural ground. The rock-clad earth embankment has a wide, shallow emergency spillway that discharges into the original water course over a rock-clad spillway. The Goedehoop Spruit then flows under a service road and a railway siding, before flowing between the Goedehoop Colliery coal beneficiation plant and current mineral residue deposit and then meets the Koring Spruit north of Goedehoop Colliery office and plant area. Flow rates recorded in this stream average below 0.01m^3/s, although the stream flow may exceed this during high rainfall events.

The Hope Spruit is a small catchment, covering approximately 9.4km^2. The catchment area is largely undeveloped. The undeveloped areas consist mostly of dry-land cropping and some livestock agriculture and impacted grasslands. The Hope dump, Hope Shaft and its associated infrastructure including the demolished village, Mahlatini informal settlement, Hope Village and the Hope Sewage Plant are located in the Hope Spruit catchment. Volumes reporting from this tributary have not been measured, as they are typically low and diffuse with no well-defined channels occurring. The Hope Spruit is also a non-perennial stream.

5.3.8.1.2 Leeuwfontein Spruit Sub-Catchment (MU8)

The mining right area of Goedehoop Colliery falls over the confluence of Leeuwfontein Spruit and the Olifants River. The headwaters of the Leeuwfontein Spruit are located some 10 km upstream from this area, and the catchment covers approximately 44.3 km^2. The activities upstream of its entry point into the minerals rights area consists of one small defunct opencast coal mine (Middelburg Consolidates Mines - Illanga Colliery) and agricultural use. A coal washing plant is currently operated at the defunct opencast mine.

Three non-perennial tributaries of the Leeuwfontein Spruit occurs within the mining right area. One of the tributaries occurs across the Ilanga Colliery and Goedehoop Colliery mining right areas.

The most significant one is crossed by the access road and conveyor to Block 8. Currently, there are no surface mining activities in the catchment of the non-perennial Spruit, but for Block 8 shaft and crossing. Two small farm dams (owned by the farmers) occur within this non-perennial tributary. The catchment of the non-perennial Spruit is approximately 9.9 km^2.

5.3.8.1.3 Olifants River Sub Catchment

The southernmost sector of the mining right area of Goedehoop Colliery occurs within this Olifants River sub catchment. Note that this sub-catchment is not the entire Olifants River catchment, but rather that portion of the catchment that occurs upstream of the confluence of the Leeuwfontein Spruit and downstream of the confluence of the Leeuwfontein Spruit on the farm Kleinfontein 49 IS to and Vlaklaagte 45 IS. Currently, the only Goedehoop Colliery mining related surface infrastructure that occurs within this sub catchment is the Block 8 silo, a portion of the Block 8 conveyor belt, the Block 20 shaft complex and a portion of the Block 20 conveyor belt. The Olifants River is a perennial river

5.3.8.2 Baseline hydrology

5.3.8.2.1 Mean Annual Runoff

The catchment areas and the estimated mean annual runoff (MAR) for the streams in the vicinity of Goedehoop Colliery and the proposed Hope No. 4 Seam project are summarised in Table 18.

Table 18: Catchment Mean Annual Runoff (MAR) for Goedehoop Colliery's Hope No. 4 Seam Project Rea.

CATCHMENT	AREA (KM^2)	NET MAR (10^3M^3)
Koring Spruit	122.8	7910
Hope Spruit	9.4	370
Goedehoop Spruit	13.0	580
Leeuwfontein Spruit	44.3	2786
Leeuwfontein Spruit Trib 5	-	420
Leeuwfontein Spruit Trib 4	-	110
Leeuwfontein Spruit Trib 3	-	80
Leeuwfontein Spruit Trib 2	-	150
Leeuwfontein Spruit Trib 1	-	180
Leeuwfontein Spruit	-	2980
Olifants River upstream of Witbank dam	3 256	125100
Olifants River Trib 1	-	60

5.3.8.2.2 Normal Dry Weather Flow

Under natural conditions the river reach of the Olifants River under discussion would have displayed little, if any, normal dry weather flow despite being perennial.

Based on the definition of normal dry weather flow, which is equalled or exceed 70% of the time, the normal dry weather flow at Middelkraal flow measuring station was determined as 0.143 m^3/s.

The normal dry weather flow for the Goedehoop Spruit and the Koring Spruit was calculated during the hydrological study undertaken for one of the amendment processes. Based on this study Goedehoop Spruit is marked as a non-perennial river on the 50 000 topographical sheets. Dry weather flows are therefore likely to be very low and will often be limited to sub-surface flow only. Average dry weather flows appear high but these are influenced by storm flow from occasional winter rainfall events.

The normal dry weather flows are based on the average monthly flows documented in the Water Resources of South Africa, 2005 Study (Middleton and Bailey, 2009) for quaternary catchment B11B. The flows were scaled based on relative catchment size. The annual normal dry weather flows for the Goedehoop Spruit and Koring Spruit were calculated to be 634 579 m^3 and 3 514 213 m^3, respectively.

Regarding the stream affected by the proposed Hope No. 4 Seam project, most of the streams are marked as a non-perennial river on the 50 000 topographical sheets. As was indicated under the Goedehoop Spruit, dry weather flows are likely to be very low and will often be limited to sub-surface flow only. Average dry weather flows appear high but these are influenced by storm flow from occasional winter rainfall events and subsurface flow.

The dry weather flows for the streams affected by the proposed project are presented in Table 19.

Table 19: Dry weather Flows for the proposed Hope No. 4 Seam.

	Affected Streams							
Month	**Hope Spruit**	**Olifants River Trib 1**	**Leeuwfontein Spruit**					**Leeuwfontein Spruit**
			Trib 5	**Trib 4**	**Trib 3**	**Trib 2**	**Trib 1**	
Oct	11 434	1 904	12 729	3 449	2 304	4 711	5 625	91 465
Nov	39.068	6 500	43 686	11 775	7 867	16 084	19 205	312 269
Dec	63 340	10 547	70 886	19 107	12 765	26 098	31 163	506 699
Jan	66776	11 119	74 731	20 143	13 458	27 514	32 853	534 15
Feb	68 366	11 384	76 510	20 623	13 778	28 169	33 635	546 898
Mar	55 779	9 288	62 424	16 826	11 241	22 983	27 443	446 210
Apr	32 525	5 416	36 400	9 811	6 555	13 401	16 002	260 188
May	16 694	2 780	18 682	5 036	3 364	6 878	8 213	133 542
Jun	8 536	1 421	9 553	2 575	1 720	3 517	4 200	68 283
Jul	4 587	764	5 133	1 384	924	1 890	2 257	36 693
Aug	2 975	495	3 329	897	600	1 226	1 464	23 797
Sep	2 883	480	3 227	870	581	1 188	1 419	23 066

5.3.8.2.3 Flood Peaks and Volumes

Flood peaks and volumes for the different catchments are given in Table 20. The unit Hydrograph method was used to determine the flood peaks and volumes for the catchments. The 1:50 1:100 year floodline.

Regarding the proposed Hope No. 4 Seam project, the peak flows of each tributary were calculated at the confluence with the Olifants River, Leeuwfontein Spruit (Olifants River Trib 21), or the Koring Spruit, whichever is applicable. The peak flows in the Goedehoop Spruit were calculated at the point where it crosses the R542.

Table 20: Flood Peaks and Volumes for the Olifants River

CATCHMENT	FLOW (M^3/S)			
	20 YEAR RECURRENCE INTERVAL	50 YEAR RECURRENCE INTERVAL	100 YEAR RECURRENCE INTERVAL	REGIONAL MAXIMUM FLOOD
Olifants River	625	900	1200	6455
Koring Spruit (at confluence to Olifants River)	135	185	230	3172
Koring Spruit (at Blinkpan Dam)	120	180	222	2994
Goedehoop Spruit	87	120	148	207
Hope Spruit	74	101	125	161
Leeuwfontein Spruit	97	167	204	243

5.3.8.2.4 Floodlines

The 100 m buffer zone specified in Government Notice 704 of the South African National Water Act should be applied to all streams and pans within the study area, as it is larger than the floodlines for all streams and pans.

Government Notice 704 of the South African National Water Act specifies that underground and opencast mining should be located outside the 50-year floodline or 100 m from a water course, whichever is the greatest. Dams and stockpiles should be located outside the 100-year floodline or 100 meters from a watercourse or pan, whichever is the greatest. The streams and pans within the study area near proposed project Hope No. 4 Seam project, were evaluated to determine if the 100 m buffer zone exceeds the floodlines. Where the 100 m buffer zone exceeds the floodlines, the 100 m buffer zone is used as the applicable buffer zone. Where the floodlines exceed the 100 m buffer zone, the floodlines are used as the applicable buffer zone.

The flood peaks presented in the Table 20 were used in the hydraulic calculations. The backwater elevations were calculated using Manning's open channel equations. Flood lines were calculated using HEC-RAS. Cross sections were taken from the 0.5 m contour data provided by the mine. In all cases the 100 m buffer zone exceeds the flood lines.

5.3.8.3 Surface Water Quality

Surface water quality within the respective watersheds subtended by Goedehoop Colliery, has been impacted on by several activities including mining, power generating facilities and agriculture. Qualities prior to the commencement of mining activities are not available. However, Goedehoop Colliery has implemented an extensive surface-monitoring programme consisting of strategically placed surface water monitoring positions to monitor water quality within each of the catchments occurring on Goedehoop Colliery's mining right area. Water monitoring takes place for all catchments and sub-catchments associated with the colliery. The surface water monitoring points at Goedehoop Colliery are indicated on Figure 22 and described in Table 21.

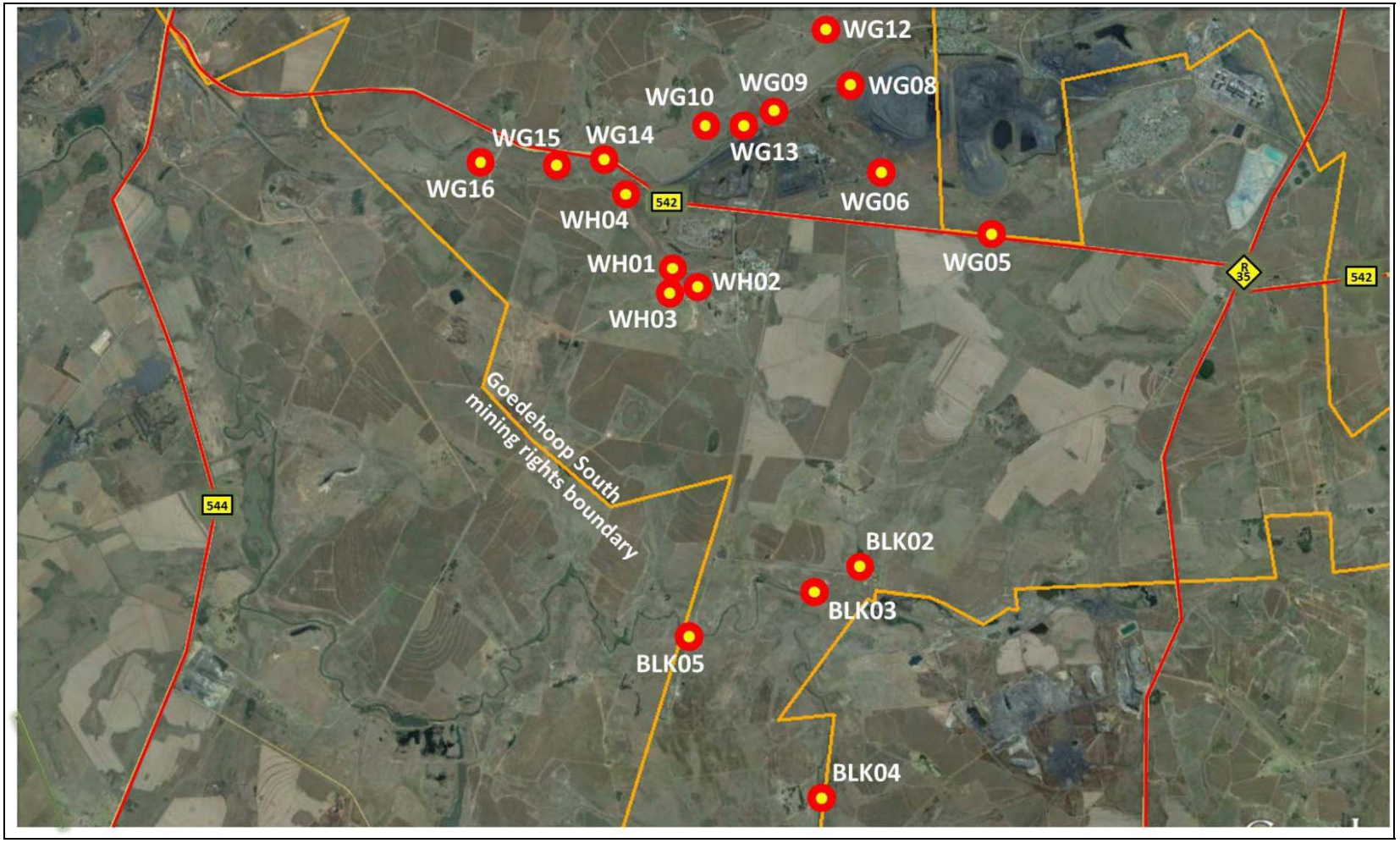

Figure 22: Goedehoop South Colliery Surface water sampling locations

In order to determine the current water quality within the sub catchments affected by the proposed Hope No. 4 Seam project, nine of Goedehoop Colliery's sampling locations were selected for the purposes of this surface water specialist report. One sample was selected on the Goedehoop Spruit (WG05), four samples were selected on the Leeuwfontein Spruit and the Olifants River (BLK02, BLK03, BLK04 and BLK05) and four samples were selected on and around the Hope Spruit (WH01 to WH04). The locations of the sampling points used for the Hope No. 4 Seam Project are depicted in Figure 23.

Table 21: Description of Surface Water Monitoring Points on and Surrounding Goedehoop Colliery

Site name	X coordinate	Y coordinate	Description of location
BLK02	-2893258.12	42462.97	Leeuwfontein Spruit before confluence at Block 8
BLK03	-2893624.42	41840.20	Leeuwfontein Spruit upstream of Olifants river
BLK04	-2896363.08	42120.91	Olifants River, upstream of Leeuwfontein Spruit
BLK05	-2894300.89	40216.30	Olifants River, downstream of Leeuwfontein Spruit
WH01	-2889418.53	39855.21	Hope Spruit
WH02	-2889537.83	40131.26	Hope Spruit
WH03	-2889658.80	39808.34	Hope discard dump
WH04	-2888446.64	39016.60	Hope Spruit
WG05	-2888688.88	43932.72	Goedehoop Spruit, Upstream at the Bridge
WG06	-2887949.53	42520.44	Goedehoop Upstream Weir
WG08	-2886757.20	41944.57	Goedehoop co-disposal facility
WG09	-2887175.90	41082.83	Downstream of Goedehoop facility on the access road
WG10	-2887150.00	40056.73	Railway sliding
WG12	-2886041.20	41726.48	Koring Spruit downstream WG11
WG13	-2887160.02	40721.14	Confluence of Koring Spruit and Goedehoopsruit
WG14	-2887905.10	38674.41	Koring Spruit at the Bridge towards Block 11
WG15	-2888021.57	38079.19	Block 11 conveyor belt next to informal settlement
WG16	-2888013.47	37150.29	Koring Spruit Block 11 bridge

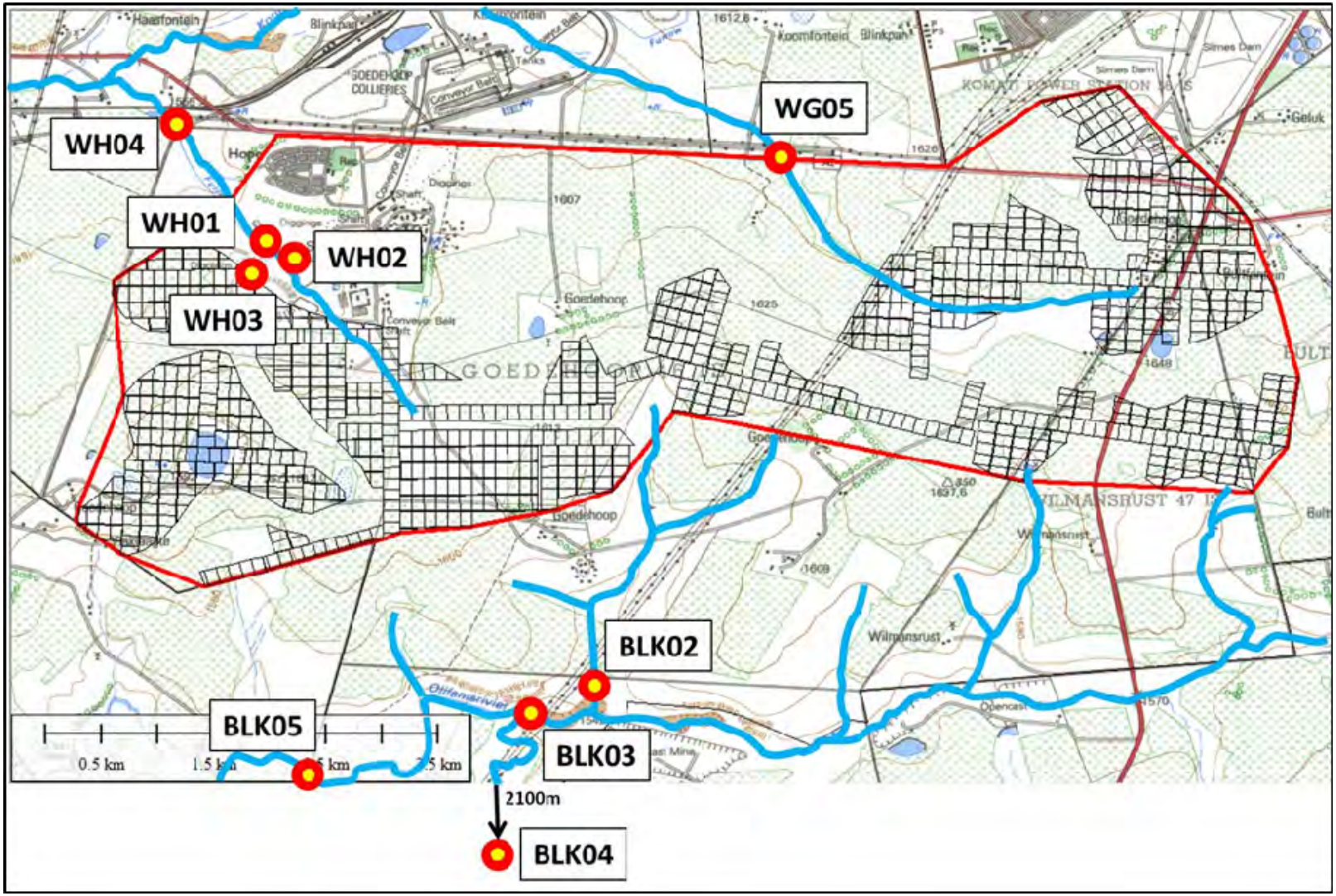

Figure 23: Surface water sampling locations used for the proposed Hope No. 4 Seam project area

The results from the water analysis are summarised below and are shown graphically in Figure 24, Figure 25 and Figure 26.

Goedehoop Spruit

Averages of monitoring data of the monitoring point indicates that water quality upstream of the Mineral Residue Deposit facility, Goedehoop plant and Rapid loading terminal areas (WG05) is, with the exception of Aluminium and Iron, of good quality, with the parameter being well outside the domestic water quality targets. See Figure 24 for the depiction of the water quality at the WG05 water monitoring point.

Hope Spruit

The Hope Spruit shows a decline in water quality from upstream to downstream. This can be seen most noticeably in the deteriorating water quality through WH02 (most upstream point), WH01 (downstream of WH02) and WH04 (most downstream point) (see Figure 25).

Leeuwfontein Spruit and Olifants River

Figure 26 shows that the water quality at BLK04 is similar to BLK05 except for the maximum electrical conductivity and sulphate readings which show an increase between BLK04 and BLK05. This shows that mining related activities in the Leeuwfontein Spruit catchment have a negligible impact on the Olifants River during the wet season but have a detrimental effect on the Olifants River during the dry season. It should be noted that not all mining related activities in the Leeuwfontein Spruit catchment belong to Goedehoop Colliery.

5.3.8.4 Water Use

The Koornfontein Dam is the largest surface water resource in the area, with a capacity of 375 000 m^3. This dam does not form part of the mine water management system. No other major surface water resources exist in the area, except for small farm dams, which provide drinking water to livestock during certain periods of the year.

For the proposed Hope No. 4 Seam project area, the Goedehoop Spruit and Hope Spruit flow into the Koring Spruit, a tributary of the Olifants River. The confluence of the Koring Spruit and the Olifants River is upstream of the Witbank Dam. The Leeuwfontein Spruit is a tributary of the Olifants River. The flow in the Leeuwfontein Spruit, Goedehoop Spruit, Hope Spruit and the Koring Spruit is small in comparison to the flow in the Olifants River. The Olifants River is an impacted river system. Impacts are largely caused by coal mining, similar to impacts that are likely to be found on the Leeuwfontein Spruit, Goedehoop Spruit and the Koring Spruit. Water quality of the Olifants River is likely to dominate the water quality once the Leeuwfontein Spruit and Koring Spruit and the Olifants River converge. The downstream users were therefore considered in the Leeuwfontein Spruit, Goedehoop Spruit and the Koring Spruit. The downstream usage classes are evaluated below:

- Domestic users – limited drinking water, but farm labourers and local inhabitants may consume this river water.
- Recreational users – it is likely that farm labourers and local inhabitants will swim in the streams and will use the water for washing.
- Industrial users – there are no industrial users in the Leeuwfontein Spruit, Goedehoop Spruit and the Koring Spruit downstream of the study area. Goedehoop South Colliery does not draw water from these rivers.

- Aquatic users – the catchments are heavily impacted by agriculture and mining, and sensitive aquatic users are unlikely to be present.
- Irrigation users – the river water is likely to be used for small-scale or informal irrigation.
- Livestock watering – the river water is likely to be used for livestock watering.

5.3.8.5 Water Authority

The Olifants river basin upstream of the Loskop Dam is government water controlled catchment. The authority in charge is the Department of Water and Sanitation (Mpumalanga Regional Office).

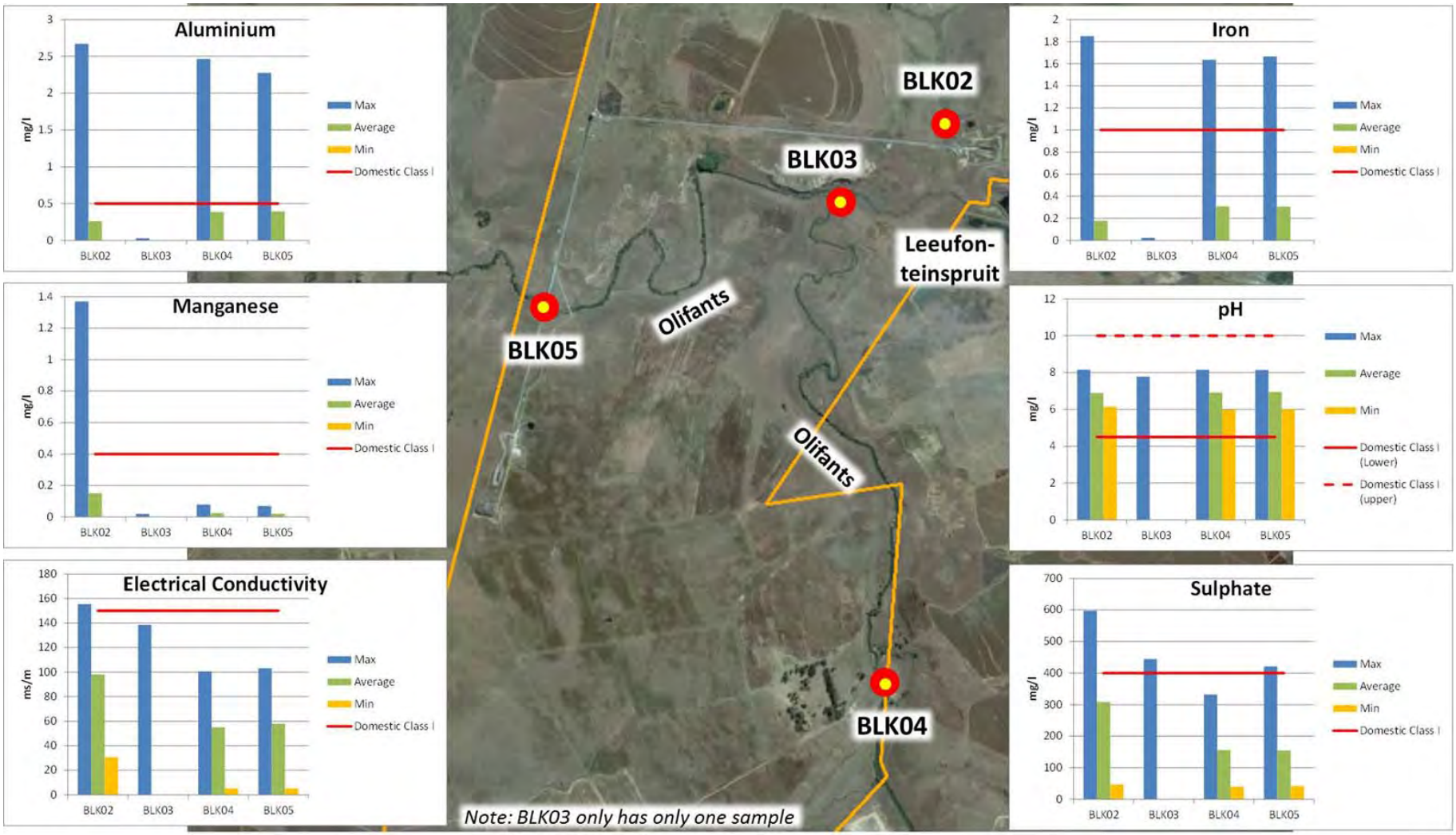

Figure 24: Water quality map of Goedehoop Spruit sampling point showing 6 key water quality parameters

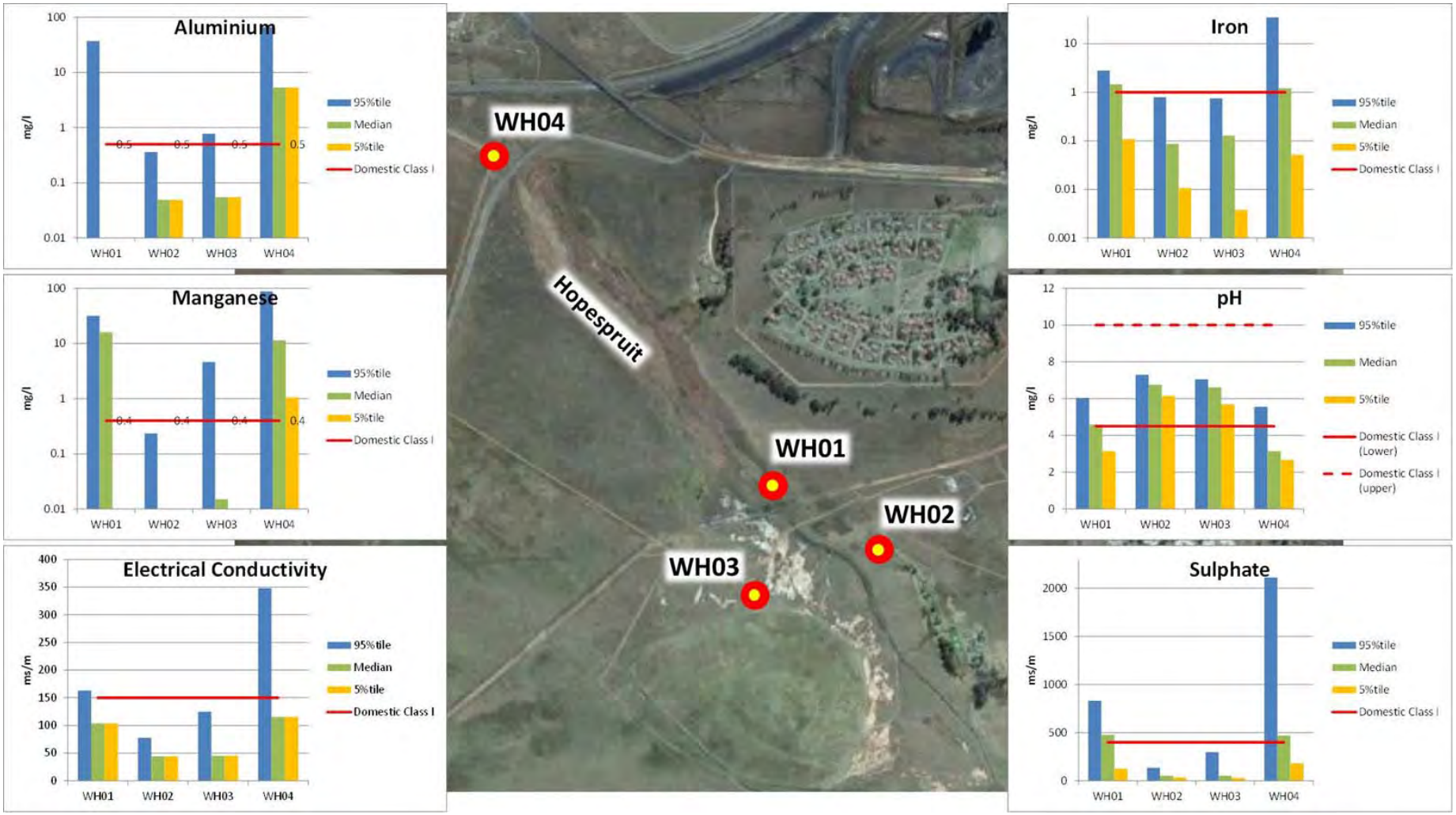

Figure 25: Water quality map of Hope Spruit sampling point showing 6 key water quality parameters

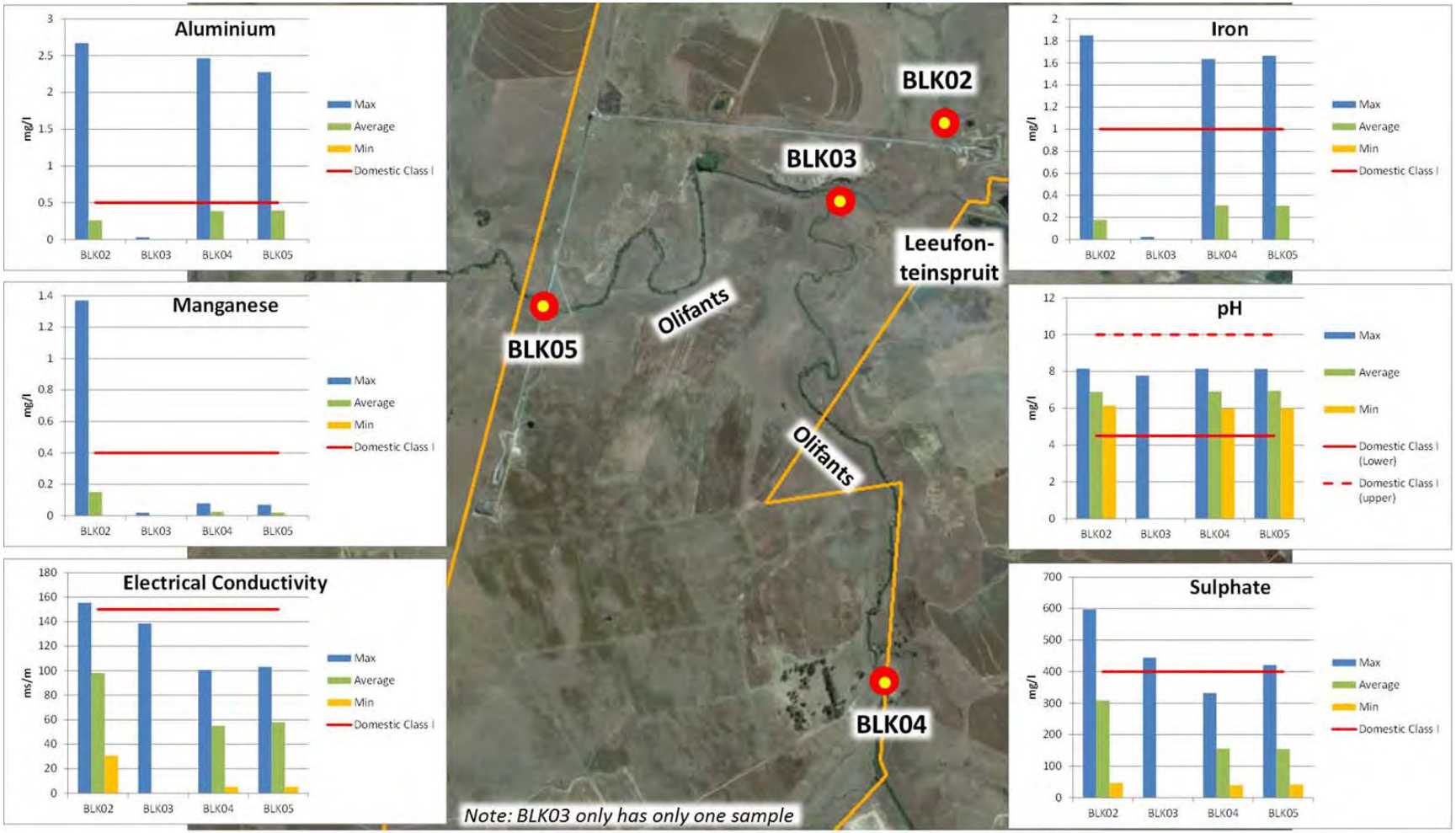

Figure 26: Water quality map of Leeuwfontein Spruit and Olifants River sampling point showing 6 key water quality parameters

5.3.9 Resource Class and River Health

Independent consultants, Digby Wells Environmental (Digby Wells) was commissioned by Anglo Operations (Pty) Limited to conduct an aquatic assessment of the aquatic ecosystems associated with Goedehoop Colliery. The aim of the aquatic assessment is to determine the overall health of the aquatic ecosystems associated with the area and to determine main focus areas for the BMP. A report from the assessment is attached as Appendix 7. Findings from this survey were also used to develop the Biodiversity Management Plan for Goedehoop Colliery.

5.3.9.1 River Health

The aquatic ecosystems associated with the Goedehoop South Colliery are located within the upper reaches and tributaries of the upper Olifants River and are named as follows: Koring Spruit, Hope Spruit, Goedehoop Spruit and Springbokspruit. The Global Positioning System (GPS) co-ordinates for each of the sampled sites are given in Table 22. An illustration of the locations of the sampling sites in relation to the mine area is presented in Figure 27.

Table 22: GPS co-ordinates and short descriptions of the various study sites.

	Site name	Coordinates	Methods applied
River course	Olifants (mainstem)		
Site	RWD B8	26° 9' 0.97'' S 29° 25' 33.35'' E	Water quality and definitive toxicity
	O1	26° 9' 33.59'' S 29° 24' 13.21'' E	Water quality, screening toxicity and SASS5
	O2	26° 9' 36.64'' S 29° 23' 39.68'' E	Water quality, screening toxicity and SASS5
River course	Hope Spruit		
Site	H	26° 6' 56.41'' S 29° 23' 53.48'' E	Water quality and screening toxicity
River course	Goedehoop Spruit		
Site	G1	26° 6' 7.85'' S 29° 25' 27.8'' E	Water quality and screening toxicity
	G2	26° 5' 44.30'' S 29° 24' 38.27'' E	Water quality and screening toxicity
	RWD GH	26° 6' 1.12'' S 29° 24' 26.06'' E	Water quality and definitive toxicity
River course	Koring Spruit		
Site	K1	26° 5' 9.82'' S 29° 24' 56.65'' E	Water quality, screening toxicity and SASS5
	K2	26° 5' 43.51'' S 29° 24' 24.61'' E	Water quality, screening toxicity and SASS5
	K3	26° 6' 12.30'' S 29° 23' 3.31'' E	Water quality, screening toxicity and SASS5
River course	Springbokspruit		
Site	Spring 1	26° 4' 34.68'' S 29° 20' 16.19'' E	Water quality and screening toxicity

	Spring 2	26° 5' 26.77'' S 29° 19' 35.44'' E	Water quality and screening toxicity
Water body	N/A		
Site	RWD Vlak	26° 2' 20.36'' S 29° 20' 2.29'' E	Water quality and definitive toxicity
Site	East Pan	26° 04' 28.89'' S 29° 23' 53.87'' E	Water quality and screening toxicity
Site	West Pan	26° 04' 31.42''S 29° 23' 14.59'' E	Water quality and screening toxicity

5.3.9.2 Water Quality

The Goedehoop Spruit

During the initial low flow survey the site G1 in the upper reaches of the Goedehoop Spruit was found to be dry. During the high flow assessment the site was inundated and water quality analyses at the site revealed elevated concentrations of dissolved salts. The levels of dissolved salts then increased at the site G2 which is located downstream of the Goedehoop South processing plant as well as the RWD (RWD GS). This increase in dissolved salts is likely a result of seepage/runoff from the Goedehoop South processing plant discard dump. These levels of dissolved salts would likely negatively affect local aquatic biota.

The Hope Spruit

The Hope Spruit runs adjacent to the Hope coal discard dump and according to results obtained during the water quality analyses it is clear that seepage from this dump is negatively affecting the water quality at the site with specific emphasis on the high flow survey.

The Olifants River

During the 2014 assessment elevated levels of dissolved salts were observed at both sites in the Olifants River during the low flow period. These elevated concentrations are likely due to upstream mining activities (not Goedehoop Colliery) compounded through evaporation/concentration during the low flow period. During the high flow survey the levels of dissolved salts returned to levels below threshold effect concentrations. All other constituents considered during the survey were found within the recommended levels.

Overall water quality conclusion

The water quality in the watercourses associated with the Goedehoop South Colliery indicates input from the various mining activities which occur within their respective catchments. Dominant pollution sources were identified to be the Hope, Koornfontein mines and Goedehoop South discard dumps.

5.3.9.3 Toxicity

The Goedehoop Spruit

The toxicity results of sites in the Goedehoop Spruit indicate that there is no acute toxic threat in the river system.

The Hope Spruit

Toxicity analysis in the Hope Spruit revealed very high acute toxic hazards during the high flow assessment. Indicating that runoff/seepage from the Hope discard dump is presenting a toxic risk to local aquatic biota.

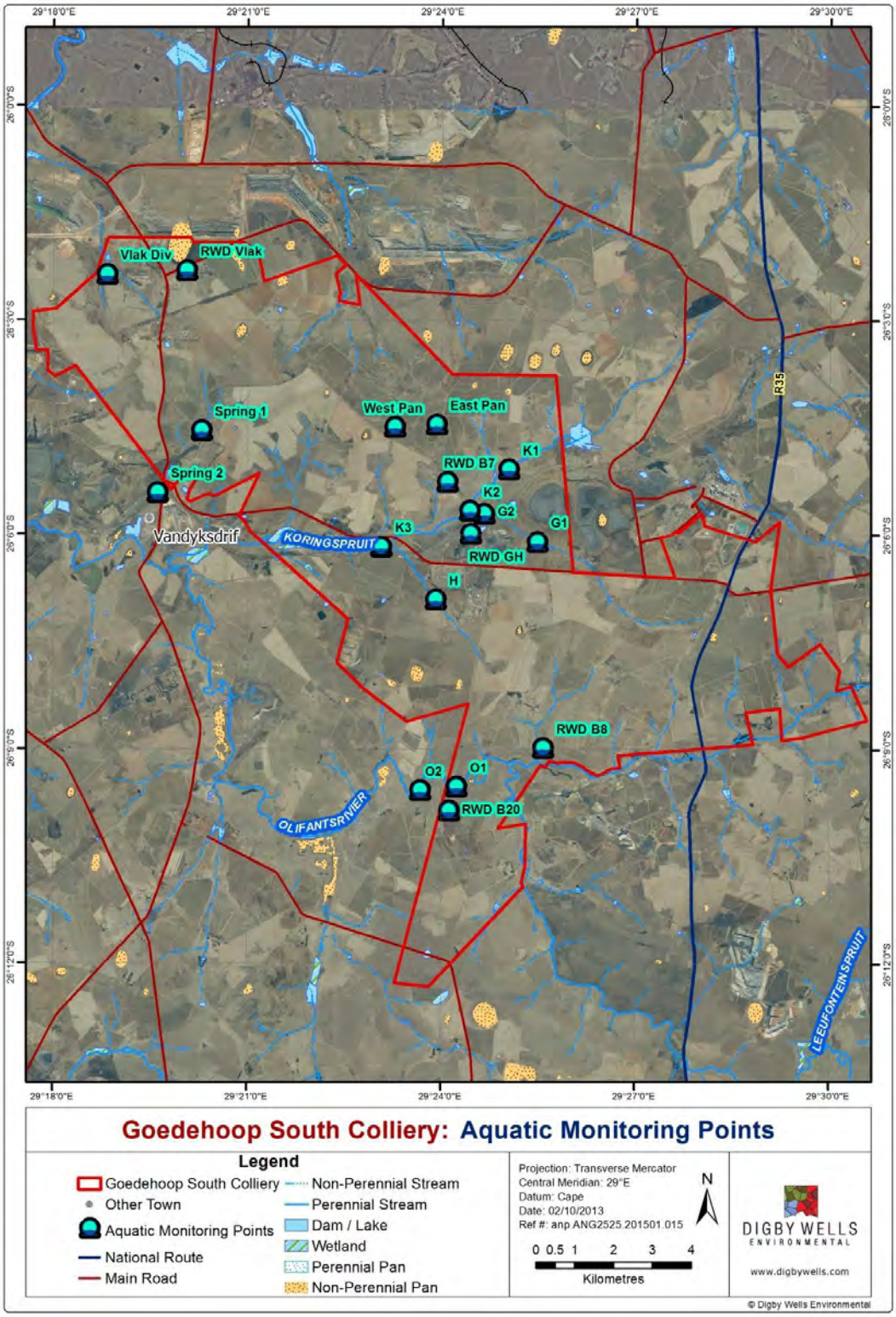

Figure 27: Goedehoop South Colliery Aquatic Monitoring points

The Olifants River

Both surveys completed on the Olifants River sites revealed that water at the sites would not present a toxic risk to local aquatic biota.

Goedehoop South impoundments and Pans

Toxicity results obtained during the low flow reveal that the pollution control impoundments at the Goedehoop South Colliery would not present any toxic threat to local aquatic biota. However, during the high flow survey acute hazards were determined in the Block7 and Vlaklaagte RWD's. The East and West pans sites were found to be not acutely toxic to aquatic biota.

5.3.9.4 Habitat

The habitat assessment for the watercourses associated with the Goedehoop South Colliery concession revealed largely modified (Class D) status's for the instream and riparian habitat. These classes were determined due to the large influences local agricultural and mining activities have on the integrity of the associated river courses.

5.3.9.5 Macroinvertebrates

The results of the macroinvertebrate assessment, SASS5, indicate modified conditions in the Koring Spruit. This is largely attributed to impacted water quality at the sites resulting in the absence of sensitive species with particular reference to conditions and available habitat at the site K3. Sites selected in the Olifants River showed fair/natural conditions with a myriad of sensitive taxa sampled in high abundances resulting in the largely natural status.

5.3.10 Groundwater

Goedehoop Colliery has commissioned a number of groundwater studies for their mining operations at their mining right area, which studies are available on request. In addition to the above-mentioned studies and in view of the proposed project, an additional groundwater study was conducted for the proposed Hope No. 4 Seam project. Geo Pollution Technologies (Pty.) Ltd. (GPT) was appointed to conduct the above-mentioned hydro geological study. See the report attached as Appendix 8

5.3.10.1 Regional Geohydrology

The groundwater in this region primarily occurs within the weathered zone as well as in joints and fractures of the competent aranaceous and argillaceous rocks of the Ecca Group.

The borehole yielding potential within this geohydrological zone is classified as d2, which implies that a median yield which varies between 0.1 l/s to 0.5 l/s. The groundwater potential for this area is given as between 40% and 60%, which indicates the probability of drilling a successful borehole (yield > 0.1 l/s) whilst the probability of obtaining a yield in excess of 2 l/s is given as between 10 and 20%.

The Mean Annual Recharge (MAR) to the groundwater system of this region is estimated to be between 37mm and 50mm per annum, which relates to about 6.5% of the mean annual rainfall (MAP). The groundwater contribution to surface stream base flow is relatively low, estimated between 10mm and 25mm per annum.

The mean depth to groundwater levels are estimated to be between 10 and 20 meters below the surface. The aquifer storativity (S) for the fractured aquifers in the study area is estimated to be

between 0.001 and 0.01. The saturated interstice types (storage medium) are pores in disintegrated/ decomposed, partly decomposed rock and fractures which are principally restricted to a zone directly below groundwater level.

The pristine groundwater quality is good with a Total Dissolved Solids (TDS) that is <300. And an Electrical Conductivity (EC) range of between 0 and 70 mS/m. The groundwater is classified to be of hydro chemical type B, with dominant cations Ca2+ and Mg2+ and dominant anions Cl- and $SO_4$2-.

5.3.10.2 Groundwater Aquifer Types (Saturated Zone)

Experience of the Karoo geology indicates that the natural regional piezometric surface is topographically controlled with the groundwater generally draining towards the surface stream channels. Groundwater is usually struck within 30 m of the surface and water rest levels are usually within 5-15 m of the ground surface. Hence, groundwater is in close contact with all potential pollution generating activities. There are four major aquifers in the region, defined as follows:

5.3.10.2.1 Shallow, perched aquifer

This aquifer is independent of the underlying geology and is found either perched on a well-developed pedogenic horizon or at the shallow interface between soil and bedrock. A shallow, perched (1.0-5.0 m) or temporary water table is prevalent at the base of the permeable sandy hill wash material, resting above or within the ferruginised horizon above the residual soil or at the soil bedrock interface. Groundwater flow patterns usually follow the topography, often coming close to surface in topographic lows, sometimes forming natural springs.

Recharge to the perched aquifer is relatively high being up to 3% of the Mean Annual Precipitation. Storativity is estimated to be high as a result of the high porosity (40 %) of the sediments. Permeability values vary considerably, depending on the nature of the overburden material, but values of 10-4 to 10-8 m/s are typical.

5.3.10.2.2 Fractured Karoo rock aquifers

Groundwater held within the sandstones and shales is usually associated with water-bearing fractures within the rock or the fractured contacts adjacent to intrusive dykes or sills. Generally the groundwater potential of these aquifers is moderate to low, however, yields may increase where boreholes are sited within low-lying flood plains or alluvial valleys. Natural features such as dykes, geological contacts and faults often provide impermeable barriers along which storativities and transmissivities are enhanced.

Recharge to the deeper fractured rock aquifers is estimated to be in the order of 1 % of the Mean Annual Precipitation. The porosity of the Vryheid formation in the Karoo sequence typically ranges from 5 to 15 %. However, the specific retention of interstitial water in the Karoo sandstones and shales is high, resulting in a low yield. Typically, only 10 % of the interstitial water is released. Permeability values range from 10-6 to 10-8 m/s.

5.3.10.2.3 Aquifers associated with dolerite intrusives:

Permanent groundwater commonly occurs within the upper portion of the weathered and jointed rock of dolerite sills in the region. Recharge to these semi-confined fractured rock aquifers may occur via leakage through remnant joints within the residual soils or at places where the residual soils are thinly developed or absent. Depths to the permanent water table are in the order of 5 to 15 m below surface.

The size and properties of this aquifer are extremely variable, depending on the precise mineralogical composition, fabric or texture of the rock and the degree of weathering of the intrusive itself as well as the alteration (chemical and structural) of country rock. Permeability values can range from essentially impermeable to as high as 10-4 m/s. The presence of the Ogies Dyke within the mining right area has a major impact on the geohydrology of the area because it essentially separates the mining right area into two separate geohydrological compartments.

5.3.10.2.4 Aquifers associated with coal seams:

The margins of coal seams or clastic partings within coal seams are often associated with groundwater, with the coal seams acting as an aquitard allowing the flow of groundwater at the margins. The groundwater potential of these aquifers is generally regarded as low. Geological features within the sedimentary sequence such as coal seams tend to enhance transmissivities and storativities, resulting in higher groundwater yields, with permeabilities ranging from 10-6 to 10-7 m/s.

5.3.10.3 Dolerite intrusives

Dolerite intrusions in the form of dykes and sills are common in the Karoo Supergroup, and are often encountered in this area. A lineament that is a possible dyke is present on site (running north east – south west through the mining area) according to the geology map. These intrusions can serve both as aquifers and aquifuges. Thick, unbroken dykes inhibit the flow of water, while the baked and cracked contact zones can be highly conductive. These conductive zones effectively interconnect the strata of the Ecca sediments both vertically and horizontally into a single, but highly heterogeneous and anisotropic unit on the scale of mining. These structures thus tend to dominate the flow of groundwater. Unfortunately, their location and properties are rather unpredictable. Their influence on the flow of groundwater is incorporated by using higher than usual flow parameters for the sedimentary rocks of the aquifer.

5.3.10.4 Faults

Faults also occur in the Karoo Supergroup, with throws of tens to hundreds of meters quite common. Due to the rupturing of the bedrock, these structures exhibit large hydraulic conductivity and is considered as preferred flow structures. Similar to the dykes, these zones also interconnect the strata of the Ecca also dominate the flow of groundwater. Their location and properties are similarly unpredictable and is incorporated by using higher than usual flow parameters for the sedimentary rocks of the aquifer.

5.3.10.5 Unsaturated Zone

Although a detailed characterization of the unsaturated zone is beyond the scope of this study, a brief description thereof is supplied.

The unsaturated zone in the proposed mining area is in the order of between 0.9 and 43.43 metres thick (based on static groundwater levels measured during the March 2015 hydrocensus) and consists of alluvial sediments at the top, underlain by residual sandstone/siltstone/mudstone of the Ecca Group that becomes less weathered with depth.

5.3.10.6 Local Geohydrology

5.3.10.6.1 Presence of Water Boreholes and Springs/Fountains

The natural water table within the Goedehoop Colliery mining right area exists within the weathered zone between 0 and 10 metres below the surface. As in most of the mining right area, this has not been affected by coal extraction and it can be assumed that it is representative of the pre-mining situation. Areas that have been affected by mining operations are localised and closely associated with opencasts, shafts and safety/rescue boreholes. These areas are considered minimal.

A hydrocensus was conducted within a 2 km radius as a site familiarisation exercise and collection of essential groundwater related data from the Hope No. 4 Seam project study area and surrounding environments. The hydrocensus was conducted from 9 to 10 April 2015. The positions of the hydrocensus points are depicted in Figure 28. The detailed information can be seen in Appendix 8 under hydrocensus Information. A total of Seventeen (17) boreholes were found during the hydrocensus of which Seven (7) are privately owned used for various purposes such as domestic drinking water, irrigation of crops and livestock watering and Ten (10) were either not in use or used as monitoring holes.

3.1.10.2.1 Depth of Groundwater Table

During the hydrocensus, fifteen (15) boreholes were available for groundwater level measurement. The groundwater levels varied between a minimum of 0.9 m to the south of the Colliery to a maximum of 43.43 m below ground level to the east of the Colliery. The relationship, using the boreholes from the hydrocensus, is shown in Figure 29.

This general relationship is useful to make a quick calculation of expected groundwater levels at selected elevations, or to calculate the depth of to the groundwater level (unsaturated zone).

The calibrated static water levels as modelled have been contoured and are displayed in Figure 30.

Groundwater flow direction should be perpendicular to these contours and inversely proportional to the distance between contours. Using this relationship, the inferred groundwater flow directions are depicted as Figure 31 below. As can be expected, the groundwater flow is mainly from topographical high to low areas, eventually draining to the local streams.

5.3.10.7 Aquifer Classification

The aquifer classification is done in accordance with the formal DWS “South African Aquifer System Management Classification, December 1995” protocol. Special aquifer attributes related to certain structural features (such as along dyke/fault contact zones, or karst development) have been incorporated into the classification through the “Second Variable Classification”.

The aquifer classification at Goedehoop Colliery was done in accordance with the following definitions of the 4 Aquifer System Management Classes i.e. Sole Aquifer System, Minor Aquifer System, Major Aquifer System and Non-Aquifer System.

The shallow weathered zone aquifer at Goedehoop Colliery is classified as a Minor Aquifer System due to its low permeability and limited use for abstraction. There are no special structural aquifer attributes at Goedehoop Colliery associated with the Second Variable Classification of the shallow weathered zone aquifers. Based on the latest groundwater study, the mining area is characterised by some surface water features which can be used if necessary. The aquifer is also important for supplying base flow to the rivers and streams.

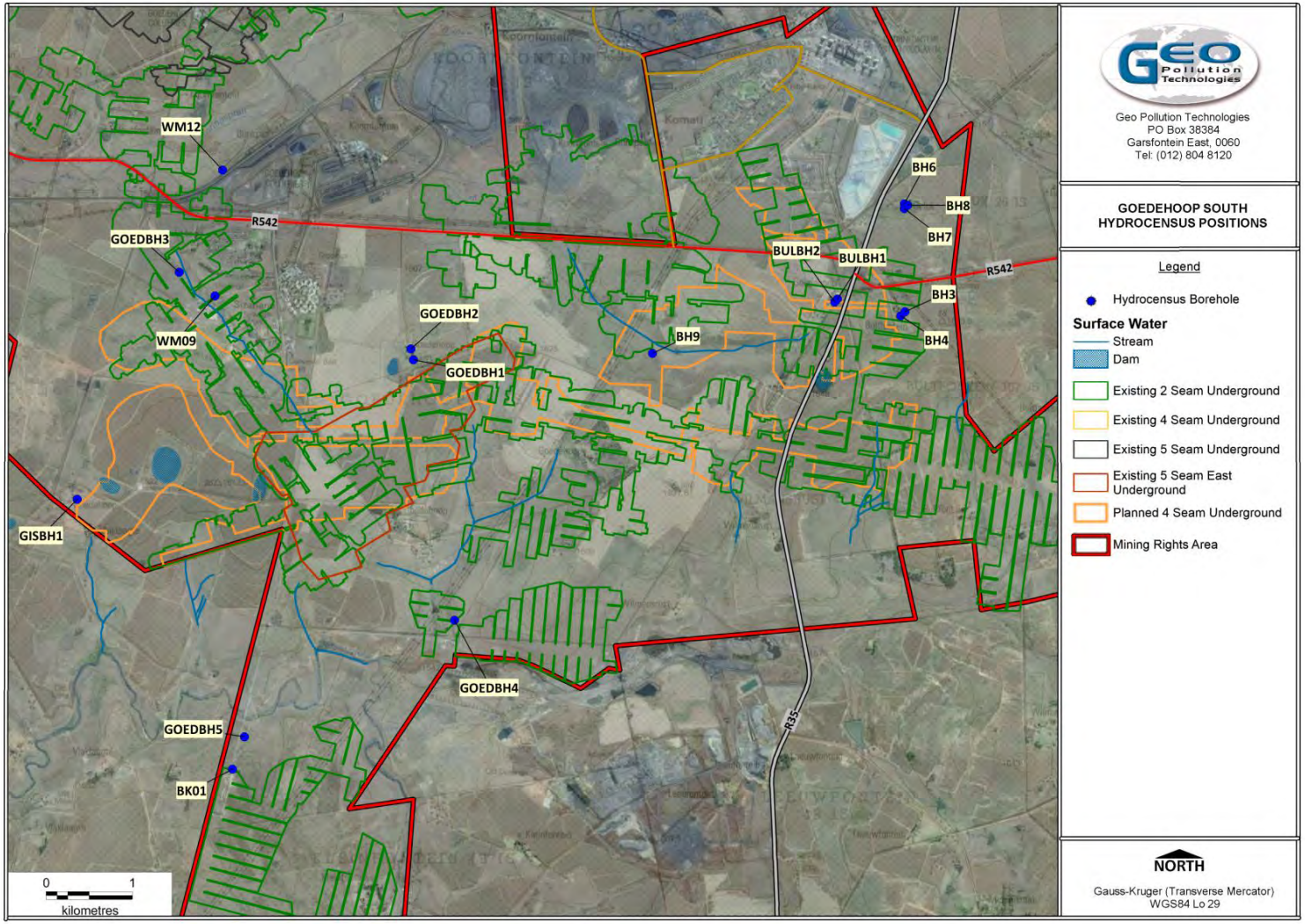

Figure 28: Hydrocensus (2015) borehole positions in relation to Goedehoop Colliery

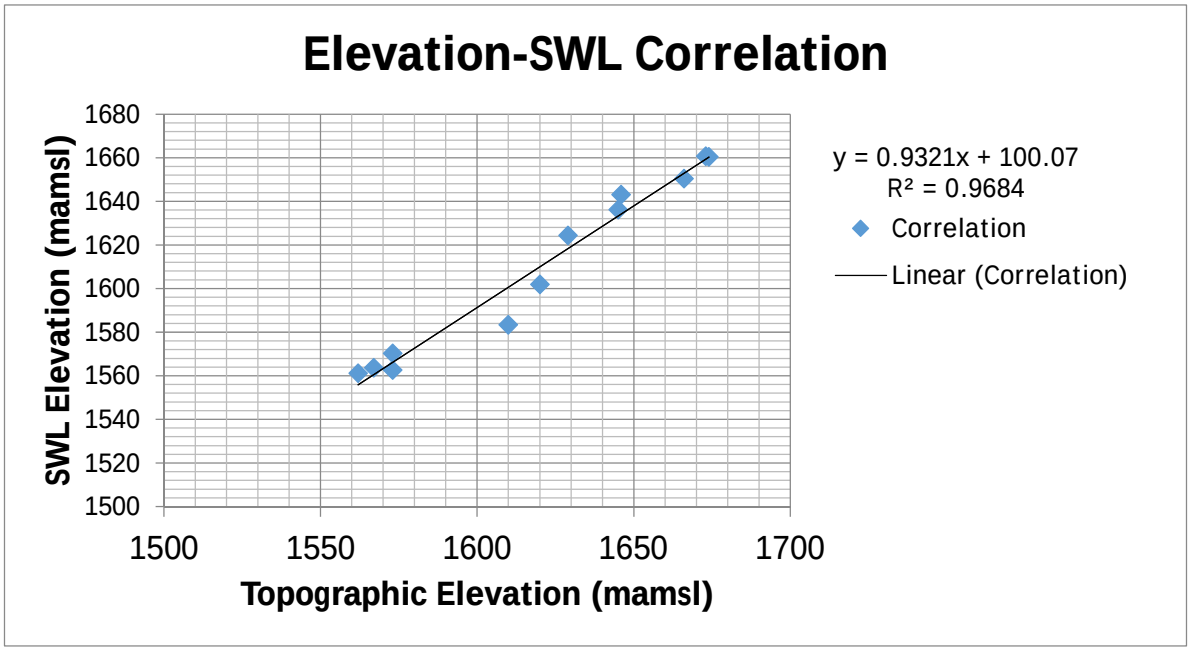

Figure 29: Correlation Graph of Topography vs available Groundwater Levels

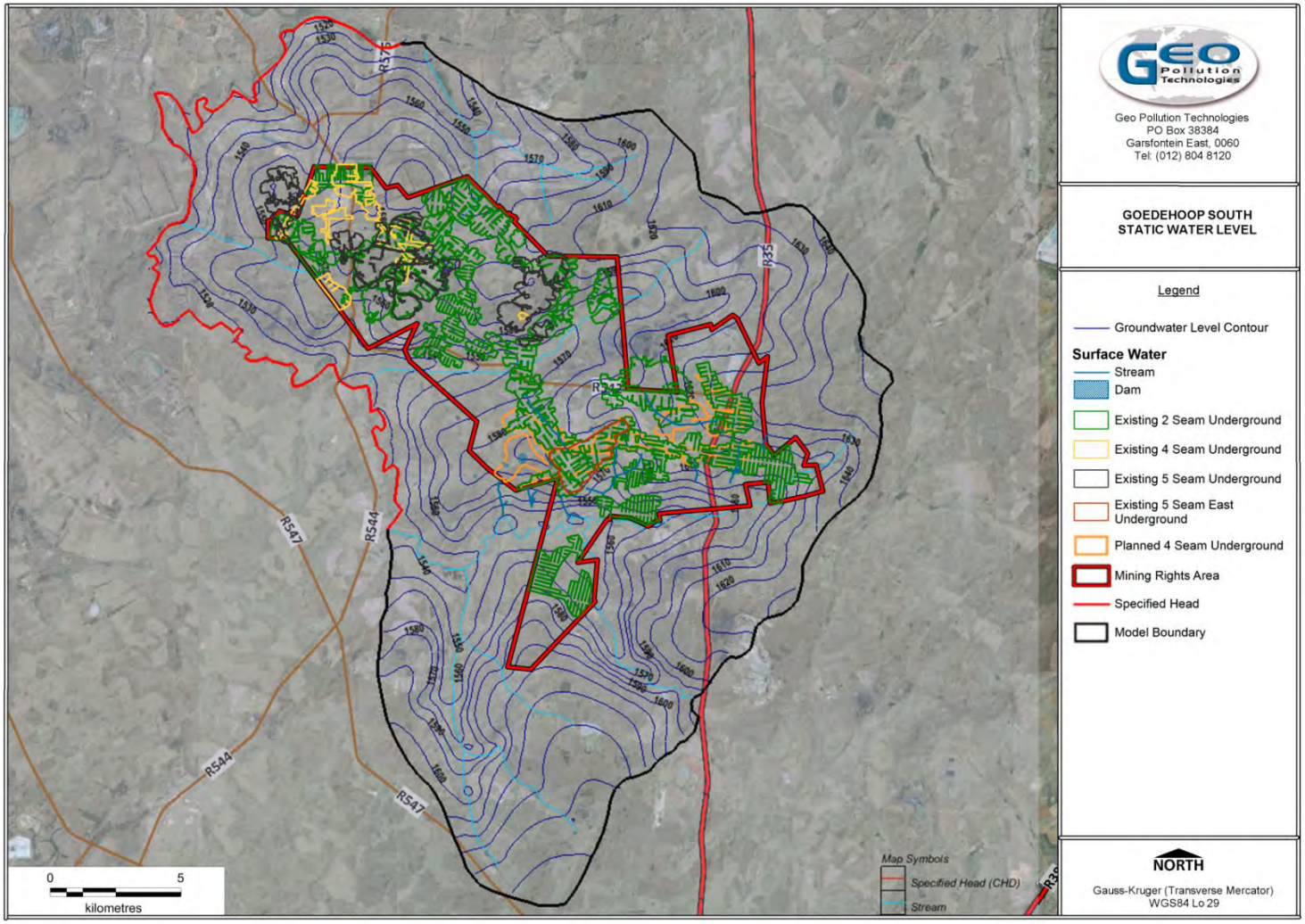

Figure 30: Calibrated Static Ground Water Levels for Goedehoop Colliery

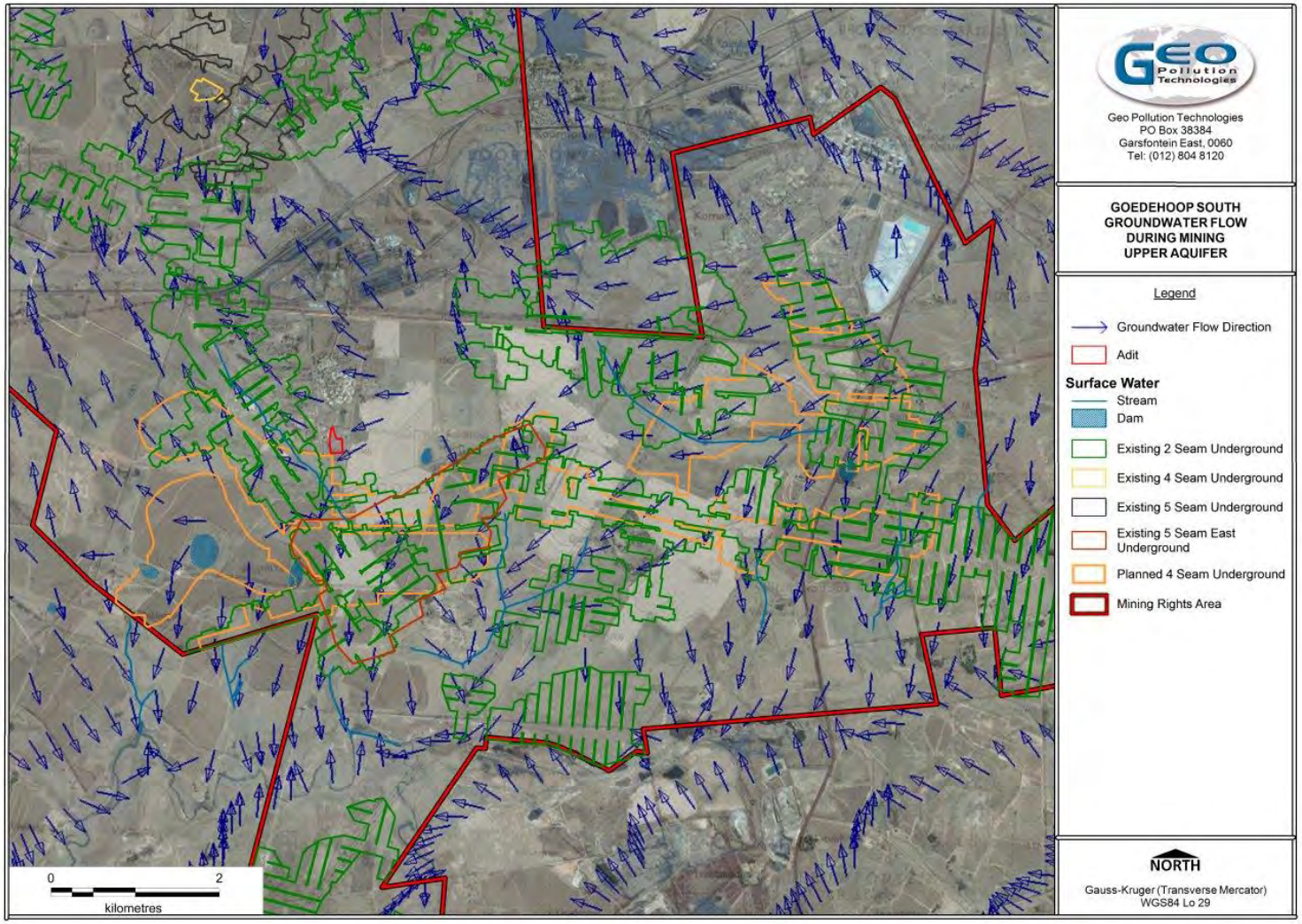

Figure 31: Groundwater Flow Directions

Aquifer Vulnerability

The groundwater quality management classification is made with regards to the aquifer vulnerability.

Based on the groundwater studies conducted for the mine, the shallow weathered zone aquifers are highly vulnerable to surface induced impacts and the shallow weathered zone Karoo aquifer at Goedehoop Colliery is classified as high.

The indicated level of groundwater protection is derived from the Groundwater Quality Management Index (GQM Index) and is calculated as follows:

GQM Index = Aquifer System Management x Aquifer Vulnerability Classification

= 2 x 3

= 6

The GQM Index is used to determine that level of groundwater protection that is required for the shallow weathered zone aquifer systems present at Goedehoop Colliery.

Aquifer Protection Classification

The ratings for the Aquifer System Management Classification and Aquifer Vulnerability Classification for the different groundwater studies yielded a Groundwater Quality Management Index between 4 and 6 for the shallow weathered zone aquifer systems at Goedehoop Colliery, indicating that MEDIUM level groundwater protection is required.

Reasonable and sound groundwater protection measures are recommended to ensure that no cumulative pollution affects the aquifer, even in the long term.

DWS's water quality management objectives are to protect human health and the environment. Therefore, the significance of this aquifer classification is that if any potential risk exists, measures must be taken to limit the risk to the environment.

5.3.10.8 Ground Water Quality

Seven (7) water samples were collected from 17 boreholes around the site during the investigation. The samples were submitted for major cation and anion analyses to determine water quality in the area. The groundwater results are compared with the maximum recommended concentrations for domestic use (Table 23) as defined by the DWS Water Quality Guidelines. Domestic use was considered the most appropriate standard to use as it is shown in this report that this is the main groundwater use in the area.

The results from these analyses were plotted as Pie diagrams (circular graphs as in Figure 32), Stiff diagrams (Figure 33), Piper diagram (Figure 34).

From the tables and figures it was concluded that the major cations in the groundwater samples are sodium, calcium and magnesium; that the major anions in the groundwater samples are chloride, sulphate and bicarbonate; and that the majority of groundwater samples can be described as unpolluted Calcium Bicarbonate and Sodium Chloride waters. The exceptions are GOEDBH3 and WM09 which can be described as groundwater that has been affected by mining related contamination. These boreholes are located in close proximity to the rehabilitated Hope Dump.

Regarding the compliance with the DWS water quality guidelines, it can be concluded that the constituents exceeding the guidelines are Ca (GOEDBH3), F (WM12), Mn (BK01), Mg (GOEDBH3), SO4 (GOEDBH3) and TDS (GOEDBH3).

- The elevation of the constituents described above can be interpreted as follows:
- Ca and Mg are elevated due to the underlying geology
- F may be elevated due to activities at the railway siding but further investigations are necessary to confirm this
- Mn and SO4 may be elevate due to mining related activities in the area
- TDS is elevated in GOEDBH3 due to the elevated concentrations of other constituents (Ca, Mg, SO4)

5.3.10.9 Geochemical Interpretation

Although no samples were submitted for geochemical analyses in the Hope No. 4 Seam project study, Acid Base Accounting (ABA) was done during previous studies. The results of 45 samples, obtained from Goedehoop Colliery, are discussed below.

From the ABA results, the following observations are made:

- The total S% (determined by means of a LECO analyser) was used to determine the Acid Potential (AP) of the rock. This might be a slight overestimation as only sulphide minerals produces acid upon oxidation and not any sulphate minerals. However, the dried tailings samples contained no sulphide or sulphate sulphur.
- The samples display average sulphur of 0.6% with a range from 0% to 8%. The NP range between -257 kg CaCO3/t to 125 kg CaCO3/t, with an average of -11 kg CaCO3/t. The material therefore has potential to produce acid mine drainage from sulphide oxidation and little potential to neutralise acidity.
- The coal seams are almost all classified as Class I Rock Type, which is potentially acid forming. Some of the shale layers are also classified as potentially acid forming.
- The Non-Acid forming materials are mostly sandstone and dolerite, as can be expected. But some shale layers also falls in this category.
- However, in general the coal seams in the area must be considered as Potentially Acid Forming, while the neutralisation potential of the surrounding bedrock is relatively low. Acid Mine Drainage (AMD) must therefore be expected.
- This fact is also illustrated in the measured groundwater qualities in the area (paragraph 5.4). In general, the sulphate concentration of groundwater impacted by mining is in the order of 2 000 mg/l, values ranging from 1 000 mg/l to 3 000 mg/l. Although values in excess of 10 000 mg/l is measured in places, these are mostly in low laying areas in close vicinity of tailings where concentration through evaporation has occurred.
- The high sulphate values coincide almost exactly with pH values as low as 3. Evidence if AMD production is thus evident.

It is thus concluded that the mining in this area will produce AMD with sulphate concentrations of about 2 000 mg/l on average.

Table 23: Water qualities (April 2015) compared to DWS drinking water quality guidelines

Water Quality Constituents		BULBH1	BK01	GISBH1	GOEDBH1	GOEDBH2	WM09	WM12	GOEDBH3	BH6	BH3	GOEDBH4	GOEDBH5	BH9	TWQR	Tolerable	Exceeding TWQR
Total Alkalinity	M Alk. [mg/l CaCO3]	216.00	261.00	22.00	36.00	110.00	54.00	162.00	145.00	147.00	143.00	129.00	180.00	183.00	*Not available*		
Aluminium	Al [mg/l]	0.03	0.05	0.45	0.01	0.02	0.03	0.02	0.05	0.03	0.02	0.03	0.05	0.03	0 - 0.15	0.15 - 0.5	> 0.5
Calcium	Ca [mg/l]	49.90	65.80	4.11	4.42	25.20	12.00	19.60	111.00	34.70	29.00	28.30	35.50	35.40	0 - 32	32 - 80	> 80
Chloride	Cl [mg/l]	25.70	98.50	9.28	5.01	15.10	38.30	13.70	40.00	16.20	11.70	6.24	15.30	32.40	0 - 100	100 - 600	> 600
Electrical Conductivity	EC [mS/m]	51.60	86.10	7.77	7.73	260.00	22.70	35.40	131.00	41.40	31.30	28.30	52.20	45.50	*Not available*		
Fluoride	F [mg/l]	0.34	0.30	0.00	0.00	0.00	0.00	1.62	0.00	0.00	0.24	0.00	0.97	0.41	0 - 1.0	1.0 - 1.5	> 1.5
Iron	Total Fe [mg/l]	0.01	0.10	0.09	0.12	0.05	0.04	0.16	0.05	0.02	0.01	0.03	0.08	0.05	0 - 0.1	0.1 - 1.0	> 1.0
Magnesium	Mg [mg/l]	18.60	20.30	2.80	2.60	7.98	8.26	10.50	76.20	16.90	11.20	11.30	22.60	12.20	0 - 30	30 - 70	> 70
Manganese	Mn [mg/l]	0.00	1.20	0.01	0.05	0.41	0.03	0.06	0.02	0.01	0.01	0.01	0.07	0.03	0 - 0.05	0.05 - 1.0	> 1.0
Nitrate	NO_3 as N [mg/l]	4.41	0.12	2.55	0.11	0.00	0.00	0.00	0.19	3.01	0.74	0.48	0.16	0.15	0 - 6		> 6
pH	pH units	7.63	7.71	7.01	7.16	7.01	7.79	7.64	6.81	7.41	7.45	7.62	7.85	7.93	6.0 - 9.0		<6, >9
Potassium	K [mg/l]	23.90	11.20	4.70	4.76	6.80	1.11	3.70	9.24	6.90	13.80	3.72	4.66	5.21	0 - 50	50 - 100	> 100
Sodium	Na [mg/l]	24.20	66.90	8.92	11.80	20.20	24.10	49.00	78.70	24.90	19.20	18.30	47.80	48.60	0 - 100	100 - 200	> 200
Sulphate	SO_4 [mg/l]	9.55	18.40	6.55	6.06	7.89	6.58	9.24	515.00	25.60	4.74	13.00	76.30	12.00	0 - 200	200 - 400	> 400
Total Dissolved Solids	TDS [mg/l]	324.00	486.00	62.00	58.00	160.00	140.00	228.00	1004.00	240.00	184.00	176.00	318.00	284.00	0 - 450	450 - 1 000	> 1000
Cation/Anion Balance %		1.02	-1.14	-1.00	4.06	3.44	1.48	2.25	2.38	2.86	3.00	2.84	1.40	1.75	*Error should not exceed 5%*		

Notes: A value of zero indicates that the analysis was below the detection limit

TWQR- Target water quality range

Tolerable - Suitable for short-term intake, in some instances health problems can occur during extensive long-term intake in sensitive individuals such as infants

Exceeding TWQR- Exceedance of target water quality range may lead to adverse affects

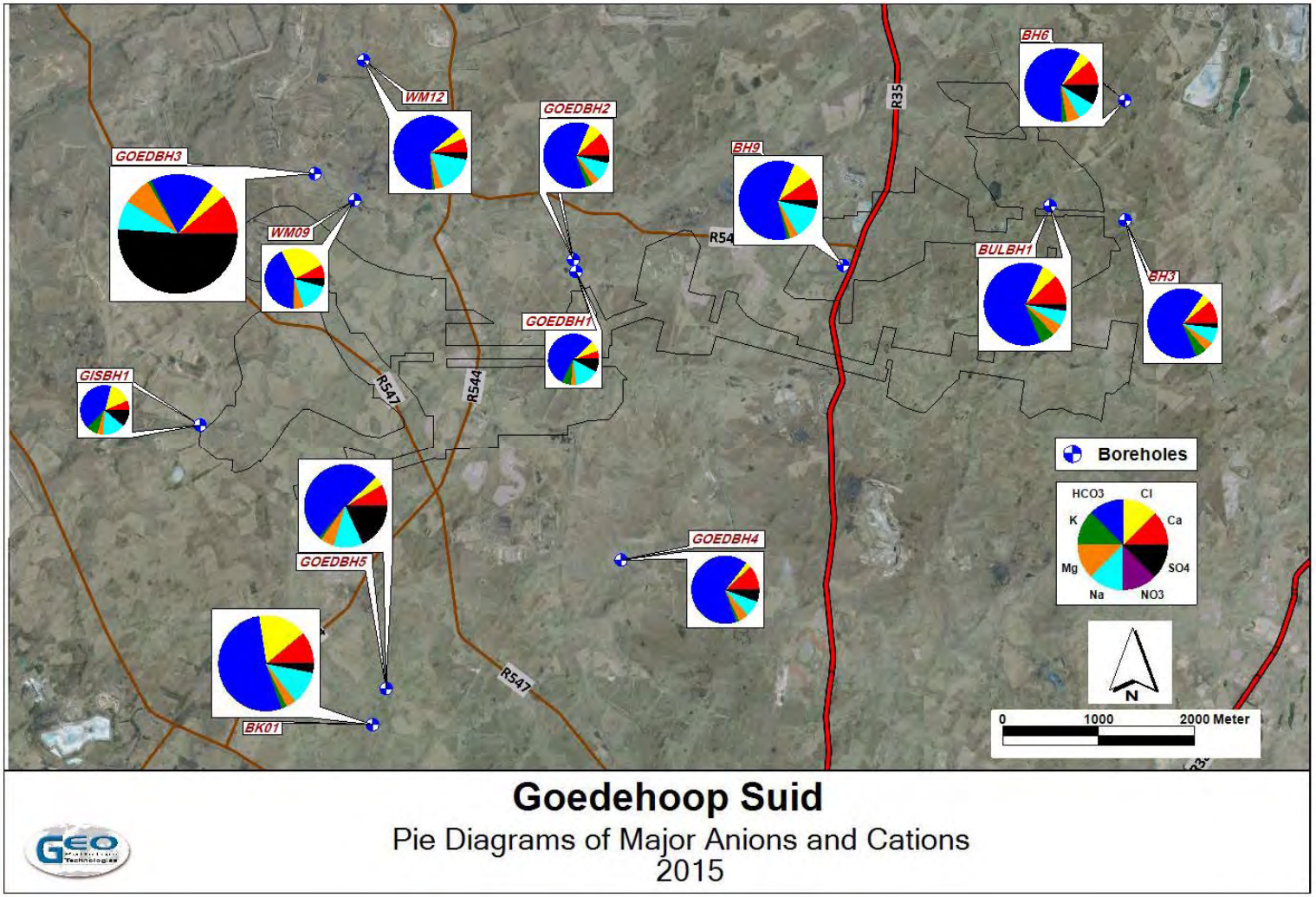

Figure 32: Pie Diagram

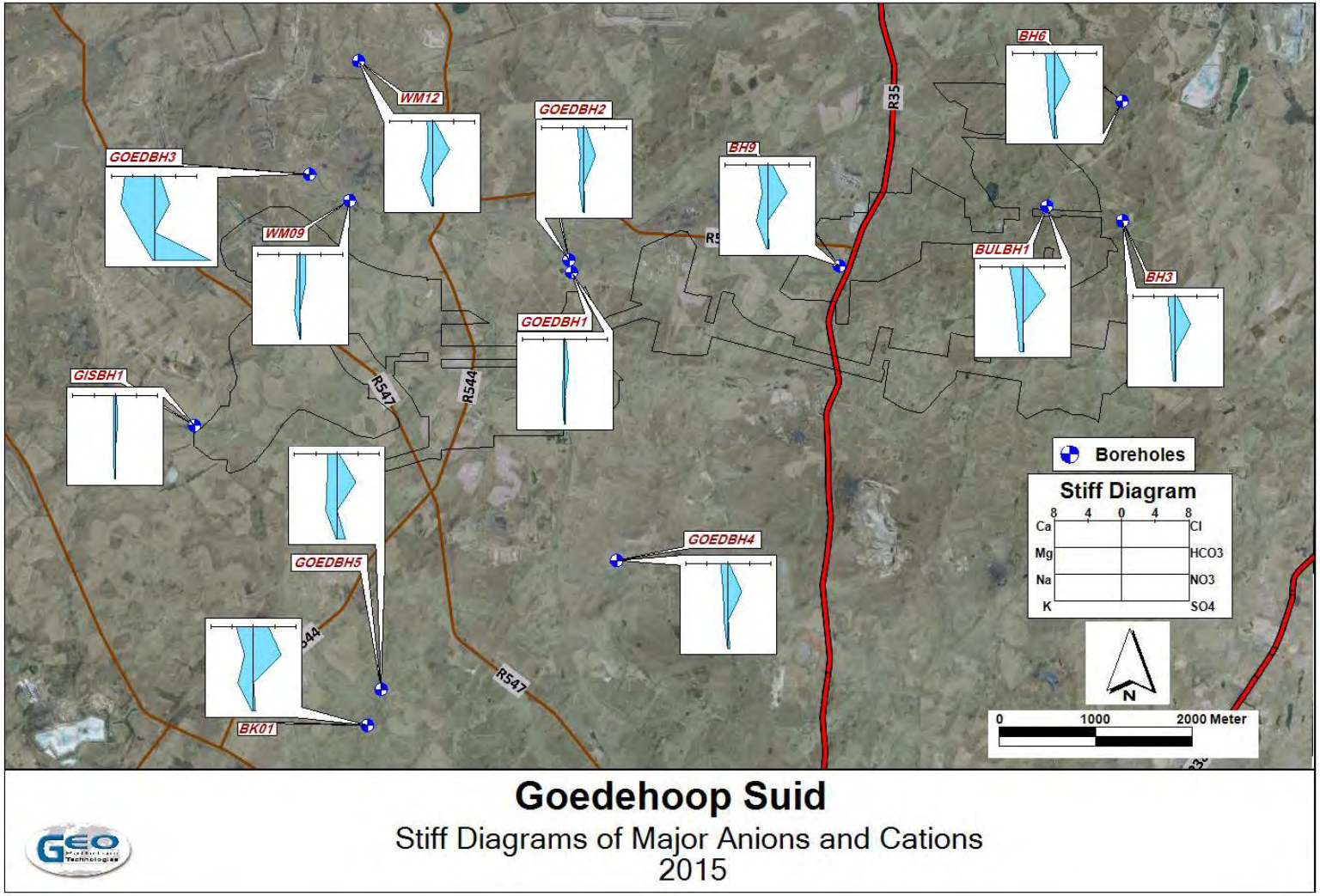

Figure 33: Stiff Diagram

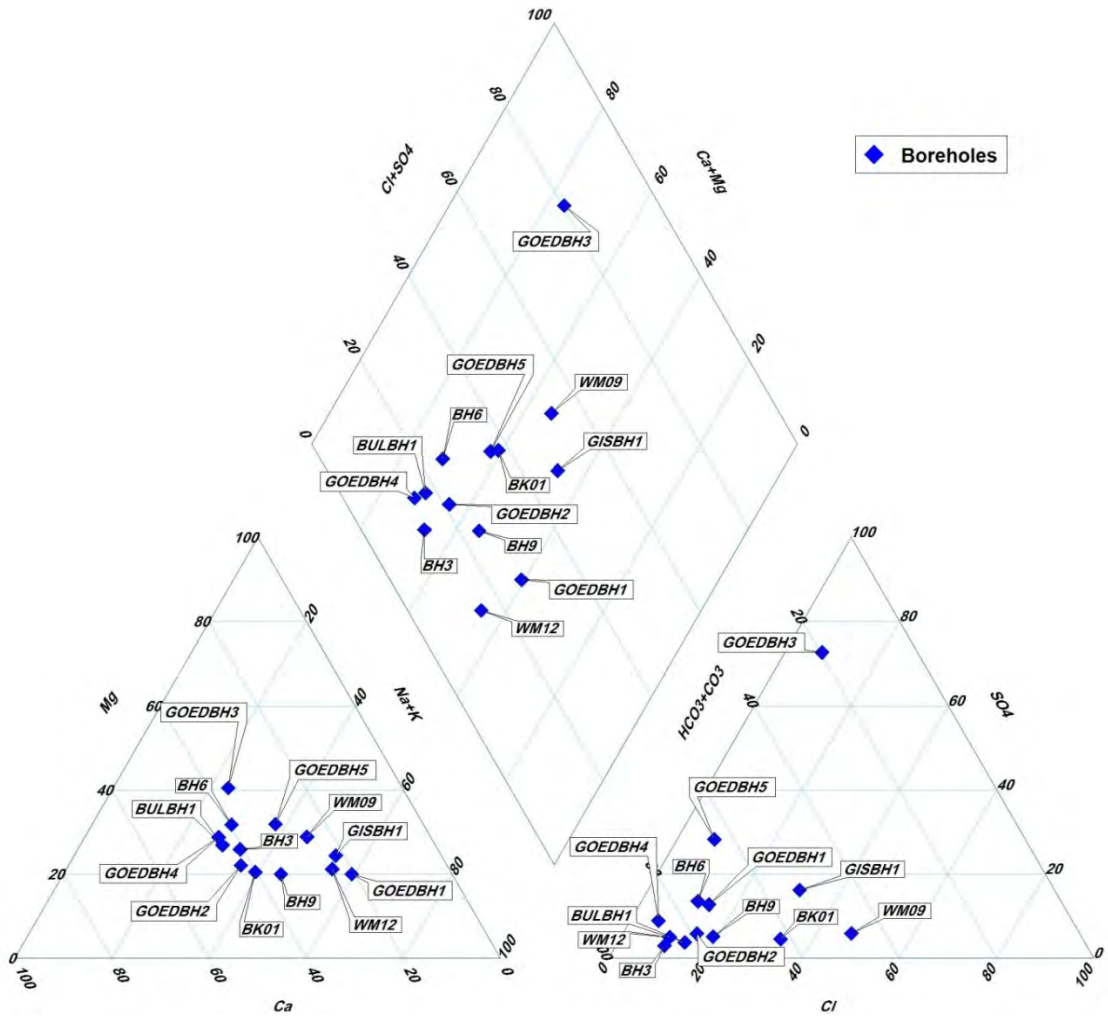

Figure 34: Piper Diagram

5.3.10.10 Underground Backfilling Material

Sections of the No 2 Seam will be backfilled to support mining in the overlying No 4 Seam. The mixture of the following materials with cement were considered:

- Power station fly ash from the Komati Power station
- Coal discard/slumps from adjacent mines or from adjacent dumps
- Sand from a quarry or borrow pit.

Only for the first two methods are there potential possibility of contamination to the groundwater, as sand is inert by nature. In a recent report, a series of investigations were carried out on these two materials to determine their leaching characteristics. It was concluded that the risk of either of the candidate backfill products failing either structurally or through metal/salt leaching to groundwater is low. The PFA (fly ash) backfill was found to be the preferred option from a structural and geochemical perspective, but either product will be suitable for use in the backfilled mine voids. It can be assumed with confidence that the backfill will have no negative impact on the groundwater quality.

Based on the model the backfilling will have limited impact on the flow and decant within the mined out underground. However further modelling is required on commencement of backfilling to validate this statement using available monitored data.

5.3.10.11 Groundwater Use

The extent of groundwater use prior to mining is not known, although the lack of any crop irrigation infrastructure in the area indicates that there was no substantial groundwater use. The local area around Goedehoop is already intensely mined by both underground and opencast techniques with the result that the geohydrology of the area is impacted upon. The implication is that groundwater use would be limited. No pump and yield investigations have been conducted on water users, however from the geological information available and dialog with local farmers it is expected that borehole yields range from 0,1 to 1,0l/s.

5.3.11 Sensitive Landscapes

Goedehoop Colliery recognises that all streams and wetlands occurring in the mining right area should be treated as sensitive landscapes. To this extent, Geovicon Environmental (Pty) Limited, an independent consultant, was commissioned by Anglo Operations (Pty) Limited to conduct an integrated wetland assessment for the entire Goedehoop Colliery mining right area. This specialist study consisted of the identification and delineation of wetland areas associated with the proposed mining operation. In addition to this, the ecological functioning and integrity (health) of the delineated wetland systems was described. Wetland areas in association with the Hope Spruit, Goedehoop Spruit, Leeuwfontein Spruit, Olifants River as well as several pans and seepage areas were identified during this soil investigation. A copy of the study is attached as Appendix 9.

5.3.11.1 Wetland Delineation

The wetland FEPAs were considered for a desktop delineation of the wetland areas within the project area. In order to ground truth these findings, the wetland areas were delineated in accordance with the DWS (2005) guidelines, whereby features such as soil, vegetation and topography were

considered. In addition to this, a soil investigation conducted by Rehab Green cc were jointly considered on a confirmatory basis for the delineation of wetland areas.

The study area affected is approximately 1 800 ha in size and was therefore divided into 19 local catchment areas containing the delineated wetland areas. See Figure 35 indicating the 19 catchment areas containing the delineated wetland areas.

5.3.11.2 Wetland Unit Identification

The wetland types associated with the study areas were initially identified at desktop level and then ground truthing was conducted to confirm these findings. The wetland types were determined according to the classification system developed by Kotze *et al*. (2007). This system focuses on the HGM determinants of wetlands and incorporates geomorphology, water movement into, through and out of the wetland and landscape and topographic setting. The size and percentage of HGM units identified for the project area are presented in Appendix 9. The HGM units associated with the proposed project area are presented in Figure 35.

Based on the hydrogeomorphic setting, the identified wetlands were classified as channelled valley bottom wetlands, seepage wetlands and depression wetlands.

5.3.11.3 General Functionality of the Wetlands

The identified wetland units were screened at a desktop level to establish whether these systems are likely to be providing any hydrological benefits. The hydrological benefits that are likely to be provided by the wetland system in the particular HGM types are summarised below:

Valley bottom wetlands with channels

- A key benefit is the enhancement to the quality of water.
- Contribute less towards flood attenuation and sediment trapping.
- Offer some nitrate and phosphate removal potential.

Valley bottom wetlands without channels

- Offer a service in the enhancement to the quality of water.
- Removes of toxicants and nitrates.
- Trapping and the retention of sediment carried by runoff waters.
- Provide flood attenuation.
- Provide valuable grazing ground during winter periods and early spring.

Hillslope seepage wetlands

- Contributes to the release of water to the stream system during low flow periods.
- Remove excess nutrients and inorganic pollutants.
- Relatively high removal potential for nitrogen in particular.
- Tend to be very important from an erosion control point of view.

Depressions (Pans)

- Limited ability to attenuate floods.
- Capture runoff during storm flow conditions.
- Unlikely to contribute to stream flow regulation.
- Temporary pans allow for the precipitation of minerals, including phosphorous.

5.3.11.4 Functionality of Wetlands within the Study Area

Wetlands are described in terms of their position in the landscape, and the classification was thus done according to the hydrogeomorphic setting. The assessment of the Ecosystem Services supplied by the identified wetland units was conducted according to the guidelines as described by Kotze et. al. 2009 (WET-EcoServices - A technique for rapidly assessing ecosystem services supplied by wetlands).

The Ecological Importance and Sensitivity was determined according to the Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2) by the Department of Water Affairs, January 2013 (now the Department of Water and Sanitation). It includes a score sheet that utilises information regarding the current state of the ecology of the wetland area and score sheets regarding the hydro-functional importance and the Direct Human Benefits taken from the WET-EcoServices determinations.

The Present Ecological State (PES) was determined using the method described by Macfarlane et. al. 2009. Level 2 Hydrological, Geomorphological and Vegetation assessments are conducted separately after which an overall wetland PES is determined (WET-Health - A technique for rapidly assessing wetland Health).

Table 24, Figure 36 and Figure 37 describe and indicate the current PES and EIS for the identified Wetlands within the Hope no. 4 seam project area.

Table 24: Current PES & EIS for wetlands identified at the Hope No. 4 Seam Project area

	Name of wetland area	Wetland units included	Current PES	Current EIS
1	Hope Spruit wetland cluster	1 channelled valley bottom wetland 5 small seepage wetlands	F (8.00)	Moderate (1.93)
2	Northern seepage wetland cluster	2 seepage wetlands	F (8.00)	Moderate (1.29)
3	Goedehoop Spruit wetland cluster, south of the R 542	1 channelled valley bottom wetland 9 small seepage wetlands	D (4.96)	Moderate (1.83)
4	Leeuwfontein Spruit, tributary 4 and 5 wetland cluster	1 channelled valley bottom wetland 1 small seepage wetlands	D (4.63)	Moderate (1.86)
5	Pan1 wetland area	1 depression wetland	C (2.49)	Moderate (1.58)
6	Pan 2 wetland area	1 depression wetland	D (4.06)	Moderate (1.53)
7	Pan 3 wetland area	1 depression wetland	D (4.0)	Moderate (1.68)
8	Pan 4 wetland cluster	1 depression wetland 1 seepage wetland	D (5.4)	Moderate (1.45)
9	Pan 5 wetland area	1 depression wetland	D (5.56)	Moderate (1.49)
10	Pan 6 wetland area	1 depression wetland	C (2.43)	Moderate (1.49)
11	Pan 7 wetland cluster	1 depression wetland 4 seepage wetlands	D (4.76)	Moderate (1.48)
12	Olifant's River tributary 1 wetland cluster	1 channelled valley bottom wetland 3 small seepage wetlands	D (5.16)	Moderate (1.76)
13	Olifant's River tributary 2 wetland	1 channelled valley bottom wetland	D (5.31)	Moderate (1.69)
14	Olifant's River tributary 3 wetland	1 channelled valley bottom wetland	D (5.5)	Moderate (1.78)
15	Leeuwfontein Spruit, tributary 1 wetland area	1 channelled valley bottom wetland	D (4.51)	Moderate (1.8)
16	Leeuwfontein Spruit, tributary 2 wetland area	1 channelled valley bottom wetland	D (4.93)	Moderate (1.77)
17	Leeuwfontein Spruit, tributary 6 wetland area	1 channelled valley bottom wetland	D (4.43)	Moderate (1.86)
18	Western seepage wetland cluster	2 seepage wetlands	E (6.81)	Moderate (1.31)
19	Goedehoop Spruit wetland cluster, north of the R 542	1 channelled valley bottom wetland 2 seepage wetlands	D (4.46)	Moderate (1.93)

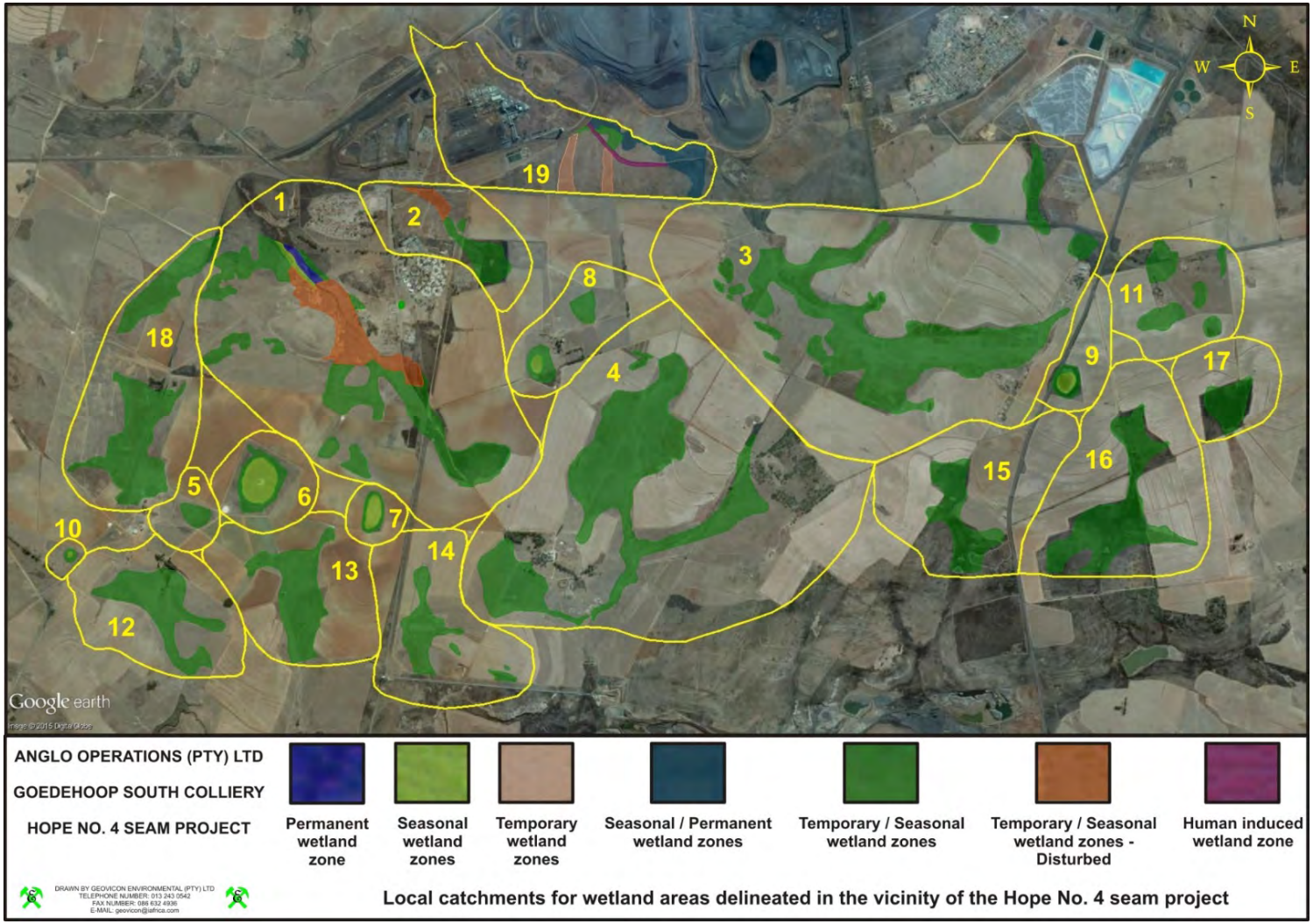

Figure 35: Map indicating the 19 catchment areas containing the delineated wetland areas within the Hope No. 4 Seam project area

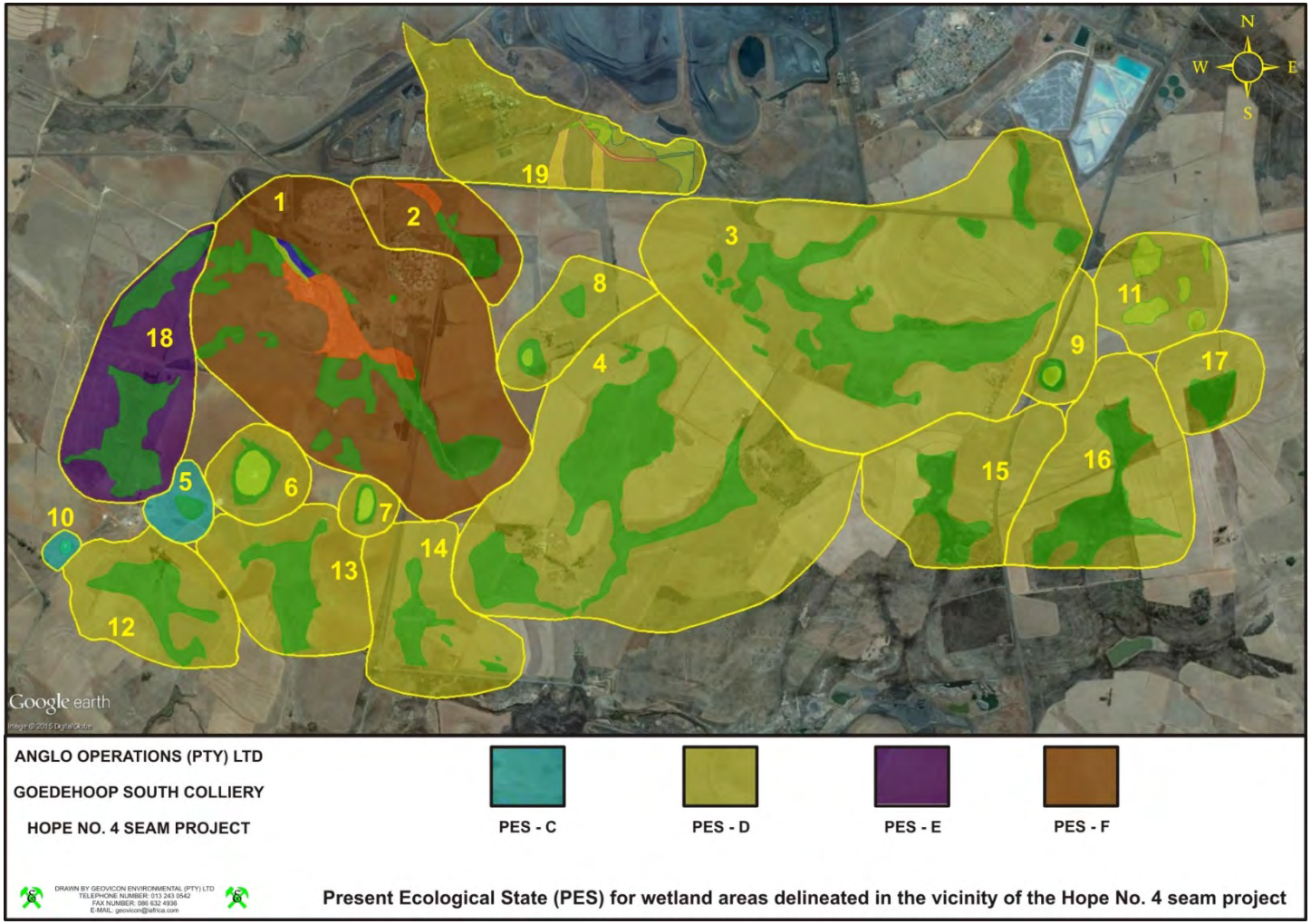

Figure 36: Map indicating the PES for the identified Wetlands within the Hope no. 4 seam project area

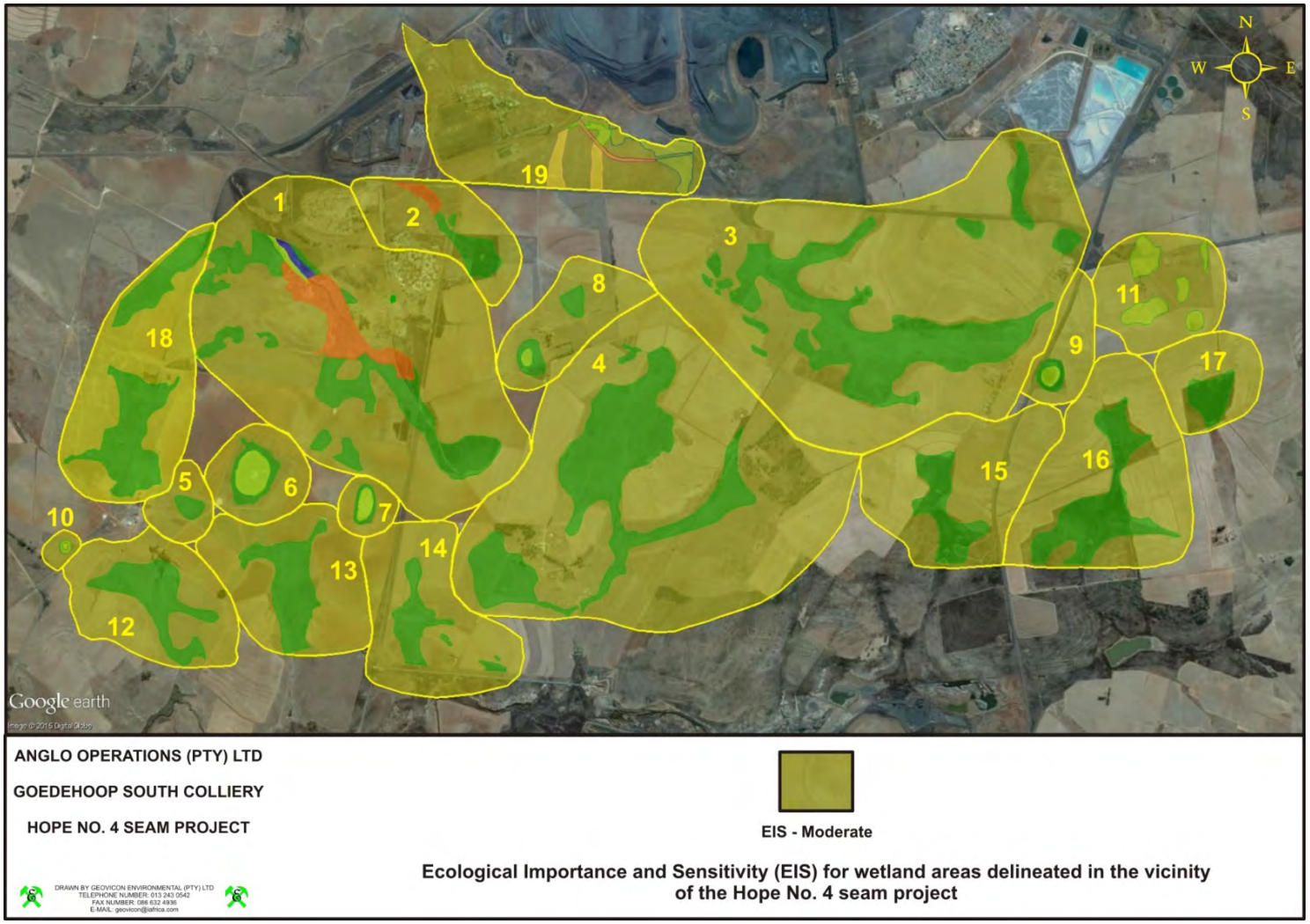

Figure 37: EIS for the identified Wetlands within the Hope no. 4 seam project area

5.3.12 Air Quality

Potentially air pollution from human activities may arise as a result of particulates entering the atmosphere. The sources of air pollution from human activities comprise of three broad categories i.e. stationary sources (agriculture, mining, quarrying, manufacturing, mineral products, industries and power generation), community sources (homes or buildings, municipal waste and sewage sludge incinerators, fireplaces, cooking facilities, laundry services and cleaning plants) and mobile sources combustion-engine vehicles and fugitive emissions from vehicle traffic). Air pollutants are generally classified into suspended particulate matter (dust, fumes, mists and smokes), gaseous pollutants (gases and vapours) and odours.

In order to describe the ambient emissions from the proposed activities at Goedehoop Colliery, which will in turn determine which activities will be emitting air pollutants, an air quality impact assessment survey was conducted. Airshed Planning Professionals (Pty) Ltd (Airshed), an independent specialist was appointed to conduct the specialist study for the proposed Hope No. 4 Seam project.

The proposed Hope No. 4 Seam project shaft is located approximately 1 km south of the coal washing plant. The main aim of the study was to assess and quantify the air quality impacts on ambient air quality and to recommend air quality management measures so as to mitigate the impacts. (See report for the Hope No. 4 Seam project attached in Appendix 10).

5.3.12.1 Description of Project Activities

The proposed Hope No. 4 Seam operation includes the construction of a box cut and shaft decline (to include an in pit crusher), a new overland conveyor (which feeds to a dedicated crushing station – thereafter it joins the existing conveying system leading to South plant), an overburden stockpile dedicated to the proposed Hope No. 4 Seam project underground waste rock, an unpaved haul road to haul overburden material to the overburden stockpiling area as well as the associated infrastructure for an underground mine entrance.

The above-mentioned infrastructure have the potential to cause particulate matter (PM) impacts hence have been included in the air quality impact assessment.

5.3.12.2 Legal Requirements

The air quality guidelines and standards are fundamental to effective air quality management, providing the link between the source of atmospheric emissions and the user of that air at the downstream receptor site. The ambient air quality guideline and standards values (National Ambient Air Quality Standards, National Dust Control Regulations and European Community Limit Values) indicate safe daily exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime. The air quality guidelines and standards are normally given for specific averaging periods.

Although there are a number of ambient air pollutants in the vicinity of the proposed operations, the pollutants of concern due to the proposed Hope No. 4 Seam project activities will consist of particulate matter and thus will be the focus of this section. Ambient air quality guidelines and standards for particulate matter and dust deposition are discussed in Airshed Planning Professionals (Pty) Ltd.

5.3.12.3 Hope No. 4 Seam Receiving/Baseline Environment

5.3.12.3.1 Air Quality Sensitive Areas

National Ambient Air Quality Standards (NAAQS), which was referenced in the evaluation of the potential ambient air quality impacts from the proposed operation, are based on human exposure to specific criteria pollutants and as such, possible sensitive receptors were identified where the public is likely to be unwittingly exposed. NAAQS are enforceable outside the mine boundary and therefore a number of sensitive receptors have been identified (see Figure 38 and Table 25). These sensitive receptors are small residential communities and individual residences and farmsteads in the vicinity of the proposed Hope No. 4 Seam project.

Table 25: Sensitive receptors included in the current and proposed Goedehoop Colliery operations.

Receptor	Description	Residential	X	Y
R	Haasfontein 28 IS – 13 - farm	Y	738732	7111300
R	Hope Village	Y	740388	7109737
R	Mahlathini Informal Settlement	Y	741158	7109222
R	Goedehoop 46 IS - 7 - farm	Y	742094	7108650
R	Blinkpan Village	Y	743234	7112386
R	Goedehoop 46 IS - 4 - farm	Y	742063	7106670
R	VOHE Offices [a]	N	740509	7108733
R	Hope No.4 Seam Building[a]	N	740865	7109212
R	Komati Village	Y	746162	7111238
R 10	Goedehoop South Main	N	740927	7110639

5.3.12.3.2 Ambient Air Quality Status Quo

5.3.12.3.2.1 Highveld Priority Area (HPA)

The Witbank/Middelburg area, which forms part of the Highveld Priority Area, is a region of major coal mining, heavy metal industries and power generation. Emissions from these activities, aggravated by unfavourable climatic dispersion, have resulted in poor air quality over the whole region. This is manifested specifically in high particle concentrations and poor visibility.

Due to the above, the Highveld Priority Area (HPA) was declared the second national air quality priority area (after the Vaal Triangle Airshed Priority Area) by the Minister of Environmental Affairs at the end of 2007 (HPA, 2011). This required that an Air Quality Management Plan for the area be developed. The plan includes the establishment of emissions reduction strategies and intervention programmes based on the findings of a baseline characterisation of the area. The implication of this is that all contributing sources in the area will be assessed to determine the emission reduction targets to be achieved over the following few years.

The DEA published the management plan for the Highveld Priority Area in September 2011. Included in this management plan are seven goals, each of which has a further list of objectives that has to be met. The seven goals for the Highveld Priority area are described in the Airshed air quality assessment report.

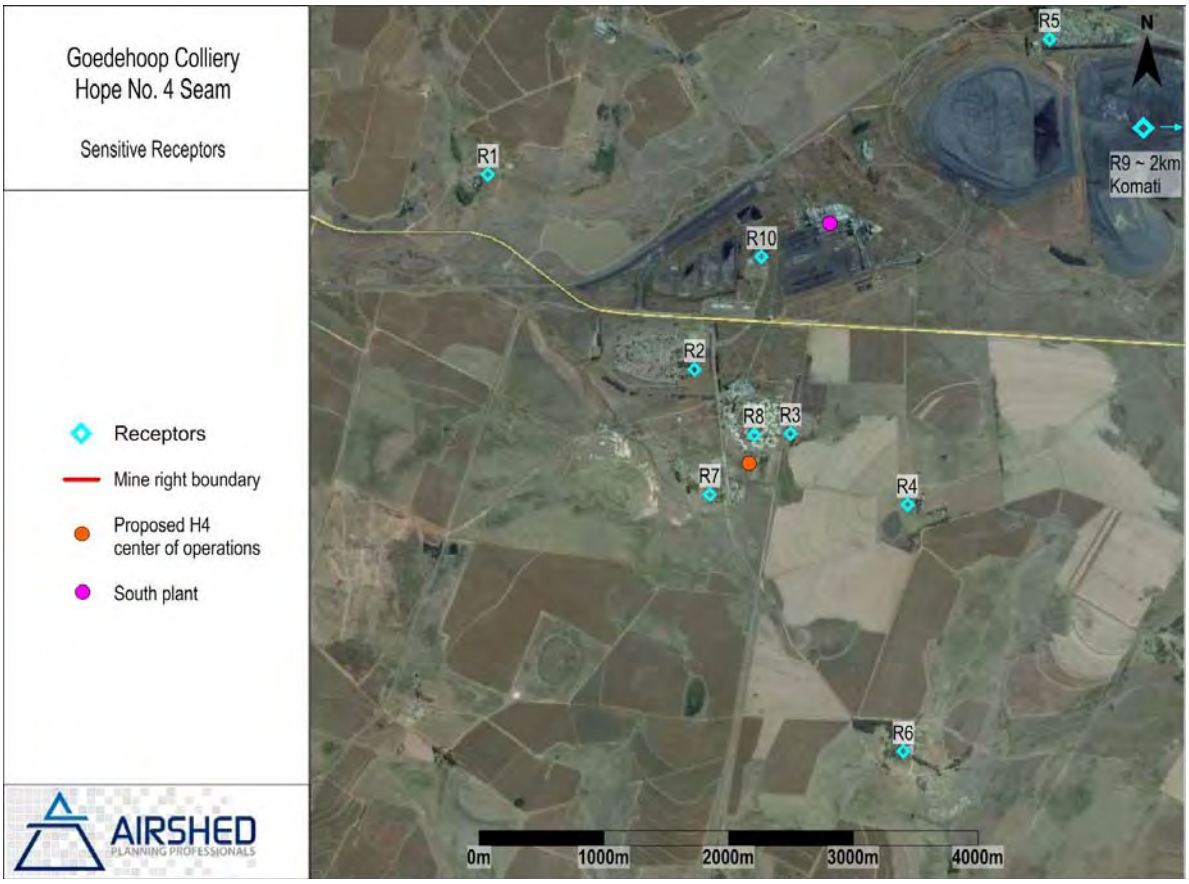

Figure 38: Air Emissions Sensitive Receptor Locations for the Hope No. 4 Seam Project

The proposed Hope No. 4 Sam project falls within the Highveld Priority Area, hence the particulate emissions from the facility are likely to contribute to the air quality of the Highveld Priority Area. The proposed project is located in the vicinity of the Emalahleni Hot Spot (HPA, 2011) and the ambient air quality, with particular reference to particulates, is outlined below.

The poor ambient air quality in the Emalahleni Hot Spot is a result of emissions from power generation, metallurgical manufacturing processes, open-cast coal mining and residential fuel burning; where industrial processes dominate the source contribution (HPA, 2011). Dispersion modelling simulated exceedances of the daily PM10 limit for more than 12 days across the Emalahleni Hot Spot (HPA. 2011). Monitored daily PM10 (Figure 39) concentrations at monitoring stations near the proposed project show regular exceedances of the daily limit, between 2012 and 2014; where more exceedances are recorded at the Komati station than at the Hendrina station. Daily PM2.5 concentrations recorded at the Hendrina monitoring station rarely exceeded the relevant standard between 2012 and 2014; however, there is a lengthy period during which no data is available.

5.3.12.3.2.2 Nuisance dust fall in the vicinity of the proposed project

Goedehoop Colliery maintains a network of dust-buckets to assess dust fall rate around the operations and in the vicinity of the proposed Hope no. 4 Seam project. Dust fall rate in the vicinity was compared with the NDCR. Results from the single dust buckets are included from Figure 40, Figure 41 and Figure 42 are discussed below.

Bethal Road is the only location to have exceeded the non-residential NDCR limit of 1200 mg/m²/day, this occurred in May 2012. The only location to have exceeded the NDCR limit for residential areas (600 mg/m²/day) is the Bethal Road bucket; this bucket is however not considered a residential location. During June and September 2014, the residential bucket "Dominee House" exceeded 600 mg/m²/day, however, the NDCR states that the limit value may not be reached more than twice per annum nor in consecutive months, thus the Dominee House bucket does not exceed the NDCR. No other dust buckets included in the network exceed the residential NDCR.

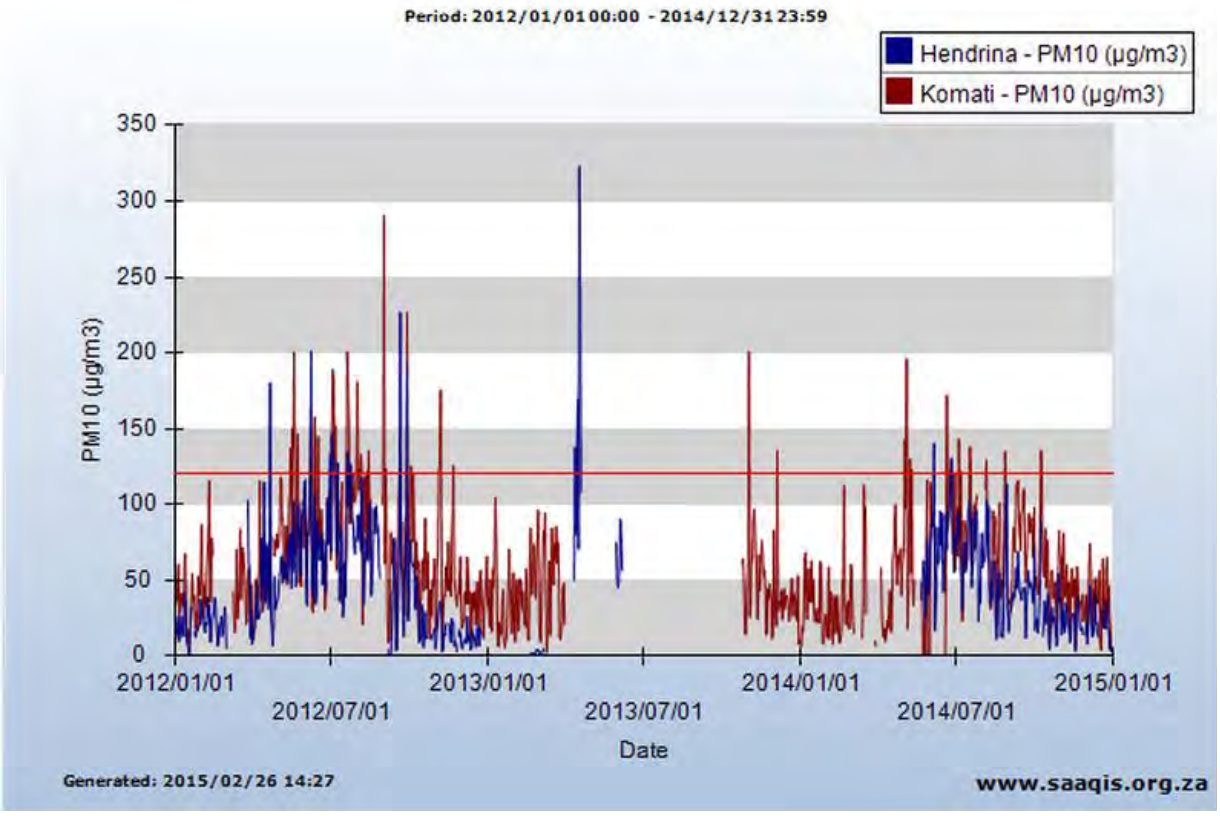

Figure 39: Daily PM10 Concentrations Monitored in the Emalahleni Hot Spot (2012 to 2014).

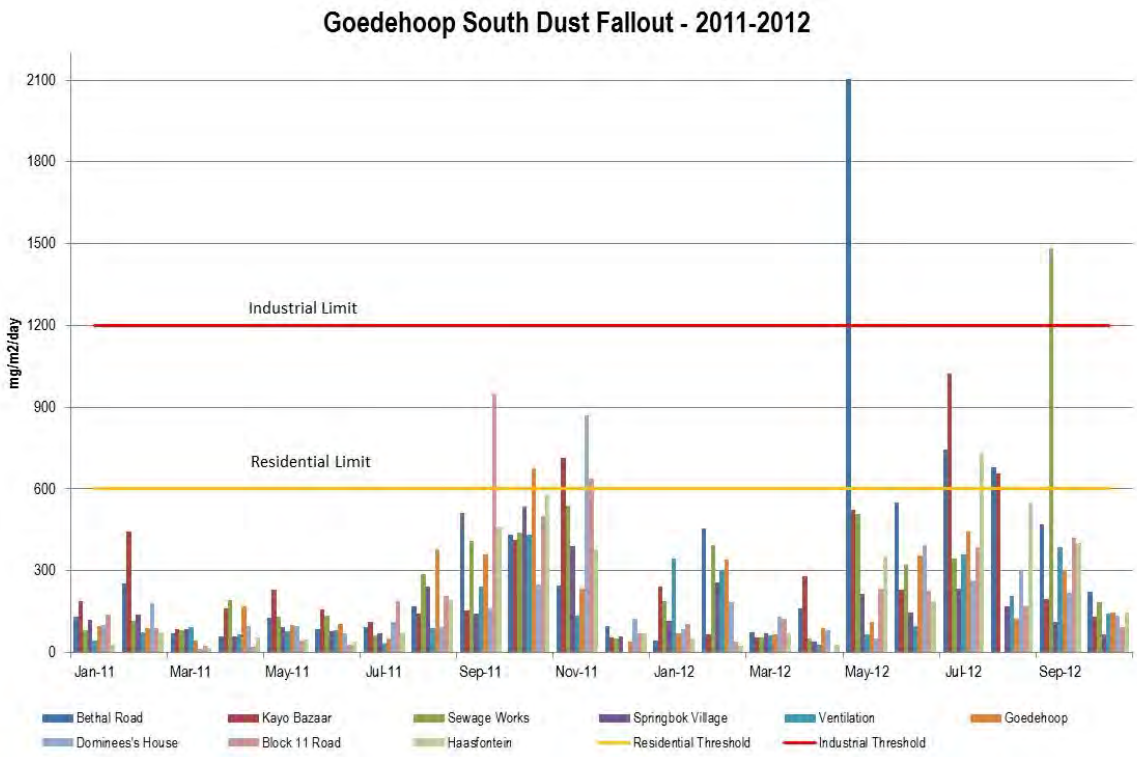

Figure 40: 2011 -2012 Single Dust Bucket Dustfall Results

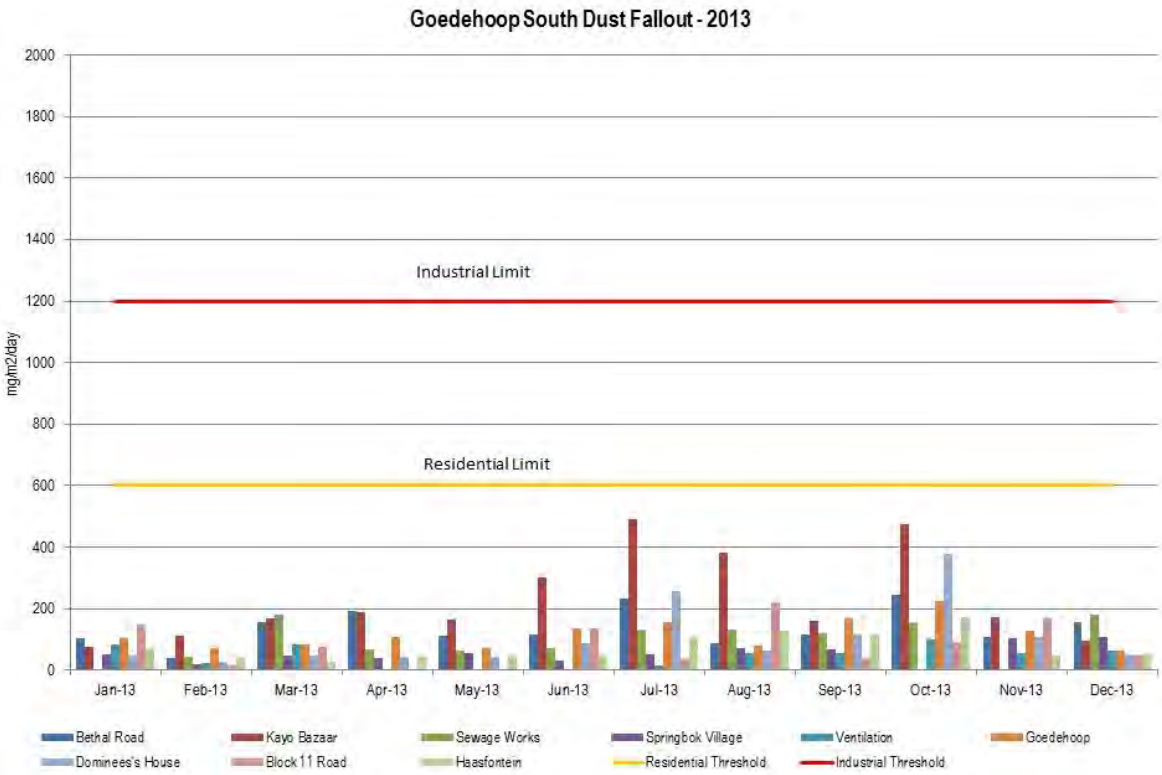

Figure 41: 2013 Single Dust Bucket Dustfall Results

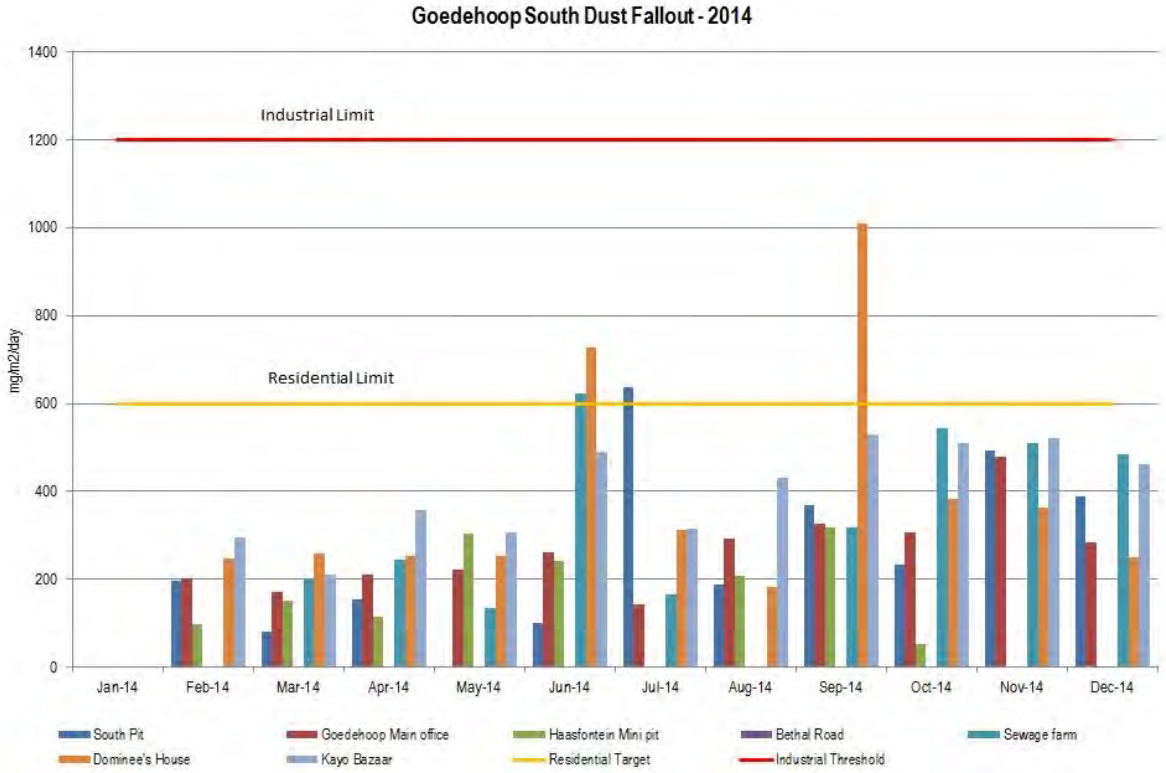

Figure 42: 2014 Single Dust Bucket Dustfall Results

5.3.12.3.2.3 Simulated Ambient Air Pollutant Concentrations

Currently, most mining at Goedehoop Colliery occur underground, with the result that these activities will not significantly impact on the overall air quality. However, the associated surface infrastructure (mineral residue deposits, plant and conveyors) may contribute to dust generation. Locally, dust generation in the area is most likely to originate from:

- Extensive opencast workings surrounding the mining right area and limited opencast workings within the mining right area,
- Agricultural practises in the mining right area (ploughing, seeding etc.)
- Goedehoop Mineral Residue Deposit Facility - Operational
- Goedehoop Old Slurry Dams –Being Reclaimed
- Dust on the Roads and overland conveyors,
- Plant run of mine and product stockpiles, *and* Shaft silos,

<u>Air Emission Inventory</u>

An emissions inventory for the current operations at Goedehoop Colliery has been updated by Airshed, which were used as the basis for assessing the impact of the coal washing plant at Goedehoop Colliery on the receiving environment. The establishment of an emissions inventory comprised the identification of sources of emissions, and the quantification of each source's

contribution to ambient air pollution concentrations, which was in addition to the above-mentioned sources.

Pollutants included in the inventory are TSP, PM_{10} and $PM_{2.5}$ and were estimated based on current operations at Goedehoop Colliery. The sources of emission were identified based on visual inspection or site visit, process descriptions, documents provided and detailed information provided by mine personnel. Gaseous emissions associated mainly with vehicle operations were not included. The source activities identified include coal crushing and screening, use of unpaved roads, material handling (handling of R.O.M and product coal, mineral residue and overburden material) and operation of shaft complexes.

5.3.13 Noise

The Witbank/Middelburg area is a region of major coal mining, heavy metallurgical industries and power generation. Even though noise attenuation occurs exponentially with distance from source the industries surrounding Goedehoop Colliery (Douglas Colliery, Koornfontein & Blinkpan Collieries and the Komati Power Station) all have the potential to contribute to the ambient noise levels of the region.

Pre-mining noise levels are not known and no background noise survey was conducted prior to mining operations started at Goedehoop Colliery. The SABS's laboratory for vibration and acoustics conducted a class 3 noise investigation for the colliery during 1993 and 1994.

In 2013 and 2015, Enviro-Acoustic Research was appointed to conduct a survey to determine the potential noise impact on the surrounding environment due to the development of the Goedehoop Colliery's Mineral Residue Deposit Expansion and Reclamation and the Binderless Coal Briquetting Plant Projects (2013) and the proposed Hope No. 4 Seam project (2015). The studies included the measuring of ambient sound levels at a number of locations. A copy of the study for the proposed Hope No. 4 Seam project is attached as Appendix 11. The report describes the potential noise impact that the mine and its associated infrastructure may have on the surrounding sound environment, highlighting the methods used, potential issues identified, findings and recommendations. Noise impact assessments were conducted as recommended by the National/International guidelines and regulations: SANS 10103:2008, SANS 10210:2004, SANS 10328, SANS 10357 and GN R154. The assessment considers a worse-case scenario, evaluating the potential noise impact during peak hours. Ambient sound levels were measured at four locations from the 8th till 13th April 2015. Potential noise-sensitive receptors (NSDs) in the area were identified using tools such as Google Earth®, supported with a site investigation as to confirm the status of the identified dwellings. Receptors in the study area were numbered from NSD01 to NSD06.

The other study can be made available upon request.

5.3.13.1 Potential Noise Sources for the Proposed Projects

Based on the study conducted in 2013, noise emitted by the Mineral Residue Deposit Expansion, the binderless Coal Briquetting Plant Project (not yet constructed) can be associated with various types of noises and noise sources. These include mechanical sources due to operation of plant equipment, material impact noises (such as the noise made when materials are dropped at a height to ground level) and electrical noise (e.g. reverse hooters from mining equipment).

Noise propagation due to road traffic depends on various acoustical factors, which include the following i.e. Road tyre interaction and other vehicle noise sources, Road vehicle type, Road traffic

volume, other including exhaust outlet, engine motor and associated engine components such as fan belt

In the study conducted in 2015, residential areas and potential noise-sensitive developments /receptors were identified using tools such as Google Earth® with the areas up to a distance of 1,000 m from closest project boundary. This was supported by a site visit to confirm the status of the identified dwellings. Five receptors in the study area were numbered from NSD01 to NSD06. Table 26 below gives the description and locations of the identified receptors.

NSD01 is representative of an informal settlement within the study area and sits close to another community namely the Hope Village (NSD02). NSD04 and NSD05 illustrate two farm dwellings within the study area namely the Harmse and Le Roux households respectively. The Le Roux household is relativity far from the study area (at over 1,600 m), however is represented in this report as it was a good measurement locality. Also included in this report are two receptors of a commercial/office nature, namely NSD05 - NSD06 of which belongs to the Goedehoop project. These facilities are only in use during daytime hours (06:00 – 22:00, SANS10103:2008 daytime criteria) and are vacant during the night.

Table 26: Locations of identified noise-sensitive receptors (Datum type: WGS84, decimal degrees)

Noise-sensitive development	Status	Location latitude	Location longitude
1	Informal Settlement	-26.117061°	29.411924°
2	Hope Village	-26.111954°	29.403633°
3	Harmse homestead	-26.122787°	29.421585°
4	Le Roux Homestead	-26.139091°	29.419492°
5	Goedehoop offices/commercial	-26.117487°	29.408004°
6	Goedehoop offices	-26.118486°	29.405884°

5.3.13.2 Noise Impact Sites outside the Mine

The Witbank/Middelburg area is a region of major coal mining, heavy metallurgical industries and power generation. Even though noise attenuation occurs exponentially with distance from source the industries surrounding Goedehoop Colliery (Douglas Colliery, Koornfontein & Blinkpan Collieries and the Komati Power Station) all have the potential to contribute to the ambient noise levels of the region.

The pre-mining noise levels were not determined prior to the commencement of mining activities at Goedehoop Colliery. However, the sources of noise and potential noise impact sites presently existing at Goedehoop Colliery were identified by the South African Bureau of Standards (SABS) laboratory for vibration and acoustics, which performed a Class 3 noise investigation in 1993. A single area in the external environment of Goedehoop Colliery was identified by the SABS study. This was the rural community at large, which includes farmhouses, and the accommodation for their labour force. Acoustical problems arising from the mining activities at Goedehoop Colliery and its location in regard

to the rural environment are not currently a problem. To date no complaints have been received from the community at large.

5.3.13.3 Current Environmental Sound Character

Ambient Sound Level Measurements

Ambient sound levels were measured at four locations from the 8th till 13th April 2015. Two class-1 Sound Level Measurements (SLM) as well as a portable weather station was used for measurements. The sound level meter would measure "average" sound levels over 10 minutes periods, save the data and start with a new 10 minute measurement till the instrument was stopped. The measurement locations were numbered from AG01 to AG04 and the positions of the locations are indicated in Table 27 and Figure 43 below.

Table 27: Locations of Measurement Locations (Datum type: WGS84, decimal degrees)

Point name	Location (latitude)	Location (longitude)
AG01	-26.122579°	29.421775°
AG02	-26.139566°	29.418956°
AG03	-26.107940°	29.404600°
AG04	-26.107478°	29.398723°

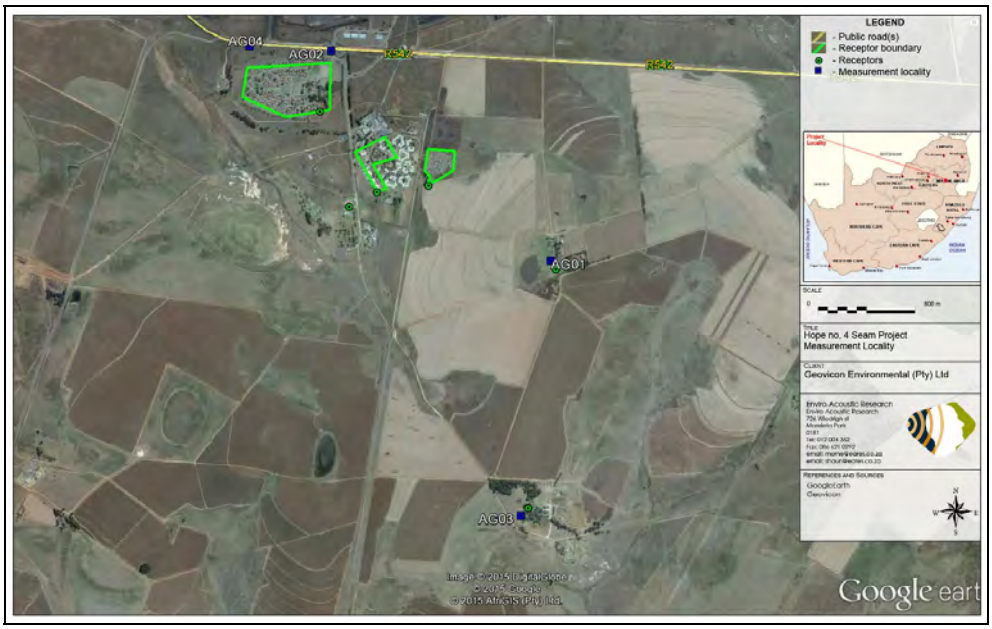

Figure 43: Localities of ambient sound level measurements

Summary Ambient Sound Levels measured

AG01 - Considering the $L_{Aeq,I}$ measured daytime data ambient sound indicated many sound levels slightly higher than a typical rural area, yet lower than urban area. Night-time data indicated Rating level ranging between typical urban, yet lower than a busy urban area.

AG02 - Considering the $L_{Aeq,I}$ measured daytime data ambient sound indicated many sound levels slightly higher than a typical suburban area, yet lower than a central business district. Night-time data indicated Rating level ranging between typical urban, yet lower than a busy urban area.

AG03 - Considering the $L_{Aeq,I}$ measured daytime data ambient sound indicated many sound levels slightly higher than a typical subruban area, yet lower than business district. Night-time data indicated Rating level ranging between typical rural, yet lower than a suburban district.

ISO/European Union and IFC: General EHS Guidelines

AG01 - $L_{Aeq,16hr}$/ $L_{Aeq,8hr}$ or similar levels measured during the day and night conformed to the recommendation of 55 and 45 dBA limits respectively set out by the World Health Organization, World Bank and International Finance Corporation for a residential areas, with the equivalent levels being less than 55 dB. However, the first day did not comply with daytime guideline values. The $L_{Aeq,6hr}$ night-time (or equivalent) measurements also conformed to the mentioned guidelines of 45 dB noise limit (for residential areas), albeit just below or above recommended guidelines.

AG02 – Some $L_{Aeq,16hr}$/ $L_{Aeq,8hr}$ or similar levels measured during the day and night conformed to the recommendation of 55 and 45 dBA limits set out by the World Health Organization and International Finance Corporation for a residential area.

AG03 – Most $L_{Aeq,16hr}$/ $L_{Aeq,8hr}$ or similar levels measured during the day and night conformed to the recommendation of 55 and 45 dBA limits set out by the World Health Organization and International Finance Corporation for a residential area.

SANS 10103:2008 typical Rating Levels for noise districts

A summary of all L_{Req} based on $L_{Aeq,I}$ measurements is presented in Table 28.

Table 28: Rating Level profile

Point name	Noise district rating based on $L_{AIeq,16/8hr}$ measurement data (day/night)	Noise district rating based on all data and character of area	Existing ambient sound levels conforming to international recommended levels? (day/night)
AG01	Rural – urban/urban – busy urban	Suburban - urban	Yes/yes
AG02	Suburban – business/ urban – busy urban	Urban/controlled area ($L_{Aeq,24hr}$).	No/no
AG03	Suburban – business/ rural - suburban	Suburban	Yes/yes

Considering the $L_{AIeq,16/8hr}$ daytime and night-time measurements two Rating Levels are proposed for the study. For singular dwellings away from significant noise sources a Suburban Rating was used. For communities and dwellings closer to the R542 Road an Urban Rating was selected. There is a high confidence in the ambient sound levels measured and the subsequent Rating Levels determined.

5.3.14 Visual Aspects

The Witbank/Middelburg area is dominated by extensive coal mining, metallurgical and power generation activities, all requiring extensive surface infrastructure to operate. The implication of this is that the "sense of place" of the region is already severely negatively impacted by these large-scale activities. Goedehoop Colliery mine infrastructure and mineral residue deposits, although visible from provincial roads, generally occur outside of any major tourist route. Sections of the mine, which are visible from different locations, are indicated in Table 29

Table 29: Sources of Potential Negative Visual Impact at Goedehoop Colliery

PORTION OF THE MINE VISIBLE	LOCATION AT WHICH PORTION VISIBLE
Springbok #1 & #2 Mineral residue deposit facilities	R544 & R545 roads, various informal settlements, Douglas Colliery Offices, Vandyksrift Village, Ratebele Village, 5 seam Hostel, Spoornet rail line and the Springbok School
Goedehoop Colliery conveyor belts	Various farms and informal settlements
Kleinshaft Dump	R544 road, various farms and informal settlements
Goedehoop Colliery Plant and R.O.M stockpiles	R545 road, Hope Village, Spoornet rail line, various farms and informal settlements
Block 11 Shaft and conveyor	R545 road, various farms and informal settlements
Hope Shaft and conveyor	R545 road, Hope Village, Hope Hostel, Hope single quarters and various farms
Goedehoop Mineral Residue Deposit System and conveyors	R545 road, Blinkpan Village, Koornfontein Mine, Spoornet rail line, various farms and informal settlements
B18 Silo and conveyor	R545 road, Spoornet rail line, various farms and informal settlements
Hope Mineral Residue Deposit Facility	R545 road, Spoornet rail line and Hope village, Hope Single quarters, Hope Hostel, various farms and informal settlements
Old Slurry Dams	R545 road, Spoornet rail line, various farms and informal settlements
Block 8 Shaft and conveyor	Various farms and informal settlements
Block 20 shaft and conveyor	Various farms

In order to determine visual impacts from the proposed Hope No. 4 Seam project, a visual impact assessment was conducted. This study evaluated the visual impact of the proposed project with a view to assessing its severity based on the specialist's experience, expert opinion and accepted techniques.

The project components that will have a negative visual impact include: silos, stockpiles and the storm water berm. This is largely due to the following:

- high visibility of the development within an open landscape;
- the high visibility of construction and operation activity within the uniform open grassland/farming areas of uniform visual pattern;
- relatively flat to undulating topography;
- the moderate visual diversity;
- a general lack of rising landforms as a backdrop to assist in visual screening;
- the scale of the structures in a rural setting; and
- high visibility of construction and operation activity within large areas of moderately diverse visual pattern and flat topography

All other infrastructure associated with the proposed project is either underground or the project will make use of existing infrastructure.

5.3.14.1 Visual Assessment

This section describes the aspects which have been considered in order to determine the intensity of the visual impact on the area. The criteria includes the area from which the project can be seen (the viewshed), the viewing distance, the capacity of the landscape to visually absorb structures and forms placed upon it (the visual absorption capacity), and the appearance of the project from important or critical viewpoints.

5.3.14.1.1 The Viewshed

The viewshed is a topographically defined area which includes all possible observation sites from which the project will be visible. The boundary of the viewshed, which connects high points in the landscape, is the boundary of possible visual impact (Alonso, et al, 1986). Local variations in topography and man-made structures would cause local obstruction of views. The viewshed, based on the GIS assessment and fieldwork, extends for the main part varies from less than 1 km to greater than 20 km in several areas.

5.3.14.1.2 Viewing Distance

The visual impact of an object in the landscape diminishes at an exponential rate as the distance between the observer and the object increases (Hull and Bishop, 1988).

Thus, the visual impact at 1000 metres would be approximately a quarter of the impact as viewed from 500 metres. Consequently, at 2000 metres, it would be one sixteenth of the impact at 500 metres. The view of the project components would appear so small from a distance of 5000 metres or more that the visual impact at this distance is insignificant. On the other hand the visual impact of the project components from a distance of 500 metres or less would be at its maximum

5.3.14.1.3 Critical Views

Views identified as being critical have been discussed under Section 4.2 of the visual impact assessment report. These have been overlaid on the viewshed to determine the extent of these within the viewing zones radiating out from the project components. In summary the critical views are:

- The main roads that fall within the viewshed namely the R 35, R 542 and the R 544
- Human Settlements such as the Komati Village and the informal settlement immediately east of the demolished village
- Farmsteads.

The area is not known for its scenic quality and as a result there are no known facilities that rely on the scenic quality of the area. The area is already surrounded by large infrastructure projects such as mining, power distribution lines and power stations and the addition of similar developments will not hugely impact on the surrounding land uses

5.3.14.1.4 The Visual Absorption Capacity

The Visual Absorption Capacity (VAC) (Table 30) is a measure of the landscape's ability to visually accept / accommodate or embrace a development. Areas which have a high visual absorption capacity are able to easily accept objects so that their visual impact is less noticeable. Conversely areas with low visual absorption capacity will suffer a higher visual impact from structures imposed on them. In this case the VAC has been defined as a function of three factors i.e. Slope, Visual pattern (landscape texture) with regard to vegetation and structures and vegetation height.

Table 30: Visual Absorption Factors and their Numerical Values

VAC Factor		Categories		
Slope	Range	0-3 %	3-6 %	> 6 %
	Numerical Value	3	2	1
	VAC	Low	Moderate	High
Vegetation Height	Range	< 1 m	1-6 m	6 m
	Numerical Value	3	2	1
	VAC	Low	Moderate	High
Visual Pattern	Description	Uniform	Moderate	Diverse
	Numerical Value	3	2	1
	VAC	Low	Moderate	High

It is therefore concluded that the VAC of the following can be regarded as **Low** due to the uniform open grassland and mealie fields. This implies that the areas with a **Low** VAC are inherently unable to visually accommodate or accept the visual change made by the proposed development.

5.3.15 Sites of Archaeological and Cultural Importance

In compliance with the National Environmental Management Act, 1998 (Act 107 of 1998), which states that a survey and evaluation of cultural resources must be conducted in areas where development projects, that will change the face of the environment, will be undertaken, a heritage study was undertaken for the new developments at Goedehoop Colliery. The impact of the developments on these resources were determined and proposals for the mitigation thereof are made. Archaetnos cc was appointed to conduct the two heritage impact assessment for the Goedehoop Colliery's proposed Hope No. 4 Seam project. The report from the assessment is attached as Appendix 12.

The aim of the study was to:

- Identify objects, sites, occurrences and structures of an archaeological or historical nature (cultural heritage sites) located on the property.
- Assess the significance of the cultural resources in terms of their archaeological, historical, scientific, social, religious, aesthetic and tourism value.
- Describe the possible impact of the proposed development on these cultural remains, according to a standard set of conventions.
- Recommend suitable mitigation measures to minimize possible negative impacts on the cultural resources by the proposed development.
- Review applicable legislative requirements.

Based on the field work conducted at the proposed development site, approximately 14 sites of cultural heritage significance were identified within Goedehoop Colliery mining right area. See Figure 44 for the location of the sites within the Goedehoop Colliery mining right area.

Four of the above-mentioned sites (site 5, 6, 7, and 13) are situated within the proposed Hope No. 4 Seam project area. Two of the sites will not be impacted directly by the proposed project and the other two will be directly impacted on by the proposed Hope No. 4 seam project. Therefore mitigation measures should be implemented. The four identified sites of cultural heritage importance in relation to Hope No. 4 seam project area is depicted in Figure 45. Note that only site no. 7 and 13 will be impacted on directly by the proposed Hope No. 4 seam project.

5.3.15.1 Site 5

This site is situated on portion 3 of the farm Goedehoop 46 IS, approximately 1.3 kilometers south of the R 542 tar road and approximately 280 meters west of the R 35 tar road. The site consists of at least 5 graves. All the graves have cement borders and headstones.

Only one surname could be identified, being Masango. Graves are divided into three categories, being unknown, heritage (older than 60 years) and younger than 60 years. No date of death could be identified. Therefore all graves are unknown and should be handled similar to heritage graves (older than 60 years) until more information become available. Graves are always regarded as having a high cultural significance. The field rating is Local Grade IIIB. It may be mitigated, and should be included in the heritage register.

5.3.15.2 Site 6

This site is situated on portion 4 of the farm Goedehoop 46 IS, at the house of Mr. Pieter Honeyborne, approximately 1.6 kilometers north of confluence of the Olifants River and the Leeuwfontein Spruit. The site consists of at least 7 graves neatly fenced in by stone walling. All the graves have granite borders and headstones.

Two surnames could be identified, being Honeyborne and Van Niekerk. Graves are divided into three categories, being unknown, heritage (older than 60 years) and younger than 60 years. The oldest date of death identified is 1917 and the youngest 2012. All dates were identified and four of the graves are heritage graves (older than 60 years) and three younger than 60 years. Graves are always regarded as having a high cultural significance. The field rating is Local Grade IIIB. It may be mitigated, and should be included in the heritage register.

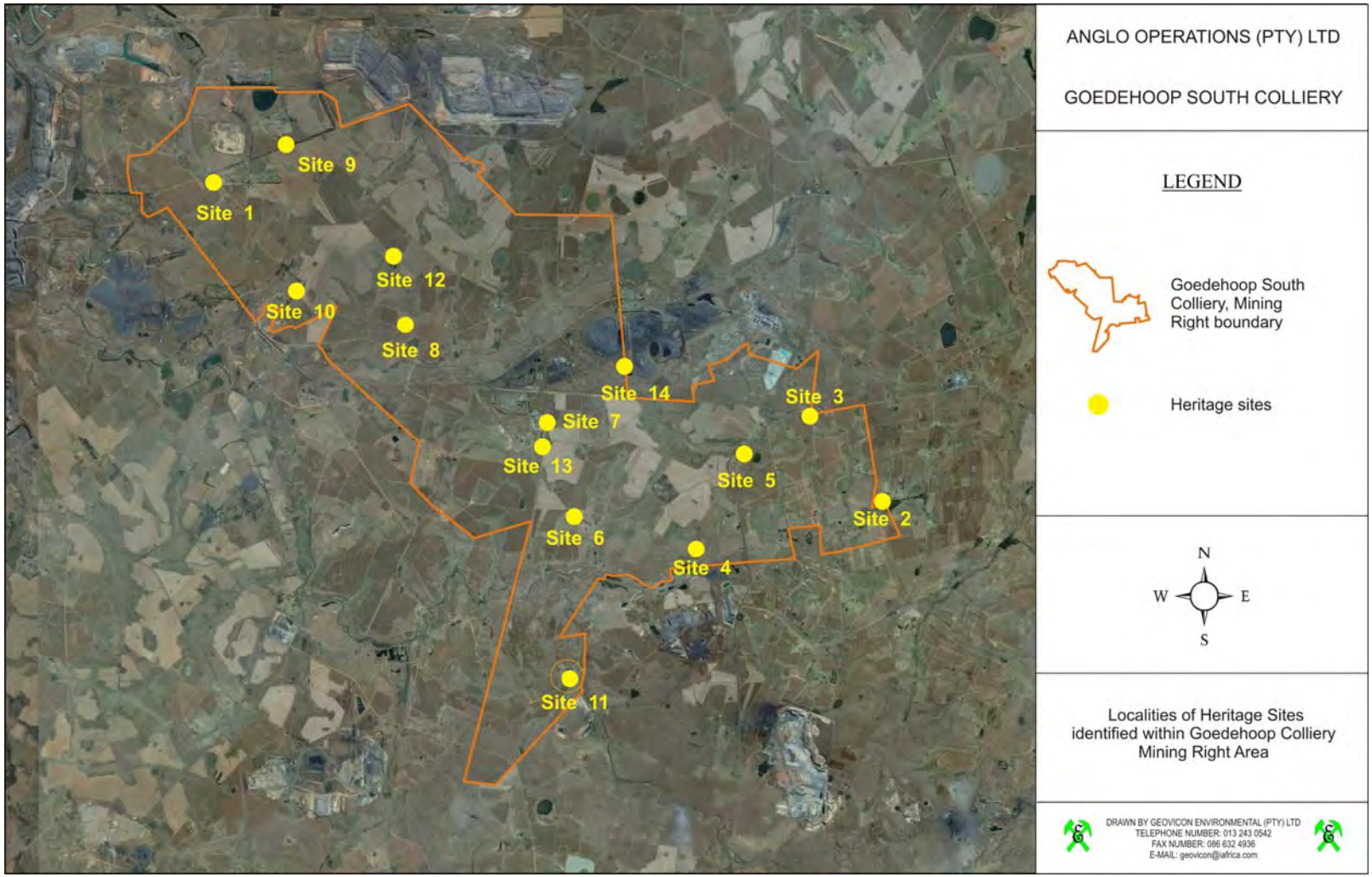

Figure 44: Localities of Heritage Sites identified within Goedehoop Colliery Mining Right Area

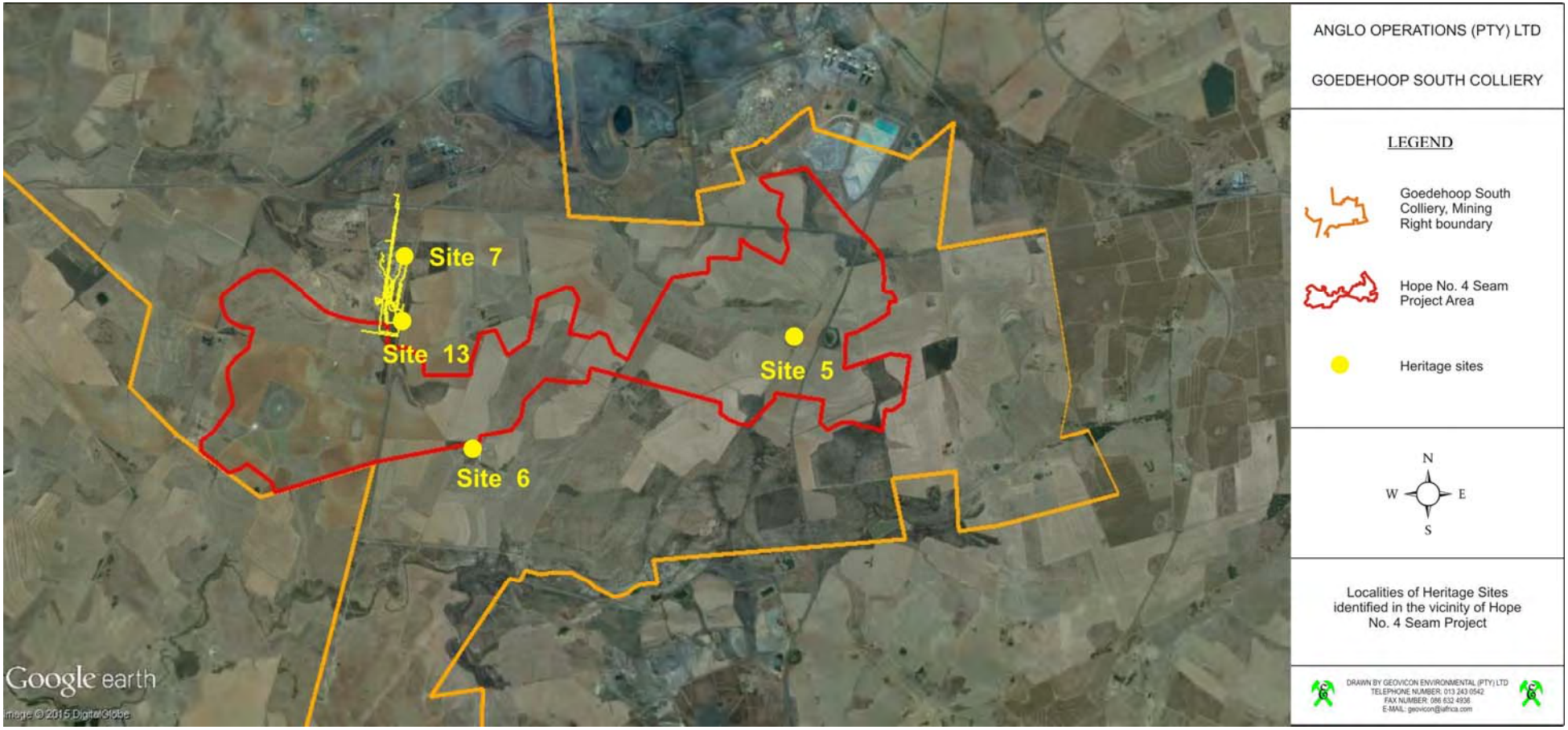

Figure 45: Localities of Heritage Sites identified in the vicinity of Hope No. 4 Seam Project

5.3.15.3 Site 7

This site is situated on portion 9 of the farm Goedehoop 46 IS, approximately 800 meters south of the R 542 tar road on the eastern side of the demolished Newtown Village of Goedehoop Colliery. This is a building that formed part of the demolished New Town Village. It is in reasonably good condition and may be older than 60 years of age. The mine however indicated that the building was built during the 1980's, but could not give no documentary evidence thereof.

The building has a low heritage significance especially since it may be younger than 60 years of age. The field given for the site is General protection C (IV C). It means that this report is seen as ample documentation and mitigation of the site, and that the building may be demolished if necessary.

5.3.15.4 Site 13

This site is situated on portion 9 of the farm Goedehoop 46 IS, approximately 1.5 kilometers south of the R 542 tar road, 600 meters south-east of the mine's environmental office and approximately 140 meters south of the proposed Hope No. 4 Seam Project's overburden stockpile. This site is within Anglo Operations (Pty) Limited's surface right area.

There seem to be approximately six graves with a possibility for more graves to exist. One of them have a brick border and cement headstone. The others are stone packed, without headstones. No surname or date of death was legible. Graves are divided into three categories, being unknown, heritage (older than 60 years) and younger than 60 years. No date of death could be identified. Therefore all graves are unknown and should be handled similar to heritage graves (older than 60 years) until more information become available.

Graves are always regarded as having a high cultural significance. The field rating is Local Grade IIIB. It may be mitigated, and should be included in the heritage register.

5.3.16 Socio-Economic Status

Chemc Environmental was appointed by Geovicon Environmental to compile a Social Impact Assessment. See Appendix 13 for the detailed report.

5.3.16.1 General Description of the Study Area

The broader region surrounding the study area is a coal mining area that accommodates a number of power stations and large industries such as Columbus Steel and Eskom. Once a major farming hub, land has since been rapidly bought by mining companies for industrial purposes. Environmental and economic impacts and various criminal activities and land invasions have over the last number of years discouraged several land owners to farm at a scale that was previously done. Main agricultural activities include dry land crops (mealies, soya) and livestock farming.

5.3.16.2 Municipal background

Goedehoop South Colliery is situated in the Nkangala Municipality District, which comprises of six local Municipalities. It is situated in the two local municipalities (Steve Tshwete Municipality and Emalahleni Municipality) in Mpumalanga. The Hope No. 4 Seam is located within the Steve Tshwete Local Municipality (STLM) in the Nkangala District Municipality (NDM) of Mpumalanga Province. In

1994, Middelburg and Mhluzi, as well as Hendrina and Kwazamokuhle, amalgamated to form the Transitional Local Councils. In 2001, the Transitional Local Councils of Middelburg and Hendrina, as well as some smaller towns, were amalgamated. A new municipality was formed, namely Steve Tshwete Local Municipality (www.localgovernment.co.za).

The Nkangala District Municipality comprises an area of approximately 16 758 km² which includes the following municipalities (Figure 46):

- eMalahleni Local Municipality
- Steve Tshwete Local Municipality
- Victor Khanye Local Municipality
- Emakhazeni Local Municipality
- Thembisile Hani Local Municipality
- Dr JS Moroka Local Municipality

Steve Tshwete Local Municipality covers a geographical area of approximately 3 976 km^2. The towns and settlements within Steve Tshwete include Middelburg, Mhluzi, Hendrina, Kwazamokuhle, Rietkuil, Pullenshope, Komati, Presidentsrus, Naledi, Lesedi, Kranspoort, Blinkpan, Koornfontein, Kwa-Makalane and Doornkop.

The Municipality is well located in terms of the Maputo Development Corridor, the Middelburg / Steelpoort mining resource link, as well as the Middelburg / Bethal / Ermelo / Richards Bay Corridor.

Figure 46: Nkangala District Municipality

5.3.16.3 Population statistics

Demographics of the Steve Tshwete Municipality are reflected in Table 31 below:

Table 31: Population statistics

Demographics	Steve Tshwete LM (Census 2011; www.localgovernment.co.za)
Population	229 831
Households	64 971
Average household size	3,3
Age structure	
Population under 15	25 %
15 to 64	70,7 %
Over 65	4,3 %
Male : female ratio	52 : 48
Population growth per annum	4,76 %
Female headed households	29,4 %
Dependency ratio per 100 (15-64)	41,5

Population growth

Steve Tshwete LM is increasingly under pressure due to population growth. In 2011, the total population in Steve Tshwete was approximately 142 772. Population grew by 0.53% between 1996 and 2001. Over the ten year period from 2001 to 2011, STLM's population increased by 4.76%. This could be attributed to the number of industries that were opened within the 10 years (2001-2011) that attracted workers into Middelburg (Steve Tshwete LM 2012-2017 IDP).

This is a substantial population growth which inevitably puts severe additional strain on the available municipal services and job creation.

Steve Tshwete LM exhibits the second highest urbanisation rate in the NDM at 72.1%. This high urbanisation rate is coupled with the depopulation of rural areas (Steve Tshwete LM 2012-2017 IDP).

The population density in the local area where Goedehoop Colliery is located is limited to residents of the mine villages, farmers and their workers and the owners of the two trading store complexes (Goedehoop Colliery Aligned EIA EMP, 2014).

Gender

The male dominated population in STLM is due to an economy that attracts migrants as a result of lucrative employment opportunities in manufacturing, industrial and mining opportunities. People from across the country and other African countries are attracted. According to the Census 2011 migration data, STLM attract people, particularly from Limpopo (8%), Gauteng (7%), Kwa-Zulu Natal (4%) and regionally (4%) (Steve Tshwete LM 2012-2017 IDP).

Age

As a result of migration to the area (jobseekers), a significant portion of the population growth is between 20 and 34 years of age. The most populous age group in 2011 were between ages 20 to 29 years of age. The gradual decrease of the population over the age of 29 is a major concern to the Steve Tshwete LM. This could be due to the causes of death identified by the 2011 census with

influenza and pneumonia, accidental injury and tuberculosis being the top three (Steve Tshwete LM 2012-2017 IDP).

An increase in the young and the economically active population of a Municipality would mean the potential increase in income earnings, however the growth would place pressure on job opportunities as there is the possibility for smaller and slower growing economies to provide work to the increasing population.

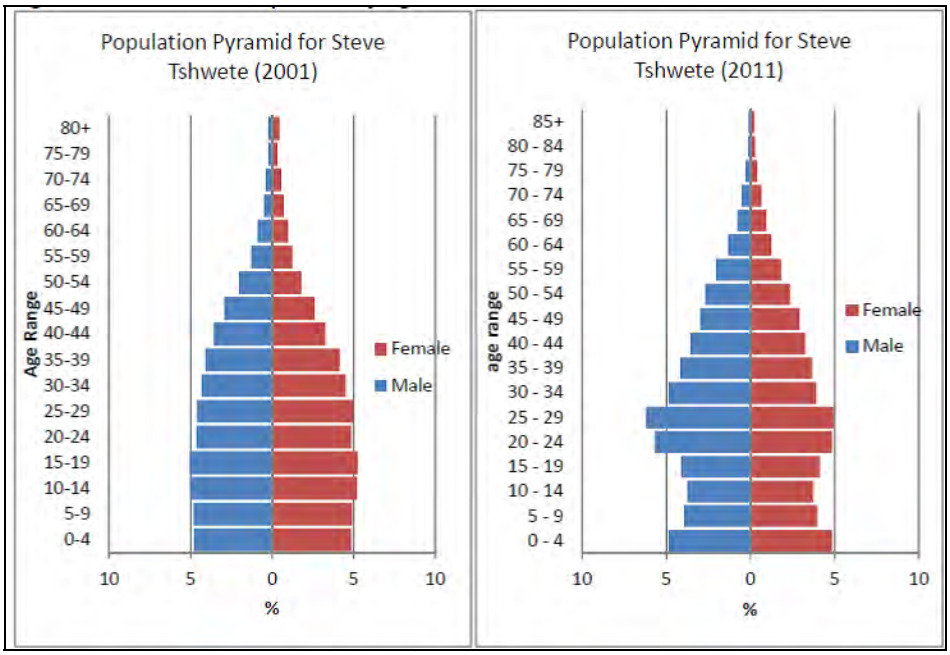

Figure 47: Distribution of population by Age and Sex in 2001 and 2011 (Steve Tshwete LM 2012-2017 IDP)

<u>Race and language</u>

The majority of people in STLM are Black African, followed by the White population as indicated in **Figure 48** (Census 2011). The most popular languages spoken are Afrikaans and English followed by IsiNdebele, IsiXhosa, IsiZulu and various other languages. The conclusion can be drawn that employment at the mines has over the years lead to in an influx of people from other provinces, resulting in pluralistic cultures and groups.

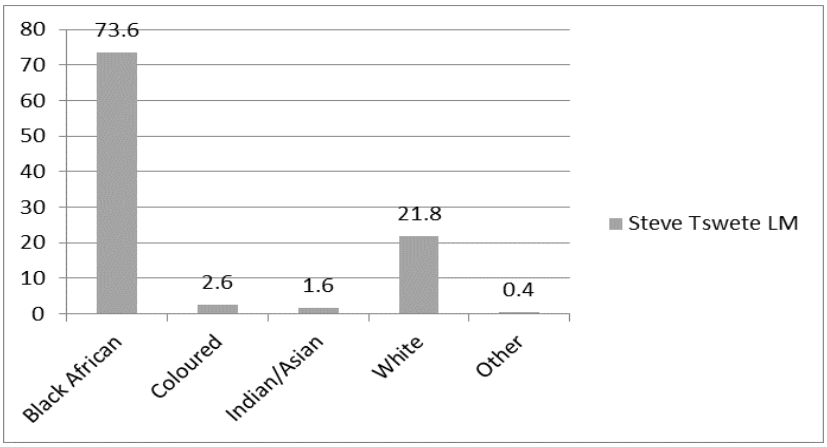

Figure 48: Race structure (%)

5.3.16.4 Education

The education levels of a population are an important indicator of the population's employability. For the purposes of this report, persons with no schooling are defined as people who never received any form of formal education. This implies illiteracy in most cases and would limit the person to perform manual labour.

Over the last 15 years the rates of no-schooling have been halved across the country. The percentage of persons 20 years and older who have no schooling decreased from 19,1% in 1996 to 8,7% in 2011 and the Mpumalanga Provinces went from around 29% to 14% (www.world-data-atlas.com).

Twenty-nine percent (29%) of the SA population above twenty years of age completed the 12th grade, compared to only 16% in 1996. The Black-African population group in particular attributed to this increase, going from 12% to 27%. The percentage of White students reaching matriculation remained stable around 40% (www.world-data-atlas.com).

Boys outnumber girls in Black-African (28% vs 26%) and Indian/Asian (43% vs 38%) population groups in terms of Grade 12 completion. In the White population groups more girls (42%) complete the 12th Grade than boys (40%) (Census 2011; www.world-data-atlas.com).

There are slight discrepancies amongst the various sources consulted with regards to education statistics, especially the number of people that did not receive any education and which are functionally illiterate. For purposes of this report the IDP figures were used as Census 2011 formed the baseline of the data.

Table 32: Highest education attainment (Steve Tshwete IDP)

INDICATOR	1996	2001	2011
No schooling	17.1	17.8	7.5
Matric only	20.0	24.4	37.4
Matric +	11.0	8.7	13.8

The majority of the population of the municipality have some form of education with only 7.46% of the population having no schooling. According to the Census 2011, the percentage of people with matric and higher education in STLM for the period between 2001 and 2011 increased by more than 5% in 2011. Only 37, 37% had obtained their matric.

5.3.16.5 Employment status

Employment status refers to whether a person is employed, unemployed or not economically active. The unemployment rate thus gives the number of unemployed as a percentage of the labour force. The labour force in its turn is the part of the 15-64 year population that's ready to work and excludes persons not economically active (scholars, housewives, pensioners, disabled) and discouraged work-seekers.

During the first quarter of 2013 the national unemployment rate was 25.5% (www.world-data-atlas.com). In Steve Tshwete LM 107 069 people are economically active (employed or unemployed but looking for work), and of these 19, 7% are unemployed. Of the 53 630 economically active youth (15 – 34 years) in the area, 27, 1% are unemployed (Census 2011).

5.3.16.6 Economic profile of the region

The Nkangala district's economy is dominated by electricity, manufacturing and mining. These sectors are followed by community services, trade, finance, transport, agriculture and construction. The relatively large economies of Steve Tshwete (Middelburg) and Emalahleni (Witbank) sustain the economy of the Nkangala District to a large extent and are based on the steel industry with high reliance on the manufacturing sector (www.mpumalanga.gov.za).

STLM is the host to a number of large industries as well as government departments and it is therefore expected that a significant amount is contributed to economic growth and employment opportunities, especially in the agriculture, mining, manufacturing, trade and community and government service sectors. Some of the most notable industries in the local economy are Columbus Steel and Eskom Power stations.

Local Economic Development key focus areas

The following are identified strategic interventions to facilitate local economic development in the Steve Tshwete Local Municipality:

Table 33: Strategic interventions to facilitate local economic development in the STLM (STLM: LED Plan 2006)

Pillar	Strategic intervention	Development programmes and projects
1.	Good governance and capacitation	• Economic Infrastructure maintenance • Inter-governmental communication and capacitation • Regulatory reform • Institutional framework
2.	Human resource and community development	• Tertiary institutions • Internal business skills • HIV/AIDS care-giver training • Extended community public works programme
3.	Industrial and big business development	• Business retention and expansion
4.	SMME development and support	• Establishing services • Expansion of existing SMMEs • Linkages with large businesses • Small Change house project
5.	Agricultural development	• Emerging farmer support • Commercial farming • Agro-processing
6.	Tourism development	• Product development • Development of 'key icons'

Anglo Operations (Pty) Ltd has, through their SLP, linked with identified IDP and LED projects.

5.3.16.7 Settlements and housing

A number of settlements have been established which are associated with the mines and power stations. Eskom has developed Rietkuil, Pullenshope and Komati and mining villages namely Blinkpan / Koornfontein, Goedehoop, Naledi and Lesedi were developed to accommodate mine employees. Kanhym, as farming company, developed Thokoza and Eikeboom villages. Social services and amenities are usually better developed in the abovementioned settlements (Steve Tshwete Local Municipality 2012-2017 IDP).

Employees at Goedehoop South Colliery are housed in the following areas i.e. Single Quarters, Hope Village, Springbok Village and Witbank (mine owned housing that are leased and employee owned housing) (Goedehoop Colliery Aligned EIA EMP, 2014).

Informal settlements are located within and around Goedehoop Colliery mining right area. Mahlatini, located approximately 1 km from Hope Village (Portion 7 of Goedehoop 46-IS and small section located on Portion 9 of Goedehoop 46-IS) has been in existence for more than a decade and has grown considerably since 2005.[1] This informal township is not recognised by the Local Authority. A number of smaller settlements, such as KwaMabone[2] (located on Portion 4 of Kleinfontein 49-IS) and individual informal houses and small settlements are scattered on the affected farm portions in the study area.

Anglo Operations promotes home ownership with the long-term goal of meeting the Mining Charter's requirement that all employees live in sustainable human settlements. The mine wishes to move away from housing provision entirely and want to ensure that employees are accommodated in their own formal accommodation located within the metropolitan frameworks of the regions where new and existing operations are based. As such a Housing and Community Allowance is paid to employees.

The table below provides a summary of the accommodation provided for Goedehoop employees, and the number of those who receive a housing allowance:

Table 34: Types of accommodation per employee type: Goedehoop (December 2012) (Goedehoop Colliery SLP, Annual Progress Report, 2013)

Employee type	Houses	Single quarters	Private leased	Total in housing	Total on housing allowance	Labour strength
Officials	53		13	66	301	367
Senior Skilled	78		7	85	317	402
Skilled	329	67	0	396	413	809
TOTAL	**460**	**67**	**20**	**547**	**1,031**	**1,578**

Key challenges with regards to housing provision in the STLM area are (Goedehoop Colliery SLP, Annual Progress Report, 2013):

Lack of affordable housing which encourages employees to remain in mine-provided accommodation in unsustainable areas.

Bulk infrastructure costs and constraints which have delayed the delivery of serviced stands for residential developments in sustainable areas and which have added to the cost of housing and selling prices.

Chronic housing backlogs. These have resulted in long waiting lists and extended delivery lead times.

Limited municipal resources, particularly funding and capacity, to provide infrastructure and services for residential developments.

In addition to this, the allocation of new occupants for mine owned houses do not always happen expediently and as far as could be established, houses that belong to Goedehoop Mine can only be sold to mine employees. The result is that houses are often unoccupied for long periods in time, not maintained, vandalised or occupied by criminals.[3]

[1] Clr. Nyambi. Ward 4. 18 May 2015.

[2] Clr. Nyambi. Ward 4. 5 May 2015.

[3] Clr. Nyambi. 5 May 2015.

A trend that exists is that a portion of the housing allowances are frequently used to supplement incomes and not used for accommodation purposes.

Community facilities

Recreational facilities

A number of recreational facilities also from part of the mine infrastructure. The mine has two recreation clubs, two swimming pools, a bowling green, squash courts, tennis courts, badminton courts, wrestling, volley ball pit, angling and road running teams, a cricket pitch, a gym and a number of soccer and rugby fields available to employees and their families (Goedehoop Colliery Aligned EIA EMP, 2014).

Health facilities

In the urban centres there are two public hospitals, i.e. Middelburg General Hospital and Impungwe Hospital (Emalahleni) and a number of clinics. Anglo Operations Highveld Hospital in Witbank is available for employees and their dependents.

In and around the study area public health care facilities are deemed to be insufficient. One mobile clinic makes its rounds twice per month and there is no public clinic. Koornfontein and Goedehoop Collieries each have a clinic treating mine employees for minor injuries. A mine ambulance transports injured employees to the mine clinic, from where the provincial hospital provide the ambulance service to Hendrina and Middelburg.

Educational facilities

Primary schools are located in and around the study area. Learners are transported with public transport such as busses to the Primary and Secondary Schools located in Hendrina, Kriel, Middelburg and Witbank.

The following school infrastructure is available to the mine employees:

Pre-primary - Middelburg, Witbank and Goedehoop Colliery

Primary - Springbok/Imbabala Primary Schools, Middelburg and Witbank

Secondary - Middelburg and Witbank

5.3.16.8 Health & HIV / AIDS

According to the 2012 Antenatal Care Survey, Steve Tshwete has the highest HIV/AIDS prevalence in the Mpumalanga province (52.3%) (Steve Tshwete LM IDP, 2015/16). HIV/AIDS has a devastating effect on the social and economic development of the local population

Anglo Operations' Anti-retroviral (ART) programme is responsible for keeping an estimated 274 employees alive. Out of this figure, 173 of the lives saved are current employees who would likely have died or been incapacitated were it not for the programme. The SLP sates that a considerable number of employees have long-term relationships with multiple partners and do not consistently use condoms. The risk of contracting HIV is also significant when women aim to start or extend their families. As part of the HIV/AIDS prevention and awareness programme, some 92% of Goedehoop Colliery employees underwent VCT in 2012 and the mine has 25 work place peer educators and 15 community peer educators (Goedehoop Colliery SLP, Annual progress Report, 2013).

5.3.16.9 Crime

Blinkpan Police Station, located approximately 8 km east of the mine, services a large area that includes the Goedehoop Colliery. However, it is understaffed with an insufficient number of vehicles. The area experiences high incidences of assault, robbery and burglaries, stock-theft and drug-related crimes.

Table 35: Crime research and statistics – SAP – Blinkpan (MP) for April 2011 to March 2014 (www.saps.gov.za)

CRIME CATEGORY	April 2011 to March 2012	April 2012 to March 2013	April 2013 to March 2014
CONTACT CRIMES (CRIMES AGAINST THE PERSON)			
Murder	5	3	5
Total Sexual Crimes	16	9	16
Attempted murder	1	1	4
Assault with the intent to inflict grievous bodily harm	41	34	30
Common assault	81	42	50
Common robbery	11	11	8
Robbery with aggravating circumstances	12	21	21
CONTACT-RELATED CRIMES			
Arson	1	0	3
Malicious injury to property	46	68	28
PROPERTY-RELATED CRIMES			
Burglary at non-residential premises	19	23	39
Burglary at residential premises	37	42	29
Theft of motor vehicle and motorcycle	23	25	16
Theft out of or from motor vehicle	16	16	12
Stock-theft	10	8	3
CRIME DETECTED AS A RESULT OF POLICE ACTION			
Unlawful possession of firearms and ammunition	1	6	0
Drug-related crime	32	39	21
Driving under the influence of alcohol or drugs	10	25	8
OTHER SERIOUS CRIMES			
All theft not mentioned elsewhere	509	455	530
Commercial crime	5	6	1
Shoplifting	2	9	3
SUBCATEGORIES OF AGGRAVATED ROBBERY			
Carjacking	1	3	2
Truck hijacking	1	0	0
Robbery at residential premises	1	3	4
Robbery at non-residential premises	4	8	10
OTHER CRIME CATEGORIES			
Culpable homicide	12	14	13
Public violence	0	0	0
Crimen injuria	4	2	2
Neglect and ill-treatment of children	2	0	1
Kidnapping	0	0	0

6 ENVIRONMENTAL IMPACT ASSESSMENT

6.1 ENVIRONMENTAL IMPACT ASSESSMENT FOR THE INITIAL SITE LAYOUT

6.1.1 Impacts (Negative and Positive) and Mitigation Measures for the Initial Site Layout

This section will only highlight anticipated impacts from the initial site layout for the proposed Hope No. 4 Seam project. This impact assessment is informed by the typical known impacts from the area and for the type of activities that will be undertaken. Note that this is only an impact assessment for the initial layout and is hence not a detailed assessment. The detailed impact assessment for the preferred site layout is described in section 6.4 of this report.

The site layout alternatives for the proposed project involved the determination of the best possible surface infrastructure layout and designs, which included site layout in terms of mining areas and surface infrastructure areas. The initial site layout for the above are described in detail in this report.
The following environmental impacts that are likely to be caused by mining and associated surface infrastructure for the initial site were identified.

6.1.1.1 Geology

Excavation of the initial boxcut for the access adit will result in the disruption of the geological profile. Note that removal of geological profile is a core function of mining, hence no detrimental impacts on geology were predicted.

6.1.1.2 Topography

The construction, operation and decommissioning of the proposed mining and associated surface infrastructure (shaft, shaft box cut, emergency coal stockpile, overburden stockpile, topsoil berms/stockpiles, pollution control dam and associated surface infrastructure) will form topographical highpoints and topographical voids, which will have an impact on the topography of the proposed mining area. This impact, which is most probable will be limited to the site and will last for the life of the project (19 years). In view of the above, the impacts on topography is deemed medium and will be low with mitigation.
Mitigation measures may include designing the infrastructure to blend well with the surrounding area, ensuring that the development covers the smallest area possible.

6.1.1.3 Soils, Land Use and Capability

The construction, operation and decommissioning of the proposed mining and associated surface infrastructure (shaft, shaft box cut, emergency coal stockpile, overburden stockpile, topsoil berms/stockpiles, pollution control dam and associated surface infrastructure) will result in the

stripping (removal) and stockpiling of the soils. The initial site layout was located within areas identified as a wetland, hence wetland soils will be removed.
This will also result in the loss of an area with sensitive landscape (wetland). Since the area in question is within a mining area, impact on current land use on the immediate area is deemed to be low.
This impact, which is most probable will be limited to the site and will exist beyond the life of the project (19 years). However due to the removal of wetlands soils, the impacts on soils is deemed high and will be remain high despite mitigation.
Mitigation for the predicted impacts will involve the use of the stripped soil for the rehabilitation of the disturbed area.

6.1.1.4 Natural vegetation and Animal life

The activities associated with the initial site layout will occur on areas with limited natural vegetation due to the disturbance already caused by the current land uses (agriculture and mining). However the shaft complex and backfilling operations for the initial site layout were sited within an area that may possess natural vegetation and some animal life due to the presence of the wetland ecosystems, hence impacts on vegetation and animal life within the wetland areas would be high.
This impact, which is most probable will be limited to the site and will last beyond the life of the project (19 years). However due to the destruction of the wetlands, the impacts on natural vegetation and animal life is deemed high and will be remain high despite mitigation.
Mitigation for the predicted impacts will involve the revegetation of the affected areas, including the wetland areas which will need special attention. It cannot be certain whether wetland rehabilitation will yield satisfactory results.

6.1.1.5 Surface water

The activities undertaken during the construction, operational and decommissioning phases of the proposed project will result in the formation of voids, which will decrease surface runoff within the affected catchments. Exposure of soils may lead to increased silt loads in surface water runoff. Rainfall captured within the adit and water removed from the adit and underground workings would be contaminated due to being exposed to carbonaceous material, resulting in elevation of some chemical components of the water, should this be released.

This impact, which is probable may affect the catchment of the Koring Spruit and may also last beyond the life of the project (19 years). Based on the fact that the Koring Spruit is one of the major streams draining into the Olifants River, the impact from the proposed project's initial site layout on surface water would be high.

Mitigation for the predicted impacts will involve ensuring that the management of the clean and dirty water is undertaken in accordance the requirements of the regulations under GN704.

6.1.1.6 Groundwater

The proposed mining operation (initial site layout) would have the following impacts on groundwater:

Groundwater quantity

The formation of the underground workings and removal of water from the workings will result in the formation of a dewatering cone.
Borehole levels of boreholes within a certain radius from the mining area may be affected by the proposed mining operation.

Groundwater quality

Seepage from the pollution control dam may enter the groundwater table, resulting in pollution of the aquifer.
After closure of the mine, the water table will rise to reinstate equilibrium with the surrounding groundwater systems. This may also results in the decanting of the water from the flooded underground workings.
Further to the above, once the normal groundwater flow conditions have been re-instated, polluted water can migrate away from the mined areas. As some coal and carbonaceous layers may remain in the mined areas, the outflow from these areas will most likely be contaminated. Consequently the groundwater quality is thus likely to decline.
In view of the above both surrounding groundwater and surface water environment will be affected by the groundwater plume migration and decanting of the groundwater.
This impact, which is probable will affect an approximately two kilometre radius around the mined out areas and the decant water will drain into the Olifants River (a major river draining into the Witbank Dam) and will last beyond the life of the project (19 years). Based on the fact that the predicted impacts especially the decanting of the groundwater to the Olifants River, the impact from the proposed project's initial site layout on groundwater is considered to be high.
Mitigation for the predicted impacts will involve the following: ensuring that the management of the clean and dirty water is undertaken in accordance the requirements of the regulations under GN704, monitoring the groundwater regime, ensuring that affected water users are compensated and where possible revision of the mining layout to eliminate the possible decant from the mining area.

6.1.1.7 Air Quality

Movement of mining machinery will generate dust and diesel fumes. Dust will be generated by wind blowing over exposed soil. Blasting will also generate dust. The generated particulates will migrate mostly towards the predominant wind direction. See Appendix 10 for the predominant wind direction within the study area, which were used for the air dispersion model for the proposed project. This may eventually land on surrounding properties (natural, farming and residential areas). This may have impacts on vegetation including the cultivated crops; residents of the informal settlements, mine villages and farmsteads and nearby road users. This impact may be limited to the local area and will exist for the duration of the proposed project. Based on the possible health effects and nuisance value the dust can have on the surrounding residences the impact may be of a high significance.
Mitigation measures for the impacts may include dust suppression on areas with high generation of dust and monitoring of particulates form the proposed project site.

6.1.1.8 Noise and vibrations

Machine operators in close proximity to machinery will be exposed to noise levels in excess of 85dBA. The operation of the machinery and surface infrastructure such as ventilation facilities will generate noise levels that may have an impact on the surrounding communities.

Noise levels may reach in excess of 130dBA during a blast. The noise of the blast may be audible within a 2km radius of the mine.
These impacts, which are probable will cover the site and immediate local area and will last for the duration of the project. Note however that the blasting impacts are limited to the construction phase hence the overall significance of the impacts are deemed to be medium, which is mainly due to the ventilation facilities on surface that will be a constant noise during the operation of the project.
Mitigation measures will include the following:

Use of a suitably qualified blaster to ensure that the blasting is designed and conducted in a manner that will not have an effect on the surrounding communities, ensure that the mine employees exposed to high noise levels are provided with ear protection and instructed to use them, and ensure that a noise specialist is appointed to recommend additional noise impact minimising measures and that these measures are implemented during the life of the proposed project.

6.1.1.9 Visual Aspects

The mine activities will be visible from the surrounding farms and their respecting farm roads. Note that due to the undulating nature of the topography this impact will be minimal. These impacts will affect the immediate area and will last for the duration of the project. As a mitigation measure, a visual specialist would be appointed to recommend measures that will be undertaken by the mine during all phases of the project.

6.1.1.10 Social Aspects

Commencement of mining activities may result in the following positive impacts on the surrounding communities i.e. creation of jobs, development of mine employees in terms of skills and career development, injection of capital into the local/regional economy, support of the infrastructure development, community development and poverty eradication projects. Negative impacts such as influx of job seekers which may have secondary impacts and the loss of land that is currently used for grazing purposes.

These impacts, which are possible would affect the local communities and will last for most part of the project and will have a medium impact on the surrounding communities. Note that these negative impacts will be neutralised by the possible positive impacts from the project.

6.1.2 Statement Motivating the Alternative Development Location

In view of the high significance for the environmental impacts that will be caused by the initial layout i.e. mainly on wetlands and groundwater environments, Anglo Operations (Pty) Limited revised its initial site layout (shaft position, infrastructure layout, backfilling operation layout and mining layout). The revision has resulted in the environmental impacts (after mitigation) as detailed in section 6.3 of this report being low. Based on the above, it was concluded that the alternative to the initial site layout as depicted in GOEDE/HOPE4/INITIAL be the final site layout for the proposed project. The final site layout is therefore the preferred layout for the proposed Hope No. 4 Seam project.

6.2 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS FOLLOWED

6.2.1 Approach to Environmental Impact Assessment

The term 'environment' is used in the broadest sense in an EIA. It covers the physical, biological, social, economic, cultural, historical, institutional and political environments.

An Environmental Impact Assessment is a good planning tool. It identifies the environmental consequences of a proposed project from the beginning and helps to ensure that the project, over its life cycle, will be environmentally acceptable and integrated into the surrounding environment in a sustainable way.

6.2.2 Environmental Impact Assessment Process Followed

Under Section 24 of the National Environmental Management Act (NEMA), the Minister promulgated the regulations pertaining to environmental impact assessments (EIA Regulations, 2014) under Government Notice R982 in Government Gazette 38282 of 4 December 2014. These EIA regulations repealed the 2010 EIA regulations and therefore any process relating to environmental authorisations must be undertaken under the EIA Regulations, 2014.

Chapter 4 of the EIA Regulations, 2014 deals with the provisions for application for environmental authorisation. In view of the above, Anglo Operations (Pty) Limited is obliged to comply with provisions of Chapter 4 for the intended environmental authorisation application for the activities (listed and unlisted activities) within the proposed Hope No. 4 Seam project.

Part 3 of chapter 4 of the EIA Regulations, 2014 contemplate process to be undertaken for the application for environmental authorisation for the proposed Hope No. 4 Seam project, which is the S & EIR process. The process to be followed is describe below.

6.2.2.1 Pre-application consultation with the Competent Authority

In terms of section 24D (1) of the National Environmental Management Act, 1998 (Act 107 of 1998), the Minister responsible for mineral resources is the competent authority for environmental matters relating to mining and associated activities. In view of the above, the application for the environmental authorisation for the proposed Hope No. 4 Seam project was submitted to the Department of Mineral Resources (DMR), eMalahleni Regional Office for their consideration and decision making. The application for the environmental authorisation for the proposed Hope No. 4 Seam project was submitted to the DMR on the 26th of August 2015.

6.2.3 Public Participation Process

Public participation is the cornerstone of the EIA process. The principles of the NEMA govern many aspects of EIA's, including public participation. These include provision of sufficient and transparent information on an ongoing basis to stakeholders to allow them to comment. Comments received from the public participation process will be included in the impact assessment and measures will be determined on how the comments will be addressed during the life of the proposed project.

The following steps will be taken during the public participation process:

- The public participation process will commence by providing an opportunity for potential interested and affected parties to register.

- Making reports compiled within the environmental impact assessment available to registered md potential interested and affected parties for their comments.
- Interested and affected parties and the public will also be invited to a public meetings where the project and all major impacts from the proposed project will be discussed.
- Further to the above, interested and affected parties and the public will be informed of the decision taken by the responsible authorities on the submitted application.

The above process will ensure that the EIR and EMPr is subjected to a public participation process, which ensures that the proposed changes (Hope No. 4 Seam project) is brought to the attention of interested and affected parties, the public and relevant organs of state including the competent authority.

6.2.3.1 Scoping Phase

According to Regulation 21 of the EIA Regulations, 2014, a Scoping report must be submitted to the competent authority within 44 days after the submission of the environmental authorisation application. The 44 days period from the date of submission of the environmental authorisation application expired on the 14th of September 2015. The Scoping Report was submitted to the competent authority on the 14th of September 2015.

As part of the public participation process, the draft Scoping report was made available to the competent authority, potential and registered interested and affected parties for their comment from the 11th of August 2015 for thirty (30) days.

6.2.3.2 EIA Phase

In compliance with Regulation 23 of the EIA Regulations, 2014, an EIR and EMPr will be submitted to the competent authority within 106 days after the acceptance of the Scoping report.

As part of the public participation, the draft EIR and EMPr will be made available to the competent authority, potential and registered interested and affected parties for their comment for a period of not less than 30 days during the EIA phase.

6.2.3.3 Information Gathering

Environmental baseline data has been obtained through various agencies, pertaining to surface water quantities and qualities, geohydrological data and modelling, topographical analyses, soil surveys, vegetation surveys, wetland surveys and geological conditions. Weather data was acquired from the Goedehoop Colliery rainfall station as well as from the South African Weather Service. The combined data was used to determine the land capability. Historic land use was determined through available data and by visual observations made during various field studies. The data accumulated and analysed is sufficient to gain a baseline indication of the present state of the environment. The use of this baseline study for impact assessments is thus justified and reliable conclusions could be made.

The following specialist studies were conducted and are referenced during the compilation of this report i.e.:

- Soil Study
- Hydrological Study

- Geohydrological Study
- Heritage Impact Assessment
- Air Quality Impact Assessment
- Wetland Assessment
- Noise Impact Assessment
- Visual Impact Assessment
- Socio-economic Impact Assessment

6.2.3.4 Decision on the S&EIR application

In compliance with Regulation 24 of the EIA Regulations, 2014, the competent authority will within 107 days of receipt of the EIR and EMPr grant or refuse the environmental authorisation.

6.3 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

The following prediction and evaluation of impacts is based on the current and proposed (Hope No. 4 Seam Project) mining operations and associated activities conducted on Goedehoop Colliery.

The evaluation distinguishes between significantly adverse and beneficial impacts and allocates significance against national regulations, standards and quality objectives governing:

- Health & Safety;
- Protection of Environmentally Sensitive Areas;
- Land use; and
- Pollution levels.

Irreversible impacts are also identified.

The significance of the impacts is determined through the consideration of the following criteria:

Probability	:	likelihood of the impact occurring
Area (Extent)	:	the extent over which the impact will be experienced.
Duration	:	the period over which the impact will be experienced.
Intensity	:	the degree to which the impact affects the health and welfare of humans and the environment (includes the consideration of unknown risks, reversibility of the impact, violation of laws, precedents for future actions and cumulative effects).

The above criteria are expressed for each impact in tabular form according to the following definitions:

Probability	Definition
Low	There is a slight possibility (0 – 30%) that the impact will occur.
Medium	There is a 30 –70% possibility that the impact will occur.
High	The impact is definitely expected to occur (70% +) or is already occurring.
Area (Extent)	**Definition**
Small	0 – 40 ha
Medium	40 – 200 ha

Large	200 + ha
Duration	**Definition**
Short	0 – 5 years
Medium	5 – 50 years
Long	51 – 200 years
Permanent	200 + years
Intensity	**Definition**
Low	Does not contravene any laws. Is within environmental standards or objectives. Will not constitute a precedent for future actions. Is reversible. Will have a slight impact on the health and welfare of humans or the environment.
Medium	Does not contravene any laws. Will not constitute a precedent for future actions. Is not within environmental standards or objectives. Is not irreversible. Will have a moderate impact on the health and welfare of humans or the environment.
High	Contravene laws. May constitute a precedent for future actions. Is not within environmental standards or objectives. Is irreversible. Will have a significant impact on the health and welfare of humans or the environment.

Significance and Risk Category	Definition
Negligible	The impact/risk is insubstantial and does not require management
Low	The impact/risk is of little importance, but requires management
Medium	The impact/risk is important; management is required to reduce negative impacts to acceptable levels
High	The impact/risk is of great importance, negative impacts could render options or the entire project unacceptable if they cannot be reduced or counteracted by significantly positive impacts, and management of these impacts is essential
Positive (No risk identified)	The impact, although having no significant negative impacts, may in fact contribute to environmental or economical health

6.4 RESULTS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

6.4.1 Assessment of the Hope No. 4 Seam Project impacts/risks identified

6.4.1.1 Pre-Construction and Construction Phases

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
Development of the Hope No. 4 Seam Access Shaft with Box cut (including dirty water collection sump and ventilation fans), Establishment of the Overburden Stockpile, Topsoil Stockpile, Borrow Pits and Construction of the Access and Service Roads (including break test ramp and arrestor bed)							
The excavation of the access shaft and its box cut will result in the disturbance of the geological profile over the shaft and box cut area. During this activity the overburden is removed to allow access to the coal seam. The excavation will be open for life of the project and will be sealed at closure of the project. However, the stratigraphy can never be replaced. Further to this, the carbonaceous material from the removed overburden and run of mine coal will have a potential to cause acid mine drainage.	Geology	Without mitigation					Limited drill and blast during the excavation will be used to limit the risk of damaging the geology around the shaft area. Blasting will be kept to a minimum and undertaken under controlled conditions. This will limit the development of cracks. As much of the carbonaceous material removed during the construction of the shaft and box cut as possible, will be separated from the clean overburden material. The separated carbonaceous material will be transported to the operational Goedehoop Colliery mineral residue deposit. The remaining clean material will be stockpiled on site and used as backfill material during the rehabilitation of the void created by the access shaft and box cut.
		S	M	M	M	M	
		With mitigation					
		S	M	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
							During rehabilitation, builder's rubble and hard rocky material must be placed at the bottom of the mining shaft/box cut and then covered with the rest of the remaining clean overburden material.
The excavation of the access shaft and its box cut and the borrow pits will result in the formation of a topographical void, which may impact on the local topographical patterns.	Topography	Without mitigation					Use material removed during the excavation of the shaft and box cut to backfill the created void to proximate the Hope No. 4 Seam project pre-mining topographical patterns during the decommissioning phase.
		S	M	S	L	L	
The formation of stockpiles (topsoil, subsoil and hards) will result in topographical highpoints, which may alter the local topographical patterns of the immediate area.	Topography	Without mitigation					Ensure that as little space as possible is used for the stockpiling of the overburden material. Use all stockpiled material during rehabilitation of the disturbed areas.
		S	M	S	L	L	
The stripping of soil layers during the construction of the shaft, roads and the material stockpile will result in the existing productive soil functions ceasing completely until the footprint is rehabilitated. Topsoil removed from the construction site will be	Soil	Without mitigation					Use sites of lower potential soils for the proposed development whenever possible and if areas with good quality soil is unavoidable, strip topsoil clean from underlying non-topsoil materials and stockpile as described in the EMPr. This mitigation measure will at this stage not lower the impact but
		M	M	M	H	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
stockpiled. The stockpiled topsoil will be prone to possible loss of fertility, which may affect the ability of the soil to support the after mining land use of the site. All productive soil functions will cease completely underneath the overburden stockpile and topsoil stockpile or berms. The weight of the stockpiled topsoil will cause compaction of topsoil under the stockpile.		With mitigation					will create the opportunity to do proper rehabilitation during the decommissioning phase which will then alleviate the impact to a large extent. The size of the overburden stockpile, topsoil stockpile or berms will be contained as far as possible and will be removed as soon as possible during the decommissioning phase of the project.
		M	M	M	H	M	
The stripping of topsoil will result in ceasing of the current land capability of the development area. Note that the land capability of a portion of the shaft area has already been reduced by the infrastructure and facilities established on site, which include a sports fields, office ruins, roads and fallow land.	Land capability	Without mitigation					Use sites of lower potential soils for the proposed development whenever possible and if areas with good soils is unavoidable, strip topsoil clean from underlying non-topsoil materials and stockpile as described in the EMPr. This mitigation measure will at this stage not lower the impact but will create the opportunity to do proper rehabilitation during the decommissioning phase which will then alleviate the impact to a large extent. The size of the overburden stockpile, topsoil stockpile or berms will be contained as far as possible and will be removed as soon as possible.
		M	M	M	H	M	
		With mitigation					
		M	M	M	H	M	
Current land use over the proposed development area will cease completely due to the commencement of the shaft development. Except for the defunct offices, disused recreational facilities and demolished village, no physical structure occurs within the proposed access shaft complex site. The area is not used for any other purpose due to the presence of mining activities in the vicinity of the area.	Land Use	Without mitigation					
		M	M	M	H	M	
		With mitigation					
		M	M	M	H	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
The excavation of the access incline shaft/box cut, establishment of the overburden and topsoil stockpiling area and the construction of the access and service roads will result in the removal of vegetation cover from to the stripping of topsoil, which will lead to the loss of habitat. It must, however, be noted here that the area to be used for development of the above facilities has limited natural vegetation due to the extensive disturbance from the existing mining infrastructure. Limited habitats are however available resulting in the area not having a biodiversity value.	Natural vegetation	Without mitigation					Use sites with most disturbed vegetation cover for the development and if development on natural vegetation is unavoidable, strip topsoil clean from underlying non-topsoil materials and stockpile as described in the EMPr. Ensure that mining activities are limited within the approved development footprint. Use stockpiled topsoil for rehabilitation of the backfilled shaft, rehabilitated stockpiling and road areas. The above-mentioned areas must be seeded with the recommended seed mix to ensure that the re-establishment of suitable vegetation is achieved during the decommissioning and closure phase of the project. The area of disturbance must be monitored for the identification of alien invasive plant species, which must be eradicated when identified.
		S	M	S	M	M	
		With mitigation					
		S	L	S	L	L	
Animal burrows and habitats remaining within the proposed development site will be destroyed during construction. This may result in the migration of remaining animal life away from the affected areas. It must be noted however that the faunal survey undertaken at Goedehoop Colliery	Animal Life	Without mitigation					The rehabilitation of the disturbed areas must be conducted such that the rehabilitated areas will encourage the migration of animals back into the rehabilitated areas.
		S	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
has declared the proposed development area not having any remaining natural habitat, due to the existing mining related infrastructure, hence no extensive animal life are encountered at the proposed development area. This has therefore resulted in the significance of the impacts on faunal life being deemed low to very low.							
Rain and runoff water outside the construction site may enter the construction site. This will result in the loss of clean runoff water that could have reported to the nearby water bodies (Hope Spruit and its wetland area).	Surface Water	Without mitigation					All silted water should be collected and silt settled before allowing clear water from running off to the nearby veldt. Diversion berms or trenches will be used to separate the clean and dirty water areas at the shaft complex. If it can be proven that the water emanating from the construction is contaminated even after silt removal, this water must be pumped to the existing return water dam.
		S	H	S	M	M	
		With mitigation					
		S	L	S	L	L	
Exposure of soils during construction by the stripping of vegetation and soils may cause erosion, which may lead to increased silt loads in surface water runoff. This may result in the contamination of the clean water environment. If allowed the above impacts may result in the Hope Spruit and its wetland system being negatively impacted. Further to the above, the overburden stockpile will be	Surface Water	Without mitigation					Areas that are stripped should be optimised to limit unnecessary stripping. Storm water upslope of the stripped areas should be diverted around these areas to limit the amount of storm water flowing over these areas. Storm water from the overburden and topsoil stockpiles must be
		M	M	S	H	M	
		With mitigation					
		S	M	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
prone to erosion prior to it being vegetated. Natural re-vegetation will likely take more than 1 season to completely cover the topsoil stockpile. The resultant erosion could lead to increased suspended solids being deposited into the Hope Spruit.							collected and silt settled before allowing clear water from running off to the nearby veldt. The timing of the topsoil stripping should be optimised to limit the time between stripping and construction. Dry season construction is preferable. Hydro seeding of the topsoil stockpile is recommended to speed up vegetation cover. An appropriate seed mix should be recomended by a vegetation specialist.
Diesel, oil and chemical spills, if allowed to occur, will result in the pollution of the surface water runoff and the groundwater regime through runoff contamination and seepage.	Groundwater	Without mitigation					Ensure that all mine machinery and vehicles are maintained on protected ground. It must be ensured that a credible company removes used oil after vehicle servicing. A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills. Store all potential pollution sources in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment.
		S	M	L	M	M	
		With mitigation					
		S	L	S	L	L	
The shaft/box cut, topsoil and overburden stockpiling areas	Sensitive	Without mitigation					The footprint of the facilities being constructed and wetland areas

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
and the access and service roads have been sited in close proximity to wetland areas associated with the Hope Spruit. If the construction of the facilities are undertaken outside the approved development footprint the construction activities may encroach into the wetlands thereby cause damage to or even destroy the identified wetlands. The impacts may also include contamination of the wetlands by acidified leachate, dirty water spills and silt from the activities or of the development into the wetland areas. In addition to the above, the drawdown created by the excavated shaft and its box cut (Figure 49) may drain the nearby wetland areas, resulting the loss of habitat.	Landscapes	M	M	S	M	M	will be physically demarcated before establishment of the facilities. The shaft complex was designed to be away from the edge of the identified wetlands. A no go zone i.e. the area between the development footprint and the identified wetlands, will be maintained at all the times during the construction of the facilities. No construction activities will be allowed on the no go zone. The slopes of the shaft benches are designed such that it minimise the impacts of groundwater drawdown on the identified wetlands. Storm water management will be implemented as specified in the storm water management plan.
		With mitigation					
		S	L	S	L	L	
Construction activities during the establishment of the Hope No. 4 Seam shaft and associated infrastructure will include land clearing, topsoil removal, material loading and hauling, stockpiling, grading, bulldozing, and compaction during construction. These activities will result in the mobilisation of particulates that will migrate away from the site to the nearby local communities. This will be a nuisance to the communities and will result in aesthetic impacts associated with fugitive dust emissions. On-site	Air Quality	Without mitigation					Ensure that source and receptor based performance indicators for routine operations at Goedehoop Colliery Hope No. 4 Seam project area are set and assessments done against such indicators. Enforce record-keeping, environmental reporting and community liaison on matters relating to the impacts on air quality Ensure that source specific management measures for Hope No. 4 Seam project are complied with.
		M	M	S	M	M	
		With mitigation					
		M	S	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
dust fall may have health and nuisance implications to employees at the existing offices. According to the air quality dispersion model conducted for the proposed project, particulates levels will exceed the NAAQS and EC levels, which include the Anglo Air Quality Standards, only at the existing offices within the Hope Shaft complex for more than the allowable times.							
Blasting operations during shaft development may affect nearby structures. This may be due to ground vibration, air blast pressure and fly rock emanating from the proposed shaft development area. Dust and noxious fumes may be generated during blasting that can affect the neighbouring residents and road users.	Noise and vibration	Without mitigation					Best practises must be used during blasting to ensure that the ground vibration and air blast pressure is within acceptable limits. Undertake a full risk assessment in order to address the aspects and to put proper controls in place.
		M	M	S	M	M	
		With mitigation					
		S	L	S	L	L	
The noise level generated from the construction activities will exceed the SANS 10103 Levels for Residential areas and may exceed the maximum rating levels for ambient noise indoors. The exceedance of the standards are considered moderate and since the impacts are limited to one of the mine's offices the impacts are considered to be low.	Noise	Without mitigation					Ensure that proper management measures as well as technical changes are undertaken to reduce the impacts on surrounding employees. This include ensuring that less noisy equipment are use, that equipment is kept in good working order and that the equipment must be fitted with correct and appropriate noise abatement measures and where possible use white-noise generators instead of tonal reverse alarms on heavy vehicles
		S	M	S	M	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
							operating on roads.
The activities undertaken during the construction of the shaft and associated infrastructure will be visible from the nearby roads and properties. The shaft and associated infrastructure will exert a high visual impact within the 1km zone. The view shed analysis (Figure 50 and Figure 51) indicates that the components of the proposed development will be visible beyond the 10 km zone. However, due to the undulating topography, visibility for the most part is restricted to 5-8 km within only patches extending beyond 10 km. Critical viewpoints such as the main roads (R 35, R 542 and the R 544), nearby human settlements (Hope Village and Mahlatini informal settlement) and nearby farmsteads may be affected by the proposed construction activities.	Visual Aspects	Without mitigation					Ensure that any earthworks and landscaping are conducted to reduce the visual impacts Ensure that colour/texture and scale are also used in reducing the visual impacts The buildings must be designed and constructed to have shapes that will reduce visual impacts Ensure that lighting is conducted in manner that will reduce the impacts on visual aspects at night times.
		M	M	S	M	M	
		With mitigation					
		M	M	S	L	L	
The shaft is sited in close proximity to a heritage site (site 13) and the overburden stockpile is sited on a heritage site (site 7). Excavation of the shaft/box cut has a potential to destroy the identified grave yard (site 13) and the	Sites of Archaeological and Cultural Importance	Without mitigation					The establishment of the shaft complex will be such that the development is always away from the identified grave site. A buffer of fifty meters will be created between the grave yard and the proposed shaft development footprint, which will be adhered to
		S	H	P	H	H	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
establishment of the overburden stockpile will result in the destruction of the identified heritage site (site 7).		With mitigation					by the mine. A management plan will be drafted for the sustainable preservation of the grave yard. The fencing in of graves, which is recommended, is standard protocol in order to clearly demarcate it as assistance for preservation and management. The grave site must have access for descendants. The site affected by the overburden stockpile will be demolished before establishment of the stockpile. A permit will be acquired from the Mpumalanga Provincial Heritage Resources Agency for the demolishing of the building and site will only be demolished after receiving the permit.
		S	L	S	L	L	
The commencement of the proposed project may result in an influx of 'outsiders' seeking jobs. This may likely attributed to the following negative impacts i.e. increase in local unemployment levels, potential conflict between locals and "outsiders" that compete for employment	Socio economic aspects	Without mitigation					Anglo Operations (Pty) Limited will ensure that no unrealistic expectations are created. Details of the construction period will be communicated to local communities and the community will be informed regarding the
		S	H	S	M	M	
		With mitigation					

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
opportunities and other resources, increase in the number and size of informal settlements, potential increase in crime and additional pressure on local government to provide housing, services, employment and so forth.		S	M	S	S	L	number of new positions that will be created. Local Councillors will be involved in the process to ensure that they convey the information to the local communities through their established means of communication (community meetings, etc.).
During the construction phase, the R 542 and minor roads leading to the site will be utilised. Low bed trucks will access the site daily and large dump trucks will also have to access the site on a daily basis. Hard parking will be allowed for equipment on site. This, together with other activities, will result in disruptions in daily living and movement patterns for surrounding communities, landowners and road users in the form of traffic and intrusion impacts resulting in short-term disruptions and safety hazards. Factors that could further impact negatively include damage to road surfaces resulting in an increase in accidents, frustrated motorists and financial implications for local and provincial government, temporary road closures,	Socio economic aspects	Without mitigation					Announce disruptions, road closures and other disruptions; Erect signboards (if required) indicating access to the construction site; Impose penalties for reckless drivers as a way to enforce compliance to traffic rules; Inspect trucks and other heavy vehicles on a regular basis to avoid oil spillages and un-roadworthy vehicles that could lead to accidents; Limit all activities to the development footprint of the proposed construction site; Fence off the development footprint of the proposed construction site prior to the commencement of site-clearing and construction
		S	H	S	H	M	
		With mitigation					
		S	M	S	M	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
construction vehicles that offload material on site (dust, noise, etc.), and increase in traffic on the access roads (gravel roads) resulting in impacts for locals, farm houses and crops. Noise, dust, visual and air pollution (intrusion impacts) during the construction phase are discussed in greater detail in Section 5.10 of the SIA Report.							activities; and Keep communication with neighbouring landowners, land occupiers and the public (interested and affected parties) open during the construction phase of the project.
Inadequate management of the construction process and general construction related activities could result in health and safety risks for workers and nearby communities, which could include construction related and road accidents, unauthorised access/trespassing, fire hazards at site and nearby surrounding lands, respiratory diseases due to dust generation and air pollution, health issues due to high ambient noise levels caused by machinery and construction equipment, pollution problems, unsafe and insufficient drinking water, increase in HIV/AIDS and other STDs and dehydration and sunburn due to high temperatures in the summer months.	Socio economic aspects	Without Mitigation					Ensure that safety measures are implemented to control access to the site. Ensure measures are implemented to ensure project related safety within the construction site and nearby communities.
		M	M	S	M	M	
		With Mitigation					
		M	L	S	L	L	
Intrusion impacts (air pollution, noise impacts, visual impacts and impacts on identified heritage sites) may result	Socio economic aspects	Without Mitigation					See mitigation under the relevant section of the environmental aspects
		M	M	S	M	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
from construction activities of the proposed project.		With Mitigation					
		M	L	S	L	L	
Construction of surface infrastructure for the Hope No. 4 Seam Shaft Complex, which include storm water management structures, water supply infrastructure, power supply infrastructure, conveyor belt system, guard house and stone dust silo and the upgrading of the existing surface infrastructure (batching plant and Hope Shaft Complex)							
The construction of the above-mentioned infrastructure will result in the change of the current land surface, which will result in the change in the local drainage patterns. It must however be noted that the area on which the above will be constructed is already occupied by infrastructure of a similar nature.	Topography	Without mitigation					The surface infrastructure has been designed to occupy as little space as possible. Available infrastructure such as workshops and offices will be used for the proposed project, hence limiting the development footprint of the proposed development.
		S	M	S	L	L	
During the construction of the above-mentioned surface infrastructure, soil stripping will be conducted in preparing the routes, foundations and plinths for the above-	Soil	Without mitigation					Ensure that the area of disturbance is limited to be as small as possible.
		S	M	M	M	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
mentioned infrastructure. This will result in the loss of the soils within the footprint of the infrastructure, which include small portions of the identified wetland areas. The use of construction vehicles may result in the contamination of soils through hydrocarbon liquid spillages, compaction of areas outside the development footprint and erosion of exposed areas. It must be noted that most of the area in which the above facilities will be constructed has been disturbed by the existing mining facilities, hence no significant impacts on soils is predicted.		With Mitigation					Avoid vehicle movement over unprotected areas. All soils removed should be preserved for use during rehabilitation. The disturbed areas should as far as possible be rehabilitated once the construction of the infrastructure has been completed.
		S	L	M	L	L	
The construction of the above-mentioned facilities with its associated infrastructure will result in the loss of natural vegetation occurring along the construction footprint. The removal of the vegetation cover may result in the loss of habitat, habitat fragmentation and loss of species of concern. Note that due to the exiting mining infrastructure in the vicinity of the proposed infrastructure and the fact that the vegetation survey did not identify red data plant species, the impact on vegetation are deemed low.	Natural Vegetation	Without mitigation					Ensure that the removal of vegetation is limited to a small a space as possible. Topsoil should be stored separately to be used in rehabilitation and landscaping. The development of erosion gullies should be monitored and managed. Large tracts/ patches of natural vegetation should be avoided. Remaining areas of natural vegetation, irrespective of their ecological state (poor or good) should be inspected for the presence of species of concern during the optimal time prior to
		S	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
							construction. Ensure that environmental awareness is conducted with the employees, including contractor's employees. Avoid use of alien plant species for rehabilitation and use only regionally, biome specific or recommended species for rehabilitation of the disturbed areas
Animal burrows and habitats within the development footprint will be destroyed by the preparation of the area where the proposed infrastructure will be constructed. This will further result in the migration of animals away from the areas of disturbance. Note that due to the currently existing mine infrastructure, limited animal life to be encountered, hence resulting in impacts on animal life very low.	Animal Life	Without mitigation					The rehabilitation of the disturbed areas must be conducted such that the rehabilitated areas will encourage the migration of animals back into the rehabilitated areas.
		M	S	S	L	L	
During the construction of the surface infrastructure for the proposed Hope No. 4 Seam project, topsoil will be stripped and civil works will be undertaken as part of the preparation of the area for the construction of infrastructure. These activities may result in bare areas, which will result in the erosion of soils during rainfall events, with elevated suspended solids reporting in the runoff water, which may	Surface Water	Without mitigation					Appropriate storm water management measures must be implemented. Erosion protection measures must be implemented at steep areas. Areas that are stripped should be optimised to limit unnecessary stripping. The timing of the topsoil stripping should be optimised to limit the
		S	M	S	M	M	
		With mitigation					
		S	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
ultimately enter the nearby watercourses. This may subsequently also result in erosion gullies along the runoff patterns, which will result in offsite impacts such as increased sedimentation of the receiving water environments.							time between stripping and construction. Dry season construction is preferable.
During the construction of the above-mentioned surface infrastructure, hydrocarbon fluids (diesel, petrol and oils) and other chemicals may spill onto the ground resulting in the potential pollution of surface and groundwater environments.	Groundwater	Without mitigation					Emergency servicing of construction vehicles will take place only in dedicated areas that are equipped with drip trays. Used oil will be removed immediately after vehicle servicing. The mine will supply absorbent fibre at site. All material with potential to pollute will be stored in secure facilities (existing workshop and stores). Waste such as sewage must either be treated at site according to accepted standards or removed by credible contractors.
		S	M	S	L	L	
The construction of the overland conveyor belt, a water pipeline and re-routing of power line together with their service roads will result in two wetland crossings. The overland conveyor belt and dirty water pipeline will cross a seepage wetland and the re-routing of the power line will	Sensitive Landscape	Without Mitigation					Given the position of the proposed Hope No. 4 Seam access shaft and the existing infrastructure at Goedehoop Colliery that must connect to the proposed shaft, it is not possible to avoid the wetland areas.
		S	H	S	M	M	
		With Mitigation					

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
cross a valley bottom wetland. Wetland habitat falling within the footprint of the proposed linear infrastructure will be disturbed during the construction process and some wetland habitat is likely to be lost. In addition, construction vehicles accessing the route, turning, offloading materials on site etc. are also likely to contribute to disturbance and destruction of wetland habitat outside the servitude. Disturbance of the wetland vegetation is also likely to provide opportunity for invasion by alien vegetation and increase the risk of erosion. It must however be noted that due to the present state of the wetlands (PES of F), the impacts on the wetlands will not be high.		S	H	S	L	L	It is therefore proposed that the following be undertaken to minimise the impacts on the wetlands i.e. • Limit the disturbance to be as small as possible • Protection of the remaining wetland areas by means of fences
Noise generated from construction activities may add to the current noise levels, which may have impacts on surrounding properties. According to the worst case daytime noise climate modelling from a construction scenario with no screening corrections considered, the nose level from the construction site will exceed the urban rating limit of 55dBA within a distance of approximately ninety meters from the development site. With the	Noise	Without mitigation					The use the smaller/less noisy equipment when operating near receptors; Ensuring that equipment is well maintained and fitted with the correct and appropriate noise abatement measures; Investigate the use of white-noise generators instead of tonal reverse alarms on heavy vehicles operating on roads, in mine pits and at stockpile areas;
		S	M	S	M	M	
		With mitigation					
		S	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
exception of the Goedehoop Colliery offices, none of the identified sensitive receptors occurs within the zone of influence. It must however be noted that mine machinery operators will also be exposed to high noise levels during the construction of the shaft complex.							Consider consulting with a blasting specialist for the development of the portal; *and* Ensure a good working relationship between the mining environmental representative and people at all potentially sensitive receptors.
The view shed analysis from the visual impact assessment has indicated that the components of the proposed development will be visible. However, due to topography and the nature of the infrastructure, visibility for the most part is restricted to site.	Visual Aspects	Without mitigation					Ensure that infrastructure are constructed to approved design specifications.
		S	L	S	L	L	
Positive Impacts							
During the construction phase of the project, approximately 150 temporary employment opportunities will be created. Despite the fact that a few permanent positions will be created as workers will be transferred from existing sections, a positive impact will result.	Socio economic aspects	Without Mitigation					Local labour and contractors will be appointed. Local labour force will ensure economic spin-offs that result due to employment benefits to the local community. The mine's contract management plan will be enforced to ensure local employment and procurement.
		S	H	S	S	M	
		With Mitigation					
		S	H	S	S	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
The construction phase of the proposed project will result in the following positive impact on the local economy i.e. Employment of locals and an increase in salary earners; Contracts with SMME's and local service providers where possible; Local procurement of material and goods, where possible; Positive impacts for the retail market (groceries, goods and services, food suppliers, etc.) for local merchants, shops and informal traders; and Accommodation for temporary skilled employees in local establishments and its associated spin-offs.	Socio economic aspects	Without Mitigation					Anglo Operations (Pty) Limited will adhere to its procurement strategy, which aims to increase local content of the project to its maximum. Majority of construction material requirements will be sourced from industries in eMalahleni, Middelburg and the surrounds. The mine will comply with the requirements as guided by the Mining Charter with regards to SMME development and the mine's procurement policy.
		M	H	S	P	M	
		With Mitigation					
		M	H	S	P	M	
Construction of borrow pits for the supply of gravel during the construction of the shaft complex							
The construction of borrow pits will result in localised areas of depression and highpoints due to excavations and overburden stockpiles.	Topography	Without mitigation					Design and undertaking the excavation of the borrow pits such that rehabilitation of the pits will be free draining. The mined areas will be rehabilitated and made to be free draining with the rehabilitated areas not having a slope of no greater than 5%.
		S	M	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
During construction and use of borrow pits, loss of topsoil either by stripping activities or by spill or by erosion of exposed areas may occur. Further to the above, the construction and operation of borrow pits will have impact on the land use and capability of the area.	Soils Land Use and Capability.	Without mitigation					Removed topsoil will be stockpiled separately outside the borrow pits area After mining the borrow pits, disturbed areas will be reshaped with 1:5 slopes, and the soils will be remediated by application of agricultural lime and fertiliser into the soils. Each borrow pits will have soil utilisation program to prevent further loss of soil potential. Areas affected will be rehabilitated to suitable land use.
		S	M	S	M	M	
		With mitigation					
		S	L	S	L	L	
Since the sites for the construction and operation of borrow pits are cultivated, no loss of natural habitat and grazing due to the removal of vegetation will occur.	Natural Vegetation.	Without mitigation					Ensure that the disturbed areas are rehabilitated and seeded with seed mix recommended by a suitably qualified specialist. Rehabilitated areas must be monitored and marinated to have good vegetation cover.
		S	L	S	L	L	
The construction and operation of borrow pits has been sited on an area that is predominantly used for cultivation. No significant animal life would exist hence low significance of the impacts.	Animal Life.	Without mitigation					Rehabilitation of the disturbed area will encourage the migration of animal life back into the borrow pit area.
		S	L	S	L	L	
Rain and runoff water upslope of the borrow pits may enter	Surface Water.	Without mitigation					Use soils berms to divert upslope runoff water to the nearby

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
the site, resulting in the loss of clean runoff water that could have reported to the nearby water bodies. However Due to the size of the borrow pits, no significant amount of runoff water will be lost.		S	L	S	L	L	stream.
Exposure of soils during the stripping of vegetation and soils may cause erosion, which may lead to increased silt loads in surface water runoff. This may result in the contamination of the clean water environment.	Surface Water.	Without mitigation					Implement storm water management at the borrow pits area. All borrow pits will be rehabilitated to ensure that the areas are free draining and that no excessive silts are generated.
		S	M	S	M	M	
		With mitigation					
		S	L	S	L	L	
The borrow pit areas and their access roads have been sited in close proximity to wetland areas. Undertaking of construction of the pits outside the approved development footprint encroach into the wetlands thereby cause damage to or even destroy the identified wetlands. Spillage of silted water and hydrocarbon liquids will result in the contamination of the wetland areas.	Sensitive Landscapes.	Without mitigation					The borrow pits will be sited to be away from any sensitive landscapes.
		S	M	S	M	M	
		With mitigation					
		S	L	S	M	M	
Construction activities result in the mobilisation of	Air Quality.	Without mitigation					Undertake dust suppression along the gravel access roads

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
PRE-CONSTRUCTION AND CONSTRUCTION PHASES							
particulates that will migrate away from the site to the nearby local communities. This will be a nuisance to the communities and will result in aesthetic impacts associated with fugitive dust emissions. On-site dust fall may have health and nuisance implications to employees at the existing offices. However Due to the distance between the site and the nearby residents, no significant impacts are envisaged.		S	L	S	L	L	
In view of the distance from the borrow pit site to the nearest residential areas, no significant impacts re envisaged.	Noise.	Without mitigation					Ensure that less noisy equipment is used. Maintain the equipment in good working order.
		S	L	S	L	L	

6.4.1.2 Operational Phase

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
Underground mining of the No. 4 Seam mine workings							
The removal of the No. 4 coal seam will result in a structural impact to the geology, which will be evident from the time coal extraction occurs into closure and is permanent. Areas with low safety factors especially those already undermined (No. 2 and No. 5 mined out areas) may potentially have a higher risk of subsidence and geological disturbance due to historic mining techniques.	Geology	Without mitigation					Ensure that the removal of the No. 4 coal seam by underground mining methods will leave underground pillars intact. The use of adequate safety factors during the determination of the pillar sizing will ensure that no surface subsidence occurs. The use of mechanical continuous miners during the removal of the coal seam ensures that blasting is kept to a minimum, and only utilised in areas where dolerite is encountered. Areas with high risk of subsidence due to historic underground mining will be backfilled to ensure stability of the overlying strata. The underground backfilling will be undertaken as per the backfilling method statement.
		L	H	P	H	H	
		With mitigation					
		L	L	S	M	L	
During blasting activities in mining, the potential	Geology	Without mitigation					The use of mechanical continuous miners during the

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
exists that cracks may develop, thereby disturbing the overlying strata. This may further disturb any structure undermined.		L	L	S	M	L	removal of the coal seam ensures that blasting is kept to a minimum, and only utilised in areas where dolerite is encountered. This reduces the possibility of fracturing of the overlying strata during mining.
Subsidence of the underground workings will impact on topography causing localised depressions. If subsidence occurs, environmental aspects such as the topography, soils, vegetation cover, land use and land capability over the subsided areas will be influenced. This may ultimately result in the loss of use of the land resulting in economic loss to the landowners. In addition to the above loss of habitat will occur, which may lead to the migration of animals away from the affected areas.	Topography	Without mitigation					Ensure that the removal of the No. 4 coal seam by underground mining methods will leave underground pillars intact. The use of adequate safety factors during the determination of the pillar sizing will ensure that no surface subsidence occurs. The use of mechanical continuous miners during the removal of the coal seam ensures that blasting is kept to a minimum, and only utilised in areas where dolerite is encountered. Areas with high risk of subsidence due to historic underground mining will be backfilled to ensure stability of the overlying strata. Backfilling will be undertaken as per design specifications. If any subsidence is encountered, the affected area will be rehabilitated to be free draining and to have good vegetation cover that can support once again the pre-subsidence
		L	H	P	H	H	
		With mitigation					
		L	L	S	M	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
							ecosystem. Compensate affected land owners.
Subsidence of the underground workings will impact on topography causing localised depressions. Subsidence is expected in areas with mined out workings and workings with low safety factors. If surface subsidence occurs above the underground workings, it will result in the reduction of the yield of the Hope Spruit, Goedehoop Spruit, Leeuwfontein Spruit and its tributaries. Runoff from these areas would have contributed to the flow in these streams. This water will be intercepted and lost from the surface water system to evaporation and infiltration.	Topography	Without mitigation					Ensure that the removal of the No. 4 coal seam by underground mining methods will leave underground pillars intact. The use of adequate safety factors during the determination of the pillar sizing will ensure that no surface subsidence occurs. The use of mechanical continuous miners during the removal of the coal seam ensures that blasting is kept to a minimum, and only utilised in areas where dolerite is encountered. Areas with high risk of subsidence to historic underground mining will be backfilled to ensure stability of the overlying strata. Backfilling will be undertaken as per design specifications. If any subsidence is encountered the affected area will be rehabilitated to be free draining.
		L	H	P	H	H	
		With mitigation					
		L	L	S	M	L	
Operation of the underground mine will result in a	Groundwater	Without mitigation					Ensure that the removal of the No. 4 coal seam by

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
drawdown of the local groundwater table. According to the groundwater model (Figure 52), groundwater draw down will occur in the vicinity of the identified wetlands of the Hope Spruit, Goedehoop Spruit and the tributaries of the Leeuwfontein Spruit. It was however noted that the majority of wetlands on site are predominantly maintained by shallow perched water tables that are generally separate from deeper groundwater and are thus considered unlikely to be affected by the dewatering. The larger valley bottom wetlands of the Hope Spruit and the Goedehoop Spruit, are characterised by vertic clay soils that expand when wet and become almost impermeable. Surface flows within these wetlands are thus also likely to be largely unaffected by the groundwater draw down cone. Pans are potentially more sensitive to groundwater drawdown. A small pan just east of the R35, about 2 kilometres south of Komati, is predicted to experience a drawdown of groundwater in its surroundings of some 6 meters. It is a small pan of about 200 m diameter. Another pan about 2 kilometres south-southwest of the old Hope shaft		L	M	P	M	M	underground mining methods will leave underground pillars intact. The use of adequate safety factors during the determination of the pillar sizing will ensure that no surface subsidence occurs. The use of mechanical continuous miners during the removal of the coal seam ensures that blasting is kept to a minimum, and only utilised in areas where dolerite is encountered. Areas with high risk of subsidence to historic underground mining will be backfilled to ensure stability of the overlying strata. Backfilling will be undertaken as per design specifications. Monitor the groundwater levels in the vicinity of the affected water bodies. Monitor the potentially affected water bodies. Should the results of the monitoring indicate that the drawdown is affecting the monitored water bodies measures should be undertake by the mine to investigate the source of the impacts and recommendations made and implemented to address the impacts on the water bodies.
		With mitigation					
		L	L	S	M	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
could be marginally affected by a drawdown of some 2 meters, but this is within the uncertainties of the model and also within the zone affected by the Hope Shaft. This potential impact can most likely be disregarded.							
The calculated drawdown of the worst case scenario as depicted in	Groundwater	Without mitigation					Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one kilometre surrounding the mine. If it can be proven that the mine is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. The numerical model should be updated during operation of the mine.
		S	M	L	H	M	
		With mitigation					
		S	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
GOEDEHOOP COLLIERY		ANGLO OPERATIONS (PTY) LIMITED					
Figure 52 indicated that some of the boreholes identified during several hydro censuses will be							

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
Regarding groundwater quality impacts, the flow of groundwater in the aquifer will be directed towards the underground workings during this stage of mining, and very little groundwater pollution is thus expected.	Groundwater	Without mitigation					No mitigation required, however it is proposed that the groundwater quality in the vicinity of the mine workings be monitored. This will confirm the prediction of low impact on groundwater pollution.
		L	L	P	L	L	
A number of wetlands, pans and streams will be undermined, may result in a loss of surface water to groundwater if the mining activities result in the formation of preferential flow paths into the mine workings, through for example fracturing of the overlying rock strata caused by surface subsidence occurring as a result of pillar failure underground.	Sensitive Landscapes	Without Mitigation					Ensure that the removal of the No. 4 coal seam by underground mining methods will leave properly sized underground pillars intact. The use of mechanical continuous miners during the removal of the coal seam ensures that blasting is kept to a minimum, and only utilised in areas where dolerite is encountered. Areas with high risk of subsidence to historic underground mining will be backfilled to ensure stability of the overlying strata. Backfilling will be undertaken as per design specifications. Monitor the groundwater levels and affected wetlands in the vicinity of the affected water bodies.
		L	H	P	H	H	
		Without Mitigation					
		L	M	P	L	L	
Groundwater drawdown during the mining may result in the draining of the wetlands and pans within the undermined areas. It must however be noted that the majority of wetlands on site, are hillslope seepage wetlands, which are however predominantly maintained by shallow perched water	Sensitive Landscapes	Without Mitigation					
		L	L	P	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
tables that are generally separate from deeper groundwater and are thus considered unlikely to be affected by the dewatering.							
Use of the continuous mechanical miners may generate dust that may have health effects on the employees if not properly managed.	Air Quality	Without mitigation					Air quality will be monitored at the underground workings. Sufficient dust suppression will be undertaken to reduce the impacts of the generated dust on the employees. Employees will be provided with dust masks and will be instructed regarding the correct use the dust masks.
		S	M	S	H	M	
		With mitigation					
		S	L	S	L	L	
Use of the continuous mechanical miners may generate noise levels that may have health effects on the employees if not properly controlled.	Noise	Without mitigation					Noise levels will be monitored at the underground workings. Sufficient noise buffering will be undertaken to reduce the impacts of the generated noise on the employees. Employees will be provided with ear buts and will be instructed to use them.
		S	M	S	H	M	
		With mitigation					
		S	L	S	L	L	
The occurrence of the Mahlatini informal settlement will have security issues for the surrounding properties and employees of the proposed Hope	Socio-economic	Without mitigation					If possible, establish a partnership with the Steve Tshwete LM and the private landowner to find workable solutions to formalise the Mahlatini settlement, such as that a portion of
		S	H	M	M	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
No. 4 Seam, land use impacts (unregulated grazing practices on private land and servitudes) and safety issues as a result of trespassing. This will be amplified by the fact that no new employment will be created for the proposed project during the operational phase. This will require serious mitigation and intervention		With mitigation					the farm be subdivided and sold/contributed to Council to establish a Human Settlement. Establish a Trust or similar legal entity for the Mahlatini subsistence farmers and draw up a contract that sets out the areas where grazing is allowed and penalties for breach of contract. Include community income-generating projects in the SLP aimed at specifically creating jobs and food security for the Mahlatini community.
		S	M	M	L	L	
The following factors that could contribute negatively towards disruptions in daily living and movement patters i.e.: trucks and other mine vehicles that are not road worthy and negligent drivers that disobey traffic rules, disregard speed limits and cause obstructions; damage to the road infrastructure resulting in an increase in accidents, frustrated motorists and financial implications for local and provincial government; possible road closures during maintenance periods; an increase in traffic on the local access and haul roads (gravel roads) resulting in impacts for locals, farm residenta and crops (dust pollution); on-site machinery and	Socio-economic	Without mitigation					Ensure proper communication with the public on any event that may have disruptions. Put in place standards on road users and ensure compliance with the standards. Inspect trucks and other heavy vehicles on a regular basis to avoid oil spillages and un-roadworthy vehicles that could result in accidents. Display a contact number on trucks where motorists can report reckless driving. The mine to consult with adjacent and other affected landowners whose private residences, crops and other
		M	M	M	M	M	
		With mitigation					
		M	L	M	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
equipment will potentially also increase dust and noise pollution that could result in impacts on the 'sense of place' for surrounding landowners.							infrastructure could be affected by dust, noise, blasting and other impacts that result from traffic movement and the mining activities. Implement and increase security measures to restrain the unauthorised movement of cattle and trespassers. Access and haul roads must be regularly graded.
The proposed project will have the following positive impacts during the operational phase within the Steve Tshwete Local Municipality and Nkangala District i.e. full-time and temporary employment of locals (SMME's and contractors) and a subsequent increase in spending power; positive impacts for the retail market as employees would obtain most of their basic needs from the nearest economic centres, such as Witbank and Middleburg; local procurement of material and goods; the local community would benefit through the implementation of SLP goals; and there will be an increase in the Municipal fiscal through rates and taxes.	Socio-economic	Without mitigation					Ensure that all relevant statutory requirements regulating employment and procurement within the mining industry are adhered to. Ensure that policies drafted by the mine to improve effective employment and procurement are adhered to.
		L	M	M	M	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
Backfilling of the mined out underground workings for stability of the strata overlying the proposed No. 4 Seam workings							
Activities involved with the establishment and operation of the backfilling of the No. 2 coal seam will include the sitting and pegging of the drilling site, establishment of access roads, transportation of the backfilling material, drilling of the boreholes and pumping of the backfilling material into the No. 2 coal seam workings and rehabilitation of the drilling sites once backfilling is complete.							
During the No. 2 coal seam backfilling operation, soils and natural vegetation will be stripped and removed to create access to the backfilling sites. The transportation and pumping of backfill material into the No. 2 workings, if not undertaken properly may spill through leaking or burst pipes and blockage of the boreholes, which will result in the contamination of the surrounding soils (including the nearby wetland soils). Based on the soil survey conducted, the proposed backfilling sites soils (Avalon and Hutton soils) with arable land capability may be affected by the backfilling operations. The above also has a potential to render the area not suitable for the continuation of the current land uses (crop cultivation and wilderness), hence	Natural Vegetation	Without mitigation					Ensure that the removed topsoils are protected from leaching, erosion and contamination. Ensure that the stockpiled soils are properly used after the completion of the backfilling operation. Ensure that the area of disturbance is limited to be as small as possible. Ensure that sensitive areas within the access road route and in the close proximity of the backfilling sites are protected from the proposed operation.
		L	H	S	M	M	
		With mitigation					
		L	M	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
having direct impacts on the landowners.							
The use of vehicles during the siting, pegging and drilling of the boreholes to be used for the backfilling may result in the spillages of hydrocarbon liquids from the vehicles. The material removed from the drilling exercises will contain carbonaceous material, which has a potential for pollution. The above material, if not properly managed, may result in the contamination of the surrounding soils and vegetation cover, which may render the land not usable after the backfilling operation.	Natural Vegetation and Soils	Without mitigation					Ensure that establishment of drilling sites are done in such a manner that the environment is protected from probable spillages and contamination by carbonaceous material.
		L	M	S	M	M	
		With mitigation					
		L	M	S	L	L	
Since the backfilling operations is situated in close proximity of an area identified as a seasonal/temporary wetland zone, the backfilling operation may result in the transformation or removal of remaining natural (wetland) vegetation. This may result from the construction activities, release of carbonaceous drilling waste and hydrocarbon liquids from vehicles used and machinery used. Further to the above the construction and use of the	Natural Vegetation	Without mitigation					The backfilling operation has been designed such that all affected wetland areas are marked and no backfilling operation will be allowed within these areas. Existing roads will be used for accessing the backfilling sites. Arrangement will be made with the landowners where land not belonging to Anglo Operations (Pty) Limited will be used.
		L	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
access road to the backfilling site will be crossing a number of areas identified as wetlands, hence destruction of these areas is possible, which may lead to the loss of wetland habitat.							
Animal burrows and habitats will be destroyed by the preparation of the backfilling sites. This will further result in the migration of animals away from these areas of disturbance. It must however be noted that no significant amount of animal life exist due to the agricultural activities currently undertaken at the proposed backfilling sites.	Animal Life	Without mitigation					The rehabilitation of the disturbed areas must be conducted such that the rehabilitated areas will encourage the migration of animals back into the rehabilitated areas. Since crossing of wetlands and stream will result from the construction/upgrade of the roads, maintenance of access to water resources for ground dwelling organisms should be considered.
		M	L	S	L	L	
The backfilling operations, including the transportation of the backfilling material may result in the generation of surface water runoff contaminated with silt (sedimentation) and possibly backfilling material should spillages occur. The sedimentation and possible contamination with backfill material will have negative impacts on the stream and their wetland area. These will cause an increase in the turbidity and will decrease acidity of the water in the streams, which will affect the	Surface Water	Without mitigation					The roads must be constructed to have berms. The berms will be used as diversion structures. The berms must be constructed such that any exit point for the water will have silt traps that will settle the silt from the construction of the roads before water report to the clean water environment. Where streams will be crossed, no concrete mixing and vehicle maintenance will be allowed. All hydrocarbons will be stored on protected storage areas away from the streams.
		L	M	S	M	M	
		With mitigation					
		L	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
aquatic habitat of the wetland, hence important habitats may be lost.							No construction of roads will be allowed within any 1:100 year flood line or a distance of hundred meters from the edge of a watercourse, unless relevant authorisations are obtained.
The backfilling operations will require the drilling of boreholes and pumping of backfilling mixture into the mined out and probably flooded underground workings. The boreholes may result in the drawdown, which may affect the yield to the surrounding groundwater users. Material used for backfilling may leach pollutants that will result in the pollution of the surrounding groundwater regime. This may even spread beyond the backfilling site via plume migration.	Groundwater	Without mitigation					Monitor static groundwater levels on a quarterly basis in all boreholes within a zone of one kilometre surrounding the mine. If it can be proven that the mine is indeed affecting the quantity and quality of groundwater available to users and surrounding water resources, the affected parties should be compensated. If pollution is noted from the site, measures to address pollution must be investigated and where applicable implemented. The numerical model should be updated during operation of the mine to determine the extent of pollution from the backfilling sites.
		M	L	P	M	M	
		With mitigation					
		M	L	P	L	L	
Some of the proposed backfilling sites were sited in close proximity to seasonal/temporary wetland areas, which are considered a sensitive landscape	Sensitive Landscapes	Without Mitigation					The backfilling operation has been designed such that all affected wetland areas are marked, no backfilling operation
		S	L	S	M	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
due to the delineated wetland areas. The backfilling operations may, if not undertaken properly, result in the destruction of these wetland areas. This may further result in the functionality of the wetland area being affected. The wetlands will be impacted through change in water quality due to dust and sediment entering the system and the disturbance of the banks of the wetland areas. Further, the loss of habitat and biota will also take place.		With Mitigation					will be allowed within these areas. Existing roads will be used for accessing the backfilling sites. Ensure that storm water is managed as determined under surface water
		S	L	S	L	L	
The backfilling operation will require a significant number of vehicular movement for the transportation of the backfilling material to the backfilling sites. This will result in the generation of dust by truck travelling over the constructed access roads. Generated dust will migrate towards the predominant wind direction and may settle on surrounding properties including nearby vegetation.	Air Quality	Without mitigation					Dust suppression must be conducted during the construction and operation of the roads. Water carts will be used for the suppression of the dust on the roads.
		M	M	S	M	M	
		With mitigation					
		M	L	S	L	L	
Noise generated from backfilling operations activities may add to the current noise levels. This may have impacts on surrounding property owners	Noise	Without mitigation					The mine vehicles used during the underground backfilling operation must be well maintained and measures should be implemented by the mine to ensure that the noise generated
		S	L	S	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
and occupiers.							from the mine machinery is lowered.
Transportation of the backfill for underground distribution will result in road safety and intrusion impacts for the Kwamabone settlement and the Honeybourne farmstead.	Socio economic aspects	Without Mitigation					Ensure that all safety measures (EMPr) are implemented to prevent the impacts on the community Ensure that all measures (EMPr) that are meant for mitigation against the intrusion impacts are implemented.
		S	M	S	M	M	
		With Mitigation					
		S	L	S	L	L	
Operation and maintenance of the Hope No. 4 Seam Project access shaft, overburden stockpiles, topsoil stockpiles, roads and shaft complex surface infrastructure i.e. storm water management structures, domestic and service water supply and mine water removal infrastructure, power supply infrastructure, conveyor belt system, guard house, batching plant, stone dust silo, workshop and administration buildings							
The presence of the shaft and box cut will result in all existing productive soil functions having to cease completely at the decline shaft footprint until the footprint is rehabilitated. In addition to the above, the overburden stockpile and topsoil stockpile or	Soils	Without mitigation					The footprint of the shaft and box cut and size of the overburden stockpile, topsoil stockpile or berms will be contained as far as possible and the shaft/box cut will be rehabilitated and stockpiles/berms will be removed as soon
		S	H	M	M	M	
		With mitigation					

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
berms will cover the natural productive soil surface, which result in all productive soil functions underneath the overburden stockpile and topsoil stockpile or berms having to cease completely. The weight of the stockpiled material will also cause soil compaction.		S	H	M	M	M	as possible.
The presence of the shaft, box cut, overburden and topsoil stockpiles and associated infrastructure will result in the current arable and grazing land capability and current land uses at the structure footprints ceasing completely until the structures are removed and the footprints rehabilitated.	Land Use and Capability	Without mitigation					The footprint of the shaft and box cut and size of the overburden stockpile, topsoil stockpile or berms will be contained as far as possible and the shaft/box cut will be rehabilitated and stockpiles/berms will be removed as soon as possible.
		S	H	M	M	M	
		With mitigation					
		S	H	M	M	M	
During the operational phase storm water generated from the access shaft complex and surrounding areas must be considered as dirty and must hence be collected in the dirty water system. This water would have contributed to the flow in the Hope Spruit catchment. The impounding of this water will result in a reduction in the yield of the catchment. This may also result in the desiccation within the surrounding wetlands, which will result in	Surface Water	Without mitigation					As is best practice, dirty areas should be minimised. This will have the dual benefit of smaller dirty water management systems and reduction in catchment yield loss. All clean water from upslope of the shaft complex should be diverted around the complex.
		S	L	L	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
the loss of the wetland habitat.							
The presence of contaminated areas at the floor of the access shaft box cut (including the dirty water sump), batching plant site and the overland conveyor transfer points will create potential for the release of contaminated water into the natural environment especially during transportation of this dirty water. Release of this water will result in the contamination of the nearby Hope Spruit, which may ultimately result in the loss of the habitat within the affected surface water resource. These impacts will be severe if discharges occur due to negligence and mismanagement during high storm water events.	Surface Water	Without mitigation					The access shaft complex, including the dirty water sump and storm water management structures will be operated to be in compliance with the requirements of the GN704. Water re-use from the dirty water sump should be maximised.
		M	L	L	M	M	
		With mitigation					
		S	L	S	L	L	
Oil, diesel and chemical spills/leaks from machinery and storage facilities and the sewage waste from the guard house may have an impact on the surrounding groundwater.	Groundwater	Without mitigation					The mine must ensure that a credible company removes used oil after vehicle servicing. A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills. Store all potential sources in secure facilities with appropriate storm water management, ensuring
		S	L	M	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
							contaminants are not released into the environment. Sewage effluent emanating from latrines or ablution blocks will be collected in conversancy tanks. When tanks are full, the waste will be collected to a permitted sweater treatment plant. A French drain will be used for the collection and treatment of sewage waste from underground ablution facilities.
The shaft complex will have overburden and topsoil stockpiles, which may be characterised by bare soil, steep side slopes that generate significant surface runoff. Runoff from these stockpiles is likely to be sediment rich. Where runoff from these stockpiles enters adjacent wetlands, sediment will be deposited and changes in wetland vegetation are likely to occur. This may ultimately result in the loss of the wetland habitat.	Sensitive Landscapes	Without mitigation					Runoff from overburden and topsoil stockpiles should enter a sediment trap prior to discharge to the environment. Overburden and topsoil stockpiles should ideally be vegetated to stabilise slopes and minimise sediment loss.
		S	M	M	M	M	
		With mitigation					
		S	L	M	L	L	
The overland conveyor belt, dirty water pipeline and re-routed power line together with their service roads will, over the life of the project, occur within the affected wetlands. Spillage of coal and dirty water and encroaching into the undisturbed	Sensitive Landscapes	Without Mitigation					Operate the conveyor belt and water pipeline as per design specification, which was undertaken to ensure protection of the affected wetlands. Monitor the stretch of the conveyor belt and water pipeline
		S	H	M	M	M	
		With Mitigation					

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
remaining wetlands during regular maintenance will be result in the pollution of the wetlands and disturbance of the affected wetland systems.		S	L	M	L	L	for spillages and where such spillages occur, the area should be cleaned as soon as possible. Ensure that remaining wetland areas are demarcated as no go zones and all mine vehicles should be restricted to the service roads.
During the operation of the shaft complex, activities such as transportation of coal via the conveyor belt, operation of the shaft portal, operation of the ventilation fans and the use of the roads for accessing the shaft complex will be sources for the generation of ambient noises. According to the noise modelling, the noise levels generated from the shaft complex will exceed the SANS 10103 Rating Level (outdoor) during day time at the mine offices and during night time at the Mahlathini informal settlement.	Noise	Without mitigation					Construct berms or barriers shielding the affected receptors from the noise sources. Ensure that proper management measures as well as technical changes are undertaken to reduce the impacts on surrounding employees and communities.
		M	H	M	M	M	
		With mitigation					
		S	L	M	L	L	
During the operation of the shaft complex, material handling (coal conveyance and conveyor tipping points), crushing and screening (within the conveyor belt) and ventilation of the underground workings will be undertaken. In addition to the above, wind	Air Quality	Without mitigation					Ensure that source and receptor based performance indicators for routine operations at Goedehoop Colliery Hope No. 4 Seam project area are set and assessment done against such indicators.
		M	H	M	M	M	
		With mitigation					

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
blowing over open spaces and movement of vehicles along the created unpaved roads will result in significant air pollutants emissions, which will include total suspended particulates (tsp), particulate matter with an aerodynamic diameter of less than 2.5 micron ($PM_{2.5}$) and particulate matter with an aerodynamic diameter of less than 10 micron PM_{10}). According to the air dispersion model undertaken for the proposed project, the simulated TSP, PM_{10} and $PM_{2.5}$ ground level concentrations as a result of the above-mentioned operations are presented in Figure 53, Figure 54 and Figure 55. Based on the above simulations, with the exception of the PM_{10} impacts on the existing site offices, the simulated $PM_{2.5}$ and PM_{10} impacts onsite and directly offsite due to proposed shaft complex operations are within the NAAQS, EC limits and standards and the Anglo Operations (Pty) Limited internal targets. The simulated dust fall impacts directly offsite due to the proposed shaft complex operation are within the NDCR for both residential and non-residential areas. All the receptors, both offsite and onsite, do		M	H	M	L	L	Enforce record-keeping, environmental reporting and community liaison on matters relating to the impacts on air quality.

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
not exceed the NDCR maximum daily dust fall rate of 600 mg/m²/day nor the non-residential NDCR maximum daily dust fall rate of 1200 mg/m²/day.							
The activities during the construction of the shaft may be visible from the nearby roads and properties. These areas may have effects on the property owners and users. The project components will exert a high visual impact within the 1 000 m zone. The view shed analysis (Figure 50 and Figure 51) indicates that the components of the proposed development will be visible beyond the 10 000 m zone. However, due to topography, visibility for the most part is restricted to 5-8 km within only patches extending beyond 10 km. Critical viewpoints such as the main roads (R 35, R 542 and the R 544), nearby human settlements (Komati Village and Mahlatini informal settlement) and nearby farmsteads may be affected by the proposed construction activities.	Visual Aspects	Without mitigation					Ensure that any earthworks and landscaping are conducted to reduce the visual impacts. Ensure that colour/texture and scale are also used in reducing the visual impacts. The buildings must be designed and constructed to have shapes that will reduce visual impacts. Ensure that lighting is conducted in a manner that will reduce the impacts on visual aspects at night times.
		M	M	S	M	M	
		With mitigation					
		M	M	M	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
Possible influx of job seekers may flock into the operational site. This may result in the following impacts i.e. conflict between locals and 'outsiders' if an outside labour force receives preference; conflict due to cultural differences and impacts on social networks; provision of accommodation for workers could become an economic and social burden for the mine and the Municipalities; unwanted pregnancies and an increase in HIV/AIDS and other sexually transmitted diseases may result, thereby placing more pressure on health care facilities; an increase of single-headed households without a main income provider and pressure on health care, social grants and infrastructure and safety and security issues for the surrounding communities due to an influx of 'jobless' people.	Socio-economic Aspects	Without mitigation					Take care not to create unrealistic expectations and communicate detail of the workforce requirement to local communities and inform them that few new positions will be created. Involve the Local Councillors in the process to ensure that they convey the information to the local communities through their established means of communication (community meetings, etc.).
		M	M	M	M	M	
		With mitigation					
		M	M	M	M	M	
The shaft complex will be situated in close proximity to one site of cultural and heritage importance i.e. one grave. Activities around the shaft complex may encroach into the identified grave site and may result in the destruction of the grave site.	Sites of Archaeological and Cultural Importance	S	M	S	H	M	Ensure that the established shaft complex is always kept away from the identified grave site and that the fifty meter buffer zone is maintained. The grave site must be made accessible to the descendants.

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
OPERATIONAL PHASE							
							The fencing used to demarcate the grave will be well maintained.

6.4.1.3 Decommissioning and Closure Phases

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
Decommissioning of underground workings, removal of infrastructure, backfilling/sealing of shaft and rehabilitation of disturbed sites							
The removal of the shaft infrastructure and rehabilitation of the disturbed areas will result in the reinstatement of the pre-mining topographical patterns, which will have a positive impact on the local environment.	Topography	Positive impact					Ensure that the area is rehabilitated in accordance to an approved rehabilitation plan. See description of the rehabilitation plan and management actions in the EMPr.
The rehabilitation of the shaft/box cut, overburden and topsoil stockpiles/berms and associated infrastructure will result in the soil productivity and land capability being restored. This will also result in the resumption of the use of the land since the infrastructure would have been removed.	Soils, Land Capability and Land Use	Positive impact					The overburden material and topsoil will be replaced at the incline shaft complex footprint as per rehabilitation plan stipulated by the soil specialist. A post-mining soil depth and land capability evaluation by a soil specialist registered at the Council for Natural Scientific Professions (SACNASP) must be undertaken in order to map the final post-mining land capability which will be used for final post mining land uses and closure purposes.
During the demolishing of the surface	Soils	Without mitigation					Ensure that rehabilitation is conducted in accordance with a

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
infrastructure, potential exist for compaction and contamination of the soils from the use of heavy vehicles. Hydrocarbon spillages from the mine machinery will also result in the pollution of the soils, which may not be usable after mining.		S	L	S	M	M	rehabilitation method statement approved by mine management. See description of the rehabilitation plan and management actions in the EMPr. All vehicles and mine machinery will be maintained to be in good order. Repairs of mine vehicles and machinery will be conducted such that it does not have an impact on the soils used for rehabilitation.
		With mitigation					
		S	L	S	L	L	
The ability of the stockpiled topsoil to support good vegetation cover would have been affected by leaching, possible erosion of the stockpiles and compaction of the stockpiled soils.	Soils/Land Capability	Without mitigation					Ensure that removed topsoil is used during the rehabilitation of the disturbed areas. Ensure that rehabilitation is conducted in accordance with a rehabilitation method statement approved by mine management. See description of the rehabilitation plan and management actions in the EMPr.
		S	M	M	M	M	
		With mitigation					
		S	L	M	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
Positive impacts will result due to the reduction in areas of disturbance and the return of land use and capability of the disturbed areas and making available an area that was covered by the overburden stockpile and access shaft complex for suitable post mining use.	Land Use	Positive impact					Ensure that rehabilitation is conducted in accordance with a rehabilitation method statements approved by the mine management. See description of the rehabilitation plan and management actions in the EMPr. Ensure that contamination of the rehabilitate area by carbonaceous material and hydrocarbon liquids are prevented.
During the decommissioning phase, most impacts will be associated with the removal of surface infrastructure around the shaft complex, the conveyor and pipeline. Haul roads will be removed, as will overburden stockpiles, berms and diversion trenches. The shaft will be sealed before being backfilled. During this process, short-term impacts will be moderate, as heavy earth-moving machinery will disturb large areas. Previously vegetated areas may be disturbed which may increase erosion potential. These short-term impacts will give way to long-term	Natural Vegetation	Without mitigation					The overburden material and topsoil will be replaced at the decline shaft complex footprint as per rehabilitation plan stipulated by the soil and vegetation specialists. See description of the rehabilitation plan and management actions in the EMPr. These areas must be reseeded with the relevant seed mix recommended by a suitably qualified person. Develop and implement a declared weed and invader eradication programme.
		S	M	M	M	M	
		With mitigation					
		S	L	M	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
benefits.							
During the decommissioning and closure phases disused infrastructure will be demolished, stockpiles will be removed for use during rehabilitation, the remaining shaft void will be backfilled, levelled, topsoiled and the area re-seeded. During the process of rehabilitation surface water runoff from the rehabilitation site may have elevated silt load, which may cause pollution of the nearby water environment.	Surface Water	Without mitigation					Ensure that water leaving the site do not have elevated silt load. Ensure that the rehabilitated areas are free draining and that water from these areas are clean.
		M	M	S	M	M	
		With mitigation					
		S	L	S	L	L	
Following the decommissioning of the underground and the cessation of the dewatering, groundwater levels will start to rebound, which can take several decades to be achieved. This estimated rebound time for this mine is about 40 years. According to the modelling conducted, the post mining groundwater water levels, although it may come very close to surface in areas shown in	Groundwater	Without Mitigation					The mining layout for the proposed Hope No. 4 Seam has been reduced to limit the potential for the decanting of the mined out area. In the event that decant from the underground workings occurs, and is not of a quality suitable for downstream users, Goedehoop Colliery will initiate an investigation by a competent person or institution to determine the most appropriate actions to be undertaken, and the positions for such actions to be
		M	L	L	L	L	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
							undertaken, to ensure that the water quality conforms to the downstream users needs. Such actions and methods to be employed will be discussed with the Department of Water and Sanitation to gain their approval prior to implementation. In the event that any water purification activities are to be conducted, these activities and or methods will be based on best available technology at the time of commencement (of the activity), and will continue until such time as a self-sustaining acceptable water quality can be achieved. The incline shafts will be sealed off satisfactorily to ensure that there is no preferential flow patterns to the workings. Monitoring must be continued until a closure certificate is issued. All the monitoring data needs to be collated and analysed on at least an annual basis after closure and included in management reports. This information will also be required by government departments (Department of Water and Sanitation, Department of Environmental Affairs) for compliance and monitoring. If it can be proven that the mine is indeed affecting the quality of groundwater available to users, the affected parties should be compensated. If pollution is noted from the site, measures to address pollution must be investigated and where applicable implemented.

Figure 56, no decanting is predicted due to the impermeable bedrock. The point closest

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
Based on the groundwater modelling, it is estimated that the leachate plume emanating from the Hope No. 4 Seam underground will remain within 100 to 500 metres from the confines of the underground even in the worst case (Figure 57, Figure 58, Figure 59 and Figure 60). However, in the worst case scenario, the Olifants River can be impacted by seepage even in the medium term, which is 10 - 20 years after groundwater levels have reached equilibrium. The affected area in this instance is the most southern section of the mine that is planned to reach as close as 400 meters from the river. Several privately owned boreholes are likely to be affected by the pollution plume.	Groundwater	Without Mitigation					
		L	M	P	H	H	
		With Mitigation					
		L	M	P	L	L	
As this phase will involve additional traffic such as trucks removing materials, significant dust may be generated on the	Air Quality	Without mitigation					Ensure that source and receptor based performance indicators for routine operations at Goedehoop Colliery Hope No. 4 Seam project area are set and assessments done against such
		M	H	M	M	M	

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
areas being rehabilitated and on unpaved roads. The simulated PM_{10} and $PM_{2.5}$ ground level concentrations as a result of the operations have shown with the exception of the PM_{10} impacts on the onsite offices, that the simulated $PM_{2.5}$ and PM_{10} impacts onsite and directly offsite will be within the NAAQS and EC limits, which includes the Anglo Operations (Pty) Limited internal targets. The simulated dust fall impacts directly offsite due to the proposed project are within the NDCR for both residential and non-residential areas. All the receptors, both offsite and onsite, do not exceed the NDCR maximum daily dust fall rate of 600 mg/m²/day nor the non-residential NDCR maximum daily dust fall rate of 1200 mg/m²/day.		With mitigation					indicators. Enforce record-keeping, environmental reporting and community liaison on matters relating to the impacts on air quality Ensure that source specific management measures for Hope No. 4 Seam project are complied with.
		M	H	M	L	L	
Noise will be generated during the	Noise	Without mitigation					Provide employees with ear plugs and employees must be

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
demolishing of surface infrastructure, removal of material by trucks from site and rehabilitation of the disturbed areas by mine machinery. This noise is expected to exceed occupational noise limits and will be short lived.		S	M	S	M	M	instructed to use the ear plugs. Continue implementing the methods decided on from the investigation of the use of white-noise generators instead of tonal reverse alarms on heavy vehicles operating at stockpile areas. Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures.
		With mitigation					
		S	L	S	L	L	
The decommissioning of the shaft complex has a potential to destroy the identified grave site (site 13), which will be contravention of the National Heritage Resources Act (Act 25 of 1999). This will further violate the rights of the diseased descendants. Movement of vehicles outside demarcated areas and other secondary impacts such as dust will impacts negatively on the site.	Sites of Archaeological and Cultural Importance	Without mitigation					The rehabilitation of the shaft complex will be such that the development is always away from the identified grave site (site 13). A buffer will be created between the grave site and the rehabilitation activities. The grave site will be made accessible to the descendants.
		S	H	S	M	M	
		With mitigation					
		S	L	S	L	L	
During the decommissioning of the project, negative impacts associated with large-scale retrenchments, which include flooding of job markets if affected employees are unable to secure new employment; decline in the	Socio-economic Aspects	Without mitigation					Where retrenchments or closure of the operation is imminent, the mine implements a process to ameliorate the social and economic impact on individuals, regions and economies (Goedehoop Colliery, SLP Annual Progress Report, 2013):
		L	M	P	M	M	
		With mitigation					

NATURE OF THE IMPACT	ENVIRONMENTAL ASPECT	IMPACT ASSESSMENT					MITIGATION MEASURES
		E	P	D	I	S	
DECOMMISSIONING AND CLOSURE PHASES							
economic active population if people leave the region resulting in a further decline of the economy of the region; abandonment of infrastructure such as houses; increase in poverty levels; increase in single-headed households without a main income provider and pressure on health care, social grants and infrastructure and safety and security issues for the surrounding communities due to a growth in the number of 'jobless' people, will occur.		L	M	M	L	L	Assessment and counselling services for affected employees. Comprehensive self-employment training programmes. Comprehensive training (non-mining skills) and re-employment programmes. Creation of jobs for local economies. Regeneration of local economies. Accessing the Social Plan Fund. Use the Future Forum, which is in place to identify challenges affecting the mine and to come up with appropriate solutions; and to implement solutions agreed upon by both employer and employee representatives.

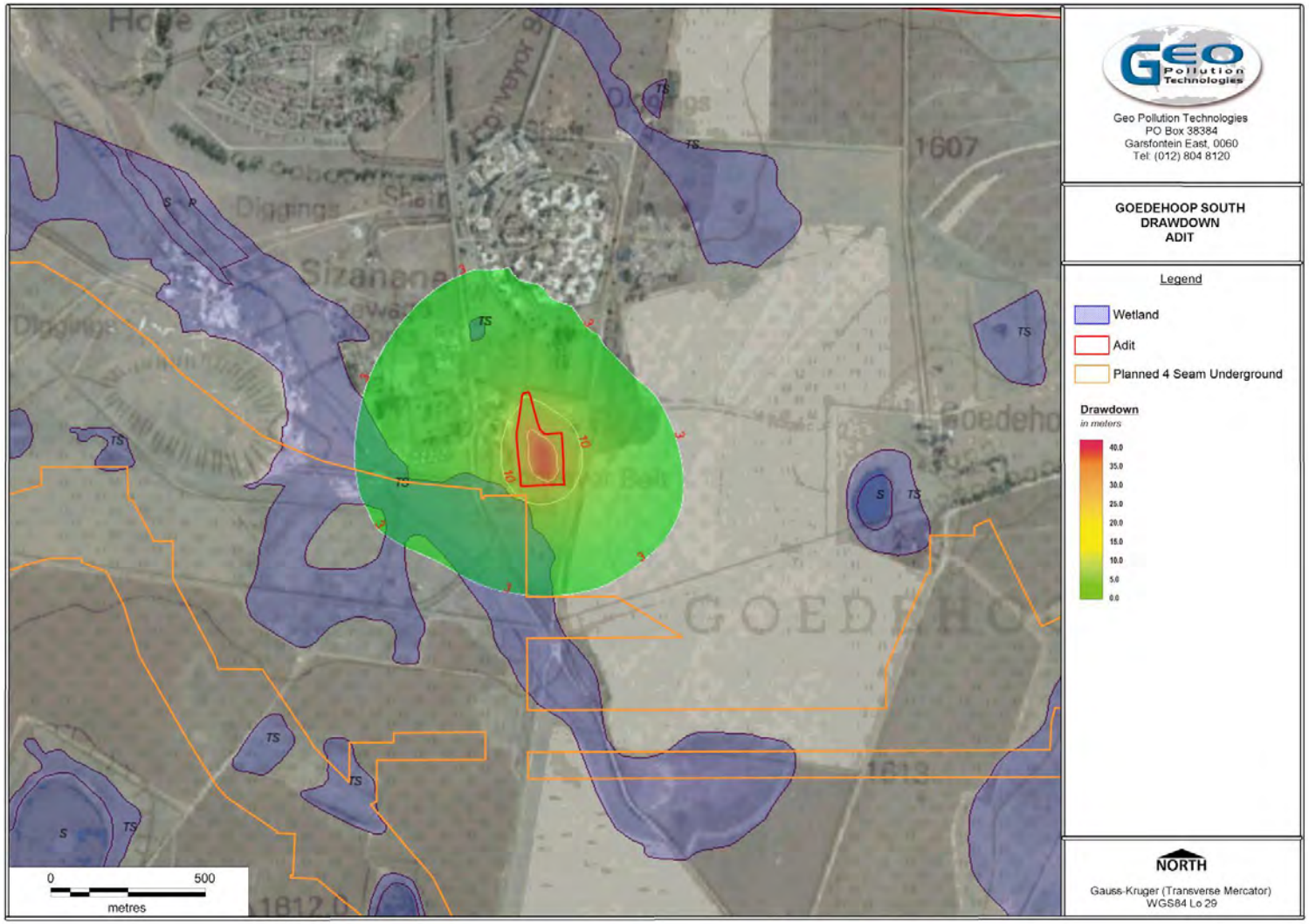

Figure 49: Cone of Depression due to the Access Shaft and Box cut

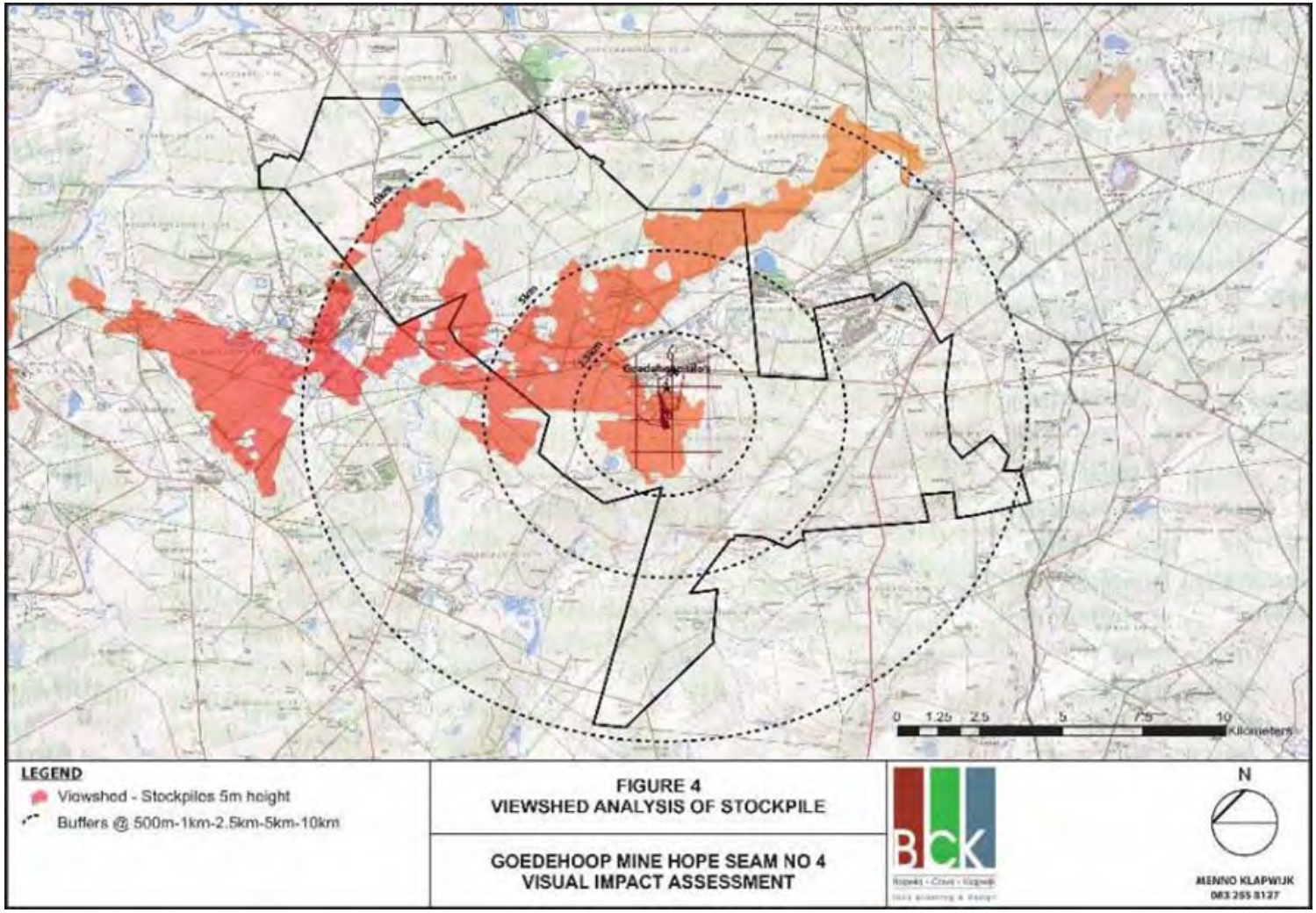

Figure 50: Overburden Stockpile Viewshed

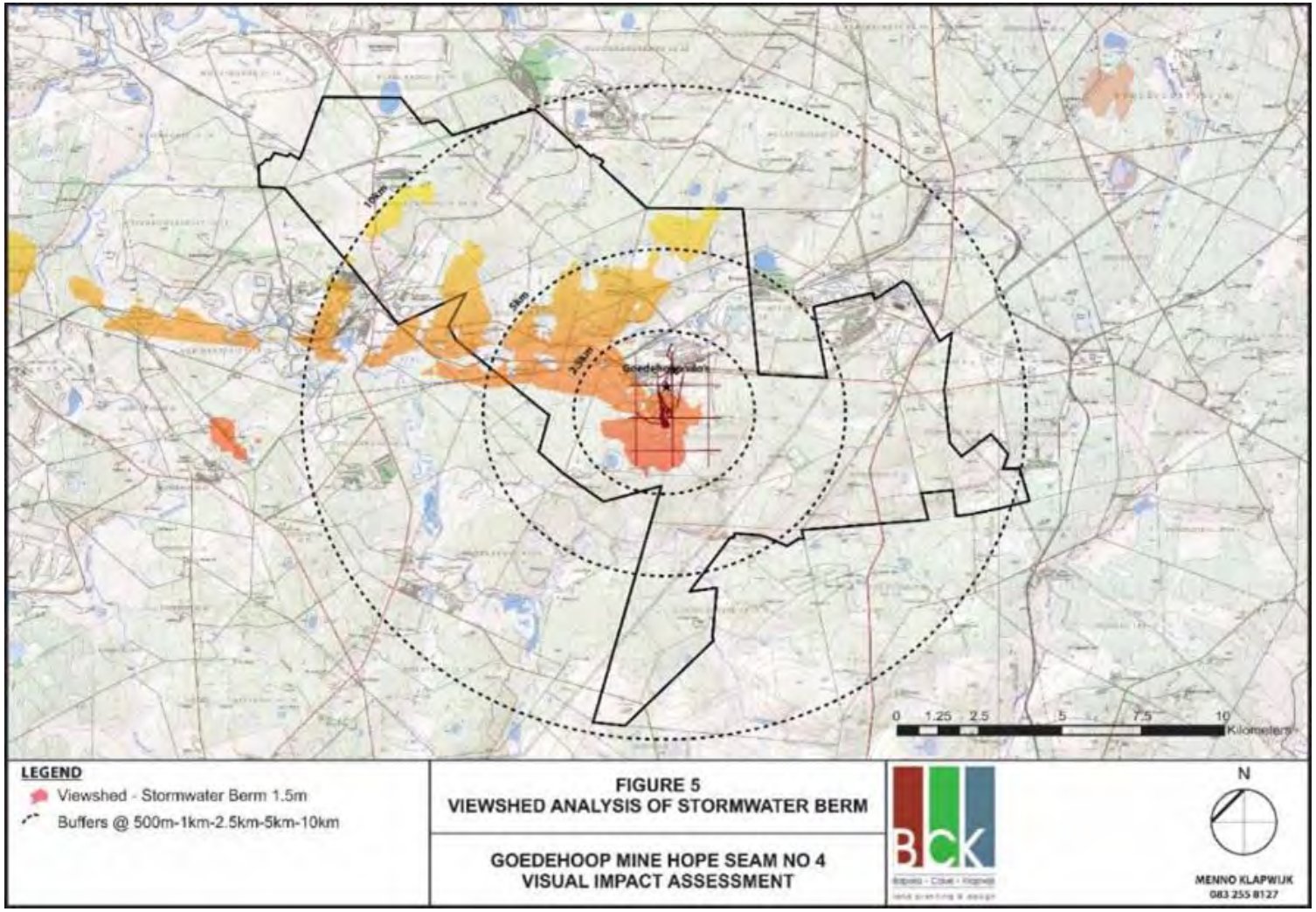

Figure 51: Storm Water Berm Viewshed

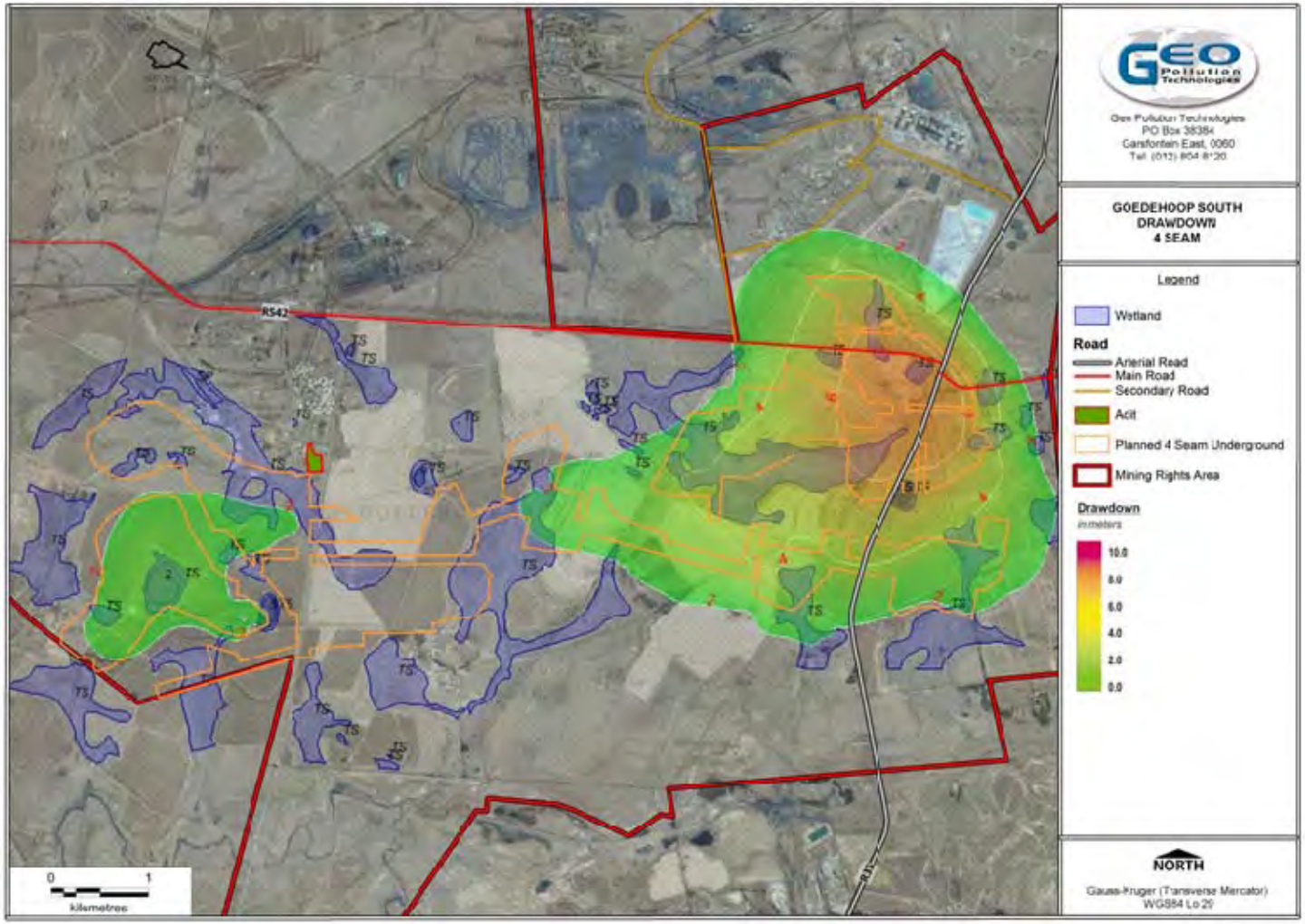

Figure 52: Cone of Depression from Hope No. 4 Seam Underground Mining

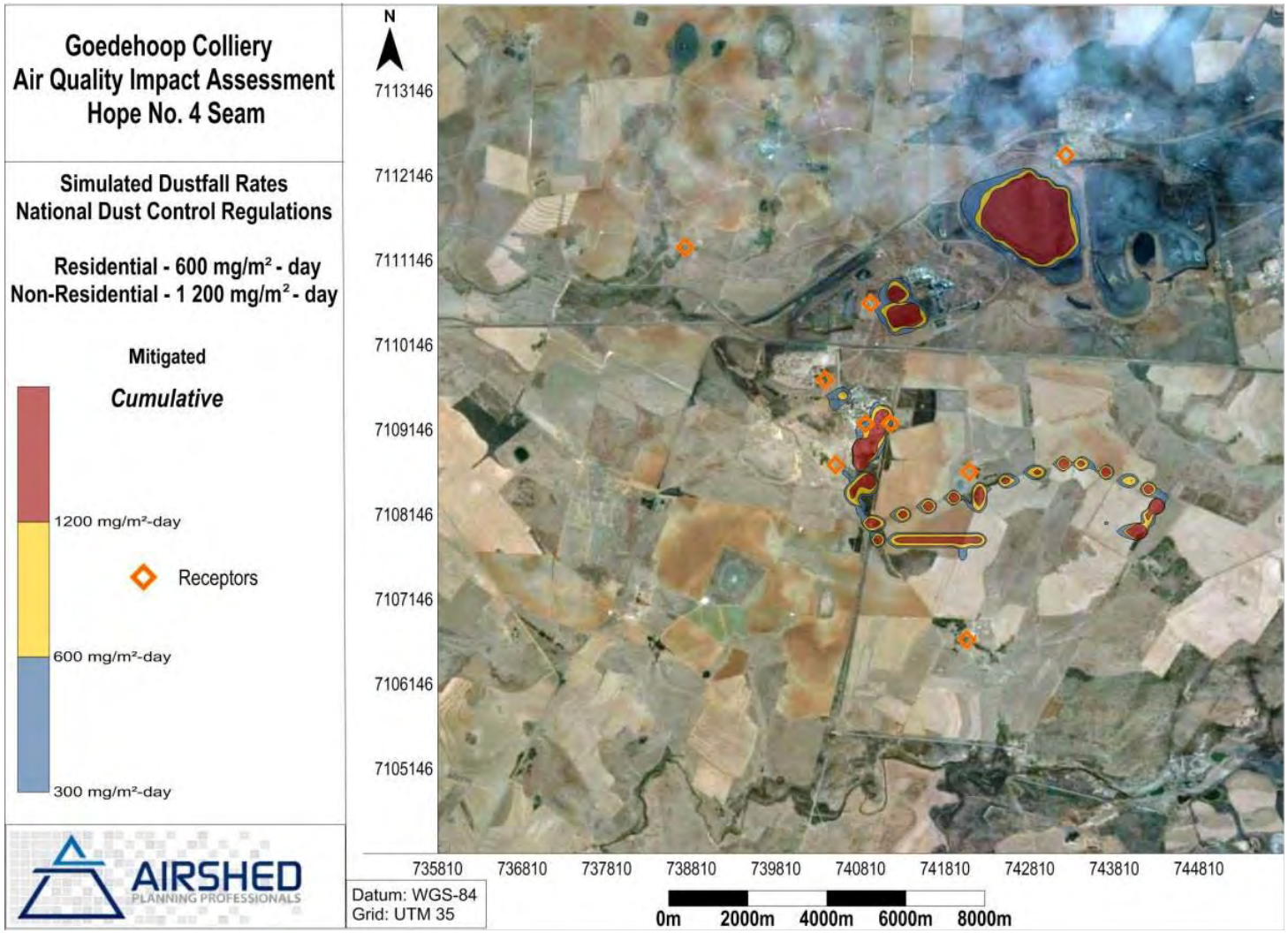

Figure 53: Area of Exceedance of NDCR Fallouts limits - Unmitigated

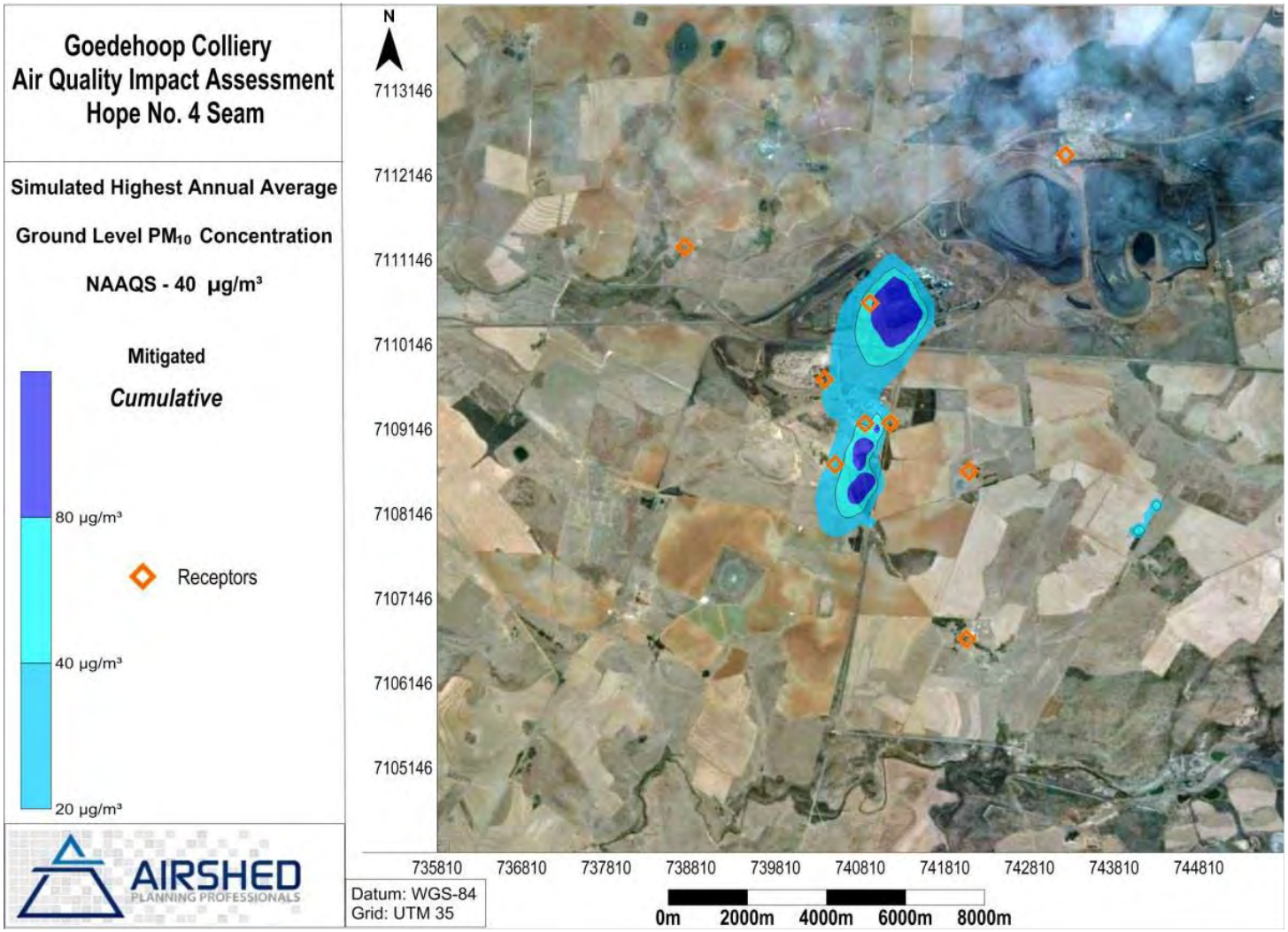

Figure 54: Area of Exceedance of PM10 Annual NAAQS - Unmitigated

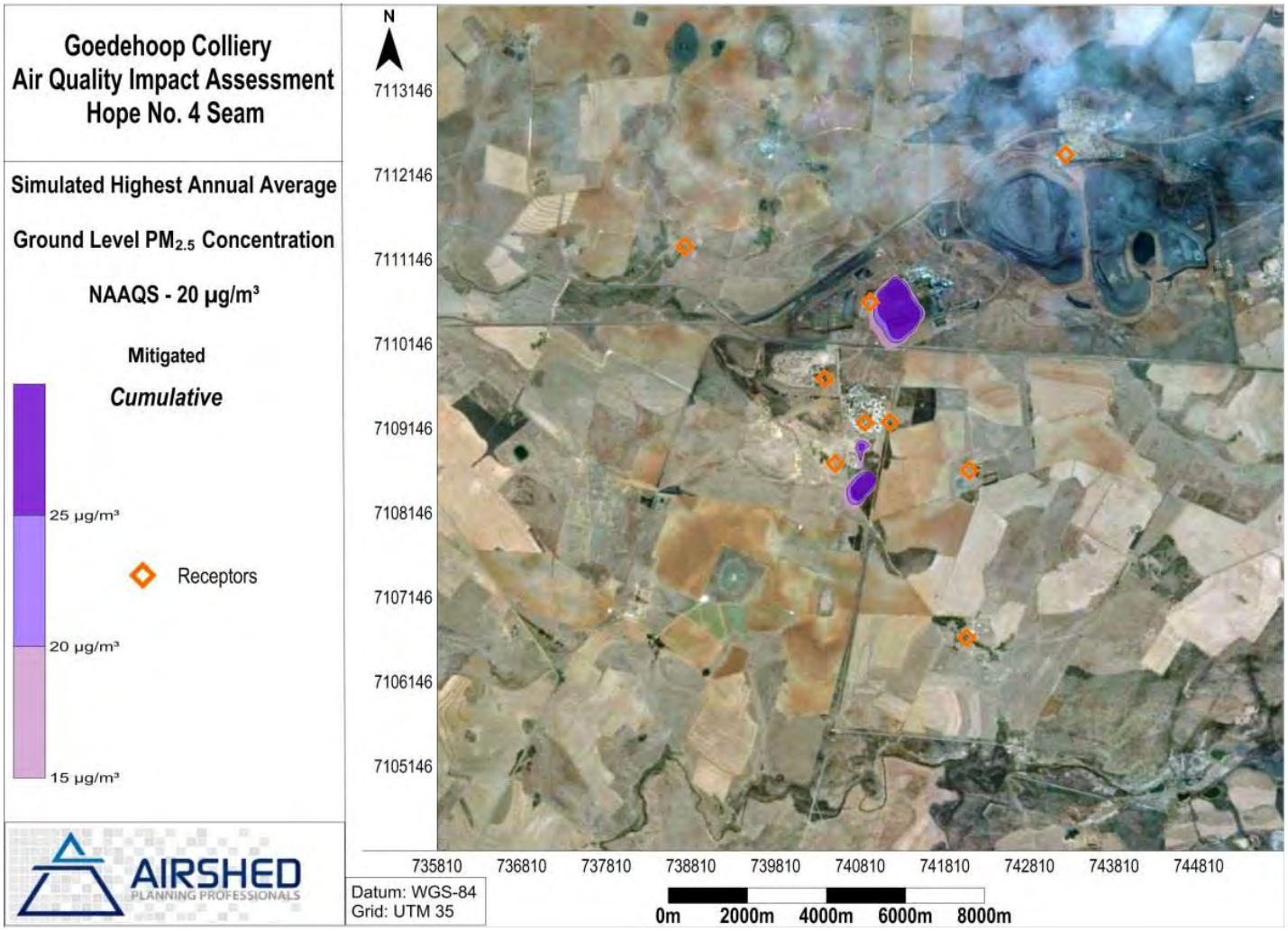

Figure 55: Area of Exceedance of PM2.5 FOE NAAQS - Unmitigated

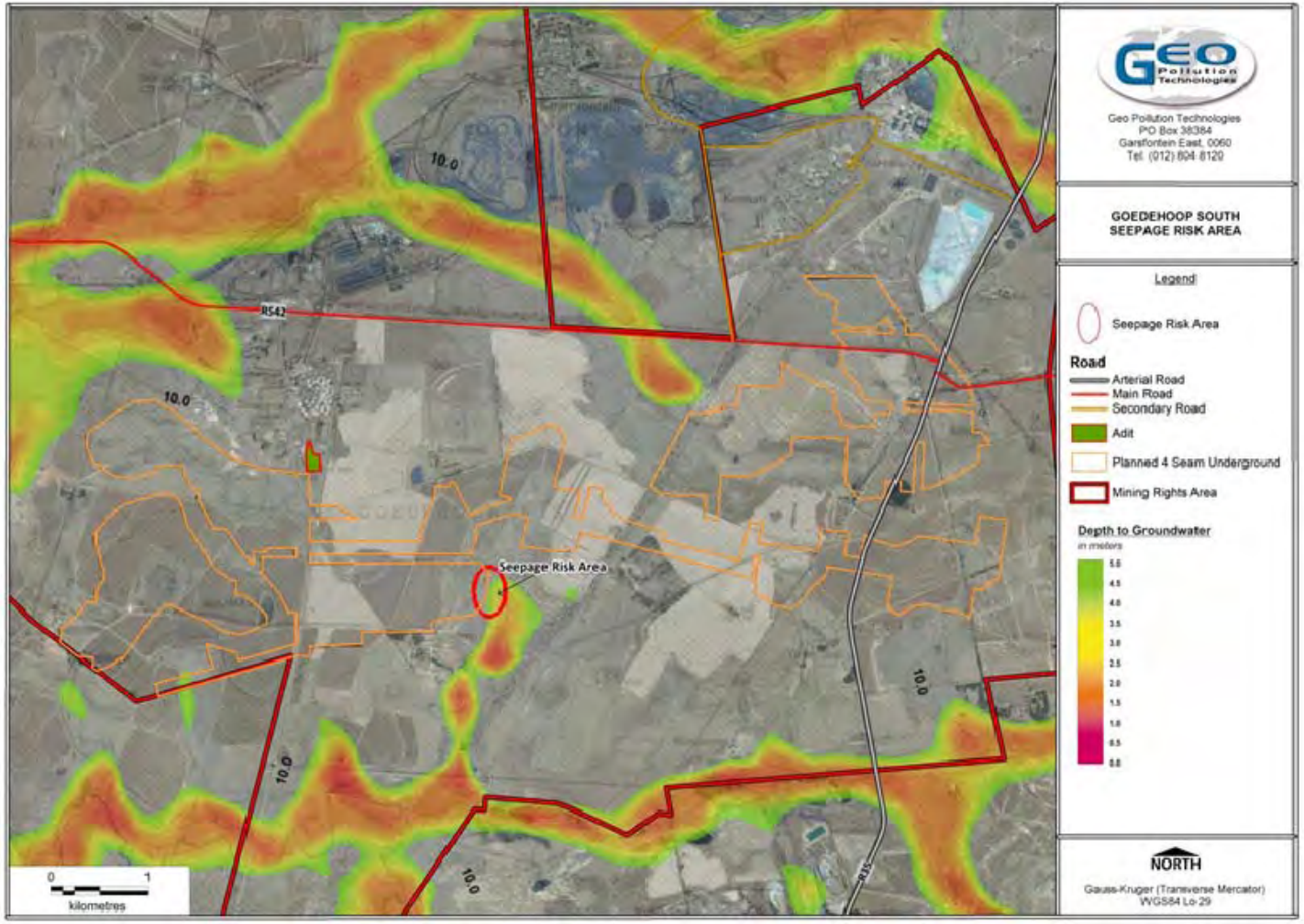

Figure 56: Predicted Groundwater Levels after Mining with possible Seepage Risk Areas

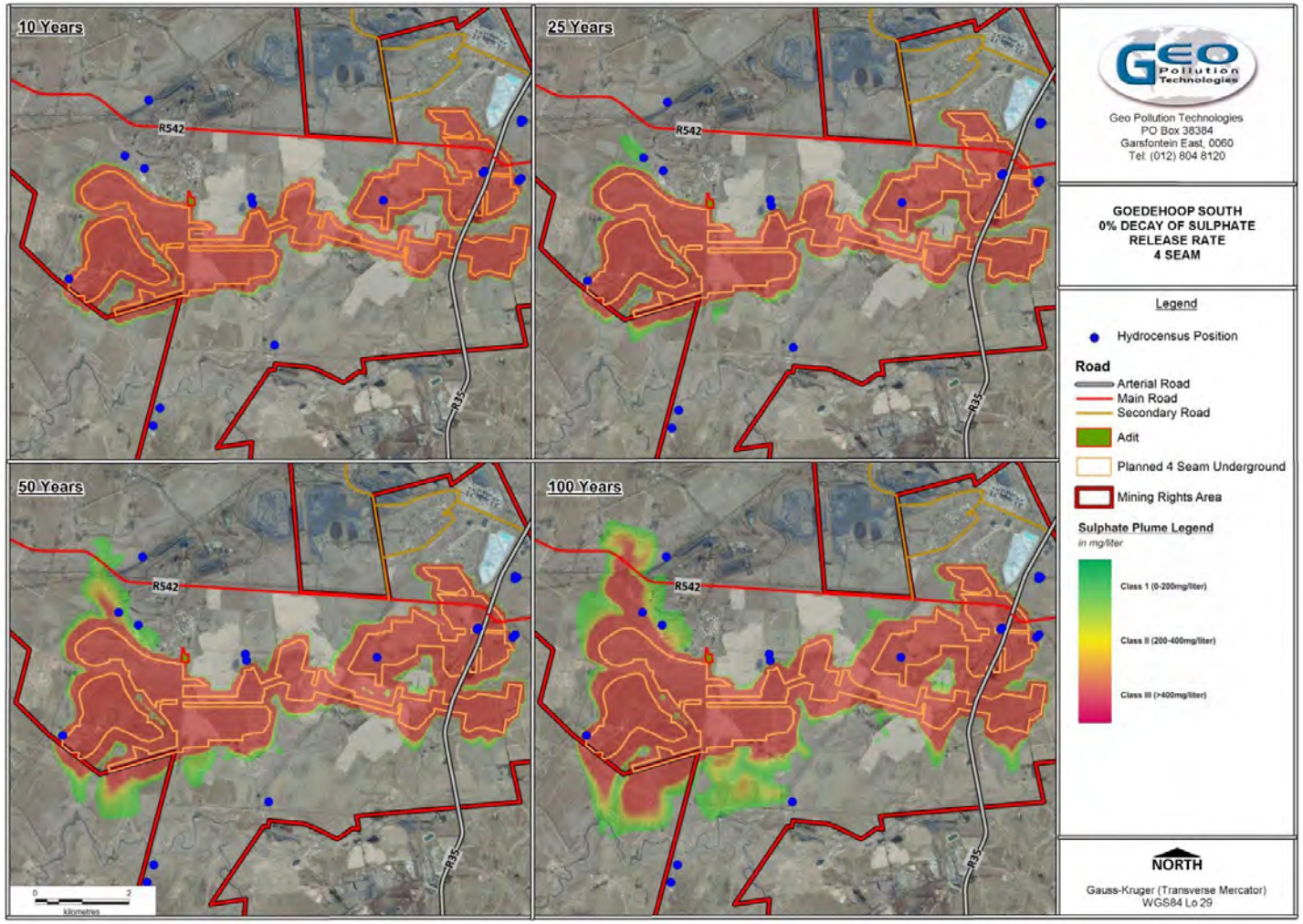

Figure 57: Hope No. 4 Seam Underground Mining Area Predicted Spread of Pollution at 4 Seam, no Sulphate Decay

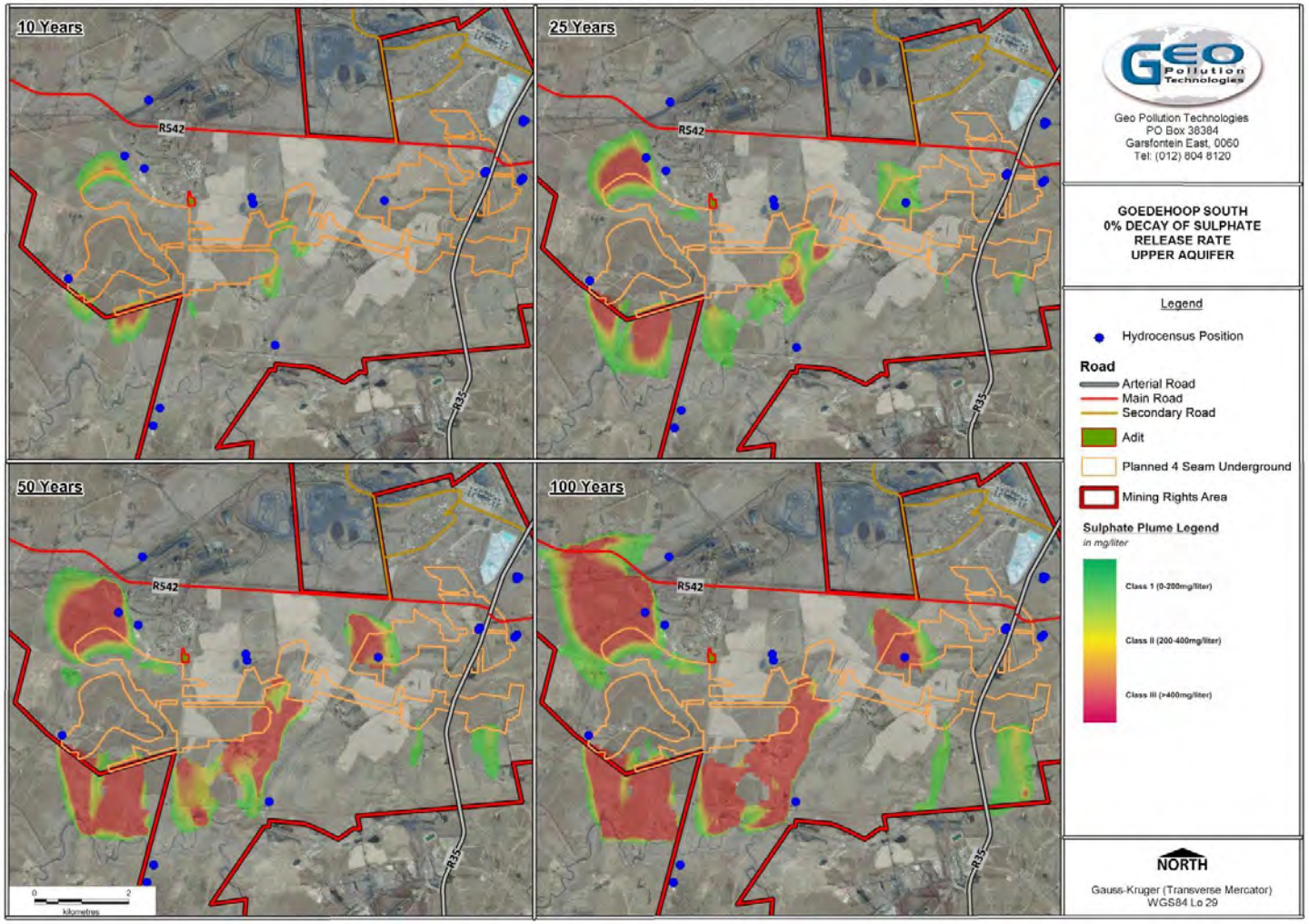

Figure 58: Hope No. 4 Seam Underground Mining Area Predicted Spread of Pollution at the Upper Aquifer, no Sulphate Decay

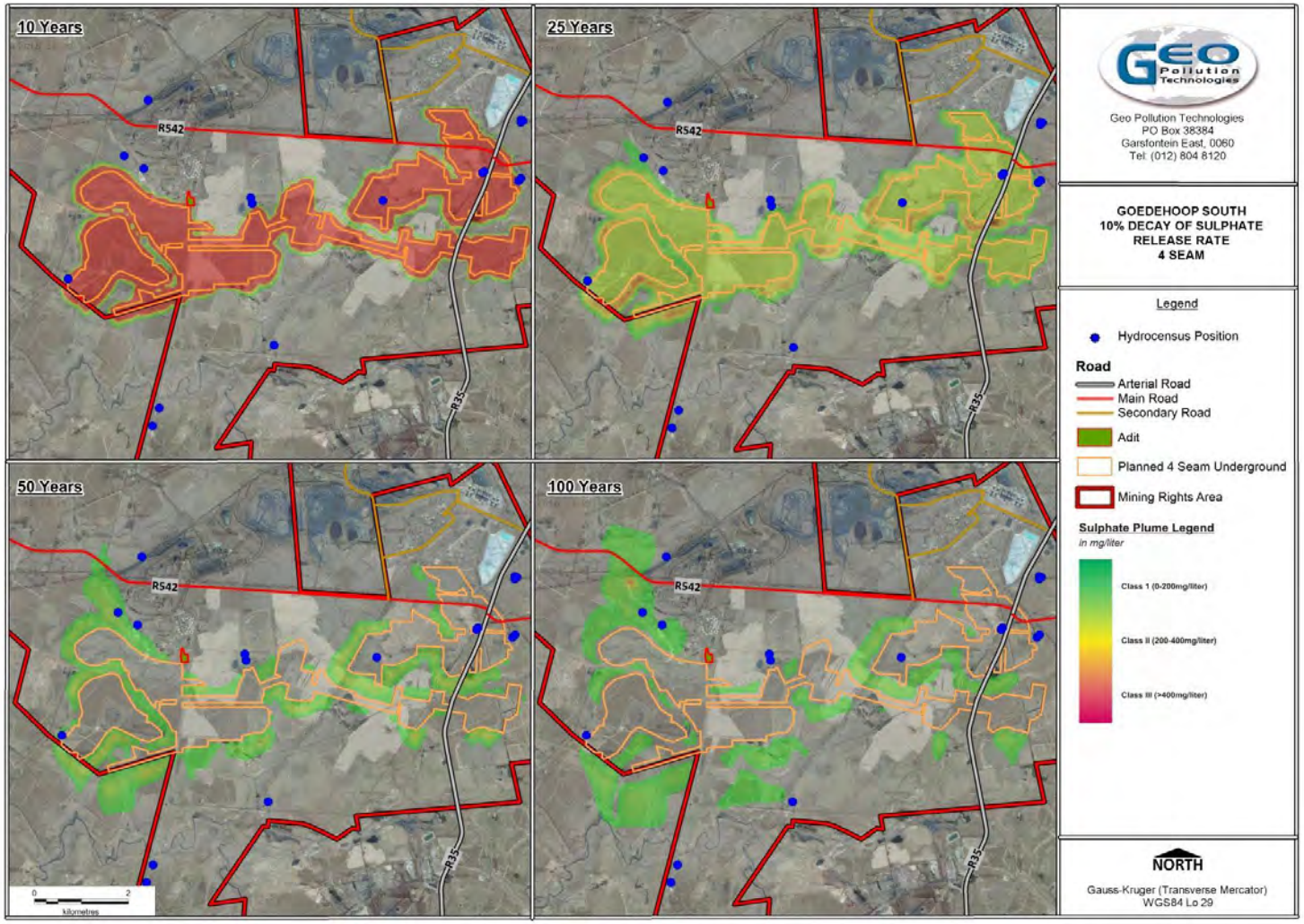

Figure 59: Hope No. 4 Seam Underground Mining Area Predicted Spread of Pollution at 4 Seam, 10% Sulphate Decay

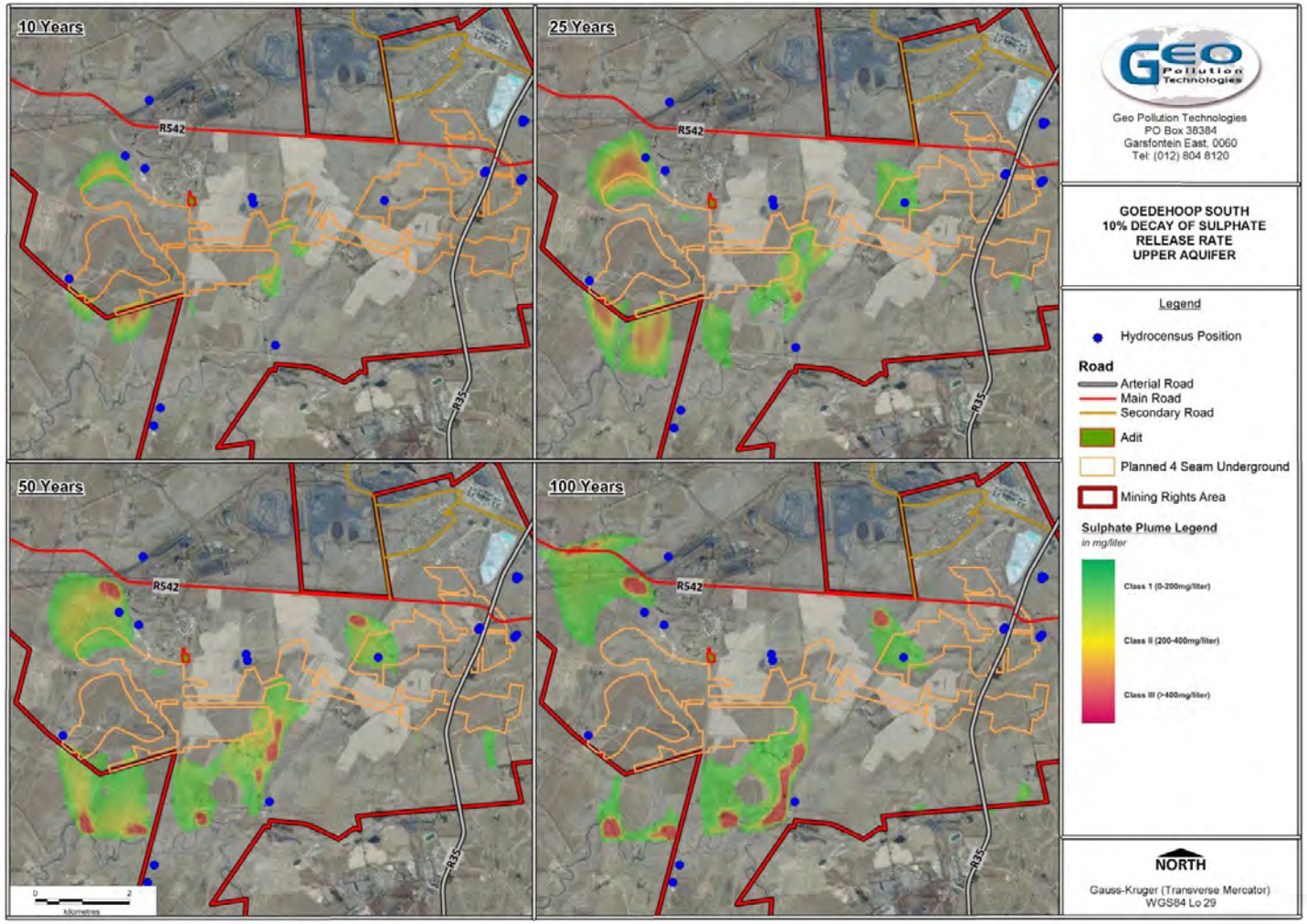

Figure 60: Hope No. 4 Seam Underground Mining Area Predicted Spread of Pollution at the Upper Aquifer, 10% Sulphate Decay

6.5 SUMMARY OF SPECIALIST REPORTS

STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS		SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT	APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED
	ASPECT	RECOMMENDATION		
Soil survey	Rehabilitation	In order to do successful rehabilitation of the decline shaft footprint the procedures in section 7.2.2 to 7.2.5 need to be executed as good as possible.	Included in EIA	Section 6.4.1.1 to section 6.4.1.4
		A post-mining soil depth and land capability evaluation by a soil specialist registered at the Council for Natural Scientific Professions (SACNASP) in order to map the final post-mining land capability which will be used for final post mining land uses and closure purposes.	Included in EIA	Section 6.4.1.3
Vegetation Survey	Loss of Natural Habitat	The most significant way to mitigate the loss of flora habitat is to limit the footprint of the mining process.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		All effort should be made to protect the wetland, rocky and Primary Grassland habitats from unnecessary transformation and degradation.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Habitat fragmentation	All impacts must be limited to the actual site only – no land use changes or otherwise disturbances of animals outside of the study area should be allowed (again, the lesser the size of the footprint area of the mine the smaller the impact on movement of flightless animals).	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Cleared vegetation should be rehabilitated as soon as possible.	Included in the EIA	Section 6.4.1.2 to section 6.4.1.3

	Alien eradication	The eradication of existing alien invasive infestations is of prime importance, the alien trees habitat type has mapped out large infestations that should be removed. Ensuring that alien invasive species are not spread across the Goedehoop mining area must also be of great importance. This will be achieved through following management plans for new developments and the rehabilitation of open areas to avoid these areas being infested.	Not applicable to Hope No. 4 Seam project but forms part of the global EMPR Included in the EIA	Not applicable Section 6.4.1.1 to section 6.4.1.4
	Pollution of environment	A waste management plan should be in place. It should be ensured that no leaching or spillage of any chemical into any natural water system (groundwater or surface water) occurs. It must also be ensured that the transport and storage of all chemicals are done in a manner that no one can gain access to these chemicals. The storage and transportation of diesel, calcine, sulphates, sewage and all other foreign chemical compounds related to the construction and operation (and decommissioning) of the activities related to the project must include safeguards against leaching and spillages. In case of spillage or leaching, immediate clean-up actions and rehabilitation procedures must be followed. Constant monitoring of areas where spillages and leaching might occur could prevent long-term contamination of groundwater and other sensitive areas. Dust suppression of gravel roads (water tankers) should take place. Blasting only during wind still conditions will reduced the translocation of the coal dust and allows it to settle in close to the excavation pit rather than on surrounding habitat.	Partly included in the EIA. Note that Goedehoop Colliery operates under a waste management plan, which Hope No. 4 Seam will be integrated into. Included in the EIA	Section 6.4.1.1 to section 6.4.1.4 Section 6.4.1.1 to section 6.4.1.4
	Impact on Red Data species and sensitive	Ridge Lines are formally protected habitats within Mpumalanga Province. Rocky outcrops are suitable habitat for numerous species. It is also an ecological system that can function independently from an impacted	Not applicable to Hope No. 4 Seam project. This is however include	Not applicable

	areas	surrounding environment. Buffering of ridges from mine infrastructure is suggested around 50m.	in the Global EMPR for Goedehoop Colliery	
		Rivers/wetland/pans are also classified as sensitive ecological systems which are similarly formally protected, at a National Level. Buffers around wetlands, pans and streams should be 100m.	Included in the EIA. Note that where buffer of 100 meters cannot be adhered to exemption under the GN704 were applied for.	Section 6.4.1.1 to section 6.4.1.4
		A sweep of the area should be undertaken by a flora specialist prior to development in order to ensure that any red data species be rescued and relocated.	Red data species were identified at Goedehoop Colliery. No red data species were identified within the Hope No. 4 Seam project area	No red data species identified within the Hope No. 4 Seam project area
Animal Survey	Loss of fauna habitat	Limit the footprint of the mining process within the natural faunal habitat areas remaining. Underground mining is preferred to opencast mining since the impact on surface faunal communities is less (although not wholly insignificant).	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		No go areas include Red Data species habitat like Area 3, 4, 5, 6, 11 and 14 and sensitive areas such as ridges and rivers.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Habitat fragmentation	All linear infrastructure associated with the mine should include “ecological crossing” – areas where animals can safely cross such structures (roads, pipelines, conveyors etc.).	Not applicable. No linear activity will cross ecologically sensitive areas	
		Corridors could be buffered and fenced according to the sensitive area used as a corridor.		
		Restore corridors by removing agricultural land between pans (Area 3 and	No linear activity will	

		7), an ecological crossing at Area 6 and habitat restoration by removing any activities within a corridor in and out of the project area. This specifically refers to ridges and river systems such as the Olifants (Area2, 6 and 13). This will require joint venture, communication through forums.	cross ecologically sensitive areas	
		Excavated trenches must be left open for as short a time as possible to avoid habitat fragmentation. All open excavated trenches must have terminal slopes of less than 45° to allow for animals to crawl out	Included in the EIA	No linear activity will cross ecologically sensitive areas
	The loss of fauna species	Blasting: Heavy mining machinery and blasting operations are expected to cause direct mortality of fossorial (ground-living) animals. Storage of overburden will cause direct mortality by crushing/suffocating fossorial animals. Therefore an ecological audit is recommended prior to the disturbance of specific areas to ensure no Suricate/Mongoose/Gerbil colonies are killed. If found relocation efforts could be applied.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Poaching: Management measures should include punishment of offenders (there must be strong focus on warnings at the mining site). The construction of fences around all areas related to the project where personnel have daily access (construction, operation and decommission) is of the utmost importance. Regular inspection of these fences to ensure the fences' integrity and patrol of the borders and surrounding areas next to the mining area for the presence of snares etc. will limit the impact of poaching and snaring. Communication with farmers whose farms border the operational areas to create awareness of potential poaching problems in the area will assist.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Artificial water surface: Areas of open water must be limited and covered as far as is possible. Medium – and large sized mammals should be denied access to these open water areas by means of electrical fencing. Steep	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4

		slopes of fine, silty soils should be avoided to protect birds drinking from getting stuck and drowning		
		Traffic: Toad fences and amphibian underpasses (pipes under road) inlaid at regular intervals will allow safe passage across the roads (especially important for roads in close proximity to wetlands/ponds/streams). The use of large underpasses or culverts will also allow safe passage of large/ meso-predators throughout the landscape. Warning signage will have to be erected as well as the speed limit reduced to 80km/h in sensitive areas for standard vehicles and 60km/h for heavy vehicles. Rumble strips can also be applied for animals such as owls that are active at nights, car headlights will blind them.	Not applicable to the Hope No. 4 Seam project	
		Monitoring of small mammals could be implemented to monitor the effects of mine activities on small mammal regimes, which are indicative of environmental health. This can take place biannually.	Included in the EMPr	Section of 5 of the EMPr
		In the event that Grass Owls will be impacted on by the development, the Grass Owl Study Group should be contacted for assistance. Christelle Pauw (gosg@webmail.co.za)	Not applicable to Hope No. 4 Seam project	
	Pollution of environment	A waste management plan should be in place. It should be ensured that no leaching or spillage of any chemical into any natural water system (groundwater or surface water) occurs. It must also be ensured that the transport and storage of all chemicals are done in a manner that no animals can gain access to these chemicals. In case of spillage or leaching, immediate clean-up actions and rehabilitation procedures must be followed. Constant monitoring of areas where spillages and leaching might occur could prevent long-term contamination of groundwater and other sensitive areas.	Partly included in the EIA. Note that Goedehoop Colliery operates under a waste management plan, which Hope No. 4 Seam will be integrated into.	Section 6.4.1.1 to section 6.4.1.4

		Dust suppression of gravel roads (water tankers) should take place. Blasting only during windstill conditions will reduced the translocation of the coal dust and allows it to settle in close to the excavation pit rather than on surrounding habitat.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Noise pollution must be kept to the minimum possible levels. Blasting should be restricted to daylight hours when nocturnal animals are not foraging. Orientation of strong direct light sources should be away from the ridge structures and trees/grassland with nesting sites.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Impact on Red Data species and sensitive areas	Rocky outcrops are suitable habitat for an array of species including Red Data reptiles. It is also an ecological system that can function independently from an impacted surrounding environment. Buffering of ridges from mine infrastructure is suggested around 50m.	Not applicable to Hope No. 4 Seam project. This is however include in the Global EMPR for Goedehoop Colliery Included in the EIA.	Not applicable
		Rivers/wetland/pans are also classified as sensitive ecological systems that support many all animal life. Buffers around wetlands, pans and streams should be 100m as the occurrence of Giant Bullfrog is high.	Note that where buffer of 100 meters cannot be adhered to exemption under the GN704 were applied for.	Section 6.4.1.1 to section 6.4.1.4
		Aquatic dependent birds: Red Data birds that require an aquatic habitat can be conserved by avoiding these sensitive areas (No-go areas) or polluting substances escaping into it. The action plan already established by AEWA has the aim to improve the conservation status of the Lesser Flamingo from a “Near Threatened” species to a species of “Least Concern” globally. This aim will be achieved by the following objectives:	No red data species were identified within the Hope No. 4 Seam project area	No red data species identified within the Hope No. 4 Seam project area

		Ensuring that all key breeding and feeding sites are designated as protected areas, Ramsar sites, BirdLife IBAs, and where appropriate, World Heritage Sites;	Not applicable to the Hope No. 4 Seam project area	
		Ensuring that all key breeding and feeding sites are protected and maintained in good ecological condition by identifying the management needs of Lesser Flamingo habitat at key sites and implementing necessary management actions. In some cases this will require maintaining, and restoring where necessary, favourable hydrological conditions and water quality;	Not applicable to the Hope No. 4 Seam project area	
		Ensuring that breeding colonies are not disturbed by planning and zoning;	Not applicable to the Hope No. 4 Seam project area	
		Raising awareness about the conservation needs of the species at national and local level;	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Ensuring that pollution guidelines and legislation at all key sites reflect the sensitivity of the species, particularly to industrial chemicals and heavy metals; and	Not applicable to the Hope No. 4 Seam project area	Not applicable to the Hope No. 4 Seam project area
		Ensuring that collisions with man-made structures, particularly power lines, telephone lines, fences, light masts and guide wires are minimised. Grassland dependant birds: A sweep will be required to specifically determine any nesting sites of Grass Owls in grassland that might be disturbed by the project. Areas where Grass Owl was confirmed need to be avoided. From here relocation strategies could be planned and	Relevant information included in the EIA	Sections 6.4.1.1 to section 6.4.1.4

		implemented if avoidance is not possible. This will require permits for TOPS species. To reduce the level of Grass Owl mortalities due to traffic, a rodent feeding program can be implemented. This will involve the availability of grain around a short owl perch. Rodents will feed on the grain which will attract the owls. These “rodent restaurants” should be strategically placed to lure owl away from roads once all nesting sites/habitat have been determined. The time frame to implement this is between April and July. Furthermore road signage and rumble strips on roads can add to mitigation. These rumble strips can be placed in roads in sequence of three were sensitive areas are entered. Cattle should not be allowed to graze sensitive areas including grasslands that are habitat to Red Data birds. This could be done through educating farmers, cattle grids and fencing.		
Surface Water Survey	Topsoil stripping	Areas that are stripped should be optimised to limit unnecessary stripping. Storm water from upslope of the stripped areas should be diverted around these areas to limit the amount of storm water flowing over from these areas.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		The timing of the topsoil stripping should be optimised to limit the time between stripping and construction. Where practical constraints exist and areas need to left stripped for long periods, contour ploughing or ripping could reduce runoff and hence reduce erosion.	Included in the EIA	Section 6.4.1.1
		Dry season construction is preferable.	Included in the EIA	Section 6.4.1.1
		Hydro seeding of the topsoil stockpile is recommended to speed up vegetation cover. An appropriate seed mix should be designed by a vegetation specialist.	Included in the EIA	Section 6.4.1.1 and section 6.4.1.2

	Construction related pollution	All construction vehicles should be well maintained and inspected for hydrocarbon leaks weekly. Wash bay discharge water should flow through an oil separator. Fuel depots and refuelling areas should be bunded. Chemicals should be stored in a central secure area. Regular toolbox talks on the responsible handling of chemicals should be undertaken.	Included in the EIA Not applicable Not applicable Not applicable Not applicable	Section 6.4.1.1
	Contaminated water discharge	The colliery must have an undertaking to comply with Government Notice 704 of the South African National Water Act. This act limits discharges of contaminated water from mining related activities to less than once in 50 years on average. Contaminated water should be reused or treated to adequate discharge standards prior to release. If the infrastructure is located in the boxcut, then no discharges are possible unless water is pumped to the environment. If the dirty water sump, silt trap and other infrastructure are located on surface, discharges can occur and Government Notice 704 becomes applicable. In both cases, if contaminated areas are present around the perimeter of the boxcut, storm water from these areas should be managed either in the boxcut or routed to a pollution control dam that has been sized and designed in accordance with Government Notice 704 of the National Water Act. Should a legal discharge occur as a result of extreme rainfall conditions, the Koring Spruit Trib 12 should have sufficient capacity to dilute poor quality spillage water. The impacts from extreme rainfall conditions should be low and will last for a short duration. Impacts resulting from negligence or mismanagement could be more severe. The severity of the impacts would be related to the volume and quality of water that is spilled. Impacts relating to small spillages would probably be relatively low to moderate and would be short in duration. Impacts relating to large spillages would be high. The effects would be short to medium term.	Included in the EIA	Section 6.4.1.1 and section 6.4.1.2

		Shallow seepage and contaminated storm water runoff must be collected and routed to a lined pollution control dam. The pollution control dam must be sized and operated in accordance with Government Notice 704 of the South African National Water Act.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		If the pollution control dam is on surface, dam water levels must be constantly monitored. Steps and procedures must be put in place to manage situations where excess water builds up in the pollution control dams.	Not applicable	
		If the pollution control dam is on surface, it must be operated empty as far as practicable and cannot fulfil the same role as water storage dams, unless specifically designed to fulfil both purposes.	Not applicable	
		Water reuse from the pollution control dam should be maximised.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Leaking or burst dirty water pipes	Pipe lines should be subjected to frequent patrols. An efficient system of reporting should be available to allow the immediate tripping of pumps should a leak be found.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		The pipeline could be bunded to allow any leaking water to flow back into the box cut. This will also allow the pipe to be drained for maintenance purposes.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Pressure sensitive technology can detect pipe leaks along the pipeline. The employment of such technology should be investigated.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Loss of catchment yield	As is best practice, dirty areas should be minimised. This will have the dual benefit of smaller dirty water management systems and reduction in catchment yield loss.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4

		The loss of catchment yield due to underground subsistence can be mitigated by preventing subsidence and surface cracking. The underground mining plan should accommodate this.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Coal falling off the conveyor	The conveyor loading facility should have measures in place to prevent overloading the conveyor.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
Groundwater Assessment	Planning stage	As seepage to the Olifants River at the furthest southern section of the mine is the prime groundwater risk, measures to reduce the pressure head at this point should be implemented. This can be accomplished by compartmentalising the underground mine as far as possible. The long thin central section of the mine is especially suited to create such underground plugs at various locations. If executed correctly, this measure could mitigate the risk of seepage to the river in full, and its importance cannot be overemphasized. *This aspect is of crucial to curb the spread of pollution and associated post-mining financial liabilities, that it should be addressed at the planning stage.*	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Operational stage	All openings to the mine (shafts, adits, boreholes) need to be sealed or have adequate berms surrounding the openings to prevent surface water entering.	Included in the EIR and EMPr	Section 5 of the EMPr
		All boreholes should be sealed from the bottom to the top to prevent groundwater entering the hole and feeding into the mine workings.	Included in the EIR and EMPr	Section 5 of the EMPr
		All depressions created by mining need to be profiled for self-drainage of surface water away from the workings.	Included in the EIR and EMPr	Section 5 of the EMPr
		Where significant water ingress cannot be prevented, measures should be put in place to intercept ingress water as close as possible to the source in order that it can be pumped out of the mine before its quality can deteriorate through contact with sulphide minerals.	Included in the EIR and EMPr	Section 5 of the EMPr

		Properly mark all significant water ingress points encountered during mine construction and development and ensure that their physical location, flowrate and water quality are recorded and incorporated into the existing groundwater model and the mine water and salt balance.	Included in the EIR and EMPr	Section 5 of the EMPr
		Properly seal all major water ingress points and ensure that the details of the sealing operation are recorded.	Included in the EIR and EMPr	Section 5 of the EMPr
		Ensure that all approved design measures are properly implemented and modify mine plans and drawings to indicate 'as-built' systems wherever they deviate from the original designs, together with motivations on the design variation.	Included in the EIR and EMPr	Section 5 of the EMPr
		Institute appropriate water level and water quality monitoring programmes to confirm rate of water rise and water quality as the mine floods. Maintain an ability to access the underground workings until long term discharge and quality predictions have been confirmed.	Included in the EIR and EMPr	Section 5 of the EMPr
		A particular concern when storing water underground where it is likely to be in contact with sulphide minerals is to manage the storage systems in a manner that absolutely minimizes the potential for water quality deterioration to occur. This would imply that storage reservoirs must be filled as quickly as possible and that measures must be put in place to prevent regular fluctuation of the stored water level as it is this wetting and drying cycle on the exposed surfaces that will enhance the rate of sulphide oxidation and lead to water quality deterioration.	Included in the EIR and EMPr	Section 5 of the EMPr
		Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and	Included in the EIR and EMPr	Section 5 of the EMPr

		update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA. See the Monitoring Network section.		
		Areas that may have subsided or areas of depressions and/or sinkholes should be filled to create free draining surfaces.	Included in the EIR and EMPr	Section 5 of the EMPr
	Decommissioning stage	As seepage to the Olifants River at the furthest southern section of the mine is the prime groundwater risk, measures to reduce the pressure head at this point should be implemented. This can be accomplished by compartmentalising the underground mine as far as possible. The long thin central section of the mine is especially suited to create such underground plugs at various locations. If executed correctly, this measure could mitigate the risk of seepage to the river in full, and its importance cannot be overemphasized.	Included in the EIR and EMPr	Section 5 of the EMPr
		Service boreholes need to be plugged from the bottom where they intersect the workings and then grouted through to surface, also to prevent decant to the surface in the event of high hydraulic pressure in the abandoned mine workings.	Included in the EIR and EMPr	Section 5 of the EMPr
		Water level and water quality monitoring programmes must be instituted to confirm rate of water rise and water quality as the mine floods. Maintain an ability to access the underground workings until long term discharge and quality predictions have been confirmed.	Included in the EIR and EMPr	Section 5 of the EMPr
		Eventually, shafts should be sealed	Included in the EIR and EMPr	Section 5 of the EMPr
	Seepage or decant	Monitoring of the water quality and volumes on frequency high enough to establish seasonal trends is an essential first step	Included in the EIR and EMPr	Section 5 and 7 of the EMPr

		Following that, risk assessment on the effect of the water qualities on the most critical receptor should be done to establish if passive treatment or active treatment processes is required. It is known from published literature that within a few years after flooding of the underground, water qualities comparable to background water qualities can be observed. To measure and analyse trends in water quality is thus of prime importance.	Part of the commitment in the Global EMPR Included in the EIR and EMPr	Section 5 of the EMPr Section 5 of the EMPr
	Further work	The pans that might be impacted during mining by the drawdown of the groundwater levels should be investigated for its connectivity with the groundwater. In the Anglo Ukwazi Hope 4 Seam Concept Study Report, it is mentioned that sections of the s Seam might require backfilling where safety factors are inadequate. The details of the areas to be backfilled and the backfill material are unknown at this stage and should be included in a follow-up study to determine the effect on groundwater flow and contamination. Monitoring boreholes should be drilled in positions where sensitive receptors might be affected, as indicated in this report. Water quantity and quality data should be collected on a regular, ongoing basis during mine operations. These data will be used to recalibrate and update the mine water management model, to prepare monitoring and audit reports, to report to the regulatory authorities against the requirements of the IWMP and other authorisations and as feedback to stakeholders in the catchment, perhaps via the CMA. The monitoring as recommended in the report should be established prior to operation. The hydrocensus and risk assessment should at least be repeated once before closure to evaluate any impacts.	This section will be include as conditions of the authorisation	Section 6.9 of the EIR

		The numerical and geochemical models should be updated against monitored data during operations, as required by the Best Practice Guidelines of the Department of Water and Sanitation.		
Wetland Assessment				
Air Quality Impact Assessment	Air quality	It is recommended mitigation measures for the proposed Hope No. 4 Seam project is focused on the unpaved haul road facilitating the transport of Hope No. 4 Seam project overburden to the overburden stockpile. At least 75% control efficiency through watering can be achieved for haul roads onsite.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		It is recommended for materials handling activities, specifically conveying coal to the stockpile and subsequent loading for external transport, that mitigation be managed by means of enclosing the conveyor (two sides and a roof) and wind sheltering as well as reduced drop heights.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		It is recommended that dust fall continue to be monitored at the current dust bucket locations along with the addition of 2 more buckets focused specifically within the proposed Hope No. 4 Seam project operational area, as described in the air quality monitoring section, prior to operation in order	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4

		to verify baseline conditions. It is recommended that PM continue to be monitored at the South plant operations. If modelling simulations for the proposed H4 operations are to be verified, it is recommended that this monitor be moved to the H4 operations after a year of data is available for the South plant site (i.e. continue South plant monitoring until the end of June 2015).	Included in the Global EMPR	Section 6.4.1.1 to section 6.4.1.4
Noise Impact Assessment	Noise impacts	The most important mitigation options recommended would be the incorporation of berms/barriers and/or cladding around noisy infrastructure. The placement and design of the ventilation shaft is also of importance, with specifications highlighted in this report.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		An annual measurement programme is recommended to be conducted during the operational phase. Measurements should be collected in 10-minute bins over at least a 24 hour period. Variables and measurement recommended settings to be analysed include L_{AMin}, L_{Aeq}, L_{AMax}, L_{AMin} L_{A10}, L_{A90} and spectral frequencies. Noise measurements must be continued as long as there are potential receptors living within 1,000 meters of the boundaries of the mining operation, or as long as a valid noise complaint is registered.	Included in the EMPr	Section 6.4.1.1 to section 6.4.1.4
		Feedback regarding noise measurements should be presented to all stakeholders and other Interested and Affected parties in the area. The feedback platform and interval periods should be defined by the developer, with an annual feedback period recommended.	Included in the EMPr	Section 6.4.1.1 to section 6.4.1.4
		If the layout of the mine changes significantly (or assumptions change) used in this report, that this Environmental Noise Impact Assessment be reviewed with the appropriate information supplied by the mine, including:	Committed to in the EMPr	Section 6.4.1.1 to section 6.4.1.4

		Locality of the noise source; Operational time of the noise source; and if possible specifications regarding the noise source		
Sites of Archaeological & Cultural Importance		Four sites of Archaeological & Cultural importance have been identified in the project area. Two of these will be impacted on indirectly and the third directly. Therefore mitigation measures should be implemented.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Graves	The first option would be to fence the graves in and have a management plan drafted for the sustainable preservation thereof. This should be written by a heritage expert. This usually is done when the graves are in no danger of being damaged, but where there will be a secondary impact due to the activities of the mine. The fencing in of graves is standard protocol in order to clearly demarcate it as assistance for preservation and management. The second option is to exhume the mortal remains and then to have it relocated. This usually is done when the graves are in the area to be directly affected by the mining activities. For this a specific procedure should be followed which includes social consultation. For graves younger than 60 years only an undertaker is needed. For those older than 60 years and unknown graves an undertaker and archaeologist is needed. Permits should be obtained from the Burial Grounds and Graves unit of SAHRA. This procedure is quite lengthy and involves social consultation. With regards to sites no 5 and 6 the graves will not be impacted directly by the mining development as it is too far from any of the possible sites for the placement of the shaft. There always is a secondary impact due to the possible transport of coal, blasting and other mining activities or since access to the site may be limited for descendants. Therefore Option 1 is	Included in the EIA Not included Not included. This is due to the fact that the sites are not on surface owned by Anglo Operations (Pty) Limited	Section 6.4.1.1 to section 6.4.1.4

		recommended. In this case of site no 13 the grave will be impacted on directly by the mining development. If at all possible, the mine plans should be changed so that the site is not directly impacted on. In this case Option 1 will have to be implemented. However, if not possible to change the mine plan, Option 2 will have to be implemented. Site no. 7 will be impacted on directly. It however received a low significance and therefore this report is seen as ample mitigation. It may be demolished, but if it is possible not to demolish the site, this should rather be considered. In case of demolition a permit will be required from the Mpumalanga Provincial Heritage Resources Agency. Only after receiving the permit the site may be demolished. It should be noted that the subterranean presence of archaeological and/or historical sites, features or artifacts is always a distinct possibility. The state of the environment also makes it possible that not all sites were identified. Care should therefore be taken when development commences that if any of these are discovered, a qualified archaeologist be called in to investigate the occurrence and adapt this report.	Included in the EIA Not included, site not affected by the mine	Section 6.4.1.1 to section 6.4.1.4
Visual Aspects	Earthworks and Landscaping	The mitigation measures during operation will need to focus on effective rehabilitation of the construction area and screening from the surrounding public roads by tree planting and berming. These specifications must be explicit and detailed and included in the contract documentation (Environmental Management Plan) so that the tasks can be costed and monitored for compliance and result. It will be important that a landscape architect be appointed during the	Included in the EIA Included in the EIA	Section 6.4.1.1 to section 6.4.1.4 Section 6.4.1.1 to

		design phase of the project to integrate the project components with the surrounding landscape to ensure that the project blends in physically and aesthetically with the environment.		section 6.4.1.4
		A detailed landscape and rehabilitation plan should be developed timeously by the landscape architect. The general landscaping shall reflect the existing surrounding landscape.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Sculpturing or shaping the cut and fill slopes of platforms and access roads to angles and forms that are reflected in the adjacent landscape can reduce the visual impact. By blending the edges with the existing landforms the visual impression made, is that the project component has followed the natural shape of the landscape, rather than been “engineered” through the landscape.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Vegetation stripping should be done in a manner where the edges are organic (non-geometric) or curvilinear rather than straight or sharp edged as viewers tend to form positive visual impressions such as “gentleness” and “delicacy” and tend to object to negative visual impressions such as “rough”, “rugged” or “violent” (Ribe, 1989). When disturbances in the landscape are viewed from a distance, those with irregular lines, rather than straight lines, appear to blend in with the natural configuration and lines in the landscape (Schaefer, 1967).	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		It is essential that all cut and fill slopes, as well as all areas disturbed by construction activity, are suitably topsoiled and vegetated as soon as is possible after final shaping. The progressive rehabilitation measures will allow the maximum growth period before the completion of the project.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		All areas affected by the construction works will need to be rehabilitated and	Included in the EIA	Section 6.4.1.1 to

		re-vegetated. This includes the areas beyond the works area such as temporary access roads, construction camp sites, workers' camp sites, borrow pits, laydown areas, etc.		section 6.4.1.4
		For access / service roads and servitudes, avoid straight edges and corridors. These lines should complement the landscape through which they pass (Litton, 1980).	Not included, not necessary	
		The special conditions of contract must include for the stripping and stockpiling of topsoil from the construction areas for later re-use. Topsoil is considered to be at least the top 300 mm of the natural soil surface and includes grass, roots and organic matter. The areas to be cleared of topsoil should be all areas that will be covered by structures, roads and construction camps. The presence of degraded and disused roads and areas left over after development that are not rehabilitated, could present a high perceptual visual impact. These areas should be topsoiled and re-vegetated. If the topsoil thickness is less than 300mm then a minimum of 100mm should be stripped	Addressed under soils	
		All areas that will be affected by construction activities and where dust will be generated will require dust suppression by regular wetting, possibly by means of a water bowser or by means of a soil binding compound. The importance of suppressing the visual aspects of dust cannot be overstressed since the visibility will generate the impression of a polluting industry.	Addressed under air quality	
		All existing large trees (if any) that fall outside the earthworks area must be retained. These will assist in softening the forms of the structures and obscure views to them. Retain a vegetation buffer strip of 20-30 m along all major access roads to form a visual screen.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4

		The rehabilitation and stabilisation of vegetation of all rehabilitated areas, buffer strips and new landforms must be done as soon as the forms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (erosion, die back, lack of grass cover) are identified early so that corrective measures can be taken.	Addressed in the rehabilitation plan	
	Colour/ Texture/ Scale	The buildings that form part of the project could dominate the landscape. To reduce their scale, colour variations on the buildings should be considered. Both horizontal and vertical colour differences can be used in a manner that will help to visually break up the large roof and side surfaces of the building.	No buildings will be constructed	
		To reduce the visual intrusion of the power plant it is recommended that the colour selected for roofing and walls be of a nature which will help to visually break up the surfaces of the buildings, and that they are matt, not glossy, so as to reduce reflection and glare from the surfaces. Roofs of buildings must not reflect or deflect sunlight or artificial light during the day or night by their colour or texture.	No buildings will be constructed	
		Roof material shall not be a silver colour (e.g. unpainted galvanised corrugated iron) or be glossy to the extent that it can reflect the sun or artificial light. This is particularly relevant given the harsh sunlight and the existing landform. It is important that the colour choices and patterns should be timeless in that they should not become dated. These colours should be complementary to the colours in the surrounding landscape, such as olive green with buff trim, light grey, grey green, blue grey, dark buff, rust, ochre or natural tones such as variations of tan and be matt in texture. This is recommended due to the fact that the buildings will on occasion be viewed from an elevated surrounding position and thus be read together	No buildings will be constructed	

		with the landscape rather than in silhouette. Certain equipment, for safety reasons, will need to be painted according to international standards. Large and long shed-like structures must have their bulk visually broken up by vertical bands or blocks of appropriate colour. The colour should be one which has a timeless quality such as buff, grey, grey blue, olive green, blue green, ochre and rust. Colours such as turquoise, pumpkin yellow or orange will not be acceptable since these tend to be fashionable and have a limited longer term appeal.	No buildings will be constructed	
	Building Form	The buildings that enclose the facilities are large in height and extent. To reduce their scale, the building forms should be broken by roof overhangs and steps in the façades. This will create shadow lines which, in turn, assist in the mottling or breaking up of the visible plant form. Large and long shed-like structures should have their bulk visually broken up by vertical bands or blocks of appropriate colour. Alternatively the façade could be made visually less imposing by the placement of other smaller buildings in front of it, the creation of shadows from roof overhangs and the stepping of the surface to accommodate other necessary elements of the buildings function. Wherever possible, tall structures should be enclosed. This will simplify the structure visibly and reduce clutter associated with heavy industry.	No buildings will be constructed No buildings will be constructed No buildings will be constructed Included in the EIA	
	Screening	To limit the visual impact from the main roads close to the site, screening berms should be constructed from material removed from the site. Where feasible, the use of waste material to build screening berms should be considered. Use excess spoil from road construction, internal road and excavations for new services and buildings platforms to provide low mounding in the road reserve to screen cars, travelling and parked, along	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4

		service road. These berms must be of sufficient height, at least 5 m, graded at a slope of 1:3 on both sides and be vegetated with indigenous vegetation. To be effective, the berms should be constructed as close as possible to existing and future roads.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		The forms of the berms should be organic (non-geometric). A geometrically- shaped berm will impose an additional visual impact on the landscape by contrasting with the flowing forms of the landscape thereby defeating its purpose.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Retain at least 20-30 m of vegetation next to all main access roads. Most importantly, all existing vegetation, including any large trees which occur within the strip between the road and the site must be retained as a visual buffer strip. Wherever possible, existing vegetation beside the road should be supplemented with indigenous species if it will improve the screening of the site from the roads. In areas adjacent to the road where cultivation has previously removed the existing vegetation, it is of particular importance to ensure that the re-vegetation of these areas is undertaken as soon as possible.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
	Lighting	As night lighting during both construction and operation is one of the more objectionable forms of visual impact, it is important that selective and sensitive location and design of the lighting requirements for the construction camp and the power station are developed. For instance, reduce the height from which floodlights are fixed and identify zones of high and low lighting requirements with the focus of the lights being inward, rather than outward.	Not included, no camp site will be constructed	Section 6.4.1.1 to section 6.4.1.4
		Avoid uplighting of structures but rather direct the light downwards and	Included in the EIA	Section 6.4.1.1 to

		focused on the object to be illuminated. Avoid directing the light towards the direction from where it would be most experienced. Light spill, particularly upwards, must be minimised. This can be achieved by implementing the following recommendations:		section 6.4.1.4
		All external light fittings shall not allow light to shine upwards,	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		All security and street / road lighting shall have “blinkers” or be specifically designed to ensure light is directed downwards while preventing side spill. Manufacturers have such lights in their catalogues. This may require that light pole numbers will increase to give the required illumination on the ground.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Lighting for security and safety must be directed downwards and towards the building to reduce light spill beyond the property boundary.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Area lighting on tall masts should be confined to the lower landform elevations.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
		Tall structures such as silos, smoke stacks and towers will by law have to be fitted with a red flashing light if they exceed a certain height. These structures should be limited to a minimum height to reduce having to comply with these aviation requirements.	Not applicable	
	Monitoring	The rehabilitation and stabilisation by vegetation of all new landforms e.g. platform side slopes, waste stockpiles, road fill or cut slopes must be done as soon as the forms are complete. The monitoring and management of the vegetation programme is important to ensure that problems (erosion, die back, lack of grass cover) are identified early so that corrective measures can be taken.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4

		During construction the detailed requirements which would have been set during the design phase and incorporated in the contract documentation, must be monitored for compliance.	Included in the EIA	Section 6.4.1.1 to section 6.4.1.4
Socio-economic Aspects		The Goedehoop SLP Progress Report (2013) illustrates that the implementation and goal achievements of the SLP is on schedule. However, there are certain community-based perceptions that need to be addressed, as community-based needs and the identified SLP goals might vary. Open communication with regards to the SLP goals and achievements and the procedures to apply for funds through the Corporate Social Investment (CSI) Fund should be communicated with the affected Ward Councillors. The Mahlatini and Kwamabone settlements poses current and future safety and security impacts for the mine and local landowners. Intervention is required: Establish a partnership with the Steve Tshwete Local Municipality to find workable solutions to formalise the Mahlatini settlement. A portion of the farm could for instance be subdivided and sold/contributed to Council to establish a Human Settlement, which could hold long-term advantages for the mine, landowners and local community. Do a risk assessment as soon as possible with regards to the movement of livestock and humans on private owned land. Establish a Trust or similar legal entity for subsistence farmers and draw up a contract that sets out the areas where grazing is allowed and penalties for breach of contract. Include community income-generating projects in the SLP aimed at specifically creating jobs and food security for the Mahlatini community.		

		Aim to renew and maintain good intercommunication relations with private landowners and make the procedures to lodge complaints/discuss issues available to landowners, the Local Councillors and relevant community structures. Keep the communication personal and refrain from using 'outsiders' in the process. Respond and attend to complaints as soon as it occurs. Security in and around the project vicinity and specifically in the Goedehoop area is a great concern for the mine and private landowners in terms of financial and human losses. Implement strict security measures for the duration of the project and compile an action plan to implement additional security measures by involving the Ward Councillors, the SAP, external security enterprises, etc., should unacceptable levels of crime prevail.		

6.6 ENVIRONMENTAL IMPACT STATEMENT

Goedehoop Colliery is an operational mine that extracts coal from the 2, 4 and 5 seams within its mining right area. The majority of the coal mining is undertaken by conventional bord and pillar mining methods. Anglo Operations (Pty) Limited proposes to extend its underground mining operations at Goedehoop Colliery.

Assessment of the coal reserves currently being mined at Goedehoop Colliery has shown that it is necessary that the mine access additional coal reserves over the next three years in order to sustain its operation. Failure to access new reserves will result in the mine closing pre-maturely, which will have a significant negative impacts on its employees and the local economy. In view of the above, the Hope No. 4 Seam coal reserve was selected as the next reserve to be mined at Goedehoop Colliery. The proposed Hope No. 4 Seam project entails mining of the No. 4 coal seam underground reserves by conventional bord and pillar underground mining methods.

6.6.1 Description of affected environment

The proposed Hope No. 4 Seam project is situated within the central block of the Witbank Coalfield where the No. 4 coal seam will be exploited. The proposed project is situated in area characterised by a gentle undulating plateau with fairly broad to narrowly incised valleys such as the Olifants River valley, which are associated with surface water features such as rivers, streams and pans. These includes the Hope Spruit, Goedehoop Spruit and Leeuwfontein Spruit and their tributaries. A variety of soil types were identified within the project area, which include recharge, interflow and responsive soils. Aside from mining, the land uses over the areas correspond to the soils found in the area and include mainly agriculture (crop cultivation and grazing) and wilderness with limited industrial and residential stands. Due to the above land uses significant change has occurred on the natural vegetation, with most of the area being cultivated lands. Surface and groundwater environments has shown some changes due to the current land uses, with the surface water environment being the most impacted. Approximately 20% of the entire mining right area is considered to be comprised of wetland systems, which provide important ecological services. The identified wetland systems have been impacted upon to some degree by the local agricultural activities and mining operations.

The proposed project is situated within the Steve Tshwete Local Municipality. The major economic activities in the region are those associated with coal mining, metallurgical industries, commerce and light engineering, power generation, agriculture and administration. Mining is the major industrial activities in the vicinity of the proposed project area. An increase in the environmental and economic impacts and various criminal activities and land invasions have been noted over the last number of years.

6.6.2 Summary of key findings of the environmental impact assessment

During the construction phase a considerable amount of impacts without mitigation on the soils, natural vegetation, surface water, groundwater, sensitive landscapes, air quality, noise, visual aspects, sites of archaeological and cultural importance and socio-economic status of the surrounding communities will be medium to very high. These impacts are as a consequence of the most favourable shaft and box cut position being in close proximity to the Hope Spruit, a severely impacted temporary wetlands, a mine village, informal settlement and mine offices. Alternatives considered for the location and designing/layout of the access shaft and box cut has shown that the selected location and designs would be the most favourable. Anglo Operations (Pty) Limited will undertake measures to ensure that the identified impacts are minimised. Assessment of the impacts with the proposed

mitigation measures has shown the significance of the impacts on all affected environmental aspects to be reduced from medium and high significance to low significance.

Land use will not change. Several landowners and land occupiers within the proposed mining area may be affected although on a temporary basis (not more than two years) due to the need to access the underground backfilling sites. Measures such as safety along the roads and dust suppression will be undertaken to ensure that the impacts on the land owners and land occupiers are minimised.

With differential stockpiling and careful handling of the soils removed from the proposed project infrastructure area, the impacts on soils will be low after mitigation.

Assessment of the vegetation within the footprint of the development area has shown limited presence of natural vegetation. No Red Data Species were identified within the project area. With proper rehabilitation and seeding with a seed mix recommended by suitably qualified persons, the impact on the natural vegetation would be low. In fact since areas with exotic plant species will be rehabilitated to have endemic plant species, an improvement in the state of the vegetation within some parts of the project area will result.

Storm water runoff from the dirty water areas of the shaft, its associated surface infrastructure and associated facilities will have a detrimental impact on the surrounding water environment should this water be released to the environment. In order to prevent the occurrence of the above-mentioned impacts, a dirty water collection sump was designed to collect all runoff water from the shaft dirty water areas. The water collected from the sump and excess mine affected water from the underground workings will be pumped to the existing return water dam. A pipeline has been designed and will be constructed for the conveyance of the mine affected water collected in the dirty water collection sump and groundwater removed from the underground workings to the existing return water dam. Note also that as much as possible, water found underground will be used for the operation of the continuous miners, which will limit the use of clean water.

Sediments will be created from the site during the construction, operational and decommissioning phase, which may impact negatively on the surrounding water environment. Silt traps which will act as settling ponds will be used to manage the silts from this runoff water. Once the silt have been settled, the clean water will be released to the natural environment. Silt traps will be constructed around the overburden stockpiles for the management of runoff water with high silt loads.

Drawdown may have an influence on some of the groundwater users. All affected groundwater users will be compensated for their loss of groundwater, should the drawdown from the mine affect the groundwater yield of their boreholes.

A number of wetlands were identified within the proposed Hope No. 4 Seam project. These included two wetlands in particular i.e. a seepage wetland north of the proposed shaft and a valley bottom wetland associated with the Hope Spruit will be affected by the proposed Hope No. 4 Seam project. Assessment of the wetland has shown that the wetlands close to the shaft are highly modified due to current land uses. Despite the current state of the above-mentioned wetlands, the shaft complex have been designed and sited to be away from these wetlands. Most of the shaft complex will be sited more than 32 meters away from the identified wetland area. Due to limited footprint area, the mine could not site some of the underground workings, the overland conveyor belts, a dirty water pipeline and a re-routed power line together with their service roads away from some of the identified wetlands. Measures will be undertaken to ensure protection of the wetland. These include storm water management within the shaft complex, increasing awareness of the presence of the wetland to the mine employees and contractors, visible demarcation of the identified wetlands, sealing of the side

of the shaft to reduce possible drawdown effects on the wetland and ensuring that where the wetlands are directly affected, as small space as possible is affected and that the area is rehabilitated whenever possible.

Two heritage sites (a grave yard and a building) are situated very close and within the proposed shaft and overburden stockpile, respectively. The position of the overburden stockpile has been moved to be more than fifty meters away from the grave site. The establishment of the stockpile will be undertaken such that the stockpiling of the overburden is from the south to the north thereby ensuring that the establishment of the stockpile is away from the grave site. No roads or other shaft or mining infrastructure will be sited fifty meters from the grave site.

Dust, vibration and noise will have medium impacts on the surrounding communities. With the strict implementation of mitigation measures these impacts will be reduced to low levels at the nearby residences and mine offices.

Approximately 170 people will be employed at the Hope No. 4 Seam project, although on a temporary basis during the construction phase. This will, to a limited extent, have a positive impact on the economies of the surrounding towns.

All workers will be housed in surrounding towns and villages to minimise their potential impact on farm security. Anglo Operations (Pty) Limited will work with the local communities to promote security on an ongoing basis.

6.6.3 Final Master Layout Plan

The final maps showing the layouts of the proposed project in relation to the shaft complex, underground mining area, borrow pits and underground backfilling sites after the impact assessment exercise is attached as Figure 61, Figure 62, Figure 63 and Figure 64. The map has been developed to superimpose the proposed mining project together with its associated structures and infrastructure on the environmental sensitivities within the preferred project site.

6.7 Final Proposed Alternatives

Based on the assessment undertaken during the consideration of the alternatives it was determined that the site located on portion 9 of the farm Goedehoop 46 IS was the preferred site for the shaft location and that it will be the most economical, if access to the targeted coal reserves be undertaken at the central coal block. Access to the western and eastern blocks will be undertaken via underground drilling and blasting practices from the central block.

In addition to the above, it was determined via a detailed analysis of the area in terms of environmental sensitivity (potential biophysical, social and economic impacts, both positive and negative), that the preferred site is located on the edge of a seasonal/temporary wetland and in close proximity to a grave site. A number of other impacts that were rated with medium to high significance included impacts on surface water, groundwater, soils, air quality, noise and social. These impacts were identified during the impact assessment process for the preferred shaft site and underground working layout. In view of the above, it was decided that the changes to the initial designs and layout be effected in order to reduce the significance of the impacts on the environment. These include the following changes:

a) Using the existing Hope Shaft workshop and office facilities instead of establishing new facilities. This has resulted in the footprint of the shaft complex covering a much lesser area, which has given the project team the ability to move the shaft away from the affected wetland. Furthermore, no

additional waste generating facilities will be required since existing facilities at the Hope Shaft workshop and office complex with serviced waste management facilities would be used.

b) Placing some of the shaft infrastructure (ventilation fans and dirty water management facilities) at the bottom of the shaft box cut instead of the surface of the shaft area and placing the overburden stockpile between the Mahlathini informal settlement and the proposed development. This has resulted in the reduction of noise and air quality impact from the proposed development on the surrounding communities. The spread of the ambient noise levels and dust particulate will be significantly reduced. The potential for the dirty water facility to pollute both ground and surface water was also reduced by placing the facility within the shaft box cut. Note that significantly lower seepage levels is expected from the dirty water collection sump when compared to seepage from a surface pollution control dam.

c) The use of a conveyor belt instead of the trucks for hauling coal from the shaft to the existing main coal stockpiling area has also reduced the impacts that could have been caused by the trucks during the haulage of coal from the shaft area. Note that the residents of Hope village, some of the farm owners and residents of Mahlatini informal settlement would have had to share the private roads with the haulage trucks from the shaft and more interruption of the traffic at the provincial road (R542) would have also resulted due to haulage trucks crossing R542 on route to the run off mine cola stockpiling area. Based on the tonnage that will be removed from the proposed underground workings, significant volumes of traffic would have been added to the existing private roads.

d) Due to the presence of the grave site, the overburden stockpiles were moved to cater for the buffer zone of fifty meter from the grave site.

e) The entire shaft position was moved in order to ensure that the shaft is more than 32 meters away from the identified wetland area.

f) Groundwater modelling has shown that a portion of the area to be undermined may result in the decanting of the groundwater, which may have detrimental impacts on the surrounding surface and groundwater environment. In view of the above-mentioned impacts on groundwater, the layout of the underground workings was revised in order to lessen the decanting possibility.

g) Delineation of wetland areas within the proposed project area has indicated that the underground backfilling areas were also sited inside one of the identified wetland areas. In view of the potential impacts on wetlands, the backfilling site layout has been revised to be more than 32 meters away from the potentially affected wetland area.

As can be seen from the above explanation, a number of adjustments were affected at the preferred site (shaft and underground workings) to ensure that the project does not have detrimental impacts on the surrounding environment and surrounding communities.

Based on the above, the following infrastructure and activities will be conducted on the site as shown in GOEDE/HOPE4/01 (final layout plan). Proposed mitigation measures were taken into consideration in determining the final layout and positions of the underground workings and shaft complex.

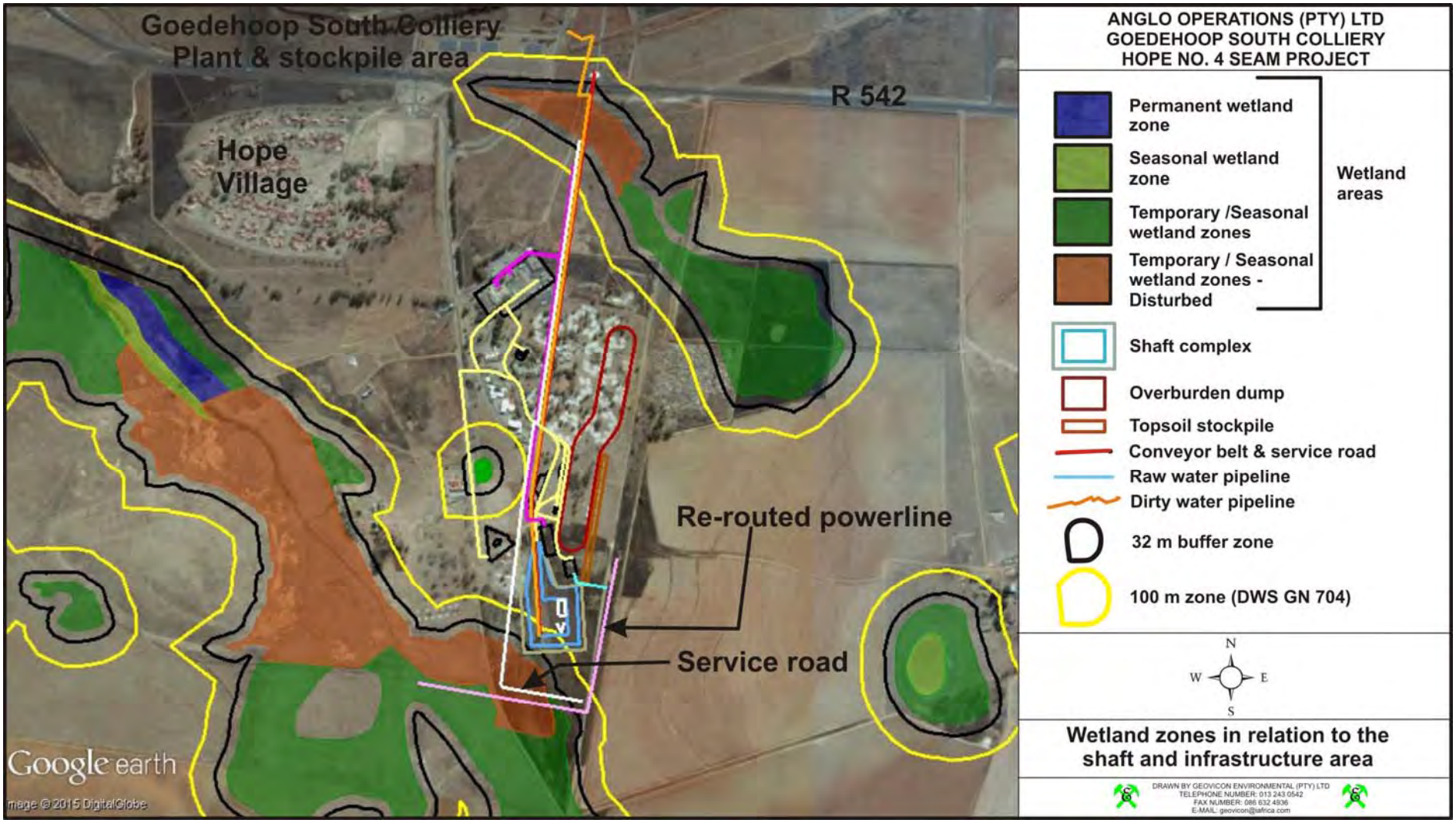

Figure 61: Master Layout Plan for the Access Shaft Complex

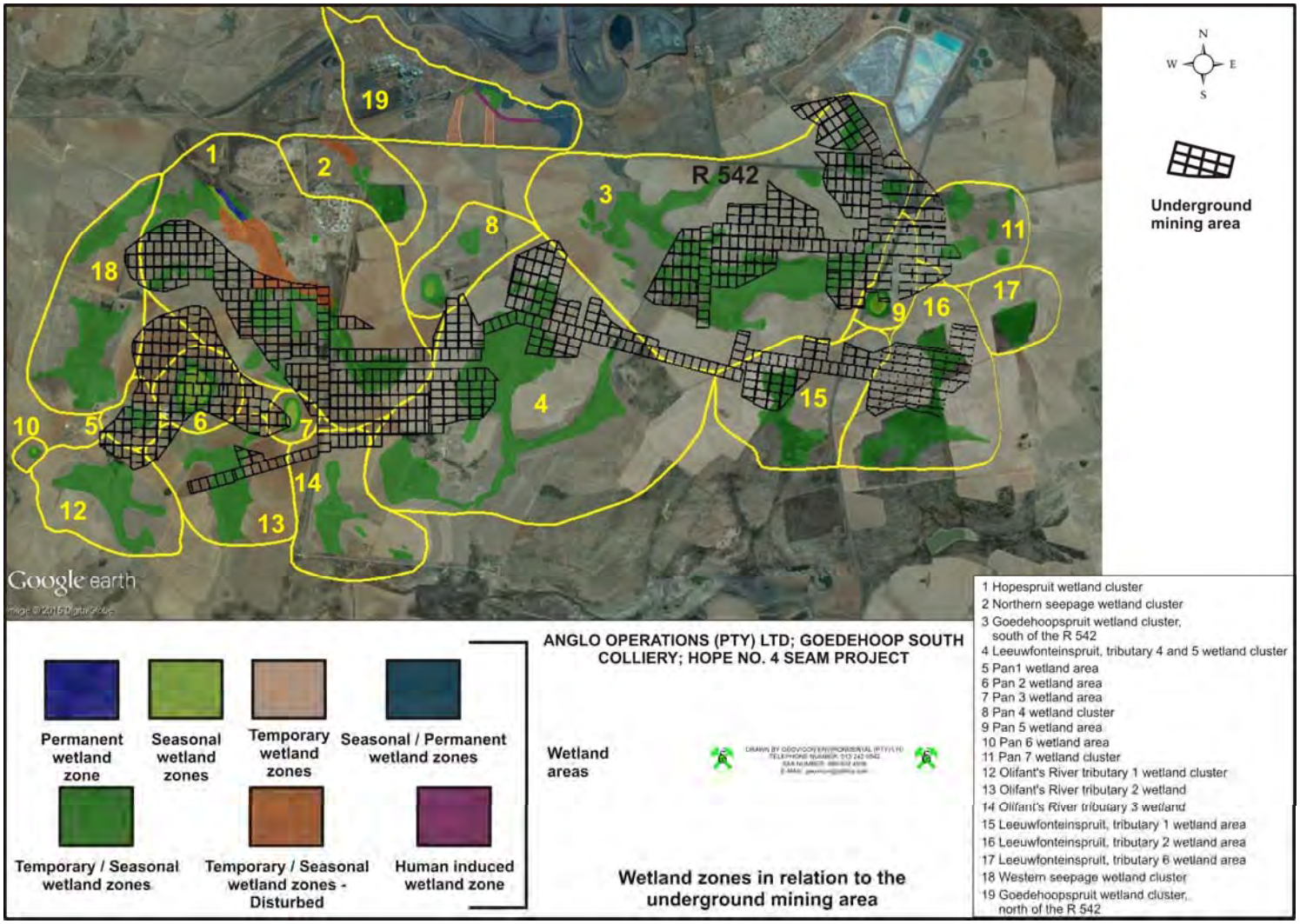

Figure 62: Master Layout Plan for the proposed Underground Workings

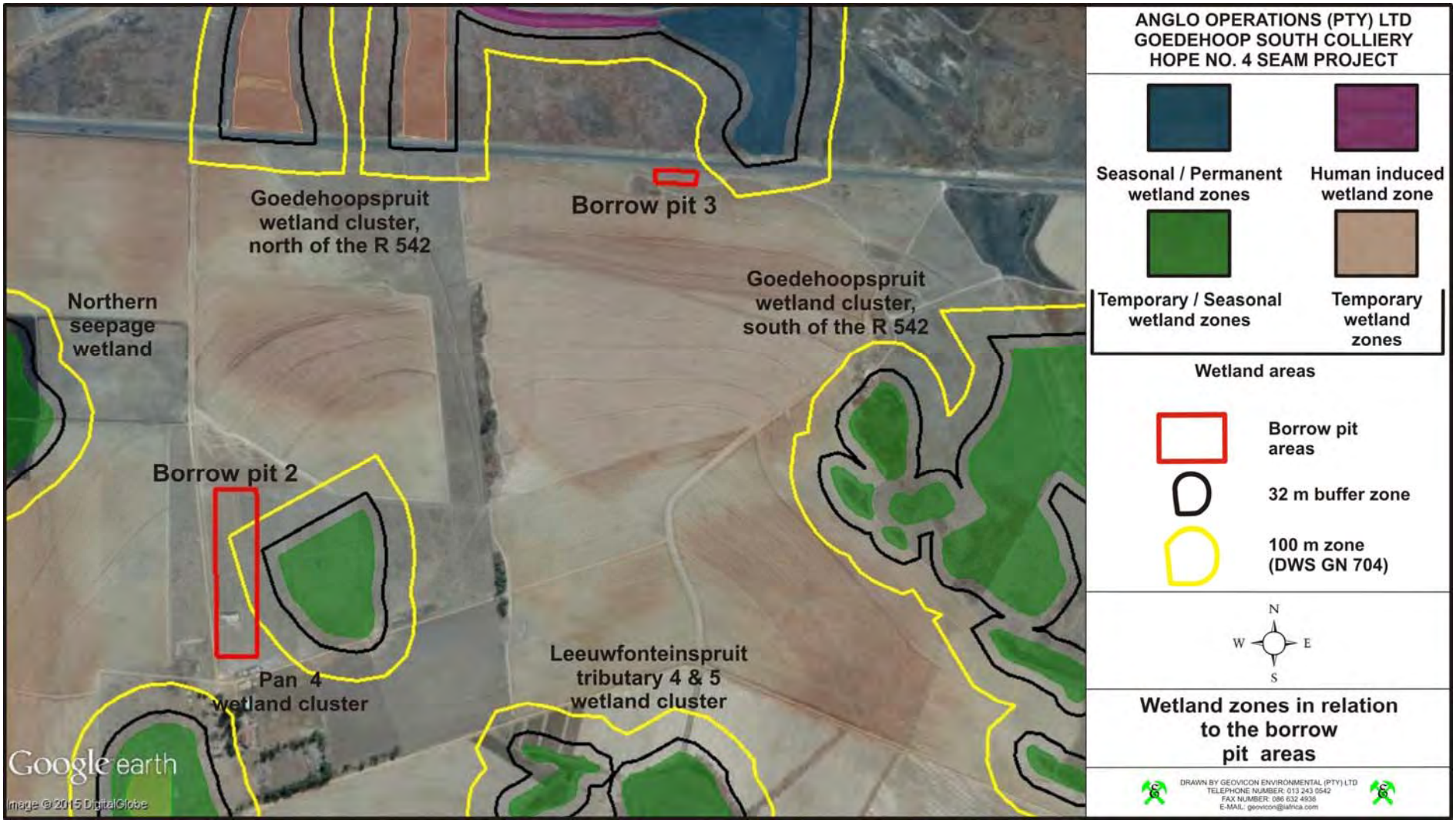

Figure 63: Master Layout Plan for the Borrow Pits

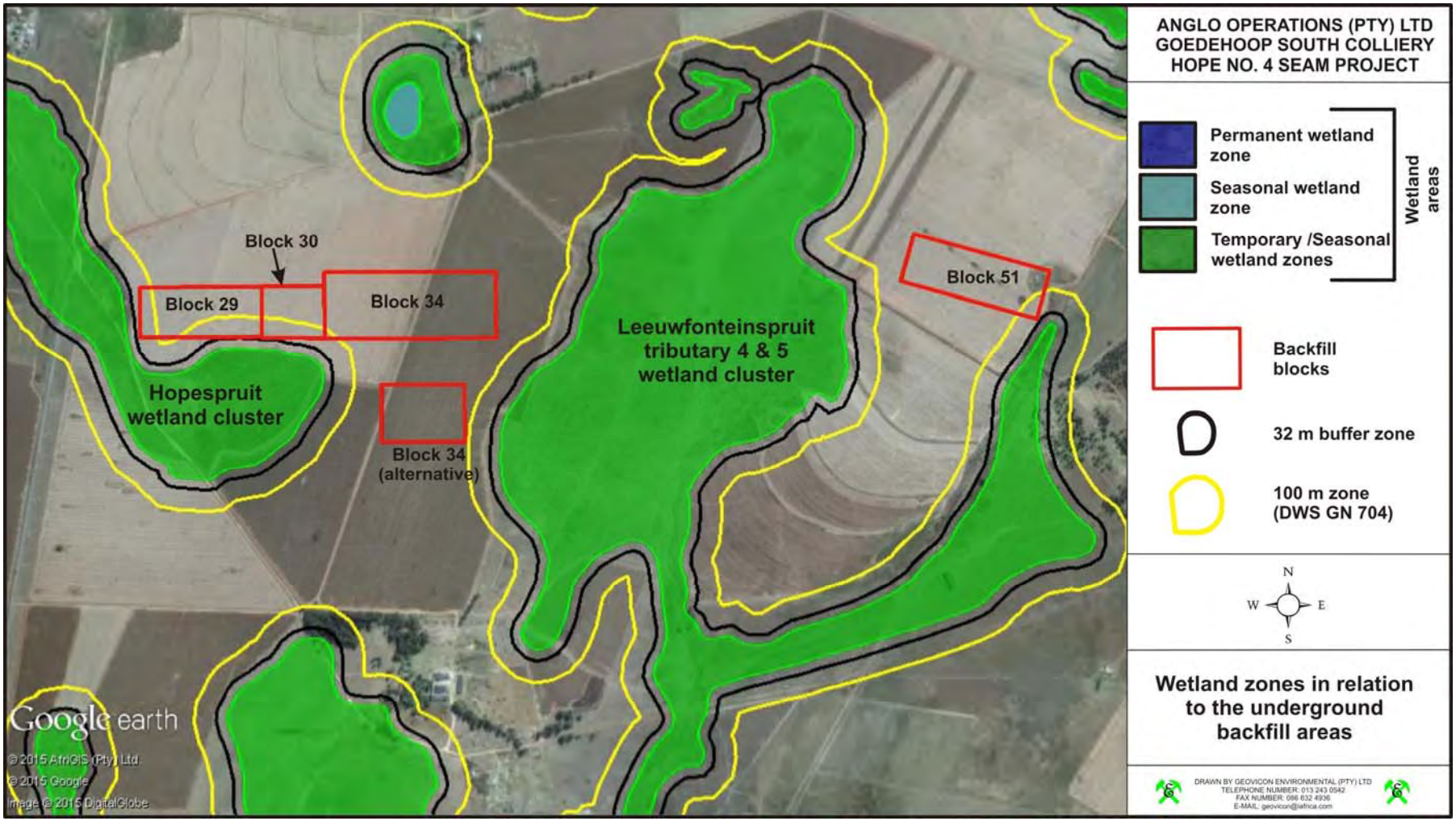

Figure 64: Master Layout Plan for the Underground Backfilling Areas

6.8 ASPECTS FOR INCLUSION AS CONDITIONS OF THE ENVIRONMENTAL AUTHORISATION

In authorising the proposed Hope No. 4 Seam project, the following conditions should form part of the environmental authorisation:

- Anglo Operations (Pty) Limited may not alter the location of any of the project activities included in this environmental impact assessment without obtaining the required environmental authorisation to do so under NEMA.
- Anglo Operations (Pty) Limited will not undertake any new activity that was not part of this environmental impact assessment and that will trigger a need for an environmental authorisation without proper authorisation.
- Anglo Operations (Pty) Limited must, where possible, update the specialists reports, management procedures and method statement included in the EIR and EMPr. Frequency of updates must be informed by suitably qualified persons.
- The EMPr must be implemented fully at all stages of the proposed Hope No. 4 Seam Project
- Anglo Operations (Pty) Limited must limit night-time operations when working on the stockpiles directly bordering the Mahlathini informal settlement. Stockpile maintenance could occur only during the day, with night-time activities limited to work behind the stockpile. This would be relevant for all work taking place at night within 150m from the closest receptors in this community.
- Anglo Operations (Pty) Limited must take all reasonable measures to integrate the environmental management at the proposed Hope No. 4 Seam Project to the Goedehoop Colliery environmental management system.

6.9 DESCRIPTION OF ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The EIA Regulations, 2014 outline specific requirements that a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures must be provided in the EIR.

The specialist assessments undertaken are based on conservative methodologies and these methods attempts to determine potential negative impacts that could occur on the affected environmental aspects. These impacts may however be of smaller magnitude than predicted, while benefits could be of a larger extent than predicted.

This section outlines various limitations to the specialist studies that have been undertaken and indicates, where appropriate, the adequacy of predictive methods used for the assessment. This has been done to provide the authorities and interested and affected parties with an understanding of how much confidence can be placed in this impact assessment.

The EIA has investigated the potential impact on key environmental media relating to the specific environmental setting for the site. A number of studies were undertaken and result thereof, which forms part of this report, will be presented during the public meeting.

The information provided in this EIR (once all studies are completed) is therefore considered sufficient for decision-making purposes.

The environment that is likely to be affected by the proposed Hope No. 4 Seam project was detailed in the section dealing with the environmental attributes. Specialists were commissioned to conduct detailed surveys and studies on the environment. These studies include a soil survey, vegetation study, wetland survey, animal study, geological reports, geohydrological study, heritage impact assessment, air quality impact assessment, noise impact assessment, visual impact assessment and surface water studies etc.

These studies cover all prevailing conditions of the environmental aspects that are studied. Hence no knowledge gaps exist in terms of the current state of the environment. There is however some limitations with regard to the determination of the future state of the studied environmental aspects. For the vegetation, animal life and stream health the studies were conducted during one season, hence no data exists for the other seasons. It must however be noted that the mine has been conducting monitoring and ad hoc assessment in a bid to update the baseline information held by the mine. Some of these information has been used to cover any knowledge gaps encountered during the impact assessment. It is a good practice that available information at the mine be updated from time to time as determined by the relevant specialists.

During the assessment of some of the prevailing environmental conditions (groundwater, air quality, noise aspects and visual aspects) at the proposed Hope No. 4 Seam project area, several limitations were encountered. It is a well-known fact that coal mining has potential to impact on these environmental aspects. These impacts can be substantial during and after the mined area has been rehabilitated.

Determination of the extent of the impact cannot be conducted due to the limited amount of data. Modelling (predictive methods) was, in this case, therefore used to estimate the behaviour of the environment after mining. These estimations represent a limitation e.g., assuming that the environment will behave in certain manner, and can lead to errors. It is therefore important that the modelling exercise be repeated with a more extensive data acquisition phase in order to obtain improved estimates of the environment and thus narrowing the existing uncertainties.

It must however be stated that the above-mentioned predictive methods were used for reasons e.g., not enough data was available. However the adequacy of the methods have also been proven. The same methods were used for several years with good results. These estimations will however improve with acquisition of more data.

6.10 Reasoned Opinion as to Whether the Proposed Project should or should not Continue

6.10.1 Reason why the activity should be authorised or not

The Goedehoop Colliery consist of an operating area and associated coal processing plant, mainly geared towards producing steam coal for the international market. Goedehoop Colliery (South) operation produces 4.1 Million tonnes per annum from an underground mine with five continuous miners sections. Goedehoop Colliery currently mines the No. 4 seam coal and the coal washing plant produce 2.5 million tonnes of coal per annum for export product. Goedehoop Colliery is supported by its own processing plant and train loading facilities.

The current tonnage profile indicates that coal reserves in Goedehoop Colliery will facilitate economic coal mining up to 2018. From there, underground coal mining becomes un-economical due to rising unit costs attributable to decreased throughput. An option identification analysis was initiated to

identify possible replacement projects to extend to life of mine ("LOM"). These options were ranked based on value adding potential. The proposed Hope No. 4 seam project was identified as the most suitable replacement project to supplement the current life of mine production profile.

According to the impact assessment undertaken for the proposed Hope No. 4 Seam project, the key impacts of the project are on sensitive landscapes through groundwater drawdown and potential destruction of the nearby wetlands, surface water environment through contamination of nearby streams by leaking or bursting of pipelines and groundwater through drawdown, plume migration and possible decanting. These impacts may be experienced throughout the life of the mine.

Other impact from the proposed project include the socio-economic impact on the surrounding communities through unrealised expectations and disruption of normal daily routes. The surrounding community may also be impacted via air pollution, higher than normal noise levels and change in the aesthetics of the area which will have impacts on the sense of place. It must however be noted that the area is currently used for mining purposes, hence the communities surrounding the proposed project area are used to mine related operations.

The project will also have positive impacts due to the employment to be created although for a short term during the construction phase. The sustenance of current employment due to the transfer of skills from existing underground mining operations to the proposed project area will also have a positive impact. A number of community based projects will be implemented by the mine, which will have positive impacts on the surrounding community.

All comments received during Public Participation Process and detailed specialist reports will be included in this EIR and EMPr. The management of the impacts identified in the EIR for all phases of the proposed project will be undertaken through a range of programmes and plans contained in the EMPr. In consideration of the programmes and plans contained within the EMPr as well as designs, layouts and method statements compiled for the project, which is assumed will be effectively implemented, there will be significant reduction in the significance of potential impacts.

Based on the above, it is therefore the opinion of the EAP that the activity should be authorised.

6.10.2 Conditions that must be included in the authorisation

See section 6.8 of the EIR.

6.11 Period for which the Environmental Authorisation

Based on the production rate, estimated reserve and the scheduled construction and decommissioning periods, the proposed mining operation will have a life of nineteen years. It must however be noted that Goedehoop Colliery already has an environmental authorisation that is valid until 2032, which will be enough to cover the life of mine of the proposed project.

6.12 Undertaking

The signed undertaking is presented at the front of this document.

6.13 Financial Provision

According to Appendix 3 of the EIA Regulations, 2014, where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts must be provide in the EIR and EMPr. In order to avoid duplication the

financial provision for the proposed Hope No. 4 Seam mining project has only been provided under the relevant section of the EMPr.

6.14 Deviation from approved Scoping Report

No deviation from the approved Scoping Report.

6.15 Other Information Required by the Competent Authority

Aside from the EIR and EMPr no other information has been requested by the competent authority

6.16 Other Matters Required in Terms of Section 24 (4)(a) and (b) of the Act

Any matter required in terms of the above section of the Act will be complied with by Anglo Operations (Pty) Limited

PART B

Environmental Management Programme

1. DETAILS OF THE EAP

The details of the EAP are provided in section 1.1 of part A of this document

2. DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

The requirements to describe the aspects of the activity are covered by the draft environmental management programme are already included in PART A of the document under section 1. The reader is therefore referred to section 1 of PART A of this document.

3. COMPOSITE MAP

The map superimposing the proposed Hope No. 4 Seam mining project, its associated structures and infrastructure on the environmental sensitivities of the preferred site is attached as GOEDE/HOPE4/01. Note that all areas that must be avoided due to their environmental sensitivity are indicated in the map.

4. DESCRIPTION OF THE MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENTS

4.1 GENERAL CLOSURE PRINCIPLES AND OBJECTIVES

The following are the closure objectives, general principles and objectives guiding closure of mining areas for Goedehoop Colliery closure planning:

- Rehabilitation of areas disturbed as a consequence of mining to a land capability that will support and sustain a predetermined mix of post-closure land uses;
- Removal of all infrastructure that cannot be beneficially re-used, as per agreements established, and returning the associated disturbed land to the planned final land use;
- Removal of existing contaminated material from mine-affected areas;
- Reinstatement of self-sustaining ecosystems over the rehabilitated infrastructure and mining affected areas, requiring minimum on-going maintenance to facilitate a walk away situation;
- Establishment of final landforms that are stable and safe in the long run;
- Establishment and implementation of measures that meet specific closure related performance objectives;
- Management of mine-affected water to prevent long-term risk of contamination of surface and underground water sources;

- Treatment of mine-affected water to ensure compliance with all relevant standards and supply for beneficial use where feasible;
- Prevention of acid mine drainage;
- Minimisation of decant from all open water bodies;
- Rehabilitation of all borrow pits to be free-draining;
- Addressing surface subsidence and all other related surface disturbance, to ensure that these are free draining to local watercourses without compromising ecological and hydrological functionality;
- Rehabilitation of the pans, wetlands and watercourses affected by mining;
- Limitation of recharge of rainfall to the underground mine workings to reduce the amount of water to be abstracted; and treatment to prevent surface and/or near surface contaminated excess mine water decant; and
- Monitoring and maintenance of rehabilitated areas and water treatment processes forming part of mine closure to ensure the long-term effectiveness and sustainability of measures implemented.

4.2 MANAGEMENT OF ENVIRONMENTAL DAMAGE, ENVIRONMENTAL POLLUTION AND ECOLOGICAL DEGRADATION CAUSED BY GOEDEHOOP COLLIERY'S HOPE NO. 4 SEAM PROJECT ACTIVITIES

The following actions will be undertaken by Goedehoop Colliery to ensure that the closure objectives are attained.

4.2.1 Infrastructure Areas

Policy

- Whenever possible, buildings and their infrastructure will not be demolished but left for after mining use. It is intended that ownership will be transferred to a third party. Should this not be possible, all buildings will be demolished and the area rehabilitated.
- All concrete, steel works and structures will be removed so that the land can be returned to as near as practically possible to its original state. Concrete work that extends below ground level will be removed to a metre below the surface. Concrete, brick and mortar will be used as backfilling material in the adit and shaft areas. Steel will be sold as scrap metal.
- All rehabilitated areas will be shaped to be free draining without concentrating flow such that erosion occurs, fertilised and a mixture of indigenous and pasture grasses will be planted. Following this rehabilitation the infrastructure areas will have a capability similar to the pre-mining environment.
- All rehabilitated areas will be maintained for a period of 3 years, where after the frequency will be reassessed. Vegetation cover will be maintained by annual application of fertiliser combined with biennial cutting or burning for the first three years. After this period, fertilizer will be applied as and when required. This will be determined by monitoring the basal cover and fertilizer levels against Anglo Operations (Pty) Limited standards.

- Maintenance with respect to erosion will be conducted on a minimum three monthly basis if and where required. This frequency will be reassessed after a 3-year period. The final rehabilitated surface will be stable, self-sustaining and erosion-free.
- All roads not required for residential or farming purposes, and overland conveyors will be removed and the ground restored as above.

4.2.2.1 Roads and Overland Conveyors

The MPRDA and Regulations under the MPRDA require all infrastructure associated with the mining operation to be removed and the surface on which it was situated to be returned, as close as is practically possible, to the original land use.

Roads

- Access roads to the Hope Shaft and Hope No. 4 Seam Shaft will be rehabilitated. All gravel roads will be graded to remove carbonaceous material (which will be removed to the Mineral Residue Deposit facility for disposal). The roads will be cross-ripped to 300 mm at right angles to the natural slope, fertiliser added as per soil requirements and vegetated with a seed mix of indigenous and pasture grasses. Maintenance will be conducted on the rehabilitated areas as indicated in the Policy statement.
- Where the roads crosses wetland areas, the affected area will be top soiled with wetland soils (preferably removed from the site and stockpiled) and the area vegetated with a seed mix of indigenous and wetland grasses.
- Where buildings and associated infrastructure will be left intact for non-mine use post closure, all access roads to the residential areas will be left in-situ. In this case, ownership and thus maintenance of these roads will be transferred to a third party.
- Note that if the ownership of the areas is not transferred to a third party, the buildings, roads and access roads will be removed, the areas rehabilitated and maintained as per point 1 above.

Overland Conveyors

During the decommissioning phase, the conveyors will be dismantled and removed from the mineral rights area.

Areas underlying the conveyors will be:

- Graded to remove all carbonaceous build-up.
- Re-shaped to prevent erosion and promote free-runoff.
- Ripped to a minimum depth of 300 mm at right angles to the inherent slope.
- Treated with an addition of fertiliser as per soil requirements.

Where the conveyor crosses an area utilised for crop production, no seeding will be undertaken (these areas will be incorporated into the surrounding crop production area).

Where the conveyor crosses natural grassland, the area underlying the conveyor will be vegetated with a seed mix of indigenous and pasture grasses.

Where the conveyor belt crosses wetlands, the area underlying the conveyor will be top soiled with wetland soils (preferably removed from the site and stockpiled) and the area vegetated with a seed mix of indigenous and wetland grasses.

Maintenance will be conducted on the vegetated rehabilitated areas as indicated in the Policy statement.

Note that the above will ensure that the areas affected by the conveyors approximate the adjacent land capability.

4.2.2.2 Coal Crushing and Screening Plant

The bulk of the activity in removing the plant will be the demolition and disposal of concrete structures. Rubble will either be placed on the Mineral Residue Deposit facility or used as backfill in shafts (incline and vertical) and all scrap metal will be cleared from the area.

All carbonaceous material will be removed from the plant area.

All foundations and plant footings will be removed to a depth of 1,0 meter (thereafter covered with a minimum 1,0 meter soil layer).

The entire area will be shaped to prevent erosion and promote free-runoff

The entire area will be ripped to a minimum depth of 300 mm at right angle to the inherent slope.

Fertiliser will be applied to the rehabilitated area as per soil requirements and vegetated with a seed mix of indigenous and pasture grasses.

Maintenance will be conducted on the rehabilitated areas as indicated in the Policy statement.

4.2.2.3 Buildings (Offices, Workshops and Stores)

The bulk of the activity in removing the workshops, stores and administration buildings will be the demolition and disposal of concrete structures. Metal will be removed and sold. Rubble will either be removed to the Mineral Residue Deposit facility or used as shaft backfill and all scrap metal will be cleared from the area and sold.

The actions as stipulated above will apply to all workshop and store areas.

If any soils are contaminated with hydrocarbons, they will be bio-remediated.

4.2.3 Sealing of underground workings and rehabilitation of dangerous areas

4.2.3.1 Subsidence

Prior to the decommissioning phase:

Any sinkholes that may develop on the mineral rights area will be backfilled with non-carbonaceous material within 1 month after discovery.

Any areas of local subsidence will be shaped to promote free surface runoff and prevent ponding.

All subsidence areas will be recorded on a plan and will be monitored regularly until the issue of a closure certificate.

An investigation into the best possible method to prevent subsidence over the areas with a high subsidence risk and based on the conclusions of this investigation, the appropriate methods will be instituted to minimise the subsidence risk.

4.2.3.2 Shafts

Shafts

The following actions will be designed by a civil engineer and undertaken during the decommissioning phase:

- A double brick wall bulk head filled with concrete will be constructed approximately 10 metres in bye of the shaft collar.
- The upper portion of the shaft will be backfilled to ground level with rubble, from demolished structures around the shaft and overburden material removed during shaft excavation. Note that in the case of the Hope No. 4 Seam Project, the overburden stockpile will not contain carbonaceous material.
- The area is top soiled (minimum 500 mm topsoil) and re-vegetated with the seed mix of indigenous and pasture grasses.

4.2.4 Rehabilitation of Borrow pits

All borrow pit areas will be reshaped with maximum 1:5 slopes, and the soils remaining in the borrow pits remediated by application of agricultural lime and fertiliser onto the soils (through ploughing), and establishment of indigenous vegetation. These areas will be treated as rehabilitated areas and thus be subject to after care and maintenance.

4.2.5 Rehabilitation of Ecologically Degraded Areas

The rehabilitation goal for degraded wetland areas as well as the rehabilitation of mining activities (constructed infrastructure or opencast mining) taking place within a wetland area or in the associated local catchment of the wetland area is to progressively re-instate areas that are safe, stable and non-polluting, that can be integrated into the greater farming area by enhancing the biodiversity and re-instating the wetland area to be used as grazing land, thus forming once more, part of the regional agricultural activities as well as align to the provincial economic initiatives. The rehabilitation goal for the wetland area is to maintain the Present Ecological State (PES) of the wetland area as indicated in a Wetland Assessment Report.

Wetland areas are evaluated based on their hydrogeomorphic classification, and as such three main drivers are recognised viz. geomorphology (topography), hydrology (surface flow) and vegetation (vegetation canopy cover of the soil). The level of rehabilitation must thus be evaluated against the re-instatement of these three components, not just for the wetland area per sae, but also for the part of the mining activities that are taking place in the local catchments of the wetland areas.

Mining activities taking place in a part of a wetland area will thus disturb part of the hydrological, geomorphological and vegetational functions of the wetland area itself. Mining activities taking place in the associated local catchment area will also disturb part of the hydrological, geomorphological and vegetational functions of the local catchment area. During the life of mine the wetland area will thus lose some of the water that would have reported to it during pre-mining conditions. The quality of the

surface runoff water during mining will not be affected, since all polluted water will be contained within the mining area.

Rehabilitation of the mining and infrastructure area must thus be sufficient in order to emulate pre-mining geomorphology, hydrology and vegetation.

4.2.5.1 Geomorphology

The topography and soil profile is an important component of the geomorphology and determine amongst others how water and nutrients will flow through the system.

Topography

Following final rehabilitation, the area must be shaped so that the topography of the area emulates the pre-mining topography. The geomorphology of the catchment will thus be re-instated.

Soil profile

The placement of the different wetland soil forms of the sub-soil layer covered by the different wetland soil forms of the top-soil layer must emulate the pre-mining soil profile and will result in the re-instatement of the geomorphology. A compacted clayish sub-soil layer will be placed underneath the sub-soil layer as to act like the original ferricrete layer that was present pre-mining. Surface runoff water will thus not move vertically into any backfilled area underneath the compacted layer. The compacted layer will assist in the lateral movement of water down-slope to the wetland area and eventually to the stream or lowest area of the wetland. The compacted layer will also assist in inundating the wetland soil forms to re-instate the wetland zones.

4.2.5.2 Hydrology

The topography is an important component of the hydrology and determine amongst others in which direction the surface runoff water is flowing over the area.

Topography

All infrastructure, buildings and voids in the mining and infrastructure area that hindered and altered the flow of water down to the wetland area must be dismantled, demolished, removed and backfilled. Following final rehabilitation, the area must be shaped so that the topography of the area emulates the pre-mining topography. The wetland area will receive once more most of the surface runoff water that it received prior to mining. The hydrology of the disturbed part of the catchment area as well as the wetland area will thus be re-instated.

Water quality

Surface water: Since the mining and infrastructure area will be covered with un-contaminated top-soil, surface water running over the area will not carry pollutants. Sub-surface water moving laterally through the sub-soil will also not carry pollutants since the compacted sub-soil layer will keep it above the potentially contaminated material.

Groundwater: In the case of opencast mining, the acid forming shale material must be put in the bottom of the opencast cuts during concurrent rehabilitation and immediately inundated with water in order to minimise the period that the material will be in contact with oxygen. The formation of acidic water will thus be reduced. Acidic water that may reach the stream/wetland area will be negligible. In the case of underground mining the Geohydrological investigation would have indicated pollution

plumes or decanting areas and monitoring boreholes would have been constructed accordingly. Water from these boreholes must be monitored following rehabilitation. In the event that any of the boreholes indicate pollution, appropriate treatment of the water must be initiated. Shaft entrances must also be sealed prior to rehabilitation.

4.2.5.3 Vegetation

Vegetation is an important component in order to curb the speed with which surface runoff water flows down a slope. Excessive flow can cause erosion and diminish infiltration. Vegetation is also imperative for the trapping of silt, pollutants and toxins.

Vegetation

During the placement of the top-soil layer, contour berms must be formed in order to aid in reducing the speed of runoff water. The rehabilitated terrestrial area will be seeded with the recommended terrestrial seed mixture and the rehabilitated wetland area will be re-vegetated with seed collected from the hygromorphic grass species in the area. Once the vegetation is established, it will re-instate the natural services of flood attenuation, stream flow regulation and sediment/pollutant/ toxin trapping. The vegetation will also re-instate the habitat for smaller animals and invertebrates.

Actions to curb degradation of wetland areas during mining:

- Continuous ground- and surface water monitoring;
- Immediate clean-up of any contamination of the wetland area;
- Immediate restoration and re-vegetation of any erosion gullies or areas of ponding as a result of the mining activities;
- Monitor, control, eradicate and manage declared Category 1, 2 and 3 invader plant species;
- Limit the settling of dust, generated by mining activities, on wetland vegetation;
- Combat movement of people (by vehicles or on foot) through wetland areas;
- Combat the setting of snares by mine employees; and
- Combat the removal of plant species, especially medicinal plant species, by mine employees

4.2.4 Management of Extraneous Water as a Result of the Goedehoop Colliery Mining and Associated Activities

4.2.4.1 Management of Water from Underground Workings

Ongoing Seepage

During the operational and decommissioning phases, detailed analysis will be conducted to confirm predicted decant points and to determine any new decant points from the underground mine workings.

If it can indeed be proven that the mined out areas will indeed decant, the following is committed to by Anglo Operations (Pty) Limited.

Commitment:

- *In the event that the decant water from the underground workings is not of a quality suitable for downstream users, Goedehoop Colliery will initiate an investigation by a competent person or institution to determine the most appropriate actions to be undertaken, and the positions for such actions to be undertaken, to ensure that the water quality conforms to the downstream users' needs. Such actions and methods to be employed will be discussed with the Department of Water and Sanitation to gain their approval prior to implementation.*
- *In the event that any water purification activities are to be conducted, these activities and or methods will be based on best available technology at the time of commencement (of the activity), and will continue until such time as a self-sustaining acceptable water quality can be achieved.*

4.3 POTENTIAL RISK OF ACID MINE DRAINAGE

In order to determine the potential risk of acid mine drainage for the proposed project and the entire Goedehoop Colliery mining and associated infrastructure areas, results from the shake flask tests and acid base accounting tests undertaken on potential acid generating material from the mine were used.

Shake flask tests were undertaken by Wates Meiring and Barnard (Pty) Ltd during February 1996 in an attempt to determine the acid generating potential of the rock and coal material encountered at Goedehoop Colliery. These tests were undertaken for the Goedehoop Colliery section of the mine.

Shake flask tests were conducted on the No 2 and 4 seams to determine probable water quality through mobilisation of the readily available pollutants. Shake flask tests give an early warning of probable acid mine water generation. The results from the tests are indicated in Table 36. The interpretation of these results indicates that:

The roof shales have a tendency to generate pyrite oxidation products, although the water will have an alkaline pH. This is due to the relatively high calcium content contained within the shales.

The No 4-seam coal has the potential to generate acid mine water.

The No. 2 seam coal has a low to moderate potential to generate pyrite oxidation products with a relatively high neutralization potential

Table 36: Shake Flask Test Results in Terms of Supernatant Quality

	N0. 2 SEAM		NO.4 SEAM			
	SEAM	ROOF SHALE	SEAM ROOF	SEAM FLOOR	ROOF SHALE	FLOOR SHALE
pH	8.15	8.10	1.80	7.65	7.05	7.20
Conductivity	52.5	138	1771	273	43.5	24.5
TDS	320	1044	12792	2482	336	37.4
Calcium	62	177	99	200	25	10
Magnesium	9.6	36	30	80	8.4	2.8
Sulphate	116	480	3487	1332	152	56
Alkalinity	120	192	-	244	12	32
Manganese	-	-	3.2	-	-	-
Aluminium	-	-	290	-	-	-
Iron			3010			

Subsequent to this study, Acid Base Accounting (ABA) tests were undertaken by Wilkens Consulting during February 2002 on samples obtained from the Goedehoop Colliery's Hope dump, Old slurry dam and the Mineral Residue Deposit facility as well as samples obtained from the Goedehoop Colliery's workings in the No. 2 Seam (Hope section, Block 11 and Block 8 underground workings) and the No. 5 coal seam (Vlaklaagte section). In 2013 Marlow Aquatec (Pvt) Limited conducted another acid base accounting on the material from the mineral residue deposit.

Samples were obtained from the floor, roof and wall (coal seam) in the respective workings in an effort to gain a better perspective of the acid producing potential of the coal seam.

The sampling positions of the ABA tests are described in Table 37 below.

Table 37: Acid Base Accounting Sample Description (Wilkens Consulting)

ABA SAMPLE SITES	DESCRIPTION	SAMPLE NUMBER
MINERAL RESIDUE		
	K 20 - Coarse mineral residue arising from washing plant	GH O1
	F 20 – fine mineral residue arising from plant	GH 02
OLD SLURRY DAM		
	Top, sample obtained from 0,5 meters below slurry dam surface	GH 09
	Top, sample obtained from 1,0 meter below slurry dam surface	GH 10
MINERAL RESIDUE DEPOSIT FACILITY		
	Top of Mineral Residue Deposit facility	GH 07
	Bottom of Mineral Residue Deposit facility	GH 08
	Slimes (slurry)	GH 34
HOPE DUMP		
	Top of mineral residue deposit	GH 11
	Bottom of mineral residue deposit	GH 12
NO. 2 SEAM UNDERGROUND WORKINGS		
	Block 11 - roof of workings	GH 19
	Block 11 - wall of workings	GH 20
	Block 11 - floor of workings	GH 21
	Hope Section - roof of workings	GH 28
	Hope Section - wall of workings	GH 29
	Hope Section - floor of workings	GH 30
	Block 8 – Roof of workings	GH 31
	Block 8 – wall of workings	GH 32
	Block 8 – floor of workings	GH 33

The results of the Acid base accounting tests are summarised in Table 38 below.

Table 38: Acid Base Accounting Sample Description (Wilkens Consulting)

SAMPLE NUMBER	SATURATED PASTE pH	AP (kg $CaCO_3$/ton)	NP (kg $CaCO_3$/ton)	NP:AP	ABAPrediction
MINERAL RESIDUE					
GH O1	7.32	334.38	23.20	0.07	Acidic
GH 02	7.40	484.06	23.05	0.05	Acidic
OLD SLURRY DAM					
GH 09	8.16	11.03	23.90	2.17	Neutral
GH 10	8.29	27.44	24.55	0.89	Acidic
MINERAL RESIDUE DEPOSIT FACILITY					
GH 07	7.64	96.19	22.25	0.23	Acidic
GH 08	7.16	50.50	19.40	0.38	Acidic
GH 34	8.31	28.06	22.50	0.80	Acidic
HOPE DUMP					
GH 11	2.64	78.99	-11.15	0.00	Acidic
GH 12	2.75	64.18	-13.90	0.00	Acidic
NO. 2 SEAM UNDERGROUND WORKINGS					
GH 19	7.40	4.94	1.38	0.28	Acidic
GH 20	8.69	15.81	13.60	0.86	Acidic
GH 21	8.54	14.19	12.55	0.88	Acidic
GH 28	9.18	128.22	24.50	0.19	Acidic
GH 29	8.51	15.84	15.15	0.96	Acidic
GH 30	7.27	21.88	6.30	0.29	Acidic
GH 31	7.41	481.56	21.15	0.04	Acidic
GH 32	8.74	32.84	22.0	0.67	Acidic
GH 33	9.02	32.28	23.65	0.73	Acidic

Notes: NP:AP<1 = Acidic 1<NP:AP<2 = Uncertain NP:AP>2 = Neutral

From the results of the ABA tests it is evident that:

- The mineral residue currently produced from the washing facility are currently neutral but have extremely high acid potentials and NP:AP ratios of >0.05
- The mineral residue on the Hope Dump is highly acidic, both currently (pH<3.5) and will be acidic in the future (NP:AP ratio 0)
- The Old slurry dam results indicated that the top 0,5 m of slurry is neutral whilst the slurry encountered 1,0 meter below surface was acidic. Currently the Old Slurry dam pH is Neutral to Alkaline.
- The Mineral Residue Deposit facility had mixed ABA results with some neutral predictions. Generally, the facility has acidic predictions. The current pH of the facility is Neutral.
- The Hope Shaft (2-seam) workings results for ABA indicate a long term acidic prediction although the samples are currently alkaline in pH.

- The Satellite shafts Block 8 and 11 (both 2 seam) were found to have an acidic prediction. These samples are currently alkaline.

If the analysis of the ABA tests on the 2-seam are compared to the shake flask tests conducted on the 2-seam it is evident that the roof shales have the highest potential to generate pyrite oxidation products. The alkaline character of the No.2 coal seam is indicated in both the ABA and shake flask tests.

4.4 Steps taken to Investigate, Assess and Evaluate the Impacts of the Acid Mine Drainage

During the assessing of the impacts of the proposed project on groundwater, a numerical groundwater modelling, which took into consideration the results from the ABA and Shake tests, was used the investigate, assess and evaluate the impacts of acid mine drainage.

Numerical groundwater modelling is considered to be the most reliable method of anticipating and quantifying the likely impacts on the groundwater regime.

Modelling fort the proposed project was done as representation of a groundwater flow system that attempts to mimic the natural processes. It is therefore a simplified version of the natural system, compiled with geological, hydrogeological, hydrological and meteorological data; which utilises governing equations to incorporate all this data and simulates the hydraulic properties or geochemical properties of the system.

4.4.1 Flow modelling

The finite difference numerical model was created using the US Department of Defence Groundwater Modelling System (GMS10.0) as Graphical User Interface (GUI) for the well-established Modflow and MT3DMS numerical codes.

MODFLOW is a 3D, cell-centred, finite difference, saturated flow model developed by the United States Geological Survey. MODFLOW can perform both steady state and transient analyses and has a wide variety of boundary conditions and input options. It was developed by McDonald and Harbaugh of the US Geological Survey in 1984 and underwent eight overall updates since. The latest update (Modflow NWT) incorporates several improvements extending its capabilities considerably, the most important being the introduction of the new Newton formulation and solver, vastly improving the handling of dry cells that has been a problem in Modflow previously.

4.4.2 Transport modelling

Transport modelling was done using MT3DMS. MT3DMS is a 3-D model for the simulation of advection, dispersion, and chemical reactions of dissolved constituents in groundwater systems. MT3DMS uses a modular structure similar to the structure utilized by MODFLOW, and is used in conjunction with MODFLOW in a two-step flow and transport simulation. Heads are computed by MODFLOW during the flow simulation and utilized by MT3DMS as the flow field for the transport portion of the simulation.

4.4.3 Risk Assessment

The groundwater risk assessment was assessed by defining the three components, which are the source, the pathway and the receptor. The risk assessment approach is therefore aimed at describing and defining the relationship between cause (source) through the groundwater pathway and the effect

to the receptor. In the absence of any one of the three components, it is possible to conclude that groundwater risk does not exist.

4.5 ENGINEERING AND DESIGNS SOLUTIONS TO BE IMPLEMENTED TO AVOID OR REMEDY ACID MINE DRAINAGE

The reactions of acid mine drainage from sulphide minerals are discussed according to the three stage stoichiometric example of pyrite oxidation after James, (1997) and (Ferguson & Erickson, 1988) in which one mole of pyrite oxidized forms two moles of sulphate:

Reaction (2.1) represents the oxidation of pyrite to form dissolved ferrous iron, sulphate and hydrogen. This reaction can occur abiotically or can be bacterially catalysed by *Thiobacillus ferrooxidans*.

FeS2 +7/2 O2 + H2O Fe2+ + 2SO42- + 2H+ (2.1)

The ferrous iron, (Fe2+) may be oxidised to ferric iron, (Fe3+) if the conditions are sufficiently oxidising, as illustrated by reaction (2.2). Hydrolysis and precipitation of Fe3+ may also occur, shown by reaction (2.3). Reactions (2.1), (2.2) and (2.3) predominate at pH > 4.5.

e2+ + 1/4O2 + H+ Fe3+ + 1/2H2O (2.2)

Fe3+ + 3H2O Fe(OH)3 (s) +3H+ (2.3)

Reactions (2.1) to (2.3) are relatively slow and represent the initial stage in the three-stage AMD formation process. Stage 1 will persist as long as the pH surrounding the waste particles is only moderately acidic (pH > 4.5). A transitional stage 2 occurs as the pH decreases and the rate of Fe hydrolyses (reaction 2.3) slows, providing ferric iron oxidant. Stage 3 consists of rapid acid production by the ferric iron oxidant pathway and becomes dominant at low pH, where the Fe2+ (ferric iron) are more soluble (reaction 4):

FeS2 + 14 Fe3+ + 8H2O 15Fe2+ + 2SO42- + 16H+ (2.4)

Without the catalytic influence of the bacteria, the rate of ferrous iron oxidation in an acid medium would be too slow to provide significant AMD generation. As such the final stage in the AMD generation process occurs when the catalytic bacteria *Thiobacillus ferrooxidans* have become established. Reactions (2.2) and (2.4) then combine to form the cyclic, rapid oxidation pathway mainly responsible for the high contamination loads observed in mining environments. This contaminated water, which is mostly found in the mined out workings or mineral residue deposits will migrate from the source towards the receptors through the groundwater flow paths.

The following measures are recommended to try and avoid or remedy the generation of acid mine drainage within the mined out workings. Note that it will be impossible to totally eliminate the generation of acid mine drainage, however the measures given below will reduce the extent of the acid mine drainage. These have been divided in terms of the phases of the proposed mining project:

Pollution prevention starts in the planning phase of an operation through evaluation of plans and, aimed at understanding the potential impacts of alternative working methodologies and a conscious effort to select, design and implement the alternatives that maximise the ability to prevent pollution. Typical pollution prevention measures that were implemented include those shown below:

- A mining layout plan that has considered closure and rehabilitation issues (decant possibility and effects of plume migration) was prepared by the mine and is submitted for approval by the competent authority. This plan has been revised to exclude a portion of the underground

mining area that will potentially result in the decanting of the groundwater, which would have had an impact on the nearby Olifants River. The mining layout plans as well as the numerical will be updated regularly (every 3 to 5 years) during operation with available monitoring data. All operational planning and activities will be undertaken with eventual closure in mind, such that operations can end in a manner that minimizes the final risks and liabilities in the post-closure phase.

- As seepage to the Olifants River at the furthest southern section of the mine is the prime groundwater risk, measure to reduce the pressure head at this point will be implemented. This will be accomplished by compartmentalising the underground mine as far as possible. The long thin central section of the mine is especially suited to create such underground plugs at various locations. If executed correctly, this measure could mitigate the risk of seepage to the river in full, and its importance cannot be overemphasized. This aspect is of crucial to curb the spread of pollution and associated post-mining financial liabilities, that it should be addressed at the planning stage.
- Current monitoring boreholes for Goedehoop Colliery and any other new one will be sampled to obtain information on the groundwater regime as well as for future monitoring purposes.

In addition to the above, the following additional water management measures will be undertaken:

- All openings to the mine (shafts, adits, boreholes) will be sealed or have adequate berms surrounding the openings to prevent surface water entering whenever feasible.
- All monitoring boreholes will be sealed from the bottom to the top to prevent groundwater entering the hole and feeding into the mine workings.
- All significant water ingress points encountered during mine construction and development will be properly marked. As far as possible, the physical location, flowrate and water quality of the ingress points will be recorded and incorporated into the existing groundwater model and the mine water and salt balance.
- All major water ingress points will be properly sealed. The details of the sealing operation will be recorded and filed.
- Where significant water ingress cannot be prevented, measures should be put in place to intercept ingress water as close as possible to the source in order that it can be pumped out of the mine before its quality can deteriorate through contact with sulphide minerals.
- Approved design measures will be properly implemented and mine plans and drawings will be modified to indicate ‘as-built’ systems wherever they deviate from the original designs together with motivations on the design variation.
- Manage the storage systems when storing water underground is likely to be into contact with sulphide minerals a manner that will minimizes the potential for water quality deterioration to occur. This would imply that storage reservoirs must be filled as quickly as possible and that measures must be put in place to prevent regular fluctuation of the stored water level as it is this wetting and drying cycle on the exposed surfaces that will enhance the rate of sulphide oxidation and lead to water quality deterioration.

4.6 MEASURES TO REMEDY RESIDUAL OR CUMULATIVE IMPACTS FROM ACID MINE DRAINAGE

In the event that the decant water from mine workings within Goedehoop Colliery is not of a quality suitable for downstream users, Goedehoop Colliery will initiate an investigation by a competent person or institution to determine the most appropriate actions to be undertaken, the positions for such actions to be undertaken, and to ensure that the water quality conforms to the downstream users needs. Such actions and methods to be employed will be discussed with the Department of Water and Sanitation to gain their approval prior to implementation.

In the event that any water purification activities are to be conducted, these activities and or methods will be based on best available technology at the time of commencement, and will continue until such time as a self-sustaining acceptable water quality can be achieved.

4.7 VOLUMES AND RATES OF WATER USE REQUIRED FOR THE MINING OPERATION

A water balance is one of the most important and fundamental water management tools available to the mines, which can assist the mines their water management. Water balance can be used by the mines in identifying and quantifying points of water consumption, as well as pollution sources. This information is key in assisting the mine in their water management designs.

In view of the above and since Goedehoop Colliery is required to submit a Water Use License Application to the Department of Water and Sanitation (DWS) for any new water uses and since the water balance forms part of the supporting documentation for the Water Use License Application, Anglo Operations (Pty) Limited appointed Jones & Wagener to compile a water balance for the mine. The water balance give details of the volumes and rate of water that is currently used and that is required by the proposed Hope No. 4 Seam mining project. A copy of the water balance for Goedehoop Colliery is attached as Appendix 14.

4.8 WATER USE LICENCE APPLICATION

During the operation of the proposed mining operation to be undertaken at Goedehoop Colliery, a number of activities that have been declared as water uses in terms of the National Water Act, 1998 (Act 36 of 1998) will be undertaken. In terms of section 22(1)(b), a person may use water if the water use is authorised by a licence under the National Water Act, 1998 (Act 36 of 1998). According to section 40 of the National Water Act, 1998 (Act 36 of 1998), the water use activities to be undertaken at the proposed Hope No. 4 Seam mining project must be authorised by the Department of Water and Sanitation, whose authorisation must be in the form of an integrated water use licence. In view of the above, Anglo Operations (Pty) Limited has compiled and submitted an application for an integrated water use licence to the Department of Water and Sanitation (Mpumalanga Regional Office, Bronkhorstspruit) for consideration.

5. ENVIRONMENTAL MANAGEMENT PROGRAMME

Table 39: Environmental Management Programme for the proposed Hope No. 4 Seam project.

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
PRE-CONSTRUCTION AND CONSTRUCTION PHASE								
Establishment of the Hope No. 4 Seam Shaft/Box cut, associated facilities and surface infrastructure (Overburden stockpile, topsoil stockpile/berms, access and service roads, water structures, water supply infrastructure, power supply infrastructure, conveyor belt system, guard house and stone dust silo) and upgrading of the existing infrastructure (Hope Shaft Complex and batching plant)								
Loss of productivity of the soils.	Soils, Land Use and Land Capability.	To ensure that the development of the shaft does not have detrimental impacts on the soil productivity, after mining land use and land capability.	Ensure that the stripping and stockpiling of the soils are undertaken in accordance with the Anglo Operations (Pty) Limited's rehabilitation guidelines.	The topsoil from the shaft area will be stripped to depths as recommended by the soil specialist (Avalon (0.9m), Glencoe (0.9m) and Witbank (0.9m)). These will be stockpiled in a topsoil stockpile.	Appointed contractor and the mine site manager.	Monitor the quality of the stockpiled topsoil annually.	Environmental Control Officer/Mine Environmental Co-ordinator (ECO)	Throughout the pre-construction and construction phase.
				The stockpiling of the topsoil may be used to create a perimeter berm that will act a visual shield and noise barrier for the surrounding community.	Appointed contractor and the mine site manager.	Monitor the effectiveness of the perimeter berm as a noise and visual barrier.	ECO.	
				The topsoil stockpile will not exceed a height of three meters, which will assist in retaining the fertility of the soils.	Appointed contractor and the mine site manager.	Monitor the height of the topsoil stockpile on establishment of the stockpile.	ECO.	
				The stockpiled topsoil will be seeded with a recommended seed mix to ensure that a good vegetation cover is achieved.	Appointed contractor and ECO.	Monitor the vegetation distribution on the stockpiled topsoil during the year of construction.	ECO.	
				No mixing of the topsoil with subsoil, softs and hard overburden will be allowed.	Appointed contractor and ECO.	Undertake regular inspections to conform correct placement of the removed soils.	ECO.	
				As far as possible, areas with disturbed vegetation cover will be used for the siting and construction of the shaft complex and associated infrastructure.				
Loss of natural vegetation and seed bank in the affected	Flora.	To ensure that the establishment of the shaft, overburden stockpile and	The management of the impact will comply with the mine's biodiversity	Soils will be stripped and stockpiled as describe in the management actions under soils.	Appointed contractor and site manager.	Same as under soils.	Same as under soils	Throughout the pre-construction and construction

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
areas.		access roads do not have detrimental impact on the area's flora.	management plan.	As much as possible areas with disturbed ecosystems were used for the siting of the shaft and its associated infrastructure. Where possible areas that will not be used during the operational phase should be rehabilitated and seeded with a recommended seed mix. This will also ensure that alien species do not encroach into the rehabilitated areas. All unused areas must be maintained such that they do not deteriorate from their pre-mining state.	ECO. ECO.	Disturbed areas will be monitored against the approved layout plan. Disturbed areas will be monitored against the approved rehabilitation plan.	ECO ECO.	phase.
Loss of catchment yield.	Surface Water.	Ensure that the establishment of the shaft complex does not have detrimental impacts on the catchment yield.	Management of the storm water runoff upstream of the shaft complex will comply with the requirements of the regulations under the GN704 and as far as possible with the requirements of the relevant DWS Best Practice Guidelines.	The shaft complex has been designed to occupy as small an area as possible. The storm water diversion structures for the shaft complex and associated surface infrastructure will be constructed in accordance with the Hope No. 4 Seam project civil designs approved by the DWS (Appendix 2), which shows the storm water management systems' silt control and erosion protection. All stripped areas will be optimised to limit over stripping. This will ensure that the generation of unnecessary volumes of silted water is controlled on site. The constructed storm water diversion structures will be maintained in good order. Any damage within the constructed storm water diversion structures will be repaired as soon as possible.	Appointed contractor supervised by the mine engineer. Appointed civil engineer. ECO. ECO. ECO.	Inspect the construction of the shaft complex. Inspect and approve the construction of the storm water diversion structures on completion of the construction. Monthly inspection of the constructed storm water diversion structures. Monthly inspection of the constructed storm water diversion structures. Monthly inspection of the constructed storm water diversion structures.	ECO. Mine engineer and ECO. Mine engineer and ECO. Mine engineer and ECO. Mine engineer and ECO.	During pre-construction and construction phase. During construction of the structures. Throughout construction phase. Throughout construction phase. Throughout construction phase.
Deterioration of water quality in Hope Spruit.	Surface Water.	Ensure that the establishment of the shaft complex does not have detrimental impact on nearby	The quality of storm water from the shaft complex will comply with the target water quality	Storm water diversion structures (berms and trenches) will be constructed to divert clean water runoff to the nearby Hope Spruit or existing storm water systems. The construction	Appointed engineer and the project team.	Inspect and approve the construction of the storm water diversion structures on completion of the	Mine engineer and ECO.	Throughout construction phase.

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
		stream water quality.	objectives as stipulated in the Goedehoop Colliery water use licence. Goedehoop Colliery will undertake the construction of the Hope No. 4 Seam shaft in compliance with the regulations under the GN704.	of the system will preferably be conducted during the dry season. If a situation exist where the storm water diverted is contaminated and cannot be diverted to the clean water system, this water will be collected into a sump and then pumped via the new dirty water pipeline to the existing return water dam.	Appointed contractor.	construction. Construction undertaken in accordance to the designs approved by relevant authorities.		
				Areas that are to be stripped of topsoil should be optimised to limit unnecessary stripping.	Appointed contractor supervised by the ECO or mine engineer.	Inspect the constructed storm water diversion structures monthly.	Mine engineer and ECO.	Throughout the construction phase.
				Storm water from upslope of the stripped areas should be diverted around these areas to limit the amount of storm water flowing over from these areas.	Appointed contractor and ECO.	Monthly monitoring of water quality at the Hope Spruit up and down stream of the shaft complex.	ECO.	During the stripping of the topsoil.
				Limit activities of topsoil stripping to such an extent that it does not result in sedimentation run-off.	Project implementation team.	Monitor the progress and efficiency of the topsoil stripping during the stripping of topsil	ECO.	Throughout the construction phase.
				Dry season construction is preferable.	Appointed contractor and the ECO.	Regular project implementation meetings.	Mine engineer.	Throughout the construction phase
				Hydro seeding of the topsoil stockpile is recommended to speed up vegetation cover establishment thereby ensuring stability of the stockpiles. An appropriate seed mix should be recommended by a rehabilitation specialist.	Appointed contractors and the ECO.	Monitor the progress of revegetation of the seeded stockpiles annually.	ECO.	Throughout the construction phase.
				Mine vehicles and machinery used during the construction phase must be well maintained	Appointed contractors and the ECO.	The vehicles and machinery will be inspected for leakages.	ECO.	Throughout the construction phase.
				Storm water diversion and collection structures (berms, trenches and pipelines) will be constructed for the diversion of water from all dirty water areas at the shaft complex (existing office and workshop, shaft box cut, batching plant, conveyor belt transfer points and		Inspect and approve the construction of the storm water diversion structures on completion of the construction. Construction will be conducted in	ECO.	Throughout the construction phase.

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
				contaminated roads) to the dirty water collection sump and the existing return water dam.		accordance to the designs specifications approved by relevant authorities.		
Groundwater contamination by carbonaceous material from shaft excavation.	Groundwater.	Ensure that the groundwater regime is not detrimentally affected by the carbonaceous material excavated from the shaft.	The carbonaceous material will be managed such that the groundwater quality in the vicinity of the stockpiles does not deteriorate beyond water quality parameters stipulated in the Goedehoop Colliery water use licence.	Blasting and excavation of the blasted material will be undertaken such that all carbonaceous material removed from the shaft area are transported to the Goedehoop Colliery mineral residue deposit.	Appointed contractor, Mine engineer, geologist and ECO.	Groundwater monitoring boreholes should be sited at designated positions based on infrastructure layout for the monitoring of the groundwater regime. These must be drilled prior to construction and must be monitored quarterly.	ECO	Throughout life of mine.
Groundwater contamination with hydrocarbon spills.	Groundwater.	Ensure that the groundwater regime is not detrimentally affected by the waste spillages.	Hydrocarbons generated will be managed in terms of the norms and standards for waste storage and in accordance to the mine's waste management procedures.	Mine machinery will be repaired in the existing workshops. No maintenance outside the dedicated workshop will be allowed unless it is emergency repairs which must be on protected ground.	Appointed contractor, Mine engineer and ECO.	The project area will be inspected on a regular basis for signs of waste/oil spillages.	ECO.	Throughout life of mine.
				All hydrocarbon liquids will be stored in leak and corrosion resistant containers. These containers will be placed on concrete floors.	Appointed contractor, Mine engineer, geologist and ECO.	The containers will be inspected on a regular basis for detection of leaks, identification of spillages and any other damages.	ECO.	
				The containers used for the storage of hydrocarbon liquids will be maintained in good condition.	Appointed contractor, Mine engineer, geologist and ECO.			
				Training, which will be in compliance with the requirements of the norms and standards for the waste storage facilities will be conducted for employees working with waste (hydrocarbon liquid), including contractors' employees.	Appointed contractor, Mine engineer, geologist and ECO.	Training will be done in accordance to the mine training programme.	ECO.	
				All spillages must be contained and the affected areas remedied. An emergency preparedness plan, which is in line with the mine's environmental emergency plan and the norms and standards for the waste storage facilities. Where necessary, sufficient supply of absorbent fibre will be kept at site to contain accidental spills.	Appointed contractor, Mine engineer, geologist and ECO.	Areas with spillages will be monitored to confirm that the area is properly rehabilitated.	ECO.	

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
				Credible waste collectors will be used for the removal of a waste from the site to a registered waste disposal facility.	ECO.	Waste will be recorded in accordance to existing mine systems.	ECO.	
Wetland destruction and loss of habitat.	Sensitive Landscapes.	Ensure that the establishment of the shaft complex does not have detrimental impacts on the identified Hope Spruit and seepage wetlands.	Maintain or improve the current PES and EIS of the wetlands within the Hope Spruit in accordance to the water use licence conditions.	The development footprint of the Hope No. 4 Seam shaft area will be demarcated before establishment of the shaft complex. The shaft complex will be outside thirty two meters from the edge of the Hope Spruit wetland area. No construction activities will be allowed outside the shaft complex development footprint. The surface of slopes of the shaft benches will be sprayed with shotcrete material in order to reduce the effects of the drawdown on the surrounding wetlands. A storm water management system will ensure that clean storm runoff water from the shaft area is diverted to the nearby stream. Storm water from the construction area will be managed in such a manner to prevent any sedimentation runoff into the nearby stream. Where necessary, silt and erosion barrier structures will be implemented where silt build up and high velocity run can be expected. Water that can come into contact with carbonaceous material will be diverted into the dirty water catchment sump and pumped to the existing return water dam.	ECO Appointed contractor and ECO. ECO. Appointed contractor. ECO.	The PES and the EIS of the affected wetlands will be monitored once every year Monthly Inspections will be conducted during the construction of the shaft complex to determine compliance with the management action. The spraying of the shotcrete will be monitored. Surface water will be monitored on a monthly basis.	ECO. ECO. Mine engineer. ECO.	Throughout the planning, pre-construction and construction phase.
Wetland destruction and loss of habitat.	Sensitive Landscapes.	Ensure that the construction of the overland conveyor belt, dirty water pipeline and re-routed power line do not have detrimental impacts on the Hope Spruit and seepage wetlands.	Maintain the current PES and EIS of the wetlands within the Hope Spruit in accordance to the water use licence conditions.	The footprint of the conveyor belt, dirty water pipeline and the re-routed power line has been designed to occupy as small space as possible. The dirty water pipeline has been designed to be connected to the conveyor belt structure, hence avoiding disturbance of the wetland. Where the pipeline is not attached to the	Appointed engineer and ECO.	Inspection by the ECO will be conducted at the construction site weekly.	ECO.	Throughout the planning, pre-construction and construction phase.

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
				conveyor belt, the pipeline will be elevated to be above ground. A plinth will be used to lift the pipeline.				
				Construction of the infrastructure within the wetlands will be limited to the construction site, which will be demarcated before commencement of construction.	Appointed contractor and ECO.	Inspection by the ECO will be conducted at the construction site weekly.	ECO.	
				All topsoil and subsoil removed during the construction of the infrastructure will be stockpiled separately outside the wetland areas and the stockpiles will not be higher than three meters.	Appointed contractor and ECO.	Inspection by the ECO will be conducted at the construction site weekly.	ECO.	
				A storm water management system that will ensure that clean storm runoff water from the shaft area is diverted to the nearby stream must be implemented before construction of the infrastructure. Storm water from the construction will be managed by managing all sedimentation runoff before diverting the storm water to the nearby stream.	Appointed contractor and ECO.	Surface water will be monitored on a monthly basis.	ECO.	
Air pollution through air pollutants' emissions, from the construction site.	Air quality.	Ensure that all operations during the pre-construction and construction phase of the Hope No. 4 Seam shaft complex do not result in detrimental air quality impacts.	The shaft complex will be constructed such that the ambient air quality does not exceed the National Air Quality Standards and the European Community Levels, which include the Anglo Air Quality Standards (internal air quality standards).	Wet suppression using water carts will be conducted at areas with excessive dust emissions, which will include used open spaces and unpaved roads, transfer points and any other area with potential to generate excessive dust. Chemical surfactants will be considered should water suppression not yield satisfactory results.	Appointed contractor and ECO.	Visual inspections of areas with possible dust emissions such as unpaved roads and transfer points will be conducted on a monthly basis.	ECO.	Throughout the construction phase.
				Traffic will be restricted to demarcated areas and traffic volumes and speeds within the shaft complex construction site will be controlled.	Safety Officer.	Ambient dust fall and PM monitoring (including recommended additional monitoring points) will be conducted monthly and daily, respectively.	ECO.	
				The farmers and community meetings	ECO.	Meetings with farmers will	ECO.	

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
				conducted by the mine will be used for environmental reporting and community liaison on matters relating to the impacts on air quality.		be arranged twice every year.		
Increased ground vibration and air blasts.	Ground vibration and air blast.	Ensure that the ground vibration levels and air blasts do not have detrimental effects on surrounding structures.	The ground vibration and air blast from the development of the shaft will not exceed the United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast.	Minimum explosives will be used and the blasting holes will be stemmed. In order to ensure that levels of ground vibration and that of air blast are within acceptable limits, not to induce damage. Reduce charge mass per delay limit as specified by a suitably qualified blaster, will be used. A log of blasting must be maintained and the following will be complied with i.e.: • Blasting may only take place between 06h00 and 18h00. • Notify people within 1 km radius 1hr prior to blasting. • Monitor and review noise levels – amend where necessary. • Address all complaints logged. • Undertake a risk assessment. Implement blast design as per blasting expert recommendations, which must include closing of private roads at a safe point and preferably where traffic can access an alternative route.	Appointed blasting contractor and/or mine blaster Appointed blasting contractor and mine blaster or geologist. Appointed blasting contractor and mine blaster or geologist.	Blasting holes will be inspected before any blasting is conducted. Mine geologist will check that that the log is maintained. The mine geologist will ensure that the blasting designs are compiled and approved by a blaster before blasting.	Blaster Mine Engineer Mine Engineer	When blasting during the construction phase of the operation.
Increased noise levels.	Noise aspects.	Ensure that the noise levels emanating from the shaft complex's construction site will not have detrimental effects on the mine employees and surrounding communities.	The noise levels from the shaft complex construction site will be managed and measures will be taken to ensure that noise levels are below the National Noise Control Regulations, SANS10103:2008 guidelines and the International Finance Corporation (World Bank) guidelines.	The topsoil berms/stockpiles and overburden stockpiles will be used as a sound barrier around noisy parts of the shaft complex. This will control noise towards the Mahlathini informal settlement and Hope Village. Limit the maximum speed on the haul roads to 60 km/h or less. Ensure that the mine employees are issued with earplugs and that they are instructed to use them. Educate employees on the dangers of hearing	Appointed contractor and ECO. Safety Officer Safety Officer Safety Officer	Undertake ambient noise monitoring programme monthly. Speed checking to be conducted as regularly as possible. Use of earplugs will be checked and reported. Safety meetings where the	Safety Officer and ECO. Safety Officer. Safety Officer. Safety Officer.	Throughout the construction phase.

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				loss due to mine machinery noise.		awareness is conducted will be recorded and records must be filed.		
				Any deviation detected by the noise monitoring results must be addressed.	Safety Officer	Actions of measures taken to address non-compliance will be recorded and filed.	Safety Officer.	
Visual impacts on the surrounding communities and road users from the shaft construction.	Visual aspects.	Ensure that all operations during the pre-construction and construction phase of the Hope No. 4 Seam shaft complex do not result in detrimental visual impacts on surrounding properties, communities and road users.	Measures will be undertaken by the mine to ensure that the visual aspects from the site are complying with the relevant visual standards and objectives, including internal standards and objectives.	Use the perimeter berms, topsoil and overburden stockpiles constructed around the shaft area as a visual screen from the surrounding communities.	Mine engineer and the ECO.	The constructed perimeter berms will be inspected for compliance with the design specifications.	Mine Engineer.	Throughout the life of mine.
				The shaping of the cut and fill slopes of benches and access roads must be to angles and shapes that are reflected in the adjacent landscape.	Appointed contractor and ECO.	The slopes will be inspected for compliance with the shaft construction method statement and designs.	Mine Engineer.	
				Where possible areas disturbed by construction activity, must be suitably topsoiled and vegetated as soon as is possible. The progressive rehabilitation measures will allow for the maximum growth period before the completion of the project.	Appointed contractor and ECO.	Areas of disturbance will be inspected to determine areas that need rehabilitation.	ECO.	
				Limit areas of disturbance to areas where infrastructure or facilities will be constructed or placed. A portion (20-30m) next to the main access road will not be disturbed in order to protect the vegetation that will form a visual buffer. Where possible, the existing vegetation will be supplemented with indigenous plant species to increase the effectiveness of the visual buffer.	Appointed contractor and ECO.	Areas of disturbance inspected against the approved design specifications of the shaft complex.	Mine Engineer and ECO.	
				Dust suppression in all areas that will be affected by construction activities and where dust will be generated.	Appointed contractor and ECO.	See monitoring under air quality.	See under air quality.	
				Existing large trees that fall outside the earthworks area must be retained. Note that	ECO.			

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				the alien eradication program, if any, will supersede this condition. Avoid upwards lighting of structures but rather direct the light downwards to focus on the object to be illuminated. Light spill, particularly upwards, must be minimised by implementing the following: Not allowing external light fittings to shine upwards, all security and road lighting shall have "blinkers" or be specifically designed to ensure light is directed downwards to reduce light spill beyond the property boundary.	Appointed contractor. Appointed contractor.	Lighting will be monitored around the site.	Safety officer.	
Damage or destruction of sites with archaeological and cultural significance.	Sites of archaeological and cultural importance.	Ensure that the development of the shaft complex does not have detrimental impacts on the identified heritage sites.	The construction will be undertaken in compliance with the requirements of the National Heritage Resources Act, 1999 (Act 25 of 1999) and recommendations from the specialist.	The establishment of the shaft complex especially the overburden stockpile will be such that the development is away from the identified grave site. A buffer of fifty meters will be created between the grave site (site 13) and the proposed development. The grave yard (site 13) will be fenced in and a management plan will be drafted for the sustainable preservation thereof. The fencing in of graves is standard protocol in order to clearly demarcate it and as assistance for preservation and management. A permit will be acquired from the Mpumalanga Provincial Heritage Resources Agency before the demolition of any site considered to be a heritage site.	Appointed contractor and the ECO. Appointed contractor and ECO. ECO. ECO and suitably qualified heritage person.	The grave site will be monitored for any mining related damages on a regular basis. Inspections will be conducted during the construction phase to confirm the adherence to the determined buffer. The condition of the fence/barrier structure used to demarcate the grave yard will be monitored for monthly. Demolition of the building (site 7) will be conducted in accordance with the permit.	ECO. ECO. ECO. ECO.	Throughout the construction phase.
Impact on employment.	Socio-economic aspects.	Ensure that the positive impacts on employment are sustained.	Employment at the proposed site will be conducted in compliance with mine recruitment policies.	Local labour and contractors will be appointed. Local labour force will ensure that economic	Community Liaison Officer. Community Liaison	Records of recruitment will be kept for audit purposes. Records of procurement	Human Resources Manager. Human	Throughout the pre-construction an construction phase.

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				spin-offs that result due to employment, benefit the local community.	Officer.	will be kept for audit purposes.	Resources Manager.	
Impact from the influx of job seekers.	Socio-economic aspects.	Ensure that measures are taken to discourage influx of job seekers.	Measures taken to control influx of job seekers will be in line with the mine's safety and security standards.	Goedehoop Colliery will ensure that the creation of unrealistic expectations are prevented by communicating the period of the construction phase to the local communities and the communities will be informed that few new positions will be created. Local councillors will be involved in the above communication.	Community Liaison Officer.	Number of job seekers will be monitored on a weekly basis and meetings held by, and with the communities, will where possible, be attended by the mine.	Community Liaison Officer and Safety officer.	Throughout the pre-construction an construction phase.
Impacts on the local economy during the construction phase.	Socio-economic aspects.	Ensure that the positive impacts on local economic aspects are sustained.	Goedehoop Colliery will ensure that the implementation of the measures are in line with the mine's targets committed to in the mine's local economic development plan or procurement strategy.	Anglo Operations (Pty) Limited will adhere to its procurement strategy, which aims to increase local content of the project to its maximum. Majority of construction material requirements will be sourced from industries in eMalahleni, Middelburg and the surrounds. The mine must comply with the requirements as guided by the Mining Charter with regards to SMME development and the mine's procurement policy.	Community Liaison Officer. Appointed contractor. Procurement Officer.	The procurements will be monitored against the mine's procurement strategy. Providers for services, capital goods and consumables will be checked against the procurement targets. Audits against the requirements of the Mining Charter will be conducted.	Procurement Officer. Procurement Officer. Procurement Officer.	Throughout the pre-construction an construction phase.
Disruption in daily living and movement patterns.	Socio-economic aspects.	Ensure that the disruption in daily living and movements is not detrimental to the local communities.	The mine will ensure that all safety standards are met.	Announce road closures and other disruptions; Erect signboards (if required) indicating access restrictions to the construction site; Non compliances will be managed according to the mine's complaints procedure Limit all activities to the development footprint of the proposed construction site;	Safety Officer. Safety Officer. Safety Officer. Safety Officer.	Checking of the number of announcements made to this effect on a monthly basis. Proof of the erected signboards will be filed for audit purposes. Records of non-compliances and redress measures taken recorded and filed for audit purposes. Inspection of the construction activities against the management	Safety Officer. Safety Officer. Safety Officer. ECO.	Throughout the pre-construction an construction phase.

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						action will be undertaken monthly.		
				Fence off the development footprint of the proposed construction site prior to the commencement of site-clearing and construction activities;	Appointed contractor.	Inspection of the construction activities against the management action will be undertaken monthly.	ECO.	
				Keep communication with neighbouring land owners, land occupiers and the public (interested and affected parties) open during the construction phase of the project.	Safety Officer and Community Liaison Officer.	Minutes of any meeting held with landowners will be recorded and minutes filed for audit purposes.	ECO.	
Increase in already high criminal activities due to the construction activities.	Socio-economic aspects.	Ensure that security measures are taken by the mine for protection of mine employees.	Mine's safety and security standards will be adhered to at all times during the construction phase.	Keep local SAPS informed of the construction and its progress.	Safety Officer. Protection Officer	Communication with SAPS recorded and filed.	Community Liaison Officer.	Throughout the pre-construction an construction phase.
				Use local labour with no criminal records.	Human Resource Officer.	Recruitment records kept for audit purposes.	Human Resource Manager.	
				Limit access to the shaft area to employees and visitors with access permits.	Safety Officer.	Register all employees reporting for duty and visitors reporting to the shaft complex.	Human Resource Manager.	
				Safety and security measures will be undertaken to comply with the current mine safety standards. These will include fencing, installation of CCTV cameras, 24-hour security guards, random security checks and access control.	Safety Officer.	Measures taken will be recorded and filed.	Safety Officer.	
Construction and operation of borrow pits used during the construction of the Hope No. 4 Seam Shaft complex.								
Loss of topsoil and degradation of land resulting in the inability of the land to sustain appropriate post mining land use.	Soil, Land Use and Land Capability	Ensure that the established borrow pits have minimum impact on erosion formation and sedimentation runoff to the surrounding environment.	Ensure that the stripping, stockpiling and use of topsoil is undertaken in accordance with the Anglo Operations (Pty) Limited's rehabilitation guidelines.	Removed topsoil will be stockpiled separately outside the borrow pits area for profiling and vegetation (rehabilitation) After mining the borrow pits, disturbed areas will be reshaped with 1:5 slopes, and the soils will be remediated by application of agricultural lime and fertiliser into the soils. Each borrow pits will have soil utilisation program to prevent further loss of soil potential.	ECO	Monitor the condition of the topsoil stockpiles through monthly inspections.	ECO	Throughout the life of the borrow pits or until the rehabilitation objectives have been attained.

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				Areas affected will be rehabilitated to suitable land use.				
Contamination of surface water environment by silted water from the borrow pits site.	Surface Water	Ensure that the established borrow pits have minimum impact on surface water environment.	The quality of storm water from the borrow pits will comply with the target water quality objectives as stipulated in the Goedehoop Colliery water use licence.	Implement storm water management/appropriate slope profiles at the borrow pits area All borrow pits will be rehabilitated to ensure that the areas are free draining and that no excessive silts are generated.	ECO	Monthly on site monitoring of the water captured at the borrow pits and monitoring of the surrounding water courses if it is deemed to have a direct impact on water courses	ECO	Throughout the life of the borrow pits
Loss of habitat due to damage or destruction of sensitive landscapes caused by the borrow pit activities.	Sensitive Landscapes	Ensure that the established borrow pits have minimum impact on sensitive landscapes.	Maintain or improve the current PES and EIS of the wetlands in close proximity to the borrow pits.	The borrow pits will be sited and operated to be away from any sensitive landscapes.	ECO	Monitoring of the affected wetlands as part of water monitoring program (and where water courses may be affected)	ECO	Throughout the life of the borrow pits
OPERATIONAL PHASE								
Mining of the No. 4 Seam mine workings using underground mining methods								
Surface subsidence due to pillar failure.	Geology/Topography.	Ensure that the removal of the No. 4 seam coal does not have detrimental impacts on the topography of the undermined area.	Mining has been designed and will be conducted to comply with the safety standards set in the Mine Health and Safety Act, 1996 (Act 26 of 1996).	Ensure that the removal of the No. 4 coal seam by underground mining methods will leave underground pillars intact as per approved underground mining designs. See section 2 for the design specifications. Safety factors will be used during mining to determine the sizes of the pillars to be left behind. A safety factor of more than 1.6 will be used where structures and sensitive landscapes will be undermined. Mechanical continuous miners instead of blasting will be used during the removal of the No. 4 coal seam. Blasting will be kept to a minimum and only utilised in areas where dolerite is encountered. Previously mined underground areas with high risk of subsidence will be backfilled to ensure	All management actions will be the responsibility of the underground mine manager.	The undermined areas will be inspected for signs of subsidence on a monthly basis. Sizes of the bord and pillars will be monitored monthly. Vibrations recorded during each blast. Safety factor will be determined after	Mine Environmental Co-ordinator /Surveyor. Mine surveyor. Blaster. Mine Surveyor.	Throughout the life of the mine.

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				stability of the mined out areas by strengthening the pillars. Backfilling will be undertaken as per backfilling method statement attached as Appendix 15. Should any surface subsidence be encountered the affected area will be rehabilitated to be free draining and to have good vegetation cover that can support pre-subsidence ecosystem. The affected landowners will be compensated for any loss suffered. Should any backfilled underground workings subside, mining will be stopped and all employees evacuated from the workings. No mining will be undertaken until it can be proven safe to do so.		backfilling. Rehabilitation of land subsidence to be supervised by the mine surveyor and the Mine Environmental Co-ordinator. Anglo Operations (Pty) Limited will negotiate compensation with the affected owners.	Mine surveyor and Mine Environmental Co-ordinator. Mine surveyor.	
Loss of surface water runoff and pollution of surface water due to surface subsidence.	Surface water.	Ensure that the mining of the No. 4 seam coal does not result in the detrimental impacts on the surface water environment.	Mining has been designed and will be conducted to comply with the safety standards set in the Mine Health and Safety Act, 1996 (Act 26 of 1996)	Mining will be undertaken as per mining design specifications. However, should surface subsidence be encountered during mining, the affected area will be rehabilitated to be free draining and to have good vegetation cover that can support pre-subsidence ecosystem.	Mine manager.	Surface water in the streams surrounding the proposed Hope No. 4 seam mining area will be monitored on a monthly basis as per surface water monitoring programme	Mine Environmental Co-ordinator.	Throughout the life of the proposed operation.
Groundwater drawdown due to the proposed underground mining operation.	Groundwater.	Ensure that the effects of the groundwater drawdown due to the proposed mining does not detrimentally affect the surrounding groundwater users and undermined water resources.	Groundwater management will be undertaken in compliance with the mine's environmental policy.	All groundwater boreholes within the zone of influence of the groundwater drawdown will be monitored for static groundwater levels on a quarterly basis. If it can be proven that the mine is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated. Should the results of the groundwater monitoring prove that the drawdown is affecting the undermined water bodies, Anglo Operations (Pty) Limited will investigate and take reasonable measures to address the impacts on affected water resources.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	Static groundwater levels and groundwater quality will be monitored on a quarterly basis. Monitoring results will be used to determine the effect of the drawdown to groundwater users. Monitoring results will be used to determine the effects of the drawdown to water resources.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator. ECO.	Throughout the life of the proposed operation.

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				The numerical model should be updated during operational phase of the mine.	Mine Environmental Co-ordinator.	Suitably qualified specialists will be appointed.	Mine Environmental Co-ordinator.	
Uncontrolled groundwater ingress into the workings.		Ensure that the ingress of groundwater into the workings are properly controlled.	The ingress of groundwater will be controlled to comply with the mine's environmental policy.	The shaft will have adequate berms surrounding the openings to prevent upslope runoff surface water from entering the shaft and box cut.		The shaft will be inspected to ensure that its operation is in compliance with this management action.	Mine engineer and Mine Environmental Co-ordinator.	Throughout the life of the proposed operation.
				All boreholes connected to the underground workings with the exception of monitoring boreholes, must be sealed from the bottom to the top to prevent groundwater entering the hole and feeding into the mine workings.	Underground mine manager and engineer	Sealing of the boreholes will be checked and approved.	Mine Environmental Co-ordinator.	
				Where significant water ingress cannot be prevented, measures should be put in place to intercept ingress water as close as possible to the source so that it can be pumped out of the mine before its quality can deteriorate through contact with sulphide minerals.		Volumes of water pumped will be metered and water balance updated with volumes data collected.	Mine Environmental Co-ordinator.	
	Groundwater.			All significant water ingress points encountered during mine development will be properly marked. The physical location, flowrate and water quality will be recorded and incorporated into the existing groundwater model and the mine water and salt balance.		Flowrates and water quality will be monitored monthly.	Mine Environmental Co-ordinator.	
				All major water ingress points (not to be used for monitoring purposes) will be properly sealed and details of the sealing operation will be recorded.		Sealed ingress points will be inspected for any significant residual ingress.	Underground mine manager.	
				All water storage areas will be filled as quickly as possible and measures will be put in place to prevent regular fluctuation of the stored water level as it is this wetting and drying cycle on the exposed surfaces that will enhance the rate of sulphide oxidation and will lead to water quality deterioration.		Levels of water in the storage facilities will be monitored.	Underground mine manager.	
Deterioration of	Groundwater	Ensure that the effects of the	Comply with the	All groundwater boreholes within the zone of	Mine Environmental	Groundwater quality will	Mine	During the

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groundwater quality down gradient of the mining operations		groundwater deterioration within the workings do not affect the surrounding groundwater users.	groundwater water quality objectives for the affected catchment and groundwater quality indicated in the Hope No. 4 Seam integrated water use licence	influence of the groundwater deterioration will be monitored for groundwater quality on a quarterly basis. The monitoring results must be interpreted annually by a qualified hydrogeologist and the monitoring network should be audited annually to ensure compliance with regulations. The monitoring data must be used to update the numerical groundwater model. Geochemical testing of the pillar material should be conducted to aid in the prediction of contaminant release and potential geochemical changes induced in the subsurface, by means of geochemical modelling. If it can be proven that the mine is indeed affecting the quantity of groundwater available to certain users, the affected parties should be compensated.	Co-ordinator. Mine Environmental Co-ordinator.	be monitored on a quarterly basis. Suitably qualified specialists will be appointed as and when necessary but not exceeding frequency of five years.	Environmental Co-ordinator. Mine Environmental Co-ordinator.	operational phase of the project
Generated dust within the mine workings may affect the health of the mine employees.	Air quality.	Ensure that the air quality within the mine workings does not affect the health of the mine employees.	Air quality within the underground workings will comply with the national dust control regulations.	Sufficient dust suppression will be undertaken to reduce the impacts of the generated dust on the employees. Employees will be provided with dust masks and will be instructed to use the dust masks.	VOHE Officer VOHE Officer	Underground workings dust fall will be monitored. Use of dust masks by employees will be monitored.	VOHE Officer VOHE Officer	Throughout the life of the proposed operation.
Noise generated from the operation of the mine machinery within the mine workings may have health effects on the mine employees.	Noise.	Ensure that the noise levels within the mine workings does affect the health of the mine employees.	Noise levels within the underground workings will comply with the required noise limits.	Sufficient noise buffering will be undertaken to reduce the impacts of the generated noise on the employees. Employees will be provided with ear buts for hearing protection	Safety Officer. Safety Officer.	Noise levels will be monitored at the proposed underground workings. Use of ear protection by employees will be monitored.	Safety Officer. Safety Officer.	Throughout the life of the proposed operation.
The proposed project will have positive impacts on the socio-economic status of the area (Steve Tshwete Local Municipality).	Socio economic aspects.	Ensure that the positive impacts from the proposed mining operation are sustained.	The positive impacts from the proposed project will improve the livelihood of the local communities.	Ensure that all relevant (mining industry related) statutory requirements regulating employment and procurement of services and goods are adhered to. This will be conducted in compliance with the social and labour plan of the mine. Ensure that the mine polices dealing with employment and procurement of services and	Community Liaison Officer. Community Liaison Officer.	Compliance monitoring of the approved social and labour plan for the mine conducted annually. Compliance monitoring of the approved social and	Community Liaison Officer.	Throughout the life of the proposed operation.

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				goods are adhered to. This will be conducted in compliance with the social and labour plan for the mine.		labour plan conducted annually.		
The occurrence of the Mahlatini informal settlement may have security issues for the surrounding properties, and employees of the proposed Hope No. 4 Seam project.	Socio-economic aspects.	To ensure that the Mahlatini informal settlement do not create detrimental issues for the surrounding properties and employees of the proposed Hope No. 4 Seam project.	The mine, its employees and the residents of the Mahlathini informal settlements will have cordial relations.	A partnership with the Steve Tshwete LM and the private landowner will be established to find workable solutions for the formalisation of the Mahlatini settlement. These may include amongst others that a portion of a farm be subdivided and sold/contributed to Council to establish a Human Settlement. Where possible, the current livestock farming must be formalised. An existing farmer could be contracted to teach the community commercial farming practices, grazing/veld management, breeding, feeding, immunisation, disease control, etc. A Trust or similar legal entity for the Mahlatini subsistence farmers will be established and a contract that sets out the areas where grazing is allowed and penalties for breach of contract will be drawn up. More community income-generating projects will be included in the SLP, which will aim at specifically creating jobs and food security for the Mahlatini community.	Community Liaison Officer. Community Liaison Officer. Community Liaison Officer. Community Liaison Officer.	Compliance monitoring of the approved social and labour plan for the mine conducted annually. Progress of the livestock farming project audited annually. Trust or entity established documented and such documentation filed. Auditing of the approved social and labour plan.	Community Liaison Officer. Community Liaison Officer. Legal representative of Anglo Operations (Pty) Limited. Human Resources Manager.	Throughout the life of the proposed operation.
Disruptions in daily living and movement patterns of surrounding communities.	Socio-economic aspects.	Ensure that the daily living and movement of surrounding communities are not detrimentally affected by the operation of the proposed Hope No. 4 seam project.	The surrounding communities will continue their daily living and movement patterns during the operation of the proposed Hope No. 4 seam project.	Ensure proper communication with the public on any event that may have disruptions. This will include the announcing of disruptions, road closures and so forth by using the local media, road sign boards and other municipal structures. Use complaint procedure for any community complaints and deal with it accordingly The mine will consult with adjacent and other affected landowners whose private residences, crops and other infrastructure could be affected by dust, noise and other impacts that result from traffic movement and the mining activities	Public Liaison Officer Protection Officer	Inspections on the filed records of announcement made will be conducted monthly. Meetings will be held with the safety officer to discuss measures and their effectiveness.	Public Liaison Officer Protection Officer	Throughout the life of the proposed operation.

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				as part of the SEP and external communication procedure. Increase security measures will be implemented to restrain the unauthorized movement of livestock and trespassers. Access and haul roads will be regularly graded.				
Backfilling of the mined out underground workings for stability of the strata underlying the proposed No. 4 Seam workings								
Soil compaction and spillage of backfilling material in the process of accessing the backfilling sites and transportation of the backfilling material may have impacts on the soils within the sites, which may impact the ability of the land to maintain its current land capability and use.	Soils Land Use Land Capability.	Ensure that the establishment of the backfilling sites and transportation of the backfilling material does not have detrimental impacts on the soils.	The land use and capability of the sites where underground backfilling will be undertaken will continue after the underground backfilling exercise.	All removed topsoil at the drilling site must either be stockpiled or used as perimeter berms along the access roads or disturbed areas. The perimeter berms will not be more than one meter high and any topsoil stockpiles will not exceed three meters. This will ensure that stockpiling does not have leaching effects on the soils and will assist in maintaining the seed bank of the removed soils.	Appointed contractor and supervised by the Mine Environmental Co-ordinator.	Height of the perimeter berms and topsoil stockpiles will be measured after construction of the berms or stockpiles.	Mine Surveyor and Mine Environmental Co-ordinator.	Throughout the underground backfilling operation.
				Ensure that the stockpiled soils and soils used as perimeter berms are used after the completion of the backfilling operation for rehabilitation of the sites after mining or backfilling activity have been completed.	Appointed contractor and supervised by the Mine Environmental Co-ordinator.	Soils fertility will be tested before use of topsoil for rehabilitation.	Mine Environmental Co-ordinator.	
				Ensure that the area of disturbance is limited to be as small as possible by adhering to the approved underground backfilling borehole site layout plans.	Appointed contractor.	The area of disturbance will be determined against the specified area's design extent.	Mine Environmental Co-ordinator.	
				Limit the construction of the access roads to as less sensitive areas as possible. As far as possible existing roads will be used for accessing the underground backfilling areas. Areas disturbed by the backfilling operation (compacted areas or areas with spillages) will be rehabilitated.	Appointed contractor and supervised by the Mine Environmental Co-ordinator.	The status of the identified wetlands will be monitored for sedimentation or hydrocarbon spillages.	Mine Environmental Co-ordinator.	
				Vehicle movement over unprotected or sensitive areas will be restricted.	Appointed contractor and supervised by the Mine Environmental Co-ordinator.	The status of the identified wetlands will be monitored for hydrocarbon spillages.	Mine Environmental Co-ordinator.	

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				Ensure that agreements are reached with the affected landowners where private land will be accessed for the purpose of the backfilling operations.	Anglo Operations (Pty) Limited legal division.	Regular meetings will be held with the farmers to confirm adherence to the agreements.	Legal representative.	
Contamination of the environment with oils, greases and diesels from the drilling machinery and by carbonaceous material generated from the drilling of the backfilling boreholes.	Soils Vegetation.	Ensure that the drilling of the backfilling boreholes does not have detrimental impacts on the soils, vegetation cover land use and capability of the backfilling sites.	The land use within the sites where underground backfilling will be undertaken will continue after the underground backfilling exercise.	Create drilling sumps where water from the drilling process will be stored and evaporated. All boreholes and sumps will be rehabilitated to pre-drilling/backfilling conditions. After rehabilitation of boreholes and sumps the area will revert to as close as possible to its previous condition. Containers for the collection of hydrocarbon waste will be provided and used during the drilling of the boreholes. Emergency repairs of any equipment/machinery should be undertaken on protected ground. All grease, oil, hydraulic fluids removed from the repairs will be taken to the mine's storage facilities or disposed of in a licensed waste disposal facility. Only emergency repairs will be allowed at the underground backfilling sites. Waste from the drilling of the boreholes will be transported to the mine's mineral residue deposit facility for disposal.	Appointed drilling contractor. Appointed drilling contractor. Appointed drilling contractor. Appointed drilling contractor.	Site will be inspected on a weekly basis to determine if the management actions are being undertaken. The rehabilitated areas will be inspected after rehabilitation has been undertaken to ensure that rehabilitation of the area is to agreed standards. Volumes of waste collected will be monitored monthly. Records of incidents and emergency repairs will be kept.		Throughout the underground backfilling operation.
The transportation of the backfilling material may result in the generation of surface water runoff contaminated with silt (sedimentation) and possibly backfilling material should spillages occur.	Surface Water.	Ensure that the transportation of backfilling material and backfilling of the underground workings does not have detrimental impacts on the surface water environment.	Surface water leaving the backfilling sites will not be contaminated with backfilling material and will not have high silt loads.	The roads will be constructed or upgraded to have storm water diversion berms (perimeter berms). The berms must be constructed such that any exit point for the water will have silt settlement/traps that will settle the silt from the roads before reporting to the clean water environment. Where streams or sensitive areas will be crossed, no concrete mixing and vehicle maintenance will be allowed. All hydrocarbons	Appointed contractor. Appointed contractor.	Inspections to be conducted after establishment of the site to ensure that all facilities for water protection are in place. Surface water bodies will be monitored once a month for signs of	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	Throughout the underground backfilling operation.

Impact Activity Reference	Environmental Attribute	Impact Management Objectives	Targets (Impact Management Outcomes)	Management Actions And Interventions	Responsibility For Actions/Intervention	Monitoring And Timeframes	Responsibility For Monitoring	Completion Date
				will be stored on protected storage areas away from the streams. No construction of roads will be allowed within any 1:100 year flood line or a distance of hundred meters from the edge of a watercourse without relevant authorisations and exemptions are obtained.	Appointed contractor.	contamination. Inspections of the roads in relation to flood lines and distances from the streams against the relevant regulations will be conducted annually	Mine Environmental Co-ordinator.	
Generation of dust by vehicular movement for the transportation of the backfilling material to the backfilling sites.	Air quality.	Ensure that the air quality in the vicinity of the backfilling sites and sites' access routes are not detrimentally altered.	The air quality in the vicinity of the backfilling sites and sites' access routes will be maintained to stay within the national and internal air quality standards.	Dust suppression will be conducted during the construction and operation of the underground backfilling areas' access roads. Water carts will be used for the suppression of the dust on the roads.	Mine Environmental Co-ordinator.	Dust fall out will be monitored every month.	Mine Environmental Co-ordinator.	Throughout the underground backfilling operation.
Road safety and intrusion impacts for the Kwamabone settlement and the Honeybourne farmstead as a result of transportation of the backfill material for underground distribution.	Socio-economic aspects.	Ensure that the transportation of the backfill material does not significantly disrupt the daily living and movements of the local communities.	The mine will ensure that all safety standards are met.	Announce road closures and other disruptions; Maintain roads used for the transportation of the backfill material in good order by regularly grading the roads and undertaking dust suppression. Keep communication with neighbouring land owners, land occupiers and the public (interested and affected parties) open during the operational phase of the project and use the community complaints procedure	Public Liaison Officer Appointed contractor. Safety Officer and Community Liaison Officer.	Confirm the number of announcements made to this effect on a monthly basis Inspection of the roads against the management action will be undertaken monthly Minutes of any meeting held with landowners will be recorded and minutes filed for audit purposes	Safety Officer. Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	Throughout the underground backfilling operation..
Operation of the access shaft complex with associated infrastructure and facilities (Overburden stockpile, topsoil stockpile/berms, access and service roads, water structures, water supply infrastructure, power supply infrastructure, conveyor belt system, guard house, stone dust silo and upgraded existing Hope Shaft Complex and batching plant)								
Erosion as a result of run-off and compaction. Contamination as a result of coal spillages from the conveyor belt	Soils, Land Use and Land Capability.	To ensure that the shaft and associated surface infrastructure and facilities does not have detrimental impacts on the soil quantity and quality	Ensure that the stripped and stockpiled soils and disturbed areas are managed in accordance with a soil stripping guide.	The footprint of the shaft and associated infrastructure and facilities will be maintained to be within the approved perimeters. Rehabilitate erosion gullies and identify the result of sedimentation run-off. Alleviate compaction through ripping and ensure that that seedbeds are preserved The stockpiled topsoil will be maintained to be	Rehabilitation Officer	Monitor vegetation cover on an annual basis. Monitor the quality of the soil within the topsoil annually and the height of the topsoil stockpile monthly.	Rehabilitation officer	Throughout the operational phase.

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				within the approved heights and lateral extent. The topsoil stockpile will not exceed a height of three meters, which will assist in retaining the fertility of the soils. The stockpiled topsoil will be maintained to have good vegetation cover. Bare areas where no further activities will take place, will be identified and revegetated with a recommended seed mix. The stockpiled topsoil will not be used for any other purpose other than the rehabilitation of the disturbed Hope No. 4 Seam project area or as berms.		Monitor the vegetation distribution on the stockpiled topsoil biannually. Monitor the extent of the disturbed area annually.		
Release of contaminated water into the natural environment especially during transportation of the dirty water from the shaft could result in the contamination of the nearby Hope Spruit.	Surface Water.	Ensure that the operation of the Hope No. 4 seam shaft complex does not have detrimental impacts on the surface water environment.	The quality of clean storm water from the shaft complex will not exceed the target water quality parameter provided in the Goedehoop Colliery water use licence and resource water quality objectives of the Hope Spruit.	The access shaft complex, including the dirty water sump and storm water management structures will be operated to be in compliance with the requirements of the GN704 and IWWMP of the mine Where possible water from the dirty water sump will be reused at the shaft and other parts of the Goedehoop Colliery operations.	Mine Environmental Co-ordinator. Mine engineer.	GN 704 audits will be conducted for the storm water management at the Hope No. 4 Seam shaft area. Quality of the Hope Spruit upstream and downstream of Hope No. 4 Seam shaft complex will be monitored monthly.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	Throughout the life of the mine.
Contamination of groundwater	Groundwater	Ensure that waste generated from the site does not contaminate the groundwater	The quality of the groundwater will not exceed the target water quality parameter provided in the Goedehoop Colliery water use licence and resource water quality objectives of the Hope Spruit.	A credible service provider will be employed to remove waste from the site. Sewage waste will be treated at the mine to acceptable quality before discharge. A sufficient supply of absorbent fibre should be kept at the site to contain accidental spills. All potential sources of pollution will be stored in secure facilities with appropriate storm water management, ensuring contaminants are not released into the environment.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	Groundwater quality (to include hydrocarbon) and sewage effluent will be monitored. Records of waste generated and removed will be kept at the mine.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	During the operational phase of the project
Sediment runoff water from the shaft complex may be deposited into the wetland area thereby	Sensitive landscapes.	Ensure that the wetlands situated in close proximity to the shaft complex are not detrimentally affected by the	The Hope Spruit wetland will maintain or improve its current present ecological status and	Storm water runoff upslope of the site will be diverted around the site to the nearby stream. Storm water from the semi dirty areas such as the overburden and topsoil stockpiles together	Mine engineer and Mine Environmental Co-ordinator.	Wetlands and surface water bodies adjacent to the Hope No. 4 Seam shaft complex will be	Mine Environmental Co-ordinator.	Throughout the life of the mine.

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result in the loss of wetland habitat.		runoff water from the shaft complex and groundwater drawdown from the shaft.	ecological importance status.	with storm water from the unused area within the catchment of the shaft complex will be routed such that it enters a sediment trap prior to discharge to the environment. Erosion protection and silt controlled measures within the storm water management structure must be maintained in good order.		monitored on an annual basis regarding any degradation.		
				Dirty water runoff and dirty mine water will not be released to the nearby wetlands. Runoff water will be routed to the dirty water collection sump before being pumped to the return water dam. Mine water will be pumped directly to the return water dam.	Mine Environmental Co-ordinator.	Wetlands and surface water bodies adjacent to the Hope No. 4 Seam shaft complex will be monitored on an annual basis regarding any degradation.	Mine Environmental Co-ordinator.	
				Overburden and topsoil stockpiles will be vegetated to stabilise slopes and minimise sediment loss. Where bare patches are identified, such area will be reseeded with a recommended seed mix.	Mine Environmental Co-ordinator.	Vegetation cover over the overburden stockpile and topsoil stockpiles will be monitored annually.	Mine Environmental Co-ordinator.	
				The shotcrete covering of the shaft benches' slopes will be maintained in good working order.	Mine Environmental Co-ordinator.	The condition of the shotcrete covering will be monitored annually.	Mine engineer.	
				Wetlands adjacent to the Hope No. 4 Seam shaft complex will be monitored for any potential impacts and where necessary rehabilitated to ensure that their PES and EIS is either maintained or improved.	Mine Environmental Co-ordinator.	Wetlands adjacent to the Hope No. 4 Seam shaft complex will be monitored on an annual basis regarding any degradation.	Mine Environmental Co-ordinator.	
Coal spillages, water leakages and coal dust from the conveyor belt and dirty water pipeline and disturbance of wetlands during maintenance will lead to pollution, damage or destruction of wetlands.	Sensitive landscapes.	Ensure that the wetlands situated in the route of the overland conveyor belt, dirty water pipeline and re-routed power line are not detrimental affected.	The Hope Spruit and the seepage wetlands will be maintained such that it improve or maintain its current present ecological status and ecological importance status.	The conveyor has been designed and will be operated to minimise the likelihood of spillages. The conveyor belt loading of 76 % will not be exceeded.	Mine Environmental Co-ordinator.	Regular inspection of the entire conveyor, dirty water pipeline and power line route will be undertaken on a weekly basis.	Mine Environmental Co-ordinator.	Throughout the life of the mine.
				The dirty water pipelines have been designed and will be operated such that no leaks report to the wetland areas. All valves were sited to outside the edge of the identified wetland.	Mine Environmental Co-ordinator.			
				Constructed and well maintained service roads				

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				will be used for the maintenance of the overland conveyor belt, dirty water pipeline and power line occurring with the wetland. Should spillages, leaks or disturbance of the wetland occur due to malfunctioning of the conveyor/pipeline or for any other reason, clean-up and rehabilitation of the spillages, polluted and disturbed areas will be undertaken as soon as possible following the event.				
Generated noise from the operation of the shaft may affect employees at one of the mine's offices and the residents at the Mahlatini informal settlement.	Noise.	Ensure that the operation of the shaft complex does not have detrimental impacts on the receptors.	Ensure that the operation of the shaft complex does not exceed the SANS 10103 Rating Level.	Used constructed berms to shield the affected receptors (Mahlatini, Hope Village and mine offices) from the noise sources. No apertures (gaps, entrances) should be allowed at berms facing affected receptors. The mine's environmental awareness training will include a noise component, allowing employees and contractors to realize the potential noise risks that activities (especially night-time activities) pose to the surrounding environment. White-noise generators instead of tonal reverse alarms will be used on heavy vehicles operating on roads. Ventilation fans has been directed away from the closest receptor. All equipment (especially transfer points, conveyor drive systems etc.) will be enclosed where practically possible. Smaller or less quitter equipment should where possible be used when operating near receptors. Equipment should be well maintained and fitted with the correct and appropriate noise abatement measures such as acoustical mufflers (or silencers), noise absorption braids and engine bay covers over heavy equipment.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator. Mine engineer. Mine manager. Mine Environmental Co-ordinator. Site managers.	Noise levels within the Hope No. 4 Seam shaft complex will be monitored on a monthly basis. Awareness programme as part of environmental training will be recorded and outcomes will be filed. As built designs of the ventilation facilities will be kept for audit purposes. As built designs of the conveyor belt transfer points will be kept for audit purposes. Measures to comply with the management actions will be recorded and filed. Measures to comply with the management actions will be recorded and filed.	Mine Environmental Co-ordinator.	Throughout the life of the mine.

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				Equipment will be well maintained and fitted with the correct and appropriate noise abatement measures.	Site manager.	Measures to comply with the management actions will be recorded and filed.		
The operation of the shaft complex, wind blowing over open spaces and movement of vehicles along unpaved roads will result in significant air pollutants emissions, which may settle on surrounding properties and communities.	Air quality.	Ensure that all operations at the Hope No. 4 Seam shaft complex are within ambient air quality criteria (including internal air quality targets).	The shaft complex will be operated such that the ambient air quality does not exceed the air quality standards including the internal air quality targets.	Wet suppression using water carts will be conducted at areas with excessive dust emissions, which include unpaved roads. Chemical surfactants will be considered should water suppression not yield satisfactory results. The traffic volumes and speed within the shaft complex will be controlled. This will be in accordance to the safety rules of the mine. Transfer chutes will be used at the conveyor belt transfer points and where crushing and screening will be installed. This will result in wind shielding and will prevent coal spillages, hence reducing the concentration of the emitted dust. The farmers and community meetings conducted by the mine will be used for environmental reporting and community liaison on matters relating to the impacts on air quality.	Appointed contractor. VOHE officer Community Liaison officer Mine engineer and Mine Environmental Co-ordinator. Mine Environmental Co-ordinator	Excessive dust and windblown events must be reported to the Mine Environmental co-ordinator for investigation Observations on the speed at which vehicle are travelling will be conducted on an ad hoc basis. Dust fall monitoring (including recommended additional monitoring points) will be conducted as part of the mines air quality monitoring procedure . Minutes of the meetings will be recorded.	VOHE Safety Officer Environmental Co-ordinator	Throughout the life of the mine.
The Hope No. 4 Seam shaft complex will be visible from the nearby roads and properties. These may affect the property owners and users.	Visual aspects.	Ensure that the operation of the shaft complex does not have detrimental visual impacts on the surrounding property owners and users.	The visibility of the shaft complex will not increase beyond the planned extent during the operational phase.	The constructed earthworks and landscapes will be maintained to reduce the visual impacts. These will include maintaining the vegetation cover over the perimeter berms and topsoil stockpiles. The heights of these facilities will not be increased during the operational phase. Lighting will be conducted in manner that will reduce the impacts on visual aspects. These will include factors such as placing lights in areas and angles that will not shine towards the communities.	Mine Environmental Co-ordinator	Monitoring for the visual impacts will include regular inspections on the heights of the berms and stockpiles and the condition of other infrastructure at the site.		Throughout the life of the mine.
Damage or destruction	Sites of	Ensure that the operation of	The grave site identified	The established shaft complex especially the	Appointed contractor	The grave site will be	ECO.	Throughout the

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of sites with archaeological and cultural significance.	archaeological and cultural importance.	the shaft complex does not have detrimental impacts on the identified grave yard.	in close proximity to the shaft complex will not be damaged or destroyed by the operational phase activities.	overburden stockpile will be maintained such that it is away from the identified grave site. A buffer of fifty meter will be maintained between the grave site and the proposed shaft complex. The fence around the grave will be maintained in good order. Access to the grave yard will be made available to the family of the deceased.	and the Mine Environmental Co-ordinator. Appointed contractor and Mine Environmental Co-ordinator. Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	monitored for any mining related damages on a quarterly basis.		operational phase.
DECOMMISSIONING AND CLOSURE PHASE								
Removal of infrastructure, backfilling/sealing of shaft and rehabilitation of disturbed areas								
Compaction and contamination of soils within the rehabilitation site.	Soils.	Ensure that the soils in the vicinity of the rehabilitation site is not detrimentally impacted.	Rehabilitated areas will be maintained to comply with the mine's closure objectives.	All vehicles and machinery used at the rehabilitation site will be kept in good working order. No repairs of mine vehicles or machinery will be conducted at the rehabilitation site unless it is emergency repairs, which will be conducted on protected ground. Movement of mine vehicles and machinery will be limited to demarcated routes, which will be rehabilitated when no longer in use.	Appointed contractor. Appointed contractor. Appointed contractor.	Vehicles and machinery will be inspected regularly and any oil incidences will be reported. All incidents of emergency repairs will be inspected and occurrence recorded. Rehabilitation site will be inspected to monitor areas with compaction or hydrocarbon contamination.	Safety Officer. Safety Officer. Rehabilitation Officer Mine Environmental Co-ordinator.	Throughout the decommissioning and closure phases.
Re-instatement of soil productivity, land capability, land use and topographical patterns.	Soils, Land Capability, Land Use and Topography.	Ensure that the rehabilitation of the shaft complex re-instate the soil productivity, land capability, and topographical; patterns to as close as possivle to its pre-mining condition or as per the mine closure objectives of the Colliery	Rehabilitated areas will be maintained to comply with the mine's closure objectives.	All infrastructure will be demolished in accordance to the rehabilitation plan. Before topsoil can be replaced, the shaft footprint should be backfilled to an elevation of approximately 0.9 m below the pre-mining topography. The backfilled and levelled shaft surface should	Appointed contractor. Appointed contractor. Appointed contractor	Demolishing of the infrastructure will be monitored. The backfilled surface will be surveyed to ensure correct elevation and slope. Soil thickness will be	Mine engineer. Mine Surveyor. Soil specialist.	Throughout the decommissioning and closure phases.

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				be covered with stockpiled topsoil.		progressively monitored during replacement.		
				Soil amelioration will then be done according to soil analyses as recommended by a soil specialist/suitable qualified person, in order to correct the pH and nutritional status before revegetation.	Appointed contractor.	The soil fertility status will be determined by soil chemical analysis after levelling (before seeding/re-vegetation).	Soil specialist.	
				The footprint will then be re-vegetated with a grass seed mixture as soon as possible in order to stabilize the soil and prevent soil loss during the rainy season.	Appointed contractor.	Type and method of seeding and the resultant vegetation cover will be monitored.	Suitably Qualified Person.	
				A short term fertiliser program will be undertaken based on the soil chemical status after the first year in order to maintain the fertility status for a maximum of 2 to 3 years after rehabilitation until the area can be declared as self-sustaining.	Appointed contractor.	The fertiliser program will be monitored to ensure that the correct quantities of fertilisers are used.	Soil specialist.	
				The post-mining land capability of the shaft footprint should be arable by replacing 900 mm of high quality topsoil or as recommended by the mine's post closure objectives.	Mine Environmental Co-ordinator.	Land capability assessment will be done after rehabilitation by a soil Specialist.	Soil specialist.	
				The post-mining land uses should remain a grass mixture until a post-mining soil and land capability assessment was done by a soil specialist.	Mine Environmental Co-ordinator.	Land use will be assessed after rehabilitation and seeding.	Mine Environmental Co-ordinator.	
				The program for declared weed and invader eradication will be implemented at the rehabilitated site.	Mine Environmental Co-ordinator.	Declared weed and invader plant species will be monitored.	Botanist.	
Pollution of surface water environment.	Surface Water.	Ensure that the rehabilitation of the shaft complex site does not have detrimental impacts on the surface water environment.	The surface water leaving the rehabilitation site will comply with the water quality parameters stipulated in the Goedehoop Colliery water use licence.	The shaft complex area will be rehabilitated to be free draining.	Appointed contractor.	Progress of rehabilitation will be monitored.	Mine Environmental Co-ordinator	Throughout the decommissioning and closure phases.
				Erosion protection measures such as the use of contour berms and repair of gullies will be undertaken until such time that the rehabilitated surfaces can be shown to be sustainable.	Appointed contractor.	Areas where grass has not yet been established will be monitored for excessive erosion.		

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				Existing roads should be used where possible and new disturbed areas should be minimised.	Rehabilitation officer.	Rehabilitation site will be inspected for misuse.		
Groundwater contamination.	Groundwater.	Ensure that the deterioration of groundwater quality down gradient of the mining operations due to plume movement is minimised.	The groundwater leaving the site will comply with the water quality parameters stipulated in the Goedehoop Colliery water use licence.	A pollution control dam could be used to intercept polluted seepage water. This should be considered if it is found that the streams/river are indeed negatively affected by pollution. Implement as many closure measures during the operational phase, while conducting appropriate monitoring programmes to demonstrate actual performance of the various management actions during the life of mine. All mined areas should be flooded as soon as possible to minimise oxygen from reacting with the remaining pyrite. Mining should remove as much coal as possible from the underground and separate acid forming and non-acid forming material. Deposit acid forming material at the base of the shaft box cut.	Mine Manager and Mine Environmental Co-ordinator. Mine Manager and Mine Environmental Co-ordinator. Mine Manager Mine Manager	Regular sampling of the streams/river must be conducted. Quarterly groundwater sampling must be conducted to establish a database of groundwater quality to assess plume movement trends. Audit the monitoring network annually.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator	During the decommissioning and closure of the proposed project
Sediment runoff from the shaft complex rehabilitation site may be deposited into the wetland area thereby result in the loss of wetland habitat.	Sensitive landscapes.	Ensure that the wetlands situated in close proximity of the shaft complex are not detrimentally affected by the runoff from the shaft complex rehabilitation site.	The Hope Spruit wetland will maintain or improve its current present ecological status and ecological importance status.	Runoff from rehabilitation site will be routed such that it enters a sediment trap prior to discharge to the environment. The wetlands adjacent to the Hope No. 4 Seam shaft complex will be maintained and where possible rehabilitated to ensure that their PES and EIS are either maintained or improved.	Mine engineer and Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	Wetlands adjacent to the Hope No. 4 Seam shaft complex will be monitored on an annual basis. Wetlands adjacent to the Hope No. 4 Seam shaft complex will be monitored on an annual basis.	Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	Throughout the decommissioning and closure phases.
Air pollution from rehabilitation site.	Air quality.	Ensure that all rehabilitation at the Hope No. 4 Seam shaft complex do not have detrimental impacts on air quality.	Decommissioning and rehabilitation of the shaft complex will be operated in such a manner that the ambient air quality does not exceed the air quality standards including the internal air quality	Wet suppression using water carts will be conducted at areas with excessive dust emissions, which include unpaved roads. Chemical surfactants will be considered should water suppression not yield satisfactory results.	Appointed contractor.	Visual inspections of areas with possible dust emissions such as unpaved roads and transfer points will be conducted on a quarterly basis.	Mine Environmental Co-ordinator.	Throughout the decommissioning phase.

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			targets.	The existing paved roads will be maintained, which will reduce the extent of areas that can generate dust.	Mine manager and appointed contractor.	Ambient air quality and dust fall monitoring (including recommended additional monitoring points) will be conducted according to the mine's existing air quality monitoring programme.	Mine Environmental Co-ordinator.	
				The traffic volumes and speed within the shaft complex will be controlled. This will be in accordance to the safety rules of the mine.	Safety Officer.	Observations on the speed at which vehicle are travelling will be conducted on an ad hoc basis.	Safety Officer.	
				The farmers and community meetings conducted by the mine will be used for environmental reporting and community liaison on matters relating to the impacts on air quality.	Mine Environmental Co-ordinator.	Minutes of the meeting will be recorded.	Mine Environmental Co-ordinator.	
Generated noise from the rehabilitation site.	Noise.	Ensure that the rehabilitation of the shaft complex does not have detrimental impacts on people.	Ensure that the rehabilitation activities do not exceed the SANS 10103 Rating Level.	Mine's environmental awareness training will include a noise component, allowing employees and contractors to realise the potential noise risks that activities (especially night-time activities) pose to the surrounding environment. White-noise generators instead of tonal reverse alarms will be used on heavy vehicles operating on roads.	Mine Environmental Co-ordinator.	Noise levels within the Hope No. 4 Seam project rehabilitation site will be monitored on a monthly basis.	VOHE	Throughout the decommissioning phase.
				Smaller or less noisy equipment should where possible be used when rehabilitating near receptors.	Mine manager.			
				Equipment should be well maintained and fitted with the correct and appropriate noise abatement measures such as acoustical mufflers (or silencers), noise absorption braids and engine bay covers over heavy equipment.	Mine Environmental Co-ordinator.			
				Equipment will be well maintained and fitted with the correct and appropriate noise abatement measures.	Site managers.			

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Visual impacts from the Hope No. 4 Seam shaft complex rehabilitation works.	Visual aspects.	Ensure that the rehabilitation of the shaft complex does not have detrimental visual impacts on the surrounding property owners and users.	Rehabilitation area will not increase beyond the planned extent.	All infrastructures will be removed during this phase in accordance to the rehabilitation plan.	Mine Environmental Co-ordinator.	Monitoring for the visual impacts will include regular inspections on the rehabilitation works against the rehabilitation plan.	Mine Environmental Co-ordinator.	Throughout the decommissioning phase.
Damage or destruction of sites with archaeological and cultural significance.	Sites of archaeological and cultural importance.	Ensure that the rehabilitation of the shaft complex does not have detrimental impacts on the identified grave yard (site 13).	The grave site identified in close proximity to the shaft complex will not be damaged or destroyed by the rehabilitation activities.	The rehabilitation of the shaft complex especially the overburden stockpile will be undertaken such that it is away from the identified grave site (site 13). A buffer of fifty meter will be maintained between the grave site and the rehabilitation site. The fence around the grave will be maintained in good order. Access to the grave yard will be made available to the family of the deceased.	Appointed contractor and the Mine Environmental Co-ordinator. Appointed contractor and Mine Environmental Co-ordinator. Mine Environmental Co-ordinator.	The grave site will be monitored for any rehabilitation related damages on a quarterly basis.	Mine Environmental Co-ordinator.	Throughout the decommissioning phase.
Impacts on employment.	Socio-economic aspects.	Ensure that cessation of the operation does not have detrimental impacts on the employees and surrounding communities.	Manage the loss of employment in accordance to the approved Social and labour plan of the mine.	Transfer and redeploy employees and contractors wherever possible. Implement non-mining related skills development programmes for employees and family members through the SLP throughout the life of mine to enable retrenched employees to seek alternative employment or start income-generating businesses.	Community Liaison Officer. Community Liaison Officer.	Monitor the employee transfer process. Monitor the progress of the mine's employee skills development programme.	Human Resources Manager. Community Liaison Officer.	Throughout the life of mine.
AFTER CLOSURE PHASE								
Residual impacts of the mined out areas on groundwater.	Groundwater.	Ensure that the decommissioned underground mining areas do not result in detrimental groundwater impacts on the surrounding groundwater users and the environment.	The groundwater around the mined out areas will comply with the water quality standards to be provided by the DWS on closure.	In the event that decant water from the underground workings occurs and is not of a quality suitable for downstream users, Goedehoop Colliery will initiate an investigation by a competent person or institution to determine the most appropriate actions to be undertaken, and the positions for such actions to be undertaken, to ensure that the water quality conforms to the downstream users needs. Such actions and methods to be	Mine Environmental Co-ordinator.	Groundwater quality and levels will be monitored around the mined out areas.	Mine Environmental Co-ordinator.	Throughout the closure phase until closure certificate is obtained.

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				employed will be discussed with the Department of Water and Sanitation to gain their approval prior to implementation. In the event that any water purification activities are to be conducted, these activities and or methods will be based on best available technology at the time of commencement (of the activity), and will continue until such time as a self-sustaining acceptable water quality can be achieved. The incline shafts will be sealed off satisfactorily to ensure that there is no preferential flow patterns to the workings.				

6. FINANCIAL PROVISION

Section 24 P of NEMA requires an applicant for an environmental authorisation relating to mining must, before the Minister responsible for mineral resources can issue the environmental authorisation comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts. The above-mentioned financial provision may be in the form of insurance, bank guarantee, trust fund or cash. This must be in an amount that must provide guarantee of the availability of sufficient funds to undertake the rehabilitation of the adverse environmental impacts of the listed or specified activities; rehabilitation of the impacts of the mining activities, including the pumping and treatment of polluted or extraneous water; decommissioning and closure of the operations; remediation of latent or residual environmental impacts which become known in the future; removal of building structures and other objects; or remediation of any other negative environmental impacts.

No regulations detailing the requirements pertaining to the financial provision for the rehabilitation, closure and post closure of prospecting, mining or production operations has yet been promulgated in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) as amended.

In view of the above, the determination of the financial provision for the proposed project will be compiled in accordance to the template provided by the Department Mineral Resources for the compilation of the EIR and EMPr.

6.1 DESCRIPTION OF CLOSURE OBJECTIVES AND EXTENT TO WHICH THEY HAVE BEEN ALIGNED TO THE DESCRIBED BASELINE ENVIRONMENT

The closure objectives for Goedehoop Colliery as detailed under section 4.1 of the EMPr, were determined based on a review of the existing closure measures and considering that many aspects of the mine are operated in a similar manner, the measures were considered in terms of physical (infrastructure), biophysical (environmental) and socio-economic measures as well as aligned to the closure components provided by the Department of Mineral Resources (DMR). This exercise was undertaken by Golder Associates in 2012 during the updating of the closure costs for Goedehoop Colliery. Updated information from the recent studies conducted for the mine were used to confirm the closure objectives. It was determined that all objectives were still relevant to the current mine setup and the proposed Hope No. 4 Seam mining project.

6.2 CONFIRMATION THAT THE ENVIRONMENTAL OBJECTIVES IN RELATION TO CLOSURE HAVE BEEN CONSULTED WITH LANDOWNERS AND INTERESTED AND AFFECTED PARTIES

The draft EIR and EMPr were made available to the interested and affected parties during the public participation process for the proposed Hope No. 4 Seam mining project. Note that the consultation of interested and affected parties included the owners of the properties directly affected by the proposed project and owners of land immediately adjacent the proposed project area.

The above confirms that the land owners and interested and affected parties were consulted regarding the environmental objectives in relation to the closure of the proposed project.

6.3 REHABILITATION PLAN FOR THE PROPOSED PROJECT

In terms of Regulation 23 of NEMA EIA Regulations, 2014, an EMPr must address the requirements as determined in the regulations, pertaining to the financial provision for the rehabilitation, closure and post closure of mining operations. In view of the above, a rehabilitation plan must be provided to the DMR in support of the financial provision determined for mining operations.

This section of the report will give details of the rehabilitation plan as required in the DMR EMPr template for the compilation of the EIR and EMPr.

Section 2.2.5 of the EIR and section 4.1 of the EMPr provides a description of the method statement for the rehabilitation of the areas affected by the proposed Hope No. 4 Seam project. A surface layout plan which shows the aerial extent of the mining activities to be undertaken at the proposed Hope No. 4 Seam is attached as GOEDE/HOPE4/01 under Plans.

6.4 COMPATIBILITY OF THE REHABILITATION PLAN WITH THE CLOSURE OBJECTIVES

The rehabilitation plan will be drafted to be compatible with the mine's closure objectives.

6.5 DETERMINATION OF THE QUANTUM OF THE FINANCIAL PROVISION REQUIRED TO MANAGE AND REHABILITATE THE ENVIRONMENT

The financial provision for Goedehoop Colliery operation is determined based on the requirements of Chapter 2.4.1 of the Guideline document for the evaluation of the quantum of closure-related financial provision provided by a mine, revision 1.6, September 2004, DMR. In addition to the above and since the quantum does not include the proposed Hope No. 4 Seam project, a separate quantum will be calculated for the proposed Hope No. 4 seam mining project.

6.6 METHOD OF PROVIDING FOR THE FINANCIAL PROVISION

Goedehoop Colliery, which operates under Anglo Operations (Pty) Limited, is covered under a group rehabilitation fund, held by Anglo Operations (Pty) Limited. Regular annual contributions are and will continue to be made to this fund to ensure that sufficient funds are available for rehabilitation of Goedehoop Colliery during the decommissioning phase. An audited statement of the standing of the fund is submitted annually to the Department of Mineral Resources.

The quantum of the financial provision for Hope No. 4 Seam Project and will be included in the next contribution made to the above-mentioned group rehabilitation fund.

7. MECHANISM FOR MONITORING COMPLIANCE WITH AND PERFOMAMCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREOF

All monitoring requirements as determined in the DMR EIR and EMPr template is attached in Table 39 of the EMPr.

7.1 FUNCTIONAL REQUIREMENTS FOR ENVIRONMENTAL MONITORING

During the impact assessment, potential impacts on the environment were identified. Mitigation measures were also specified for prevention and management of the impact so as to minimise their effect on the environment. This section will describe how the mine intends to ensure that the mitigation measures are being undertaken and that their effectiveness is proven.

A monitoring programme has been developed for the identified impacts and their mitigation measures. This monitoring programme will be undertaken and results thereof used to determine the effectiveness of the mitigation measures. The ECO will have an overall responsibility for ensuring that all monitoring is conducted according to the approved EMPr. Below is the explanation of how each environmental aspects to be affected by the mine will be monitored, which include all aspects of the environment affected by the proposed Hope No. 4 Seam project.

7.1.1 Geology

The geological layers will be disturbed permanently and the coal seams will be removed. No mitigation measure can be undertaken for this impact. The mine will however use safety factors as a monitoring tool to ensure that the remaining geology is not affected by the mining operation.

7.1.2 Soil

The soil profile will be disturbed during the construction and operational phases of the mining operation. As a mitigation measure, the stripping, stockpiling and replacement of the soil layers must be conducted such that all topsoil removed are replaced during the rehabilitation of the disturbed areas. During the construction phase, the stockpiled soils will be monitored to determine the quality of the soils. The results of the analysis will be useful in determining the amount and type of fertilizers required for the soils during the decommissioning phase. The soils will also be monitored once used during the rehabilitation of the disturbed areas. Competent and accredited laboratories will be used for the analysis of the soils. Records of soil placement and package thickness will be kept during mining the decommissioning phase.

7.1.3 Topography

Undermining could result in surface subsidence, which may result in the formation of preferential flow paths into the mine workings. This could occur through blasting activities or through surface subsidence occurring as a result of underground pillar failure.

In view of the above, it is necessary that undermined areas will be monitored for possible surface subsidence. Monitoring will involve the continuous calculation and sizing of the pillars that is used to determine the safety factor for the underground mining. This will be used to determine areas of possible subsidence. All areas with possible subsidence will hence be monitored for any signs of subsidence.

7.1.4 Natural Vegetation, Land Use and Capability

The ability of land (soils) to enable establishment and maintenance of good vegetation cover over an area can be used to describe the land capability of an area. During the mining the land use and capability over the areas where the shaft and associated surface infrastructure will be placed would have been impacted upon. As a mitigation measure, the disturbed areas will be rehabilitated and made comparable to an after mining land use. For the purpose of monitoring of the effectiveness of the mitigation measure on land use and capability, the establishment and ability to maintain a good vegetation cover together with monitoring described under soils will be conducted. Distribution of plant species suitable for the after land use will be monitored during the closure phase of the project, which will be suitable for determining the effectiveness of the mitigation measures.

7.1.5. Surface and Groundwater

7.1.5.1 Water Monitoring

The existing water quality monitoring program will be continued, until it can be shown that water quality (surface and groundwater) is both stable and within acceptable guidelines and limits, as determined by the relevant State Departments. Frequency of monitoring will remain monthly for the surface water monitoring points and quarterly for groundwater monitoring points for until the first three years after closure. Thereafter, the frequency for surface water monitoring points will decrease to quarterly and the groundwater monitoring points to be twice a year. This will again be reviewed after a further 2 years.

Additional groundwater monitoring points

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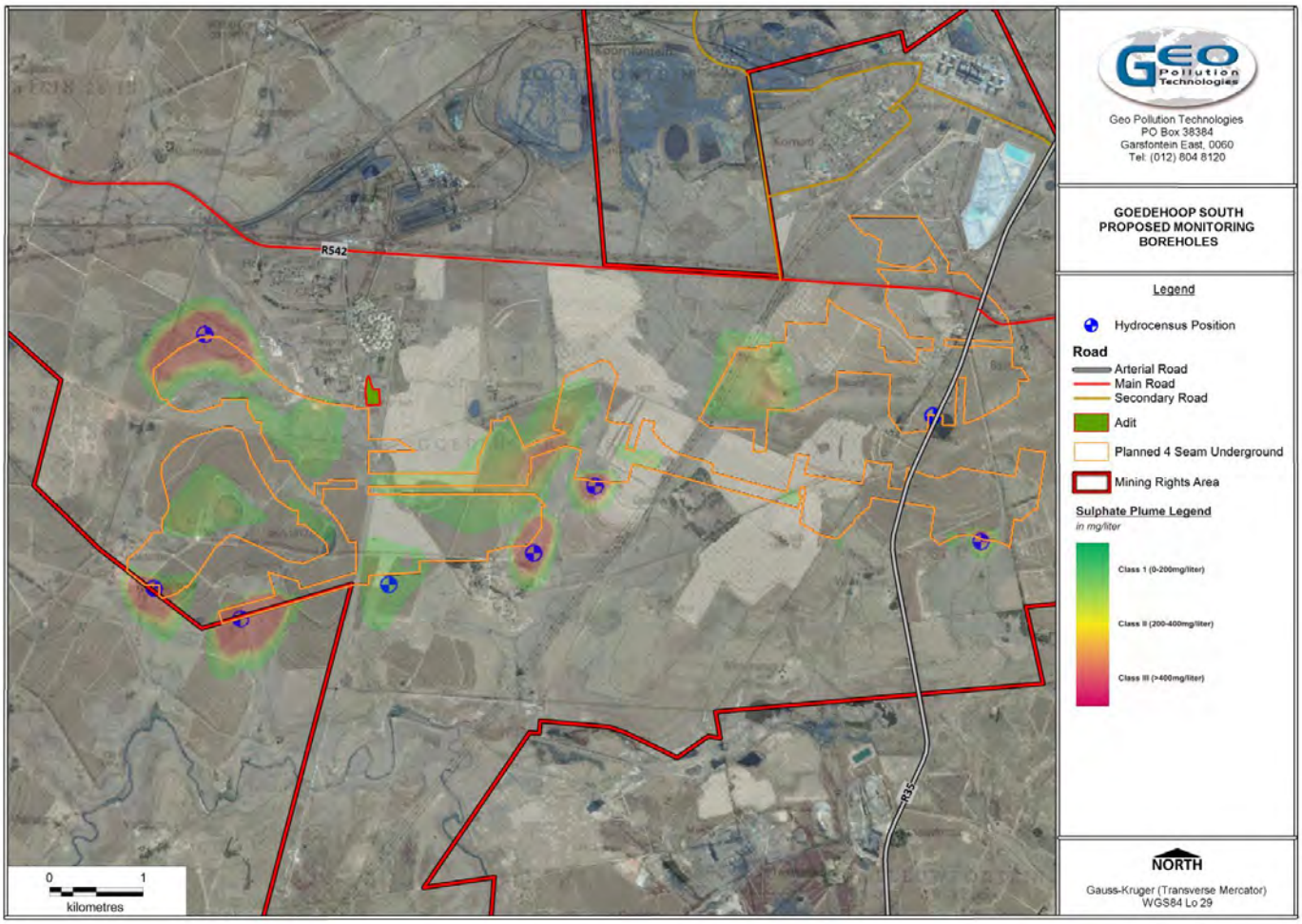

Figure 65) will be sampled to include monitoring of the impacts from the proposed Hope No. 4 Seam project area.

7.1.5.2 Bio-monitoring

Vegetation and SASS 5 monitoring surveys will continue through the decommissioning phase. The vegetation surveys will be expanded to include all rehabilitated areas to ensure that the vegetation composition and cover is adequate.

Note that the frequency of the bio-monitoring surveys will be decreased during the decommissioning phase to annually. The bio-monitoring and vegetation surveys will continue for a minimum of 3 years after closure.

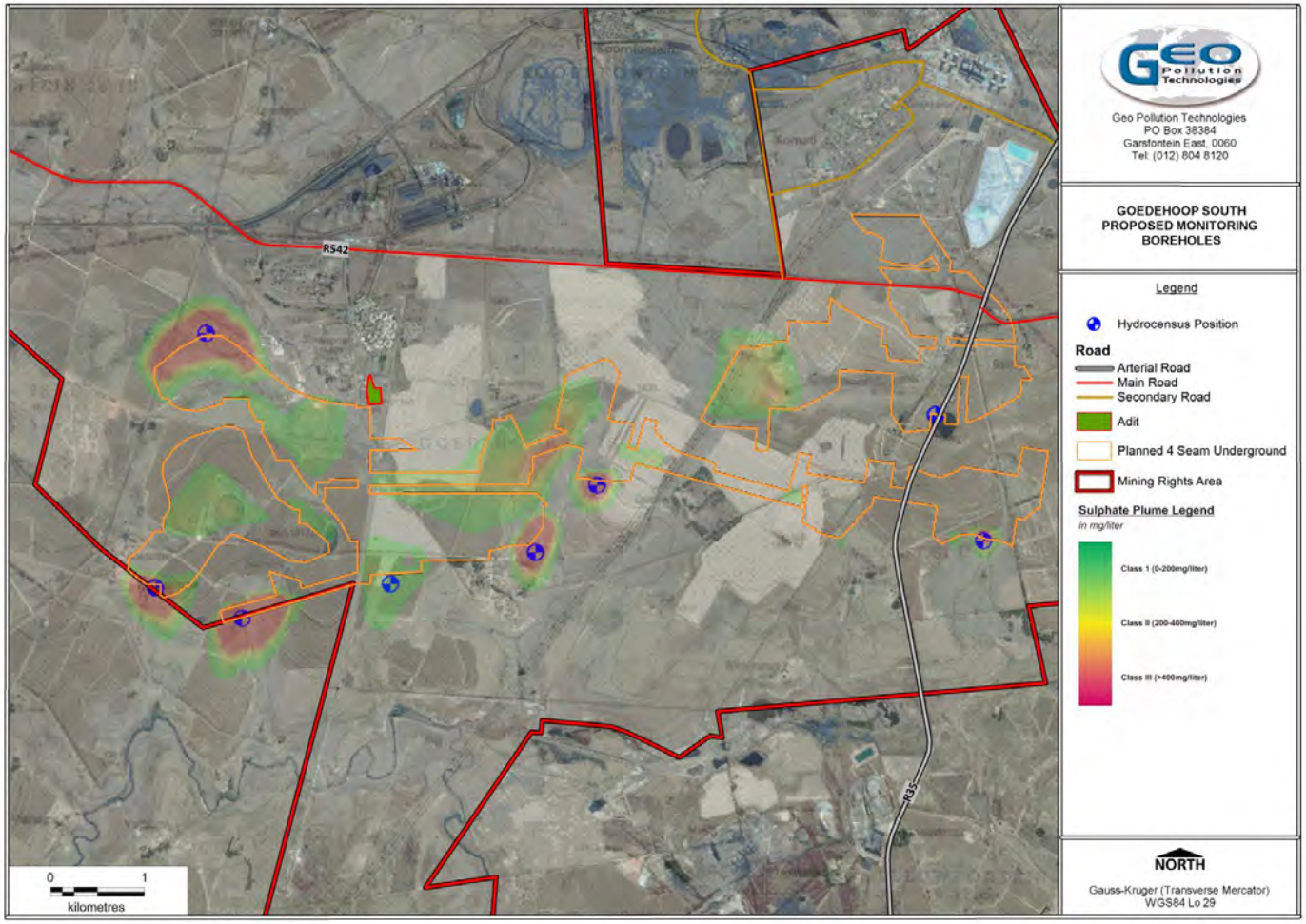

Figure 65: Additional Groundwater Monitoring Points

7.1.6 Noise

Environmental Noise Monitoring can be divided into two distinct categories, namely:

- Passive monitoring – the registering of any complaints (reasonable and valid) regarding noise; and
- Active monitoring – the measurement of noise levels at identified locations.

Active environmental noise monitoring is recommended due to the medium (after the implementation of appropriate mitigation measures) significance for a noise impact to develop. In addition, should a valid complaint be registered, the mine must investigate this complaint as per the following sections. It is recommended that the noise investigation be done by an independent acoustic consultant.

Annual noise measurements will be conducted annually at the following receptors i.e. NSD01 and NSD05. Noise measurements should continue during the construction and operational phase (annual) for the first two years of operation when the noise monitoring plan can be reviewed (measurements increased, continued, reduced or stopped).

Noise measurements must be conducted as required by the National Noise Control Regulations (GN R154 of 1992) and SANS 10103:2008.

7.1.7 Air Quality

During mining the movement of machines and blowing winds will generate dust. Impacts resulting from the generated dust will be low. Despite this, the fact that cumulative impacts may result from other sources, Goedehoop Colliery has developed a dust-monitoring programme. Services of an independent service provider are used to monitor the overall dust generated at Goedehoop Colliery. The locations of the dust fallout sampling points are adequate for the monitoring of the activities from the proposed cumulative operations. It is recommended that four additional sampling points be added into the current dust fall monitoring network. See Figure 66 for the location of the recommended sampling points. The air quality monitoring must be in line with the ambient air monitoring, performance assessment and reporting programme provided in the air quality assessment report.

7.1.8 Sensitive Landscapes

The monitoring of wetlands will involve the assessment of the wetland Present Ecological State and the Ecological Services on an annual basis. The soil types in the unaffected areas will not change thus a soil investigation will not be necessary. Soil investigation will only be limited to the areas where wetlands are affected. Below is the description on how the Present Ecological State and the Ecological Services will be determined.

7.1.8.1 Present Ecological State – PES (Wetland Health or integrity)

The Present Ecological State (PES) will be determined using the method described by Macfarlane *et. al.* 2008. Level 2 Hydrological, Geomorphological and Vegetation assessments are conducted separately after which an overall wetland PES is determined.

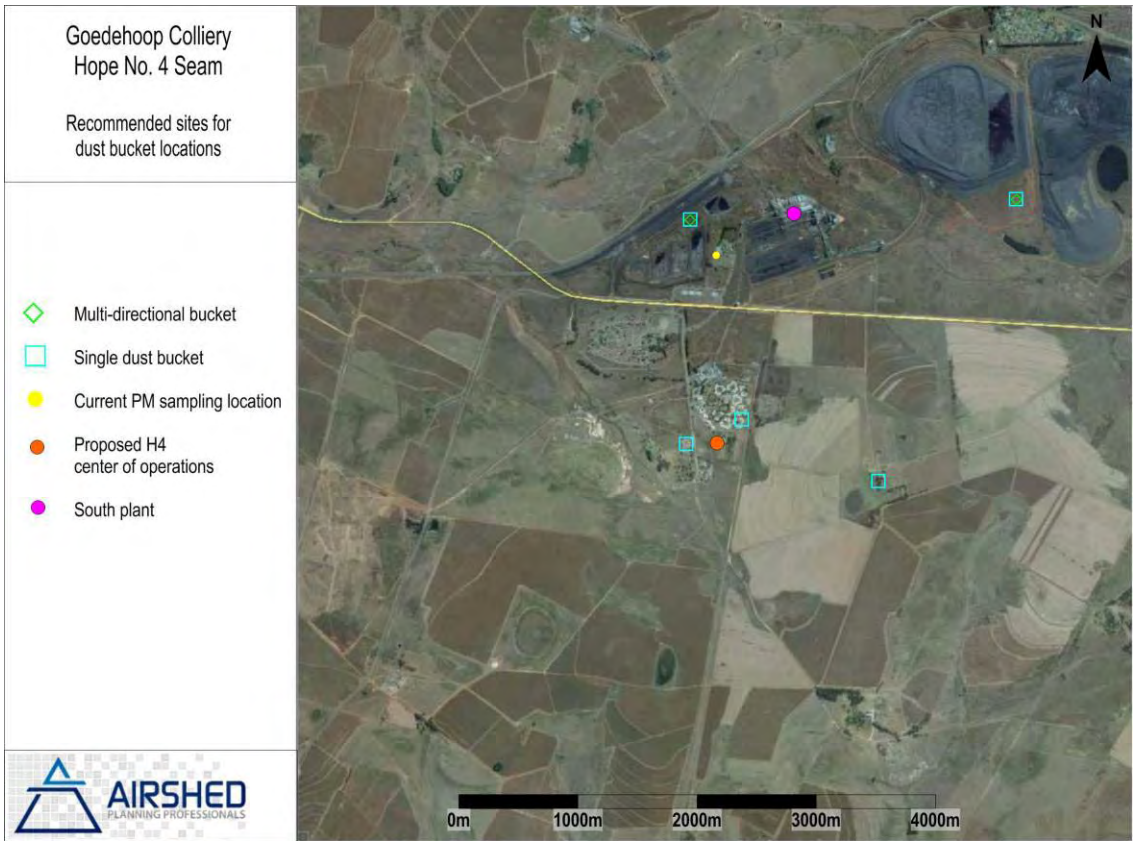

Figure 66: Recommended additional dust bucket locations for the Hope No. 4 Seam project

7.1.8.2 Ecosystem services

The assessment of the ecosystem services supplied by the identified wetland units was conducted according to the guidelines as described by Kotze *et. al.* 2008 (WETEcoServices - A technique for rapidly assessing ecosystem services supplied by wetlands). This technique is designed for inland palustrine wetlands that refers to non-tidal wetlands dominated by emergent plants, shrubs or trees and includes a variety of systems commonly described as marsh, floodplain, vlei or seep. A level 2 assessment will be undertaken which examines and rates natural as well as human services. **The system is not designed to provide a single overall measure of value or importance of a wetland.**

7.1.8.3 Field work

The field work that will be conducted annually and will include surveying the area to determine if there is a change in the vegetation composition. Animal species will be verified and if any water is available, bio-monitoring will be conducted. Soil investigation will be conducted only on areas being rehabilitated.

The survey will also include the observation of any erosion features as well as the detection of any declared invader plant species or plant species that must be protected.

7.1.9 Interested and Affected Parties

A list of all identified interested and affected parties is given in the EIR. Any additional or new parties that would like to be included in this list will be included in the list.

Goedehoop Colliery has regular meetings with the interested and affected parties and will continue having these meetings. These meetings are held with interested and affected parties on a bi-annual basis. Issues raised in these meetings are recorded and addressed as far as possible.

The mine also uses an open door approach with the surrounding inhabitants and landowners. This allows the mine to pro-actively react to any perceived complaint from its neighbours thus ensuring that the situation is resolved timeously.

7.2 MONITORING COMPLIANCE WITH AND PERFORMANCE ASSESSMENT AGAINST THE ENVIRONMENTAL MANAGEMENT PROGRAMME AND REPORTING THEREOF

As part of the general terms and conditions for an environmental authorisation and in order to ensure compliance with the EMPr and to assess the continued appropriateness and adequacy of the EMPr, Anglo Operations (Pty) Limited (Goedehoop Colliery) will:

- Conduct monitoring on a continuous basis (see Table 39 under section 5 of the EMPr).
- Conduct performance assessments of the environmental management programme once in every two years.
- Compile and submit a performance assessment report to the minister in which compliance with the approved Environmental Management Programme is demonstrated.

The performance assessment report will as a minimum contain the following:

- Information regarding the period applicable to the performance assessment
- The scope of the assessment.
- The procedure used for the assessment.
- The interpreted information gained from monitoring the approved environmental management programme.
- The evaluation criteria used during the assessment.
- The results of the assessment.
- Recommendations on how and when non-compliance and deficiencies will be rectified.

7.3 ENVIRONMENTAL AWARENESS PLAN

Anglo Operations (Pty) Limited has developed an environmental awareness plan and an emergency procedure that it uses to inform its employees of any environmental risks that may results from their work and the manner in which the risk will be dealt with in order to prevent pollution nor degradation of the environment. Copies of the environmental awareness and an emergency procedure for Goedehoop Colliery, which will be applicable to the proposed Hope No. 4 Seam project are available on request.

7.4 UNDERTAKING TO COMPLY

The signed undertaking will be presented to DMR on approval of the EIR and EMPr.

7.5 STATUTORY REQUIREMENTS

A water use licence application for all the water uses within the proposed Hope No. 4 Seam Project has been submitted to the Department of Water and Sanitation.