NAME OF APPLICANT: Xstrata South Africa (Pty) Ltd

REFERENCE NUMBER: MP/30/5/1/2/2/10062 MR

SCOPING REPORT SUBMITTED WITH DUE REGARD TO CONSULTATION WITH COMMUNITIES AND INTERESTED AND AFFECTED PARTIES

AS REQUIRED IN TERMS OF REGULATION 49 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (ACT 28 OF 2002), AND IN ACCORDANCE WITH THE STANDARD DIRECTIVE FOR THE COMPILATION THEREOF AS PUBLISHED ON THE OFFICIAL WEBSITE OF THE DEPARTMENT OF MINERAL RESOURCES.

APRIL 2013

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

This document has been prepared by **Digby Wells Environmental**.

Report Title: **Scoping report for the Proposed Consbrey Colliery**

Project Number: **MSO1805**

Name	Responsibility	Signature	Date
Degrecia Zwane	Project Administrator		9 April 2013
Marcelle Radyn	Project Manager		10 April 2013
Michael Hennessy	Legal Reviewer		26 February 2013

EXECUTIVE SUMMARY

Xstrata South Africa (Pty) Limited (Xstrata SA) is currently the holder of prospecting rights (under Reference Number MP 30/5/1/1/2/820 PR) over various portions of the farms Bankfontein 215 IS, Bosmanskrans 217 IS, De Wittekrans 218 IS, Dwarstrek 216 IS, Hartbeesfontein 259 IS, Morgenster 204 IS, Goedenhoop 205 IS, Smutsoog 214 IS, Klipfontein 241 IS and Welgemeend 214 IS in the Magisterial District of Ermelo (the Prospecting Rights). These rights relate to different coal seams within the area covered by the Prospecting Rights. Xstrata SA has entered into an agreement with Msobo Coal (Pty) Limited (Msobo Coal) in terms of which the Prospecting Rights have been sold to Msobo Coal, but subject to the consent of the Minister of Mineral Resources in terms of Section 11 of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA). The process of effecting cession was finalised, however it only occurred after the application for a mining right was submitted. For this reason the Environmental Impact Assessment (EIA) process is undertaken in the name of Xstrata SA as they were the applicant at the time. The proposed Consbrey Colliery is located within the boundaries of the Albert Luthuli and Msukaligwa local municipalities, under the jurisdiction of the Gert Sibande district municipality, Mpumalanga Province.

The Mining Right Application (MRA) was lodged with the DMR in November 2012 and the acknowledgement letter (with reference number MP 30/5/1/1/2/10062 MR) was received on 14 March 2013, permitting Xstrata SA to proceed with the necessary environmental process. Xstrata SA has been directed to lodge a Scoping Report as contemplated in Regulation 48 and 49 of the MPRDA Regulations, by 12 April 2013. Although this directive has been addressed to Xstrata SA, in view of the intention of Xstrata SA, the current holder of the prospecting rights and Msobo Coal, that Msobo Coal will ultimately become the holder of the mining right, this Scoping Report has been prepared under the name of Msobo Coal (Pty) Limited.

Digby Wells Environmental, independent environmental consultants are to undertake the necessary processes. The EIA process will be aligned with the requirements of Section 39 (1) and Regulation 49 of the MPRDA in support of the MRA for the proposed coal mining activities at Consbrey Colliery in order to obtain environmental authorisation from the DMR.

The Scoping Report was made available for public review under Reference Number MP 30/5/1/1/2/10060 MR, between 6 March 2013 and 9 April 2013. A public meeting took place on 26 March 2013. This Scoping Report will highlight the concerns and issues raised to date. This Scoping Report will be used as a guide for the compilation of the Environmental Impact Assessment and Environmental Management Programme Report (EMPR) aimed to discuss all social and environmental related issues.

The proposed project site covers predominately a greenfield area characterised by agricultural activities, towards the east it encroaches on the historical Consolidated Breyten Mine (with the associated Consbrey dump which was part of JCI Mine). The mineral to be mined is bituminous coal located within the Ermelo coal field. The coal seams will be mined with the use of both open pit (truck and shovel) and underground (bord and pillar) methods.

Access to the sites will be via existing roads, where possible and if necessary, new roads will be constructed. The coal from Consbrey will be transported to the Spitzkop Colliery by truck or by a conveyor belt system. The coal will be washed at Spitzkop Colliery's beneficiation facility.

The **key potential negative** environmental and socio-economic impacts identified during the scoping phase for the proposed project (determined according to the significant potential impacts caused on the receiving environment), and that may require mitigation are described below. Again, these were determined on a desktop level due to time constraints.

Construction Phase

During the construction phase, materials in the overburden may give rise to deterioration in water quality caused by the pyritic bioturbated sandstones and shales and black carbonaceous shales that are associated with the coal seams and occur close to the coal seams, this material may cause Acid Mine Drainage (AMD) if oxidation occurs. The land affected by surface and underground infrastructure will be converted to mining land for the duration of mining activities. Construction activities may lead to the increased pressure on local services and resources, partially attributable to the proposed project's water and electricity requirements, and partially attributable to an influx of job-seekers who will require housing and other basic services, and who may make use of local health and educational facilities, amongst other services.

Operational Phase

During operations, open pit mining will take place, resulting in a progressive impact on the natural topography. There will be overburden stockpiles, soil stockpiles and open pits which will also increase the secondary impacts such as disturbance to catchment area and erosion. The changes induced by mining may lead to a dewatering cone in the immediate vicinity of the mine, resulting in an increase in recharge, storage capacity (open pit workings) and deterioration in water quality. The mining activities will open the areas to oxidation and the possible formation of AMD that will have to be contained. Open pit mining results in a constant removal of soil and overburden, which could increase erosion and loss of soil fertility. Soil erosion is a major problem in South Africa as soil takes a long time to regenerate. The open pit workings will receive run-off, precipitation and seepage. This will result in surface water coming into contact with potentially contaminating material. The open pit workings will also reduce the local catchment size. During the operational phase, impacts resulting from open pit operations on archaeological sites could be high, depending on the nature and location of sites identified in the Archaeological Impact Assessment (AIA). The De Wittekrans Iron Age complex is known to exist directly next to the proposed mining operation. The temporary loss of agricultural land in the area may cause a negative impact, and some local farmers may have to be relocated to other areas during operation. Increased dust, noise, and traffic levels may also cause a negative impact for surrounding landowners and nearby residents.

The operational phase will also include underground mining with the use of Continuous Miners. The vent shaft will be fully operational. Blasting of the underground areas will cause an increase in noise and dust levels. Surface subsidence caused by the proposed underground mining activities could occur.

Decommissioning Phase

A significant negative impact will be experienced in the area due to the large number of job losses. An important source of income will be lost for many families in the area and people may start to move out of the town, if other jobs in the vicinity are not available.

Post Closure Phase

The potential for AMD is of significant concern due to the long time frame associated with it and the large financial expenditure associated with the handling of water contaminated in this fashion. Underground mining has the potential to impact on surface water quality if there is a decant point or if water is discharged. This decant water will make its way to the closest stream. If subsidence occurs, this could impact on surface drainage and result in a negative impact on the catchment.

The **key potential positive** environmental and socio-economic impacts identified during the scoping phase (determined according to the potential significant impacts caused on the receiving environment) are described below:

Construction Phase

The proposed Consbrey Colliery will result in the creation of temporary job opportunities for local and regional labourers and contractors. Multiplier effects on the local economy as a result of increased spending power of employees and services providers of the mine, rates and taxes payable by Xstrata SAMsobo Coal to the municipality, as well as Local Economic Development (LED) and Human Resource Development (HRD) spent by Xstrata SA.

Operational phase

Employment opportunities will be created, and will positively influence the lives of households.

Prior to the EIA/ EMP report being compiled and submitted, several specialist investigations are to be conducted in order to close any knowledge gaps identified during the scoping phase. The studies which are proposed to be conducted during the EIA phase include:

- Topography and Visual Impact Assessment;
- Soil, Land Use and Land Capability Impact Assessment;
- Flora and Fauna Impact Assessment;
- Surface Water Impact Assessment;
- Wetland Impact Assessment;
- Aquatic Environment Impact Assessment;
- Groundwater Impact Assessment;
- Air Quality Impact Assessment;
- Noise Impact Assessment;
- Heritage Impact Assessment (this depends on the outcome of the South African Heritage Resources Agency (SAHRA) and/ or the relevant Provincial Heritage Resources Authorities (PHRA) for the need for further investigations); and

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1.3 State whether or not the Department of Land Affairs have been identified as an interested and affected party. 4

1.4 State specifically whether or not a land claim is involved. 4

1.5 Name the Traditional Authority identified by the applicant. 4

1.6 List the landowners identified by the applicant (Traditional and Title Deeds owners). 4

1.7 List the lawful occupiers of the land concerned. 7

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A. SCOPING REPORT

1 METHODOLOGY APPLIED TO CONDUCT SCOPING

1.1 Name the communities as defined in the guideline, or explain why no such communities were identified.

The proposed Consbrey Colliery is located in the Albert Luthuli and Msukaligwa Local Municipalities, under the jurisdiction of the Gert Sibande district municipality, Mpumalanga Province. The regional setting and local setting is depicted in Plan 1 and Plan 2 below, respectively.

The majority of the information contained within the scoping report was based on desktop studies as well as experience in the project area. Due to the timeframes imposed by the DMR, and Xstrata South Africa (Pty) Limited (Xstrata SA) not being able to obtain any extensions to them, detailed scoping investigations could not be undertaken. Xstrata SA does however, recognise the importance of these activities and has committed to conducting them with the sufficient levels of detailed (during the EIA phase), as legislation requires.

The following communities were identified as Interested and Affected Parties (I&APs):

- Kwa-Zanele (near Breyten); and
- Chrissiesmeer Settlement (near kwachibhibikhulu).

This information was confirmed during the public review period of the Scoping Report (6 March 2013 to 9 April 2013), and has been gathered using existing meeting minutes and existing stakeholder databases.

During the public review period of the scoping report, this community was consulted in order to:

- Introduce the proposed project and its processes;
- Identify additional stakeholders and/or communities which need to be included in the Public Participation Process (PPP);
- Make suggestions for enhanced project benefits and reasonable alternatives;
- Raise issues of concern, suggestions and comments about the proposed project, the Scoping Report and the draft Terms of Reference for the EIA specialist studies to be undertaken; and
- Invite stakeholders to register as I&APs.

Plan 1: Consbrey Colliery Regional Setting

Plan 2: Consbrey Colliery Local Setting

1.2 State whether or not the Community is also the landowner.

The desktop review indicates that the following Community Associations are landowners of properties located within the mining rights area:

- Mrabheli Communal Property Association (Hartbeesfontein 239 IS Re Ptn 6)
- Mgudlwa Communal Property Association (Hartbeesfontein 239 IS Ptn 3/5)
- Libomvu Mkhweli Pondwe Trustee (Opgoedenhoop 205 Ptn 4/3)
- Libomvu Mkhweli Pondwe Trustee (Welgemeend 206 Ptn 5)

The information gathered from the desktop review will be verified during the PPP.

1.3 State whether or not the Department of Land Affairs have been identified as an interested and affected party.

The Department of Land Affairs (DLA) has been identified as an I&AP and included in the stakeholder database. The Government of the Republic of South Africa has been identified as the owner of the following properties:

- Brakfontein 215 IS - Ptn 2 and Ptn 6/4;
- Dwarstrek 216 IS – Ptn 2;
- Klipfontein 241 IS – Ptn 6/1; and
- Smutsoog 214 IS – Re of Ptn 3 (Area 1 and 2).

This is in anticipation of any potential land claims on properties included in the MRA (see Section 1.4) and also considering the environmental sensitivities of the proposed project.

1.4 State specifically whether or not a land claim is involved.

A request to identify and provide the required information on any land claims associated with the MRA and proposed project has been submitted to the DLA on 28 February 2013. According to the DLA, there are no claims lodged against the proposed Consbrey coal mine farms

1.5 Name the Traditional Authority identified by the applicant.

There are no traditional authorities, but Ward Councillors.

1.6 List the landowners identified by the applicant (Traditional and Title Deeds owners).

The affected properties and land owners are depicted on Plan 3.

A list of the directly affected farm portions which will be directly affected by the proposed project are indicated in Table 1.6-1 below. Any other lawful occupiers will be identified during the EIA phase.

Table 1.6-1: List of Landowners Directly Affected

Farm name	Ptn	Owner
BANKFONTEIN 215 IS	2	NATIONAL GOVERNMENT OF SOUTH AFRICA / Department of Rural Development and Land Reform

BANKFONTEIN 215 IS	6	BANK APPELS BOERDERY PTY LTD
BANKFONTEIN 215 IS	11	CONSOLIDATED COLLIERIES LTD
BANKFONTEIN 215 IS	14	BANK APPELS BOERDERY PTY LTD
BOSMANSKRANS 217 IS	1	ROUX ALETTHA CATHARINA
BOSMANSKRANS 217 IS	5	ROUX ALETTHA CATHARINA
DE WITTEKRANS 218 IS	R	ANVIN BELEGGINGS TRUST
DE WITTEKRANS 218 IS	3	ANVIN BELEGGINGS TRUST
DE WITTEKRANS 218 IS	9	LANDMAN, KAREL PIETER
DWARSTREK 216 IS	R	M J C VAN DER MERWE BELEGGINGS TRUST
DWARSTREK 216 IS	1	DIRK STEYN TESTAMENTERE TRUST
DWARSTREK 216 IS	2	NATIONAL GOVERNMENT OF SOUTH AFRICA / Department of Rural Development and Land Reform
DWARSTREK 216 IS	3	ADAM VAN NIEKERK TRUST
DWARSTREK 216 IS	4	ADAM VAN NIEKERK TRUST
DWARSTREK 216 IS	6	NATIONAL GOVERNMENT OF SOUTH AFRICA / Department of Rural Development and Land Reform
HARTBEESTFONTEIN 239 IS	3	MGUDLWA COMMUNAL PROP ASSOC
HARTBEESTFONTEIN 239 IS	5	MGUDLWA COMMUNAL PROP ASSOC
HARTBEESTFONTEIN 239 IS	6	MRABHELI COMMUNAL PROP ASSOC
HARTBEESTFONTEIN 239 IS	9	STEENKAMP & TERBLANCHE TRUST
KLIPFONTEIN 241 IS	6	NATIONAL GOVERNMENT OF SOUTH AFRICA / Department of Rural Development and Land Reform
MORGENSTER 204 IS	2	LANDMAN, KAREL PIETER
MORGENSTER 204 IS	3	GAWIE VOLSCHENK
MORGENSTER 204 IS	6	MORGENSTER NO 204 PTY LTD
OPGOEDENHOOP 205 IS	3	LIBOMVU MKHWELI PONDWE-TRUSTEE
OPGOEDENHOOP 205 IS	4	LIBOMVU MKHWELI PONDWE-TRUSTEE
OPGOEDENHOOP 205 IS	13	ADAM VAN NIEKERK TRUST
SMUTSOOG 214 IS	2	NATIONAL GOVERNMENT OF SOUTH AFRICA / Department of Rural Development and Land Reform
SMUTSOOG 214 IS	3	NATIONAL GOVERNMENT OF SOUTH AFRICA / Department of Rural Development and Land Reform
WELGEMEEND 206 IS	5	LIBOMVU MKHWELI PONDWE-TRUSTEE
WELGEMEEND 206 IS	6	BOTHA, HANNELIE

Plan 3: Consbrey Colliery Land Tenure

1.7 List the lawful occupiers of the land concerned.

A list of lawful occupiers on the directly affected farm portions are indicated in Table 1-2 below.

Table 1.7-1: List of Directly Affected Land Occupiers

Farm name	Ptn	Contact Person
BANKFONTEIN 215 IS	2	Chris Khumalo
BANKFONTEIN 215 IS	6	Ockert Steyn
BANKFONTEIN 215 IS	11	Consolidated Collieries
BANKFONTEIN 215 IS	14	Ockert Steyn
BOSMANSKRANS 217 IS	1	Alettha Catherina Roux
BOSMANSKRANS 217 IS	5	Alettha Catherina Roux
DE WITTEKRANS 218 IS	R	Vincent Schulze
DE WITTEKRANS 218 IS	3	Vincent Schulze
DE WITTEKRANS 218 IS	9	Pieter Karel Landman
DWARSTREK 216 IS	R	Martiens Van der Merwe
DWARSTREK 216 IS	1	Ockert Steyn
DWARSTREK 216 IS	2	Mashinene
DWARSTREK 216 IS	3	Adam Van Niekerk
DWARSTREK 216 IS	4	Adam Van Niekerk
DWARSTREK 216 IS	6	Basaan Mahlangu
HARTBEESTFONTEIN 239 IS	3	Neels van der Walt
HARTBEESTFONTEIN 239 IS	5	Neels van der Walt
HARTBEESTFONTEIN 239 IS	6	George Bea
HARTBEESTFONTEIN 239 IS	9	Dr. Terreblanche
KLIPFONTEIN 241 IS	6	Josaia Mgulie
MORGENSTER 204 IS	2	Pieter Karel Landman
MORGENSTER 204 IS	3	Gawie Volschenk
MORGENSTER 204 IS	6	Amien and Zeat
OPGOEDENHOOP 205 IS	3	Jabu Masango
OPGOEDENHOOP 205 IS	4	Jabu Masango
OPGOEDENHOOP 205 IS	13	Adam Van Niekerk
SMUTSOOG 214 IS	2	Kalie Shongwe
SMUTSOOG 214 IS	3	Kalie Shongwe
WELGEMEEND 206 IS	5	Jabu Masango
WELGEMEEND 206 IS	6	Ockert Botha

1.8 Explain whether or not other persons' (including on adjacent properties) socio-economic conditions will be directly affected by the proposed prospecting or mining operation and if not, explain why not.

Stakeholders were consulted by means of public, focus group and one-on-one meetings, where required, during the public review period of the Scoping Report.

An engagement process has commenced with the I&APs. BIDs were distributed to relevant authorities and I&APs. The scoping report was made available for public review, under Reference Number MP 30/5/1/1/2/10060 MR, between 6 March 203 and 9 April 2013. Public consultation meetings took place on 26 March 2013. Consultation with the directly and surrounding landowners have taken place.

The major comments and issues raised to date include:

- The tourism and ecotourism industry in the area will be affected by the proposed activities;
- Loss of employees in existing developments in the area to mining;
- Creation of permanent jobs to the community;
- Post closure water impacts;
- AMD could lead to the loss of agricultural land; and
- Timeframe on how long AMD will last after rehabilitation.

A comments and response report will be compiled during the EIA phase, wherein all comments will be included in the Environmental Impact Assessment and Environmental Management Programme Report (EMPR) and the comments and issues raised from the I&APs will be addressed.

1.9 Name the Local Municipality identified by the applicant.

The proposed Consbrey Colliery is located in the Msukaligwa and Albert Luthuli Local Municipalities.

1.10 Name the relevant Government Departments, agencies and institutions responsible for the various aspects of the environment, land and infrastructure which may be affected by the proposed prospecting or mining operation.

The relevant Government Departments, agencies and institutions have been identified from a review of existing stakeholder databases and drawing on professional experience from projects undertaken within the same proposed project area. The I&AP database (see Appendix 4) provides more detail on the various stakeholder groups listed below and will be updated throughout the PPP.

The following Government entities were identified:

- Department of Mineral Resources;
- Department of Water Affairs;
- Department of Agriculture, Rural Development and Land Administration;
- Department of Environmental Affairs;
- Department of Agriculture;

- Department of Rural Development and Land Reform;
- Mpumalanga Department of Economic Development, Environment and Tourism;
- Mpumalanga Department of Public Works, Roads and Transport;
- Traditional Authorities;
- Gert Sibande District Municipality;
- Albert Luthuli Local Municipality;
- Msukaligwa Local Municipality; and
- Department of Land Affairs.

The following Agencies and/or Institutions were identified:

- South African Heritage Resource Agency;
- Mpumalanga Tourism and Parks Agency;
- Mpumalanga Heritage Resource Authority;
- Various environmental NGOs;
- Various CBOs;
- Farmers Unions; and
- Business.

1.11 Confirm that evidence that the landowners or lawful occupiers of the land in question, and any other interested and affected parties including all those listed above, were notified, and has been appended hereto.

Announcement of the proposed project was done on Friday, 1 March 2013. Proof of the formal announcement of the proposed project, which included the distribution of a Background Information Document (BID) accompanied by an announcement letter and registration and comment sheet, was provided to the DMR. This was done by means of sending the letters via email and post to all stakeholders on the database (see Section 5.1*).*

2 A DESCRIPTION OF THE EXISTING STATUS OF THE CULTURAL, SOCIO-ECONOMIC AND BIOPHYSICAL ENVIRONMENT, AS THE CASE MAY BE, PRIOR TO THE PROPOSED PROSPECTING OR MINING OPERATION; WHICH DESCRIPTION MUST INCLUDE:

2.1 Confirm that the identified consulted interested and affected parties agree on the description of the existing status of the environment.

An engagement process has commenced with the I&APs. BIDs were distributed to relevant authorities and I&APs. The scoping report was made available for public review, under Reference Number MP 30/5/1/1/2/10060 MR, between 6 March 2013 and 9 April 2013. Public consultation meetings took place on 26 March 2013. Consultation with the directly and surrounding landowners have taken place.

The major comments and issues raised to date during the consultation meetings are the following:

- The tourism and eco-tourism industry in the area will be affected by the proposed activities;
- Loss of employees in existing developments in the area to mining;
- Creation of permanent jobs to the community;
- Post closure water impacts;
- AMD could lead to the loss of agricultural land; and
- Timeframe on how long AMD will last after rehabilitation.

A comments and response report will be compiled during the EIA phase, wherein all comments will be included in the EMPR and the comments and issues raised from the I&APs will be addressed.

2.2 Describe the existing status of the cultural environment that may be affected.

The National Heritage Resources Act, 1999 (Act 25 of 1999) (NHRA) emphasises the importance of cultural heritage resources and provides criteria by which such resources must be evaluated and managed.

Based on relevant previous impact assessment reports, literature reviews and historical sources, the cultural landscape of the project area can be described as a primarily agrarian landscape with deep time depth. The cultural landscape therefore comprises natural and cultural heritage such as historical, archaeological and rock art sites. Significantly, the topography as described in section Table 2.6-6 below is conducive to providing suitable shelters for archaeological and historical groups that have occupied the landscape in the past. Evidence of one such shelter is found on the western boundary of the project area and is discussed in more detail in section 2.3 below.

The cultural landscape may further be defined as a relic landscape. Most notably, in relation to important episodes in South African history, evidence is given of such events such as the Mfecane and Anglo-Boer Wars. Another aspect of the relic landscape that must be considered is the historically known presence of San/ Bushman in the Mpumalanga Lakes

District, especially surrounding Chrissiesmeer where descendant populations of these early inhabitants still reside.

2.3 Describe the existing status of any heritage environment that may be affected.

The baseline description of the heritage baseline has been summarised. A heritage statement will be submitted to SAHRA detailing the De Wittekrans Complex and other heritage information.

Fossil plants are the predominant palaeontological resource found in this region of South Africa. Around Ermelo, in particular, there are exposures of Permian rocks of the Vryheid Formation which contain fossil plants of the *Glossopteris* flora but no vertebrates (Bamford, 2011).

Tool producing hominids have occupied southern Africa for approximately 2 million years. This is primarily evident in the stone tools that have remained, not only indicating their presence in the landscape, but also attesting to the technological development of our *Homo* genus. Based on the criteria for classification, it is evident that the initial model[1] of Earlier (ESA), Middle (MSA), and Later Stone Age (LSA) (with variants) developed by Goodwin and Van Riet Lowe (1929) is appropriate. Evidence of the Stone Age in Mpumalanga is not well documented and is limited to a few well-known sites. Previous impact studies surrounding the project area yielded no Stone Age finds. The aforesaid baseline description of the heritage in and around the project area has been summarised.

LSA and rock art sites may occur together as these were typically associated with shelters in sandstone cliffs or outcrops, which are prominent in the project area. The economy of the LSA people is associated with hunter-gatherer or herder societies. A prominent site located 650 m to the west of the Consbrey project boundary is the De Wittekrans Complex. In the report completed by Ouzman (2009) he describes the complex as consisting of four individual sites all with archaeological deposit, including stone tools and pottery. The rock art within the complex consist of fine-line, brush painted made by hunter-gatherers and finger painted rock paintings associated with herder people. A study conducted by van Schalkwyk (2003) in the surrounding area also identified a rock art site (2630AA3) some 13 km from Consbrey, indicating that there is a high probability that rock art sites occur within the wider region surrounding the project. Additionally, the Chrissiesmeer Lake District has been occupied by San/Bushmen for many generations. According to Potgieter (1955) they lived on reed platforms on the lakes or in rock shelters. There is an existing small group of Bushmen who still call the lakes their home and act as guides for tourists (Anonymous, 2011).

The Stone Age is followed by the Iron Age in southern Africa. This period is also divided into Early, Middle and Late Iron Age and as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. One of the identifiers of Iron Age Sites are stonewalled settlements. According to Maggs (1976), Type V and Type N walling are present within Mpumalanga and may be found on the slopes of hills. Type V

[1] This model has been reassessed and modified through time (Clark, 1959; Clark et al, 1966; Sampson, 1974)

consists of the standard core of cattle enclosures surrounding beehive houses and grain bins. Corbelled huts may be present with this type of walling. Type N walling consists of a few cattle kraals in the centre of the settlement, linked by other stone walling and a perimeter wall that encloses the entire settlement (Huffman, Handbook to the Iron Age: The Archaeology of the Pre-Colonial Farming Societies in Southern Africa, 2007).

Another form of identification is through the remains of material culture, specifically ceramics. Murimbika (2007) states that the region was predominantly occupied by Ndebele Nguni speaking groups during this period and that the predominant ceramic facies identified are Blackburn (1050 CE - 1500 CE), Moor Park (1350 CE - 1700 CE) and Nqabeni (1700 CE - 1850 CE). Only one site possibly dating to the Late Iron Age was documented in previous studies conducted in the surrounding area. The site comprised remnants of a stonewalled enclosure, but no diagnostic ceramics were noted and thus could not be associated with a specific group (Murimbika, 2007).

The Historical Period is generally accepted to date from approximately the mid-19th century, and is generally associated with the movement and contact with Europeans. It should be noted that some, most notably the Five Hundred Year initiative, suggest that Historical Period be recognised as occurring earlier, especially in Mpumalanga. Mpumalanga served as a conduit for many travellers moving north through the country. Some of the first to settle in the region were Boers who left the former Natal (now KwaZulu-Natal) after the Boer Republic of Natalia was annexed by the British. It is also during this period that Mfecane events took place in the region. Mfecane, referring to the period during the 18th and 19th centuries in which transformation in southern Africa occurred primarily through conflicts associated with the Zulu. Mfecane battlefields occur within region. According to Huffman and van der Merwe (1993), local traditions state that the capital of a Swazi chief, Mandla-angangawempisi (Mandlangampisi), was situated on Kafferkraal 98 HT between 1780 and 1840 (Huffman & van der Merwe, Archaeological survey for Savemore Colliery, 1993). Mandlangampisi is reputed to have fought and been victorious in two battles against Zulu warriors during the Mfecane period. One specific battle took place in or near a cave known as Mhlogamvula in the KwaMandlangampisi mountain range 110 km southeast of the project area.

In addition to Swazi and Zulu, Pedi and smaller groups of Ndzundza Ndebele and Kopa also occupied the region during the mid-19th century. While the larger Swazi and Pedi groups were able to successfully assert their own authority over their respective lands, Ndzundza and Kopa often came into direct conflict with the *Zuid Afrikaansche Republiek* (ZAR) (Delius & Cope, 2007). Tensions came to a head in the late 1840s when the Kopa were accused of raiding horses from the Boers. A retaliatory raid was organised, and the Kopa chief was captured and flogged with the result that Kopa raids increased. The Boers requested the Swazi to assist who besieged and destroyed the Kopa stronghold Thaba Ntsho in 1864. The Swazi/ Boer alliance subsequently focussed on the Ndzundza Ndebele, but were unsuccessful at defeating them. A tribute system was implemented as a compromise where the Boers ostensibly leased land from the Ndzundza chief.

The Anglo-Boer Wars are arguably the next most notable historical events to take place within the region in which Chrissiesmeer played a central role. The British, under the command of Gen. H.L. Smith-Doriens were encamped around Lake Chrissie on 6 February 1901. The Boers, under the command of Gen. Louis Botha, intended to conduct a surprise attack on the British forces. The Boers enlisted the help of the local San community who were monitoring the British movements in the area. With the San's knowledge of the terrain, the Boers were able to launch the surprise attack at repel the British. The battle continued until the 9th of February 1901 when adverse weather caused the Boers to lose their advantage and were eventually forced to retreat (Jones, 1999; Delius & Cope, 2007; Anonymous, San Involvement in the Battle of Chrissiesmeer, 2013).

After the war, the farm Bothasrus was given to Lukas Potgieter as compensation for losing a leg during the first Anglo-Boer War. He later sold the farm to field-cornet Nicolaas Breytenbach who formed the town Breyten in his own name. In 1905, the KwaMadala Native Location, situated about 30 km from Ermelo, was established as a freehold township on Portion 7 and Portion 5 of Smutsoog 241 IS in the project area. The claimants were some of the Native Location residents and had permission to occupy stands owned by the Town Council of Breyten (Land Claims Commission, 2003). Based on the 1913 Land Act, blacks were segregated which resulted in the majority of the land surrounding the project area being owned by whites who practiced farming (Schirmer, 2007).

An agricultural census conducted in 1918 and again in 1993, showed that agriculture was the main form of livelihood across many of the districts in Mpumalanga. The general landscape may therefore be characterised as a large-scale agricultural landscape. This is confirmed through a review of historical cartographic sources. Black farmers in the region were forced into at least five categories of livelihood patterns:

- Labour trade in exchange for permission to plough on white-owned land;
- Black farmers would rent land from companies who owned large tracts of land;
- Some black farmers were able to farm on white-owned land and on their own sections of the property;
- Some black farmers could farm on mission-owned land; and
- Few black farmers legally owned their land.

Previous studies within the surrounding area (Huffman & Calabrese, 1997; Van Schalkwyk, 2003; Van Schalkwyk, 2003; Fourie, 2007; Murimbika, 2007) primarily identified sites associated with these types of settlements from the early 20th century. Heritage resources mainly include homesteads and burial grounds and graves. Historical layering (i.e. a chronological review of available historical maps) indicated that infrastructure associated with the agricultural economy within the project area was well established and present during the 1950s.

The struggle for land and the poor working conditions under which black farmers were expected to operate led to numerous political struggles in the region during the 1940s to 1990s. Farm worker's associations were formed in towns such as Ermelo, even the youth gathered to discuss political issues (Holden & Mathabatha, 2007). During the apartheid era, many people were forcibly removed from their homes and relocated to other areas to facilitate the national policy of separate development. In 1958, for example, coloured people in Ermelo were forcibly removed from their homes and relocated to an area 'zoned' as a coloured township (Christopher, 1991). In 1968, claimants from the KwaMadala location were removed to the KwaZanele Township, about 10 km from Breyten. Four-roomed houses were allocated to the claimants, for which rent was levied. On 6 February 2003, 245 households from the KwaZanele Township received financial compensation which will be used to improve their present housing and infrastructure (Land Claims Commission, 2003).

2.4 Describe the existing status of any current land uses and the socio-economic environment that may be directly affected.

The proposed Consbrey Colliery is situated in the Mpumalanga Province, which is made up of three district municipalities, namely Ehlanzeni, Gert Sibande (formerly East Vaal) and Nkangala. The Project falls within the Gert Sibande District Municipality, which is the smallest district municipality in the Province. The project area falls within two municipalities with the northern portion of Consbrey falling within the boundaries of the Albert Luthuli Local Municipality and the southern portion of Consbrey falling within the boundaries of the Msukaligwa Local Municipality (refer to Plan 1 depicting the regional setting).

2.4.1 Albert Luthuli Local Municipality

According to the 2011 Census, the Albert Luthuli Local Municipality has a population of just more than 186 000 individuals, 98% of whom are Black Africans and 2% White. Educational levels are low, with only 17% of the population above the age of 5 years having completed secondary school, and just more than a tenth not having received any formal education (refer to Figure 2.4-1). Of the economically active individuals (those between the ages of 15 and 64), only 27% are employed (Statistics South Africa, 2011).

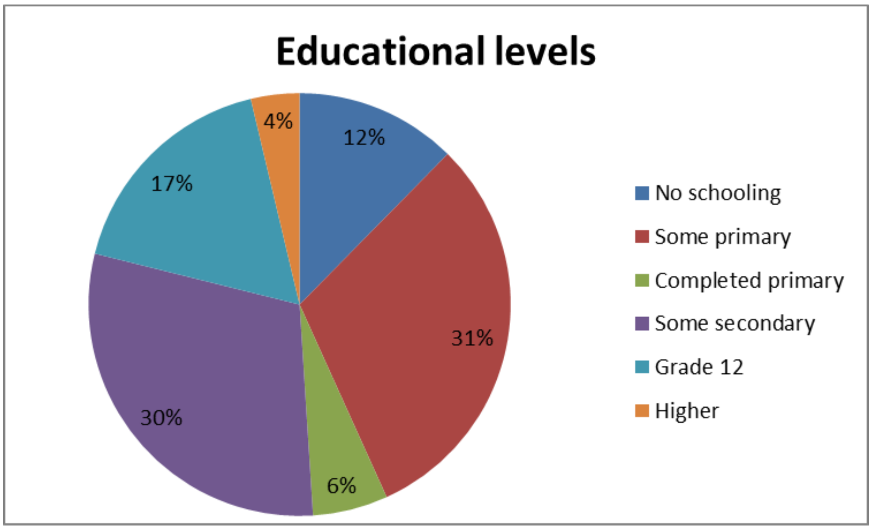

Figure 2.4-1: Educational levels for individuals aged 5 and above

The Albert Luthuli Local Municipality's economy is based on manufacturing, mining, trade, catering / tourism, transport, communication, finance, real estate, and social (mostly government) and personal services. Recently there has been a sharp growth in the number of retail and service establishments, specifically in the town of Ermelo. According to the 2011 Census data, 58% of the population falls within the economically active age group (between the ages of 15 and 64). The agriculture, forestry, and fishing sectors provide a large number of employment opportunities in the area, as does the retail and services sectors. One of the primary economic development objectives for the Albert Luthuli Municipal Council is to create an environment which is conducive to investment and which will focus on capacitating communities to sustain themselves.

2.4.2 Msukaligwa Local Municipality

According to the 2011 Census, the Msukaligwa Local Municipality has a population of just less than 150 000 individuals, 88% of whom are Black Africans and 10% White. Educational levels are low, with only a fifth of the population above the age of 5 years having completed secondary school, and a tenth not having received any formal education (refer to Figure 2.4-2). Of the economically active individuals (those between the ages of 15 and 64), only 44% are employed (Statistics South Africa, 2011).

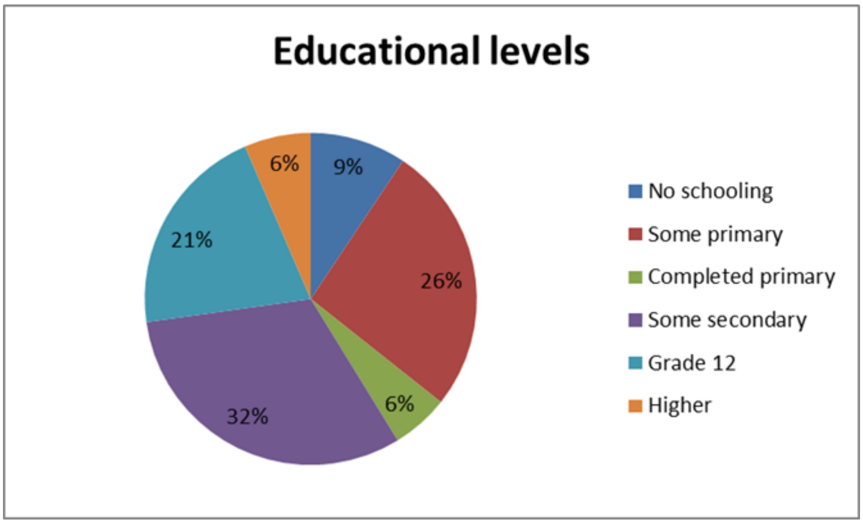

Figure 2.4-2: Educational levels for individuals aged 5 and above

The Msukaligwa Local Municipality's economy is based on manufacturing, mining, trade, catering/ tourism, transport, communication, finance, real estate, and social (mostly government) and personal services. Recently there has been a sharp growth in the number of retail and service establishments, specifically in the town of Ermelo. According to the 2011 Census data, 64% of the population falls within the economically active age group (between the ages of 15 and 64). The agriculture, forestry, and fishing sectors provide just more than a quarter of all employment opportunities in the municipality, with wholesale and retail making up a further 13%, community, social and personal work 14%, and manufacturing and mining contributing another 15%. One of the primary economic development objectives for the Msukaligwa Municipal Council is to create an environment which is conducive to investment and which will focus on capacitating communities to sustain themselves.

2.4.3 Gert Sibande District Municipality

In terms of agriculture, maize, sunflower, wheat, soya beans, beans and potatoes are produced in the surrounding areas. The Nooitgedacht Agricultural research station offers an extensive agricultural support service. Ermelo is also South Africa's largest wool producing area per hoof. The annual Merino Wool Festival and Agricultural Show in March attract thousands of tourists each year, thus contributing to the economy of the area. Agriculture is therefore an established and significant sector of the economy into which other development initiatives could be directed.

Coal mining is a major economic contributor in the area, as is electric power generation from coal fired power stations and associated industries supporting mining and power generation.

The contribution of the Consbrey project to the local economy could be substantial. The proposed Consbrey Colliery will supply the Spitzkop operation with coal for processing, thereby allowing the operation to extend its productive period and enhance its contributions toward the socio-economic well-being of the area by, inter alia, providing additional job opportunities and extending the timeframe of existing opportunities. Mining activities are of strategic importance to the functioning and existence of towns like Breyten, Hendrina and Ermelo. Economic and business activities have developed in the areas surrounding local mines (a multiplier effect of mines), thus a very large portion of the local population is either directly or indirectly dependent on mines for the generation of income. Once mining activities come to an end, the livelihoods of people living in and around the towns will be adversely affected as its sustainability will be jeopardised.

Finally, the rates and taxes payable to the Msukaligwa and Albert Luthuli Local Municipalities as a result of the Spitzkop operation constitutes an important source of income for the municipality, who requires such funds for the development of local infrastructure and the upgrading of facilities for the surrounding communities.

2.5 Describe the existing status of any infrastructure that may be affected.

2.5.1 Roads, Railway and Powerlines

There are access roads to some of the farms of the proposed Consbrey Mine area. There are no major power lines or railway lines that traverse the potentially affected area. The N11 provincial road traverses the south westerly portion of the project area and other farm roads traverse the area. The R38 runs about 5 km from the southern portion of the project area and the R36 runs about 500 m from the eastern portion of the project area.

Once the EIA phase commences all infrastructure in the area will be identified through site visits to the area.

2.6 Describe the existing status of the biophysical environment that will be affected, including the main aspects such as water resources, fauna, flora, air, soil, topography etc.

2.6.1 Climate

Ambient air quality in this region of South Africa is strongly influenced by regional atmospheric movements, together with local climatic and meteorological conditions. The most important of these atmospheric movement routes are the direct transport towards the Indian Ocean and the recirculation over the sub-continents.

Mpumalanga Province experiences a wide range of both natural and anthropogenic sources of air pollution ranging from power generation to veld fires, mining activities, industrial processes, agriculture, paper and pulp processing, vehicle use and domestic use of fossil fuels. Different pollutants are associated with each of the above activities, ranging from volatile organic compounds to heavy metals to particulate matter, dust and odours. Mpumalanga experiences distinct weather patterns in summer and winter that affect the dispersal of pollutants in the atmosphere. In summer, unstable atmospheric conditions result in mixing of the atmosphere and rapid dispersion of pollutants. In contrast, winter is characterised by atmospheric stability caused by a persistent high pressure system over South Africa. This dominant high pressure system results in subsidence, causing clear skies and a pronounced temperature inversion over the Highveld central plateau area. This inversion layer traps the pollutants in the lower atmosphere, which results in reduced dispersion and a poorer ambient air quality. Preston-Whyte and Tyson (1988) describe the atmospheric conditions in the winter months as highly unfavourable for the dispersion of atmospheric pollutants.

2.6.1.1 Wind Direction and Wind Speed

The spatial and annual variability in the wind field for the Ermelo modelled data is clearly evident in Figure 2.6-1. The predominant wind direction is from the east, east northeast and north northeast, with frequent winds also occurring from the east south east and west south west. Over the three year period, frequency of occurrence was 15.6% from the east, 11.6% from the east northeast sector and 10.6% from the north northeast sector. Less frequent winds (under 2% of the time) were coming from the south southeast and south. Calm conditions (wind speeds < 0.5 m/s) occurred for 3.2% of the time. Wind class frequency distribution per sector is given in Figure 2.6-4.

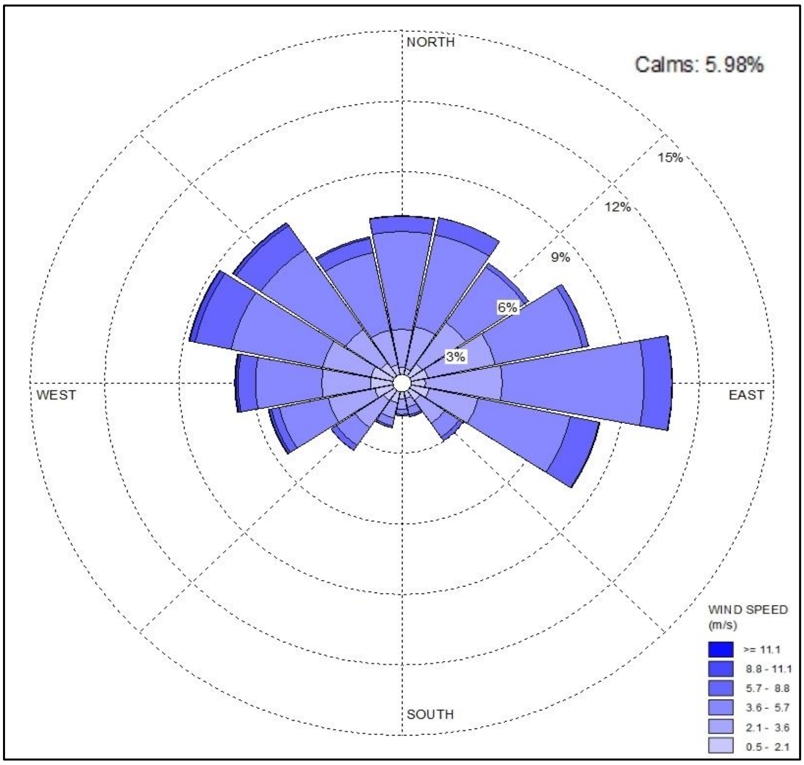

Figure 2.6-1: Period Surface Wind Rose for Ermelo Modelled Data, 01 January 2008 – 31 December 2010

There are variations in the wind direction throughout the day as seen in Figure 2.6-2. During the night time predominant wind direction is from the north, north northwest, north northeast, east and east north east sectors. In the morning, the main wind direction is from the northwest, north northwest and west northwest with some from the east and east southeast. Throughout the afternoon period, the main wind direction is from west northwest, west, east and east southeast. Throughout the evening the predominant wind direction is east, north northeast, north east and east southeast. Less frequent winds (under 2% of the time) were coming from the south. More calm (wind speeds < 0.5 m/s) winds were experienced during the afternoon and least calm period was during the evening.

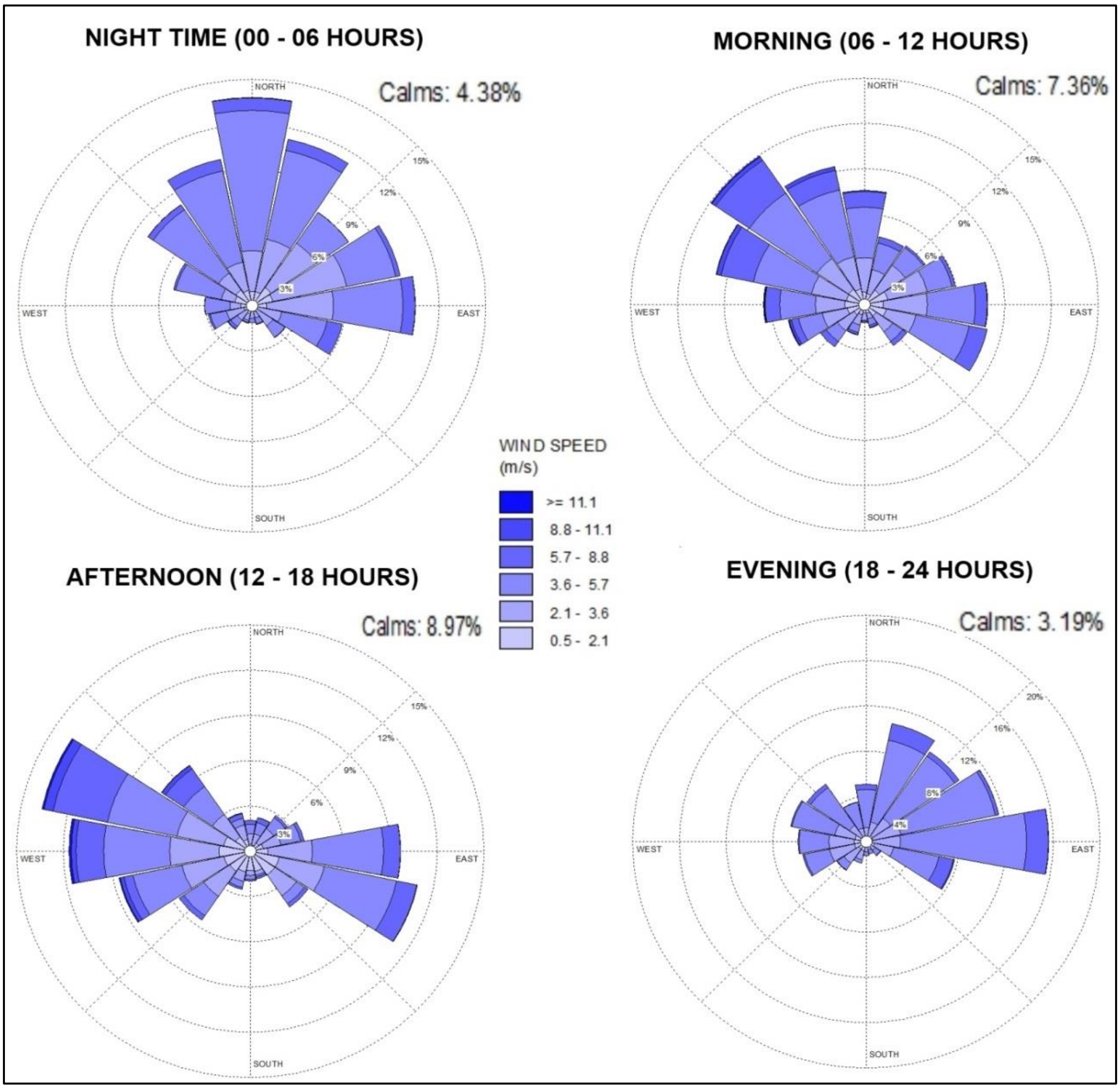

Figure 2.6-2: Diurnal Variation of Winds between Night time 00:00 – 06:00 (top left), Morning 06:00 – 12:00 (top right), Afternoon 12:00 – 18:00 (bottom left) and Evening 18:00 – 24:00 (bottom right) (Modelled Data 01 January 2008 – 31 December 2010)

As seen in Figure 2.6-3, seasonal changes bring about changes in wind direction and speed. In spring, maximum wind speed is between 8.8 - 11 m/s. Predominant wind direction was from the northwest, west northwest, north and north northeast. In summer, the main wind direction was from the east with the main wind speed between 3.6 - 5.7 m/s and highest wind speed experienced was 5.7 – 8.8 m/s. In autumn, predominant wind direction was from the east and west north west. Highest calm winds (wind speeds < 0.5 m/s) were experienced in autumn. In winter, predominant wind direction was west and east. Highest wind speeds exceeding 11 m/s were experienced during this season. Less frequent winds (under 2% of the time) were coming from the south.

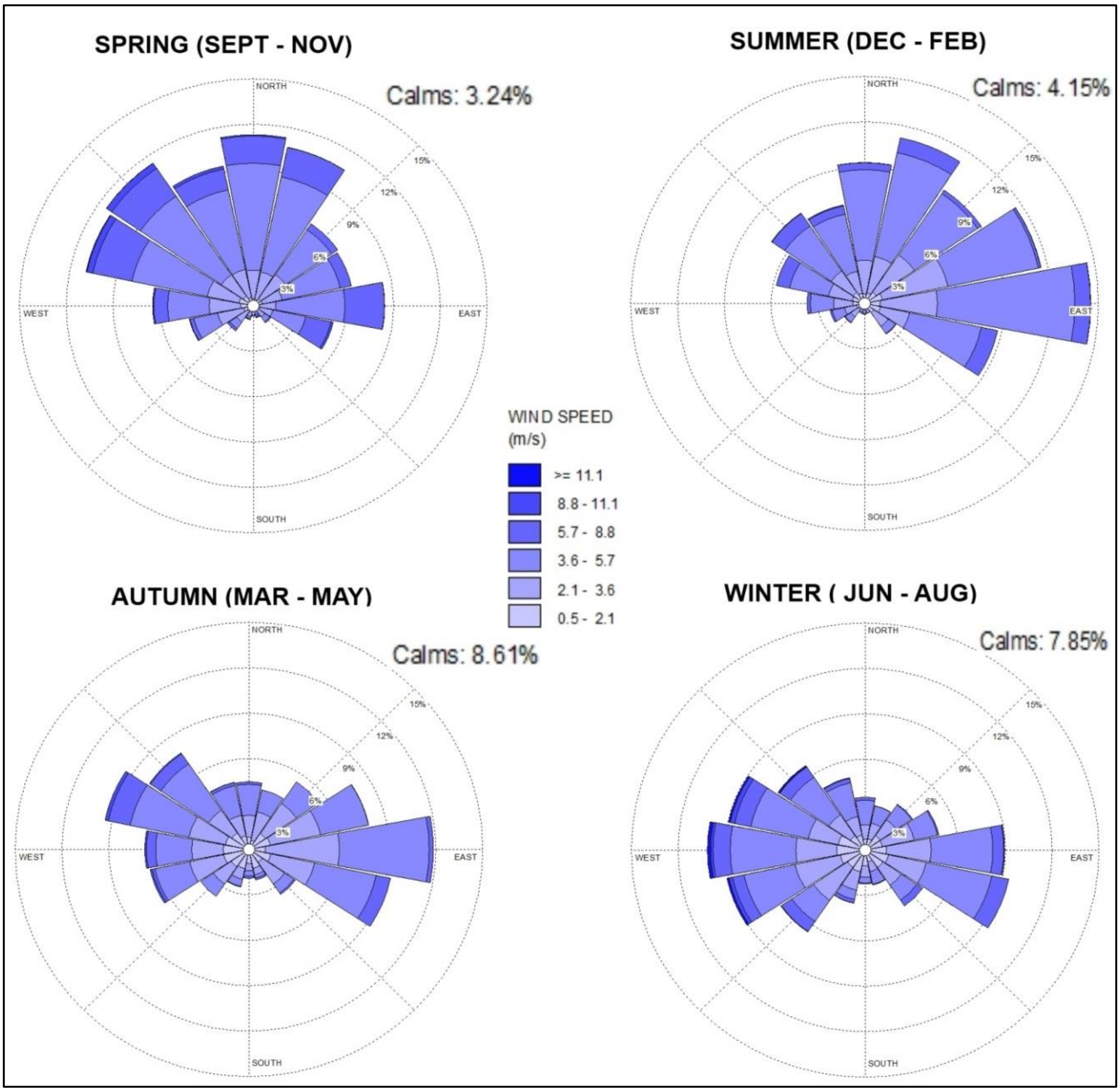

Figure 2.6-3: Seasonal Variation of Winds in Spring (September – November) (top left), Summer (December - February) (top right), autumn (March – May) (bottom left) and Winter (June – August) (bottom right) (Modelled Data 01 January 2008 – 31 December 2010)

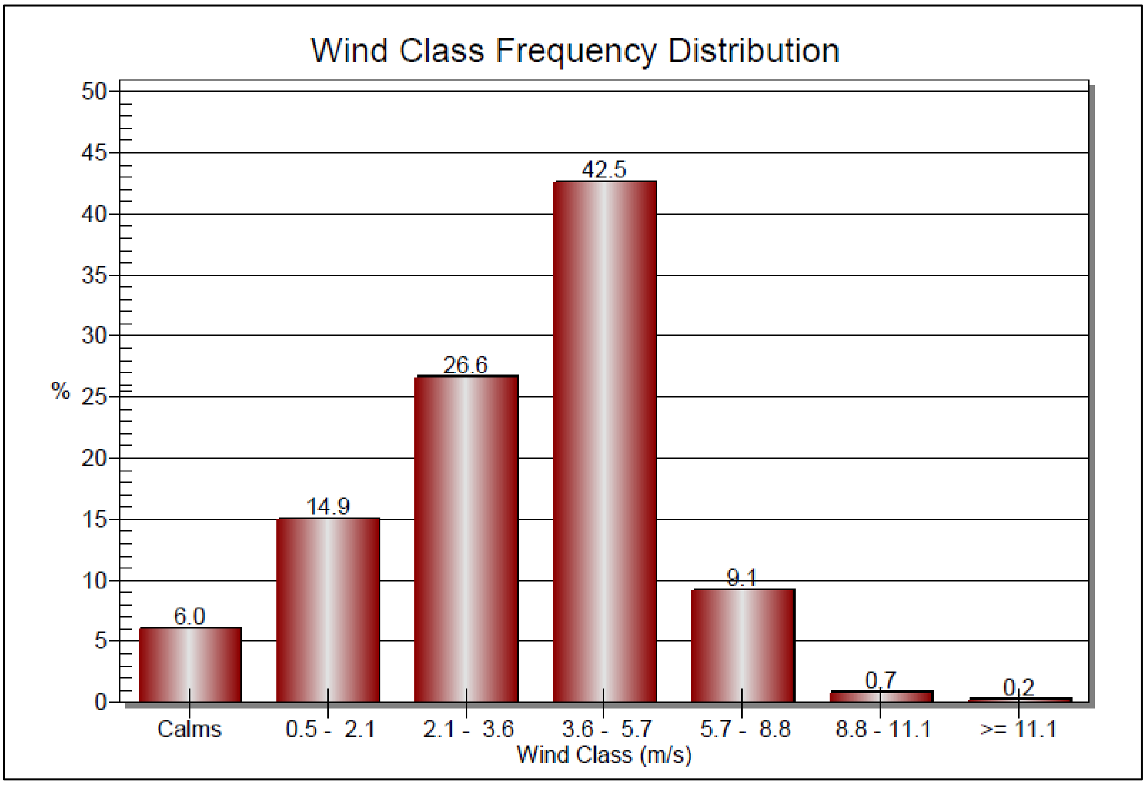

Figure 2.6-4: Wind Class Frequency Distribution for Ermelo Modelled Data, 1 January 2008 – 31 December 2010

2.6.1.2 Temperature

Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers.

South African Weather Service does not have an Automatic Weather Station (AWS) within the reasonable distance from the proposed Consbrey coal mine site that would give representative and accurate climate data, so the use was made of modelled data and trends were observed analysing the three years available (2008-2010).

The average monthly maximum temperatures range from 20.3°C in January to 8.6°C in July, with monthly minima ranging from 18.7 C in December to 6.5°C in July. Annual mean temperature for Consbrey is given as 14.0°C (Figure 2.6-5).

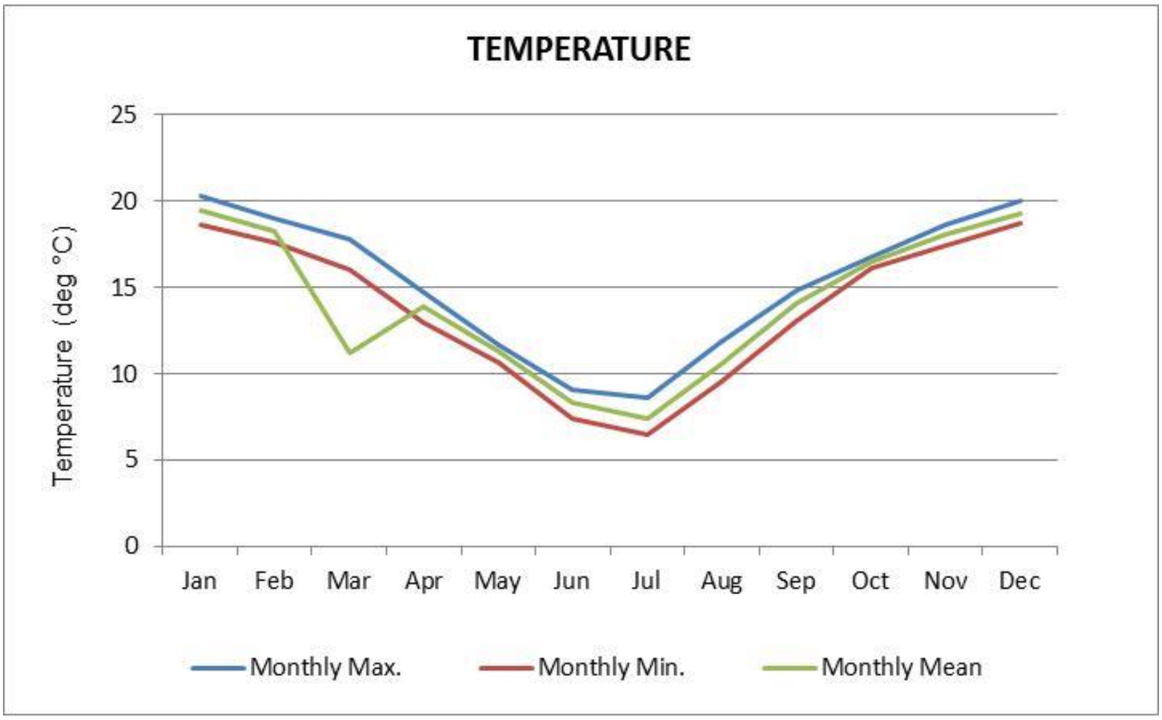

Figure 2.6-5: Average Monthly Temperature derived from the Ermelo Modelled Data (2008-2010)

2.6.1.3 Relative Humidity

As depicted in Figure 2.6-6, the monthly minimum relative humidity on the other hand is from 68% in December, with the highest minimum (74%) occurring in January. The monthly maximum relative humidity is from 83% in July, with the highest minimum (87%) occurring in May.

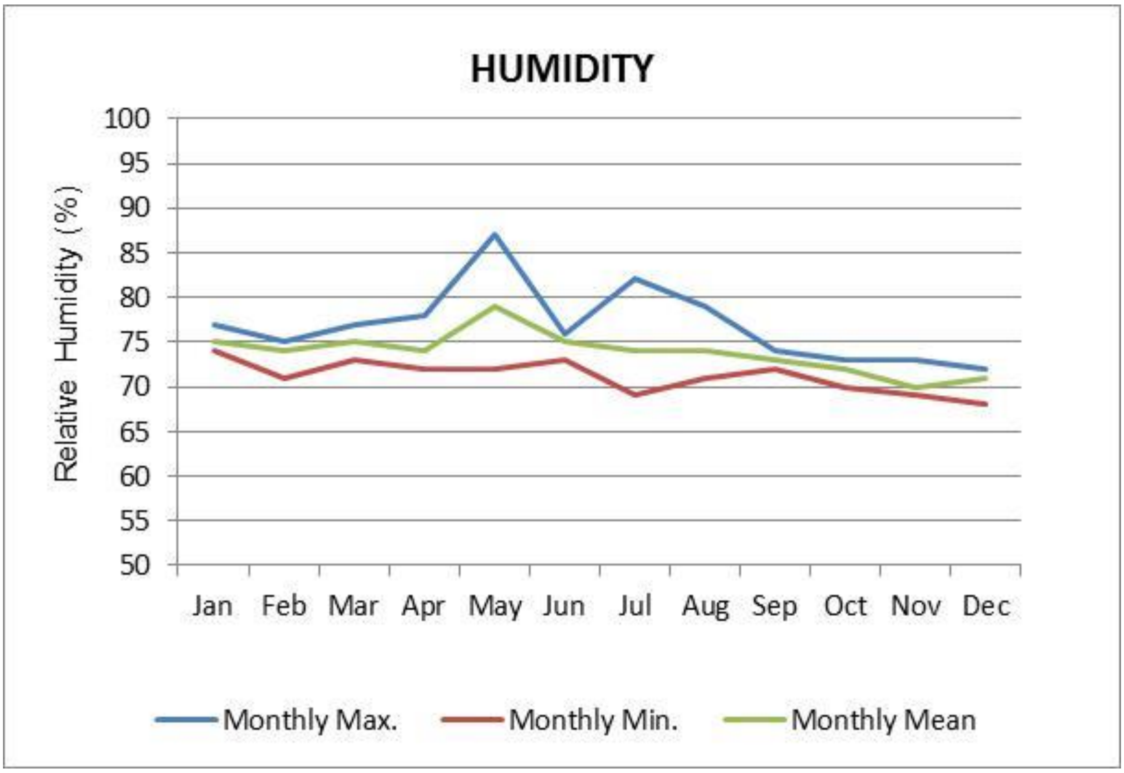

Figure 2.6-6: Average Monthly Relative Humidity derived from the Ermelo Modelled Data (2008-2010)

The data in Table 2.6-1 is representative of the relative humidity for the Ermelo area. The annual maximum, minimum and mean relative humidity is given as 77%, 71% and 74% respectively.

Table 2.6-1: Average Monthly Relative Humidity derived from the Ermelo Modelled Data (2008-2010)

Relative Humidity (%)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	77	75	77	78	87	76	82	79	74	73	73	72	77
Monthly Min.	74	71	73	72	72	73	69	71	72	70	69	68	71
Monthly Mean	75	74	75	74	79	75	74	74	73	72	70	71	74

2.6.1.4 Precipitation

As depicted in Figure 2.6-7, the highest monthly maximum precipitation (358 mm) occurs for January. The rate decreases down to 5 mm in June. The monthly minimum precipitation ranges between 166 mm in December and no precipitation in June and July.

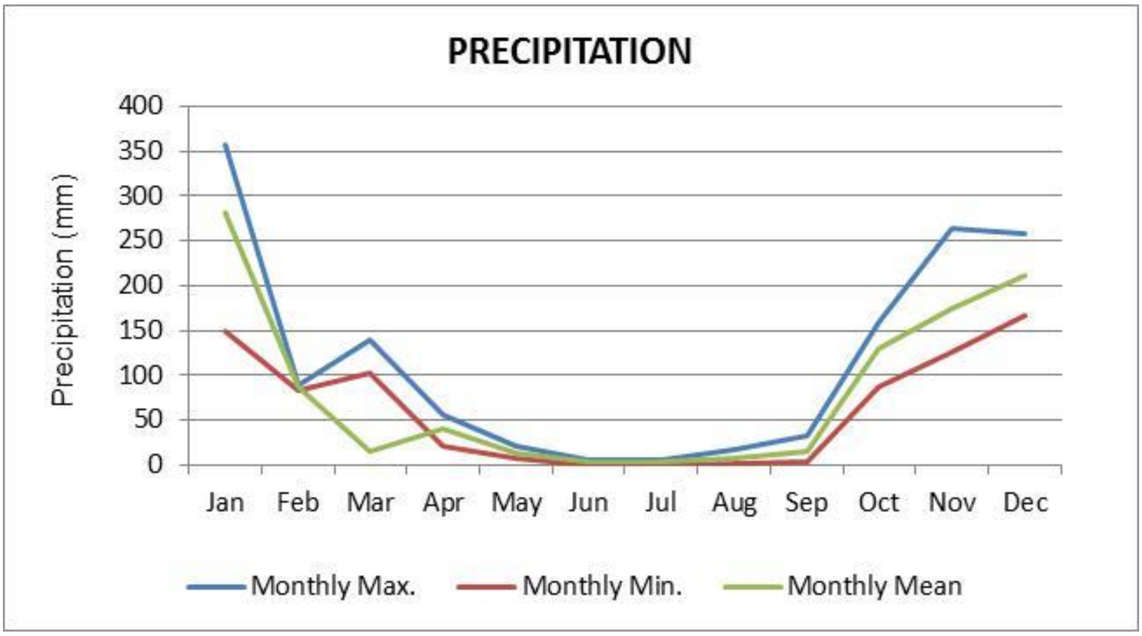

Figure 2.6-7: Average Monthly Precipitation derived from the Ermelo Modelled Data (2008-2010)

As shown in Table 2.6-2, the three year annual maximum, minimum and mean monthly precipitation rates for the Consbrey site are 117 mm, 63 mm and 82 mm, respectively.

Table 2.6-2: Average Monthly Precipitation derived from the Ermelo Modelled Data (2008-2010)

Precipitation (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	358	90	140	56	22	5	5	18	32	160	264	258	117
Monthly Min.	149	84	102	21	8	0	0	2	4	88	127	166	63
Monthly Mean	282	88	15	40	14	3	3	8	16	130	175	212	82

2.6.1.5 Evaporation

The Carolina Weather Station is the only station with evaporation data in the surrounding area. Mean monthly S-pan evaporation data shows that the evaporation exceeds precipitation. Owing to the similar altitudes of Carolina and Consbrey project area (1703 mamsl and between 1610 m and 1825 m with an average of 1717 mamsl, respectively), it is believed that the evaporation figures for the proposed mine should be similar to those of the Carolina Weather Station.

As depicted in Figure 2.6-8, the monthly minimum evaporation ranges between 136 mm in December and 52 mm in April.

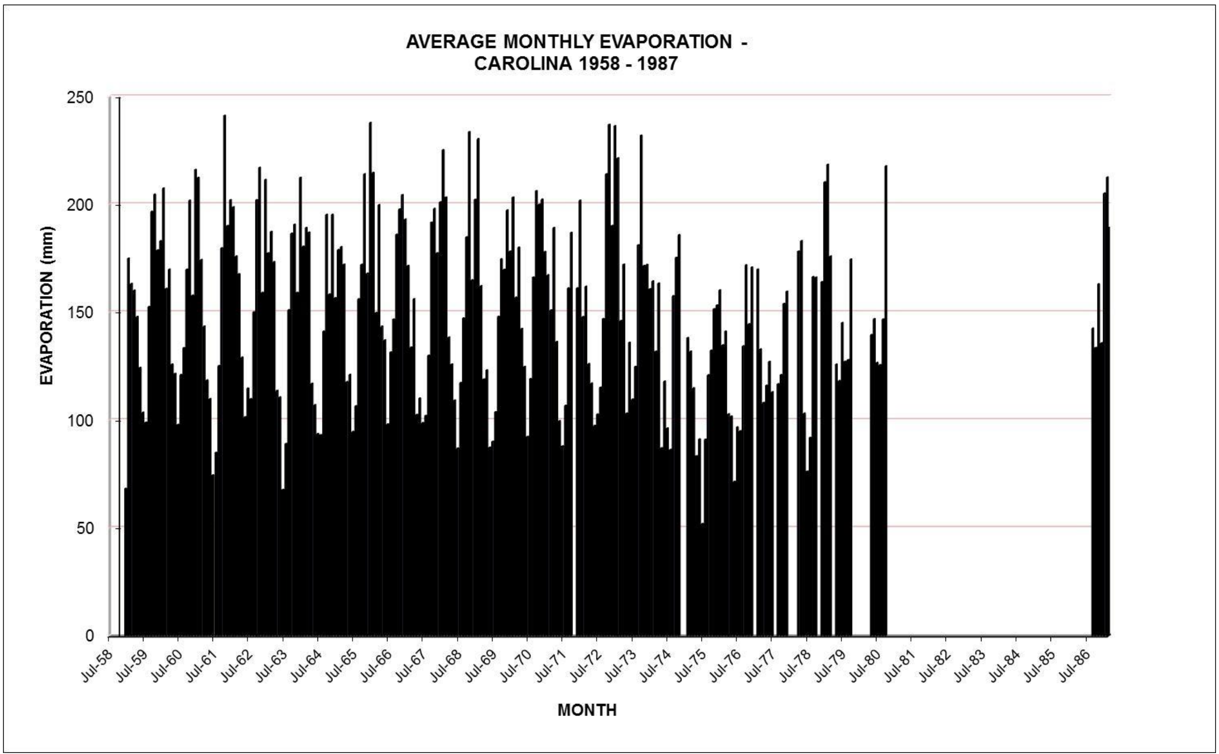

Figure 2.6-8: Average Monthly Evaporation for Carolina S-Pan Evaporation Station (1958 – 1987) (Source: South African Weather Service)

As shown in Table 2.6-3, the annual maximum, minimum and mean monthly evaporation rates for the Carolina area for the period 1958 - 1987 are 195 mm, 104 mm and 152 mm, respectively. The highest monthly maximum evaporation (195 mm) occurs for December. The rate decreases significantly down to 96 mm in June.

Table 2.6-3: Maximum, Minimum and Mean Monthly Evaporation Rates for the Carolina Area Evaporation Station for 1958 - 1987 Period (South African Weather Service)

Evap. (mm)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Monthly Max.	230.2	203.1	199.6	182.9	146.8	145	131.3	181	231.8	241	204.2	237.7	194.6
Monthly Min.	134.6	131.7	102.7	83.2	71.4	51.8	84.8	116.6	120.8	144.4	135.6	68.1	103.8
Monthly Mean	188	160.5	155.1	122.8	113	95.5	106.6	144.5	179.6	190.4	174.8	195.1	152.2

2.6.2 Geology

The stratigraphy and depositional environment at the proposed Consbrey Colliery is the same as the rest of the Ermelo coal field. Formations are near horizontal with dips of between 1 to 2 degrees to the west. The predominant rocks are sedimentary rocks of the Ecca Group that contains the arenaceous strata of the coal-bearing Vryheid formation, which was laid down during the Carboniferous age (300 million years ago). The Ecca Group rests unconformably on tillite of the Dwyka Group, over most of the area, which in turn is underlain by pre-Karoo rocks. The tillite was deposited on a very uneven surface and is therefore not laterally persistent. The tillite is overlain on average by 90 m of shale and sandstone before the coal zone is found (DWA, 2005). The geology of the area is depicted on Plan 4 below.

Plan 4: Consbrey Colliery Regional Geology

Erosion over the millennia has removed much of the upper seams and other strata, leaving behind an undulating topography with varying depths of overburden covering the remaining coal seams. The overburden material that will be disturbed consists mainly of sandstones and sandstone/ shale laminations. The geology can be stratigraphically classified as indicated in Table 2.6-4(DWA, 2008).

Table 2.6-4: Stratigraphic Classification of the Regional Geology (DWA, 2008)

	Subgroup	**Lithology**	**Formation**
Karoo Supergroup	Upper Ecca	Sandstones	Volksrust
	Middle Ecca	Sandstones	Vryheid
		Shales	
		Coal	
	Lower Ecca	Shale	Pietermaritzburg

The Vryheid formation consists of feldspathic sandstone, shale, mudstone and coal (Wilson & Anhauesser, 1998). The formation contains five bituminous coal seams, named E, D, C, B. These coal seams are separated by mainly arenaceous sediments. The coal seams are generally flat with a regional shallow south-westerly dip. The C and B seams commonly comprise several coal horizons with shale partings; hence they have been termed seam groups. A series of shale and sandstone overlie the coal zone with the uppermost layer invariably being sandstone. Soils, weathered sandstone and ferricrete overlie this uppermost layer. The proposed project targets the C and B seams.

The C seam, which averages 1.8 m in thickness, is usually composed of a C Upper (CU), C interburden (CUCLIB) and C Lower (CL) seam, separated by a parting of variable lithological composition. Locally the CU seam may split into two recognisable leaves. It is overlain by a sandstone layer of variable thickness and in some instances a thin band of carbonaceous shale is present above the C upper seam.

The B seam group, which is also an average of 1.8 m thick in total, is generally represented by two seams, termed the B and the BL1, separated by a sandstone parting. Locally the B seam may include the thin BX seam lying above the B seam. The B seam is overlain by sandstone which in turn is overlain by a persistent shale member. Thereafter there is an alternating sequence of sandstone and shale developments. The Beaufort group sediments do not occur in this area, since they have been removed by erosion.

2.6.2.1 Structural Controls

The major coal deposits of South Africa resulted from post-glacial deposit formation. The Dwyka tillite cut elongated valleys in the softer rock and the direction of the moving ice was responsible for the shape and orientation of the coal fields today. In the Ermelo area these coal fields are elongated in a north-south direction and the lateral extent and thickness of coal deposits was controlled by the shape of the valley floors (Lurie, 1994).

After deposition, the Ecca sediments were subjected to faulting and intrusion by dolerite sills and dykes. Some areas of Tselentis have been extensively faulted with associated dolerite intrusions along the fault planes. The numerous faults and dykes that occur can complicate mining and water pollution control (DWA, 2008).

These dykes and sills have caused coal deposits to either become *pseudo - anthracite*, where restricted burning has taken place, or to be rendered useless, where heat from the structures has destroyed the coal.

2.6.3 Topography

The gently undulating highland topography of this region is typical of central Mpumalanga province, with fairly broad to narrowly incised valleys of the headwater drainages. It is characteristic of the post-African erosion surface back-working into the African surface, which remains preserved in places on the higher lying interfluves (Partridge and Maud, 1987). The proposed project site is situated north of the intercontinental watershed between the Upper Vaal and Olifants and Inkomati Water Management Areas. The project area is drained in a northerly direction, valley side-slopes are generally gentle with gradients ranging from 1 in 20 to 1 in 100, but outcropping resistant sandstone and dolerite ridges occasionally flank the flat, marshy valley floors which have gentle downstream gradients. In contrast, the north-easterly flowing Komati head-streams display narrower valleys with steeper flank and channel gradients which indicate a more virile erosional regime. The proposed project area is undulating and includes valleys and hills which act as drainage areas for the local streams. The maximum height is about 1,800 metres above sea level (masl). The topography of the area is depicted in Plan 5 below.

Plan 5: Consbrey Topography

2.6.4 Visual

The project area and immediate surrounds is predominantly characterised by grassland areas and agricultural activities, interlaced by a number of rivers, wetlands, perennial and non-perennial pans. There are also mining activities in the immediate vicinity of the project area such as the Spitzkop and Tselentis Collieries. The Sptizkop Colliery is located about 5 km southeast of the proposed Consbrey Colliery and the Tselentis Colliery is located about 5 km east of the proposed Consbrey Colliery.. The general sense of place is expected to be typically that of a Highveld maize farming region, with small towns serving the farming community. However, it is expected that many of the residents in the nearby towns are employees of the coal mines in the region. Coal mining in the Breyten area commenced in the late 1800s.

The proposed Consbrey Colliery is located approximately 6.2 km northwest of Breyten, 29 km southwest of Carolina, 27 km north of Ermelo, and 12 km southeast of Hendrina. In terms of roads, the N11 national route traverses the south westerly project boundary, R542 traverses the southerly portion of the project area, the R36 briefly passes the far eastern boundary and the R38 between Hendrina and Carolina is located 4 km to the north and the. Furthermore, there are a number of main and other access roads which pass through the project area. There are also a number of houses that occur within and adjacent to the project area. Depending on discard dump and surface infrastructure heights, it is possible that the proposed Consbrey Colliery will be visible from the town of Breyten, however, it is less likely to be visible from other settlements located further away. It should be noted that there are old umps present in and around the town of Breyten. The proposed project is likely to be seen by motorists travelling along the N11, R36 and main and secondary roads within the project area. Houses within and directly adjacent to the project area are likely to be visually affected by the proposed development.

Chrissiesmeer is a biodiversity sensitive area and is located approximately 30 km towards the east of the proposed project area. This area is known as a place of lakes and legends, and is further known to be culturally significant.

2.6.5 Soil

A detailed soil survey in the vicinity of the project areas showed that the following catenary sequences of soils occurred (Loxton, Hunting and Associates, 1981). The land types are depicted in Plan 6 below.

2.6.5.1 Upland Soils

Wide hill crests and upper slopes tend to be occupied by shallow Klipfontein series soils which consist of very shallow topsoil underlain by hard ferricrete. Occasionally and associated only with dolerite dykes, deep, friable, free draining, red soils of the Hutton Form occur. Where the dolerite influence is strong, the clay content tends to be above 35% and the Doveton series is dominant. Where the influence of dolerite drops, so too does the clay content and soils of the Msinga soil series (rarely the Hutton series) dominate.

2.6.5.2 Midslope Soils

The upper to lower middle slope positions are occupied by yellow brown, apedal, moderately to highly leached, medium textured soils of the Clovelly Form. Clay content is commonly between 15 and 25% which means that most of the soils belong to the Southwold and Oatsdale soils series with the Oatsdale series being the most leached. Occasionally, where drainage is somewhat restricted on these midslope positions, soils of the Avalon series occur (yellow brown, medium textured, and mesotrophic subsoil over soft plinthite). In the lower part of the midslope, where iron and manganese oxides have accumulated to form an indurated zone of hard ferricrete, soils of the Glencoe series are found (yellow brown, medium textured, mesotrophic, moderately deep to shallow subsoil over ferricrete or hard Ecca sediments).

2.6.5.3 Soils of pans, depressions, drainage lines and seepage areas

A significant portion of this landscape consists of soils which, owing to their position in the landscape, are seasonally or permanently wet. They commonly possess pale-coloured, leached, upper horizons which overlie gleyed, mottled or indurated subsoil horizons. The soil pattern is quite complicated due to these soils being formed as a result of alluvial, eluvial or illuvial processes or a combination of these. Where the leached upper horizons overlie mottled subsoil, they belong to the Longlands Form. Occasionally, (e.g. around pan fringes) the leached horizon is very thick (Fernwood Form soils) or absent altogether with the topsoil directly overlying gleyed clay (Katspruit Form).

Plan 6: Consbrey Land Types

2.6.6 Land Capability

Land capability is classified as arable. Hydromorphic soils dominate the proposed open pit area. These soils are classified as Kroonstad and Fernwood soils which have special cultivation needs due to the moderately sloping landscape, sandy and imperfectly drained nature of many soils. The sandy nature causes natural soil fertility to be low while soil pH tends to be acidic.

Agricultural potential on hydromorphic soil is determined by wet or dry average seasonal conditions. Agricultural potential is high when dry seasons prevail and low when wet seasons prevail due to the imperfect internal drainage of hydromorphic soils.

2.6.7 Land Use

The current land use is agriculture, specifically grazing. There is clear evidence that some areas were previously used as arable dry-land farming due to the presence of many contours on the property.

Present land use is grazing. The influence of relatively small areas of arable high potential soil on land capability is small. The influence is small because evidence exist that land use was spontaneously changed by farmers from arable to grazing. This change probably occurred because many of the soils found on the property are classified as hydromorphic and difficult to manage or shallow and unsuitable to use as arable soil.

2.6.8 Flora

The Mpumalanga C-Plan is depicted in Plan 7 below and the protected biodiversity areas are depicted on Plan 8, respectively. This means that the ecosystem has undergone degradation of ecological structure, function or composition as a result of human intervention, although it is not critically endangered. As such the fauna and flora study will be integral to the EIA/ EMP report in terms of sustainable development. The proposed Consbrey Colliery site is located about 30 km from the Chrissiesmeer Biodiversity site.

The Grassland Biome is found mainly on the high central plateau of South Africa, and the inland areas of KwaZulu Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Grasslands are dominated by a single layer of grasses and the amount of cover depends on rainfall and the degree of grazing. Trees are absent, except in a few localised habitats and geophytes are often abundant (Low & Rebelo, 1996).

According to Acocks (1988) the area of interest falls within the Pure Grassveld vegetation biome and the veld type is known as the North-eastern Sandy Highveld (type no. 57). Two variations are recognised, namely: the Near-Bankenveld Variation and the Near-Highveld Sourveld Variation. The area of interest falls within the Near-Highveld Sourveld Variation (type no. 57b) which occurs mainly on the top and eastern side of the watershed.

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. The Nooitgedacht

Dam Nature Reserve is the only official conservation area for this veld type, but the Ermelo Game Park represents a good example of this vegetation type (Mucina and Rutherford, 2006).

The dominant grasses of this veld type are *Themeda triandra, Tristachya leucothrix*, *Digitaria tricholaenoides, Heteropogon contortus* and *Eragrostis racemosa* with *Trachypogon spicatus* and *Microchloa caffra* and others of lesser importance (Acocks, 1988) also present. However, Low and Rebelo (1996) recorded that the dominant grasses in this vegetation type are *Eragrostis plana, E. curvula, Heteropogon contortus, Trachypogon spicatus* and *Themeda triandra*. This difference may be indicative of a considerable change in species composition and community structure of these grasslands as a result of past and present land uses.

The grassland on the higher lying, rocky areas with shallow soils is dominated by *Tristachya leucothrix* (hairy trident grass) and *Themeda triandra* (rooigras); these grasslands also include fairly high proportions of *Loudetia simplex* (russet grass) and *Microchloa caffra* (pincushion grass).

Plan 7: Consbrey Mpumalanga C-Plan

Plan 8: Consbrey Biodiversity Areas

2.6.8.2 Medicinal Plant Species

Medicinal plants are important to many people and are an important part of the South African cultural heritage (Van Wyk *et al*, 1997). Plants have been used traditionally for centuries to cure many ailments, as well as for cultural uses such as building material and for spiritual uses such as charms. In the Ermelo and Carolina areas a number of plant species with medicinal properties are expected to occur and have been found in previous studies in surrounding areas. The medicinal plant species found in the project area will be investigated further during the EIA phase (see Fauna and Flora Impact Assessment Terms of Reference for the EIA phase in Section 6).

2.6.8.3 Alien Invasive Plant Species

Alien plants tend to spread and invade ecosystems and become problem plants in areas away from their natural habitat. This is a universal problem in many countries, including South Africa. The Conservation of Agricultural Resources Act regards weeds as alien plants with no known useful economic purpose that should be eradicated. Invader plants, also considered by the Act, are also of alien origin but may serve useful purposes as ornamentals, as sources of timber, or may have other benefits. These plants need to be managed and prevented from spreading. From previous studies in surrounding areas it can be expected that a number of alien invasive plants will occur in the area. The fauna and flora study to be undertaken during the EIA phase will confirm the status and presence of the alien invasive plant species (see Fauna and Flora Impact Assessment Terms of Reference for the EIA phase in Section 6 below).

2.6.9 Fauna

2.6.9.1 Mammals

The limited remaining habitat around the pans and drainage lines, the isolation of these areas by agricultural fields from other natural grasslands, and the proximity of human activity and dwellings will have an influence on what mammal species are still likely to occur in the area. It is probable that more rodent species occur at many of the sites, as they are difficult to observe during the day as many have nocturnal habits. It is also difficult to assess the faunal importance of such a limited area within the broader landscape as most species of fauna are mobile and may visit these areas from time to time but are unlikely to be resident. Discussions with local farmers and the Mpumalanga Parks Board will assist in identifying local mammals. The fauna and flora study will assist in identifying mammals present in the area, and those likely to occur as well as red data species. From previous studies, it was possible to determine mammals likely to occur in the area. These are included in Table 2.6-5 below.

Table 2.6-5: Mammals Likely to Occur in the Area

Order	Scientific Name	Common Name	IUCN Status
Artiodactyla	*Antidorcas marsupialis*	Springbok	Least concern
Artiodactyla	*Damaliscus pygargus phillipsi*	Blesbok	Least concern
Artiodactyla	*Raphicerus campestris*	Steenbok	Least concern
Artiodactyla	*Redunca arundinum*	Reedbuck	Least concern
Artiodactyla	*Sylvicapra grimmia*	Grey/ Common Duiker	Least concern
Carnivora	*Aonyx capensis*	Common Clawless Otter	Least concern
Carnivora	*Atilax paludinosus*	Water Mongoose	Least concern
Carnivora	*Canis adustus*	Side striped Jackal	Near Threatened
Carnivora	*Canis mesomelas*	Black-backed Jackal	Least concern
Carnivora	*Caracal caracul*	Caracal	Least concern
Carnivora	*Cynictis penicillata*	Yellow Mongoose	Least concern
Carnivora	*Felis nigripes*	Black-footed Cat	Vulnerable
Carnivora	*Felis silvestris*	African Wild Cat	Least concern
Carnivora	*Galerella sanguinea*	Slender Mongoose	Least concern
Carnivora	*Genetta genetta*	Small-spotted Genet	Least concern
Carnivora	*Genetta tigrina*	Large-spotted Genet	Least concern
Carnivora	*Ictonyx striatus*	Striped Polecat	Least concern
Carnivora	*Leptailurus serval*	Serval	Near Threatened
Carnivora	*Suricata suricatta*	Suricate	Least concern
Carnivora	*Vulpes chama*	Cape Fox	Least concern
Insectivora	*Atelerixs frontalis*	South African Hedgehog	Near Threatened
Lagomorpha	*Lepus capensis*	Cape/ desert Hare	Least concern
Lagomorpha	*Lepus saxatilis*	Scrub/ Savannah Hare*	Least concern
Rodentia	*Cryptomys hottentotus*	Common Molerat	Least concern
Rodentia	*Hystrix africeaustralis*	Porcupine	Least concern
Rodentia	*Otomys angoniensis*	Angoni Vlei Rat	Least concern
Rodentia	*Otomys irroratus*	Vlei Rat	Least concern
Rodentia	*Pedetes capensis*	Springhare	Least concern
Rodentia	*Rhabdomys pumilio*	Striped Mouse	Least concern
Rodentia	*Tatera brantsi*	Highveld Gerbil	Least concern
Tubulidentata	*Orycteropus afer*	Aardvark	Least concern

2.6.9.2 Birds

The proposed Consbrey project occurs within an important birding area as shown on Plan 8.

A variety of land and water birds are likely to occur in the area. Hadedah ibis, Blacksmith plover, Cape wagtail, Sacred ibis, Common sandpiper, Ethiopian snipe, African spoonbill, Grey heron and Black headed heron are Common waders. Barn owls and the spotted eagle owls have been known to occur in the area.

The Secretary bird (Near Threatened) occurs in grassland habitats and the African grass owl (Vulnerable) occurs in grassland with vlei areas. Both these habitats are present within the area. Being Red Data birds they will need to be protected and conserved. The fauna and flora study to be undertaken during the EIA phase will confirm the status and presence of bird species (see Fauna and Flora Impact Assessment Terms of Reference for the EIA phase in Section 6).

2.6.9.3 Reptiles and Amphibians

The southern rock agama is known to occur in the area, and the spotted skink was observed on a farm to the north of Breyten. The reptile populations in the area are expected to be higher, but since these animals are very sensitive to vibrations and noise, and hide easily in crevices and undergrowth, they are not easily spotted. The fauna and flora study to be undertaken during the EIA phase will confirm the status and presence of reptiles and amphibians (see Fauna and Flora Impact Assessment Terms of Reference for the EIA phase in Section 6).

2.6.9.4 Invertebrates

From previous studies conducted in the area, a number of families, species and individuals were collected in each insect order, as well as in the Arachnida. The Diptera, Coleoptera and Hemiptera are the most represented invertebrate orders followed by the Arachnida and Hymenoptera. These are some of the larger more cosmopolitan insect orders, occurring in a variety of habitat types. They can be easily collected with sweep-net sampling methods, which exclude many ground-dwelling invertebrates such as some spiders (Arachnida), some ants (Hymenoptera), some crickets (Orthoptera) and most cockroaches (Blattodea). The invertebrate population dynamic is fairly consistent with what one might find with sweep-net sampling of grassland areas. The fauna and flora study to be undertaken during the EIA phase will confirm the status and presence of invertebrates (see Fauna and Flora Impact Assessment Terms of Reference for the EIA phase in Section 6).

2.6.10 Surface Water

2.6.10.1 Catchment Description

The proposed project area is located over two Water Management Areas (WMAs) namely the Inkomati (WMA 05) and the Olifants (WMA 04). The affected quaternary catchments are the X11A and the B12A for the WMA 05 and 04 respectively (Plan 9 - Quaternary Catchments).

There are streams traversing the proposed project area in the two catchments. In the B12A catchment, the Klein Olifantsrivier drains the project area in a north-westerly direction while the Vaalrivierspruit drains the project area in a northerly direction in the X11A catchment, which drains directly into the Nooitgedacht dam.

The surface water attributes of the affected catchments namely Mean Annual Runoff (MAR), Mean Annual Precipitation (MAP) and Mean Annual Evaporation (MAE) are summarised in Table 2.6-6 (WRC, 2005) indicating that the ratio of precipitation: evaporation is 045 and 0.48 for the B12A and the X11A quaternary catchments respectively.

Table 2.6-6: Summary of the Surface Water attributes for the Two Affected Quaternary Catchments

Quaternary Catchment	Rainfall Zone	MAP (mm)	MAR (mm)	MAR $m^3 * 10^6$	Evaporation Zone	MAE (mm)
B12A	B1B	672	59	23.9	5A	1501
X11A	X1A	688	18.8	12.7	4A	1446

Table 2.6-7 is a summary of the percentage catchment area that is occupied by the proposed project site (WRC, 2005) which is represented by 4.9 and 11.4% for the B12A and X11A quaternary catchments respectively.

Table 2.6-7: Summary of the Proposed Project area within the Two Quaternary Catchments

Quaternary Catchment	Catchment Area (km^2)	Project Area in Catchment (km^2)	% of Project Area on Catchment
B12A	405	20	4.9
X11A	674	77.4	11.4

Plan 9: Consbrey Quaternary Catchments

2.6.10.2 Surface Water Quantity

Stream Flow

There are no DWA stream flow gauges located within the two quaternary catchments or in the vicinity of the project site.

Estimated Design Rainfall

The 24 hour design rainfall depth was calculated from the rainfall data of nearby rainfall stations (Table 2.6-8) using the Design Rainfall Estimation (DRE) in South Africa (Smithers and Schulze, 2003).

Table 2.6-8: Summary of the Closest Rainfall Stations

Station Name	Station Number	Lat.	Long.	Rainfall Record Period (years)
Hendrina	0476369 8	26.1603	29.7161	49
Ermelo Wo	0479870 X	26.4978	29.9839	50

The calculated 24 hour design rainfall data is summarised in Table 2.6-9.

Table 2.6-9: Estimated 24 Hour Design Rainfall for Rainfall Stations Close to Project Site

Station Name	Station Number	24 Hr. Design Rainfall (mm)	
		1:50	1:100
Ermelo	0479870 X	137	154
Hendrina	0476369 8	131	147

2.6.10.3 Surface Water Quality

There are no DWA water quality monitoring sites located within the two catchments occupied by the proposed project area. Sampling will be conducted up and downstream of the site as well as in areas around the site to determine the pre-mining baseline during the EIA phase.

2.6.10.4 Surface Water User Survey

The predominant land and surface water use in the region is agricultural (livestock watering and crop irrigation) and urban supply (from local dams). There are mining activities also located within the vicinity of the proposed project area and the extent of surface water use will be determined within the EIA phase. Micro consultation with land owners will determine more detailed analysis of onsite water use.

2.6.11 Wetlands

The proposed Consbrey Colliery is located between the town of Breyten and Hendrina, located in the Gert Sibande District Municipality. The dominant wetland types within the proposed project area include a number of endorheic pans and channelled valley bottom wetlands. Based on the National Freshwater Ecosystems Priority Areas (NFEPA) Wetlands Map, the wetland areas within the project area are ranked between RANK 5 (Wetlands excluding dams within a sub-quaternary catchment identified by experts at the regional review workshop as containing impacted working for wetlands sites) and Rank 6 (Any other wetland excluding dams). Therefore, the integrity of the wetland areas within the project area has been impacted as a result of the existing land use activities.

The Mpumalanga Conservation Plan (C-plan) however indicates that the status of the project area ranges from “highly significant” to areas of “least concern”. The areas that are categorised as “highly significant” are those areas that form part of the outskirts of the Mpumalanga Lake District. The Chrissiesmeer Lake District occurs within a plateau surrounded by the drainage basins of important river systems that arise around the fringes of the pan field, namely the Vaal River, the Komati River (via the Boesmanspruit), the uMpuluzi River and the Usutu River (McCarthy *et al*., 2007). The Endangered Wildlife Trust (EWT) is currently involved in two biodiversity conservation projects for the area, that are directed by the Mpumalanga Tourism and Parks Agency (MPTA). These are the application for the Chrissiesmeer Lake District to be declared a Wetland of International Importance through the Ramsar Convention and secondly to use biodiversity stewardship to legally protect the land in the area.

The estimated wetlands within the project area are depicted on Plan 10. This plan depicts the wetlands according to the National Fresh Water Priority Areas database.

Plan 10: Consbrey Estimated Wetlands

2.6.12 Aquatic Environment

2.6.12.1 Affected Water Courses

Due to the location of the proposed mining operation within two separate quaternary catchments, two river systems will be affected by the proposed mining operation.

The first of which is the Vaalwaterspruit system located in quaternary catchment X11A. This watercourse flows directly into the Nooitgedacht Dam. The present ecological status of the aquatic biota associated with this watercourse is currently a Class C which is defined as a moderately modified state. The aquatic biota associated with the watercourse has an attainable ecological status of Class B which is a largely natural state. Plan 11 depicts the aquatic sensitivity plan of the rivers and streams in project area. The aquatic sensitivity of the project area is classed as “not required”; however the Vaalwaterspruit drains into the Nooitgedacht dam that is considered irreplaceable.

The second watercourse affected by the proposed mining operation is the Klein Olifants River. This watercourse is the primary draining feature in quaternary catchment B12A and flows into the Olifants River. It should be noted that this river system flows through the heavily industrialised area of Pullens Hope and the Witbank/ Middleburg Coal fields and therefore the cumulative impacts associated with the proposed mining operation are of particular interest. The aquatic biota associated with the Klein Olifants River is considered to be a Class C (moderately modified) state. The attainable ecological status for the Klein Olifants River is a Class B (Largely natural).

2.6.13 Groundwater

Three superimposed groundwater systems, with typical yields between 0.1 and 2 ℓ/s, are present in the Mpumalanga coal fields. They can be classified as the upper weathered Ecca aquifer, the fractured aquifers within the unweathered Ecca sediments and the aquifers below the Ecca sediments, also called the pre-Karoo aquifer.

The weathered material in the upper weathered aquifer consists mostly of decomposed and highly weathered coarse grained sandstone, with shale and siltstone in some areas. The sustainability of the shallow weathered aquifer is dependent on seasonal recharge from rainfall. The rainwater infiltrates the soil and a portion of it (effective recharge) eventually reaches the saturated zone.

The fractured aquifer consists of unweathered, interlaminated sequence of sandstone and shale, fresh sandstone, carbonaceous shale, coal and in some instances dolerite. The pores within the sedimentary rocks are well cemented and allow little permeation of water. All groundwater movement is therefore along secondary structures such as fractures, cracks and joints.

Dolerite dykes and sills that occur in this area may act as impermeable or semi permeable boundaries to the groundwater system, with the result that the water table on either side of the dyke may not be at the same level. The intrusion of the dykes under high temperature and pressure results in the formation of cooling joints forming within the host rock at the dyke contacts. These dykes therefore would compartmentalise and/or behave as conduits for groundwater flow and would therefore significantly impact on the water levels and interconnectivity of the weathered and fractured aquifers (Hodgson et al, 1985).

Of all unweathered sediments in the fractured aquifer, the coal seam often has the highest hydraulic conductivity. The floor of the coal seam controls the initial build-up during the initial stages of water accumulation. The topography of the Dwyka played a crucial role in determining the distribution of the lower seams, and their associated clastic rocks. The lower seams narrow towards and pinch out against paleo-highs. Thus, the shape of the pre-coal environment is still a crucial factor in the current hydrogeology.

The Dwyka tillite forms a hydraulic barrier between the overlying mineral deposits and the pre-Karoo aquifer due to its low hydraulic conductivity. The pre-Karoo aquifer is not exploited within this area due to the scarcity of fractures, high fluorides and excessive pumping depth. This pre-Karoo aquifer is not expected to influence the dynamics of the overlying Ecca aquifers as they are mostly separated by the generally impervious Dwyka tillites (DWA, 2005).

2.6.13.1 Groundwater Use

Vryheid formation borehole yields are typically in the order of 0.1 – 2 ℓ/s, although yields up to 9 L/s have been recorded. However, the groundwater yield potential is low, since 83% of boreholes yield less than 2 ℓ/s. Groundwater levels vary between 5 and 25 mbgl (meters below ground level) (Barnard, 2000).

Land use and groundwater use in and around the mining areas has remained fairly constant since 1998. Hydrocensus results (DWA, 2005) illustrated that, with the exception of coal mining, the typical groundwater use for the general Consbrey area are domestic and stock watering. However, during a detailed hydrocensus done in 1996 around the Smutsoog mine, it was found that groundwater is used for domestic purposes, stock watering and irrigation supply. Two boreholes were also used for water supply to the mine (DWA, 2008).

During the 2005 hydrocensus none of the local farmers were able to provide accurate information about borehole yields, but variations between 0.14 ℓ/s to 2.7 ℓ/s were reported. It was generally recorded that borehole yields had reduced significantly during the drought in 1992, but it was noted that the groundwater response to the onset of rainy seasons was, in years of normal rainfall, generally quite rapid. The mining operations till 1992 did not appear to have affected the boreholes.

A hydrocensus will take place within the project area to update these findings and look at the current water use.

2.6.13.2 Groundwater Levels

Based on the results of the 2008 hydrocensus, the rest groundwater levels in the proposed Consbery project area have not been disturbed by nearby mining activities. The measured groundwater levels varied between 0.9 and 8 mbgl (Figure 2.6-9).

Typically, groundwater levels in the Vryheid formation vary between 5 and 25 mbgl (meters below ground level) (Barnard, 2000). The average rest level of the upper aquifer in the Witbank farm area is approximately 6 to 8 mbgl (DWA, 2005a). The groundwater table intercepts the surface at local pans and becomes deeper beneath higher lying areas. In general, the water table is very shallow and seeps can be seen in the areas where groundwater daylights forming headwaters of the streams (Silk, 1997). A number of natural springs were reported to exist during periods of normal rainfall. It appears from these reports that these are frequently close to or slightly above the coal seam outcrop.

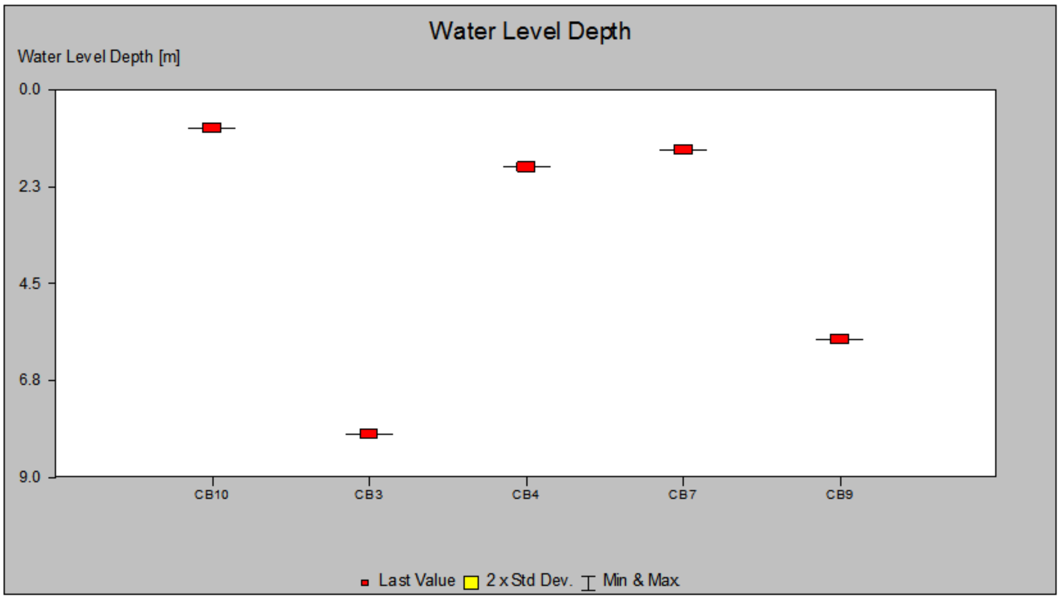

Figure 2.6-9: Groundwater Levels Consbery 2008 Hydrocencus

2.6.13.2.1 <u>Groundwater Recharge</u>

Rainfall in the Tselentis area averages around 700 mm/a. Recharge to Karoo sediments and to various types of mining has been studied extensively during the past 26 years in the Mpumalanga Mines. Factors relevant for recharge in mines that can be expected at the New Areas are identified and shown in Table 2.6-10 (Hodgson, 2006).

Table 2.6-10: Factors Relevant for Recharge in Mines (Hodgson, 2006)

Description	Recharge % of annual rainfall
Influx into bord-and-pillar mining > 100m	1
Influx into bord-and-pillar mining 60 – 100m	1.5
Influx into bord-and-pillar mining 30 – 60m	2
Influx into bord-and-pillar mining 15 – 30m	2.5

Description	Recharge % of annual rainfall
Influx into bord-and-pillar mining < 15m	4
Recharge to undisturbed Karoo sediments	3
Recharge to stooped areas	6 – 11
Recharge to open pit areas	10 - 20

2.6.13.3 Groundwater Quality

Uncontaminated groundwater in the Vryheid formation is classified as Magnesium-Bicarbonate water and depicts recently recharged water. The ambient groundwater quality is of ideal drinking water quality, EC < 70 mS/m, and also suitable for stock watering and irrigation. However, the occurrence of nitrate in the groundwater might be of concern in some areas when using the source for drinking water purposes (Barnard, 2000). The results of the 2008 analysis are presented in Table 2.6-11. The results are colour coded in reference to the South African National Standards for drinking water (SANS 241:2005). Entries in red indicate concentrations exceeding the maximum allowable limits.

The salinity across the proposed mine area does not vary considerably. The recorded TDS values range between 30 and 368 mg/ℓ. These values are typically below 1000 mg/ℓ, well within Class I acceptable limits. Measured pH values indicate an overall minor acidic to alkaline groundwater system. Across the project area, the pH range is 6.68 to 8.21.

The results indicated elevated aluminium concentrations in CB7 and CB9. High iron concentrations were encountered in CB4. CB6, CB7 and CB9 also showed elevated iron concentration. Elevated manganese and aluminium were reported in CB6. CB5 also showed elevated manganese concentrations. The cause of the elevated dissolved metals will be investigated during the EIA phase.

The major ion chemistry is depicted in the Figure 2.6-10. The Piper diagram shows CB1, CB2, CB3, CB5 and CB8 as being typically recently recharged waters with typical bicarbonate and magnesium/calcium signatures. Borehole CB4 is dominated by sodium and / or potassium cations and a combination of carbonate/ bicarbonate and chloride anions. Sodium dominance is attributed to cation exchange processes as groundwater flow in through the aquifers in the vicinity of these boreholes. CB6, CB7 and CB7 depict a groundwater type affected by mine pollution. These water types will be further investigated during the EIA phase.

Table 2.6-11: 2008 Hydrocensus Sampling Results (Digby Wells, 2005)

Sample ID		pH-Value at 25° C	Conductivity at 25° C in mS/m	Total Dissolved Solids	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Total Alkalinity as $CaCO_3$	Chlorides as Cl	Sulphate as SO_4	Nitrate NO_3 as N	Fluoride as F	Aluminium as Al	Iron as Fe	Manganese as Mn	Ammonia as N
Class I	(Acceptable)	5-9	<150	<1000	<150	<70	<100	<50	N/S	<200	<400	<10.0	<1	<0.3	<0.2	<0.1	<0.5
Class II	(Max. Allowable)	4-10	150-370	1000-2400	150-300	70-100	200-400	50-100	N/S	200-600	400-600	10-20	1-1.5	0.3-0.5	0.2-2	0.1-1	0.5-1
CB1		8.19	40.6	246	26.4	14.2	41.8	1.87	174	17	18.4	0.13	0.36	-0.01	<0.01	<0.01	<0.2
CB2		8.21	40.4	264	26.4	14.2	41.5	1.79	179	18	18.7	<0.1	0.38	-0.01	<0.01	<0.01	<0.2
CB3		8.05	40.9	238	36.4	15.8	24.3	4.26	145	24	14.7	6.1	0.35	-0.01	<0.01	<0.01	<0.2
CB4		7.25	21.5	232	16.4	5.76	52.6	3.62	136	15	35.7	0.72	0.68	-0.01	3.65	<0.01	<0.2
CB5		8.31	23.2	146	12	10.5	21.7	4.16	109	6	10.4	<0.1	0.32	-0.01	0.06	0.03	<0.2
CB6		6.68	52.4	368	46.8	26.1	12.8	23.5	34	14	203	0.3	0.25	-0.01	0.31	0.02	0.85
CB7		6.81	3.71	30	1.41	0.52	5.15	0.47	8	6	7.3	12	0.22	1.3	0.57	<0.01	<0.2
CB8		8.2	38.4	250	39.4	11.6	31.9	6.36	212	5	3.8	0.12	0.34	-0.01	<0.01	<0.01	<0.2
CB9		7.34	12.97	104	6.62	4.17	12.9	1.28	24	7	45.2	0.58	0.22	4.43	1.86	<0.01	0.33

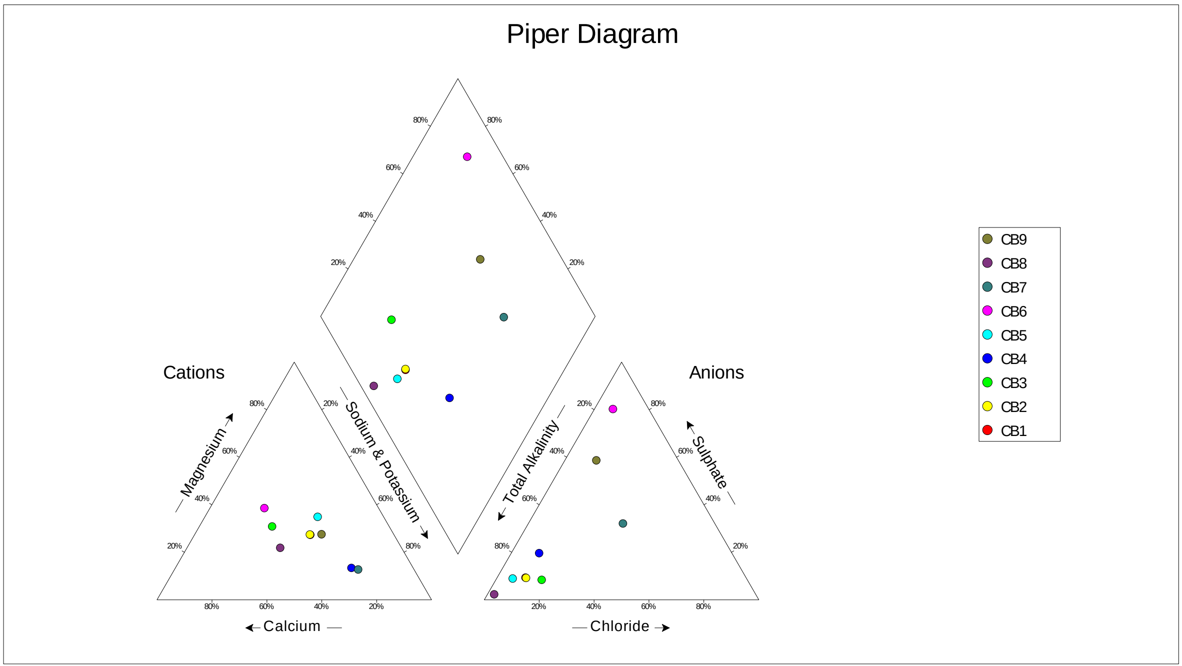

Figure 2.6-10: Piper Diagram for 2008 Hydrocensus

2.6.13.4 Conceptual Groundwater Model

The weathered aquifer ranges between 0 and 15 mbgl of which the lower 5 to 10 m is saturated. This aquifer is utilized for domestic and stock water use, via springs and shallow boreholes. The saturated depth of this aquifer is dependent on rainfall recharge and the influx of water into shallow underground mining operations is also expected to have a strong seasonal control (DWA, 2005).

The fractured Ecca aquifer contains a very low quantity of interstitial water as the pore spaces are generally too well cemented. Water movement in this stratum is therefore in secondary fractures, cracks or joints. Vertical percolation of water into coal voids is inhibited by horizontal stratification of the Ecca sediments and no instance has been found where overlying aquifers were totally drained due to bord and pillar mining. However, coal voids often fill up with water after mine closure due to slow seepage and the flooding, in turn, reduces the acid producing potential within the groundwater. Seepage of this water, from the roof and floor, into bord and pillar mine workings, occurs very slowly and is usually an insignificant contribution to the final void fill volume (Hodgson & Krantz, 1998).

Horizontal movement of groundwater within the fractured aquifer, for this area, is commonly intercepted by cross-cutting dolerite dykes which either serve to compartmentalise groundwater or behave as a conduit for groundwater flow; thus creating a dynamic groundwater system.

Very few major faults intersect the South African coalfields due to the tectonically undisturbed state of the Karoo Sequence. Very few faults with a displacement of more than 0.5 m exist within the greater Witbank area and these small fractures and faults are generally associated with dips along flanks of paleo-valleys (Hodgson et al. 1985). The scarcity of these faults is exacerbated by the presence of the Jurassic dolerite dyke and sill swarms, which have subsequently intruded most pre-Jurassic faults, fractures and horizontal separations (DWA, 2005).

2.6.13.5 Geochemistry

The acid-generating and base-neutralising capabilities of the geological layers in the main open pit mining area at Tselentis are indicated in Table 2.6-12 (DWA, 2000). This is given as a desktop indication of possible acid-base capability which will be updated and calibrated for the project area during the EIA phase.

Table 2.6-12: Acid-generating and Base-neutralising Capabilities at Tselentis

Potentially acid generating	Sandstone/siltstone layer; coal seam floor
Potentially very acid generating	Argillaceous sandstone layer; bioturbated siltstone layer
Very slightly acid generating	Micaceous sandstone
Slightly acid generating	Upper weathered sandstone layer
Very high neutralising capacity	Dolerite dyke

The acid generating and base neutralising capabilities of the geological layers in the Witbank open pit mining area at Tselentis is shown in Table 2.6-13 (DWA, 2000).

Table 2.6-13: Acid-generating and Base-neutralising Capabilities of the Geological layers in the Witbank coalfiled at Tselentis (open pit areas)

Some acid generating potential and very little base potential	Clean sandstone layer
High aced producing potential and some base potential	Sandstone layer above coal seam
Potentially acid generating	C Lower parting seam

It is clear that the acid generating and neutralising potentials for the geological layers at Tselentis are site specific and that acid and neutralising potentials in the Consbrey will have to be evaluated during the EIA phase.

2.6.14 Air Quality

The pollutant of importance for the proposed Consbrey Colliery is particulate matter. The Department of Environmental Affairs (DEA) operates an Ambient Air Quality monitoring station at the residential area of Kwa Zamokuhle just north east of Hendrina.

The residential area of Kwa Zamokuhle in Hendrina area was identified as one of the five towns in the Highveld Priority Area where an ambient air quality monitoring station should be placed. Hendrina was one of the areas identified as having a high frequency of exceeding the PM_{10} daily average standard, and also in terms of annual average SO_2 concentrations and thus identified as a "hot spot". The site that was considered the most appropriate was Tsiki-Naledi Secondary School in Kwa Zamokuhle. The air quality monitoring station gives a good indication of ambient air quality in the town of Hendrina, as there are no direct sources near to the school. There is also no direct influence of domestic fuel burning, as the school is in a built-up area.

The data from South African Air Quality Information System (SAAQIS) gives an overview of the state of the ambient air quality in the vicinity.

The daily average PM_{10} and $PM_{2.5}$ ambient concentrations, as well as diurnal profiles at Hendrina Ambient Air Quality Monitoring Station for the period August 2008 to February 2013 are provided in Figure 2.6-11 to Figure 2.6-14 respectively.

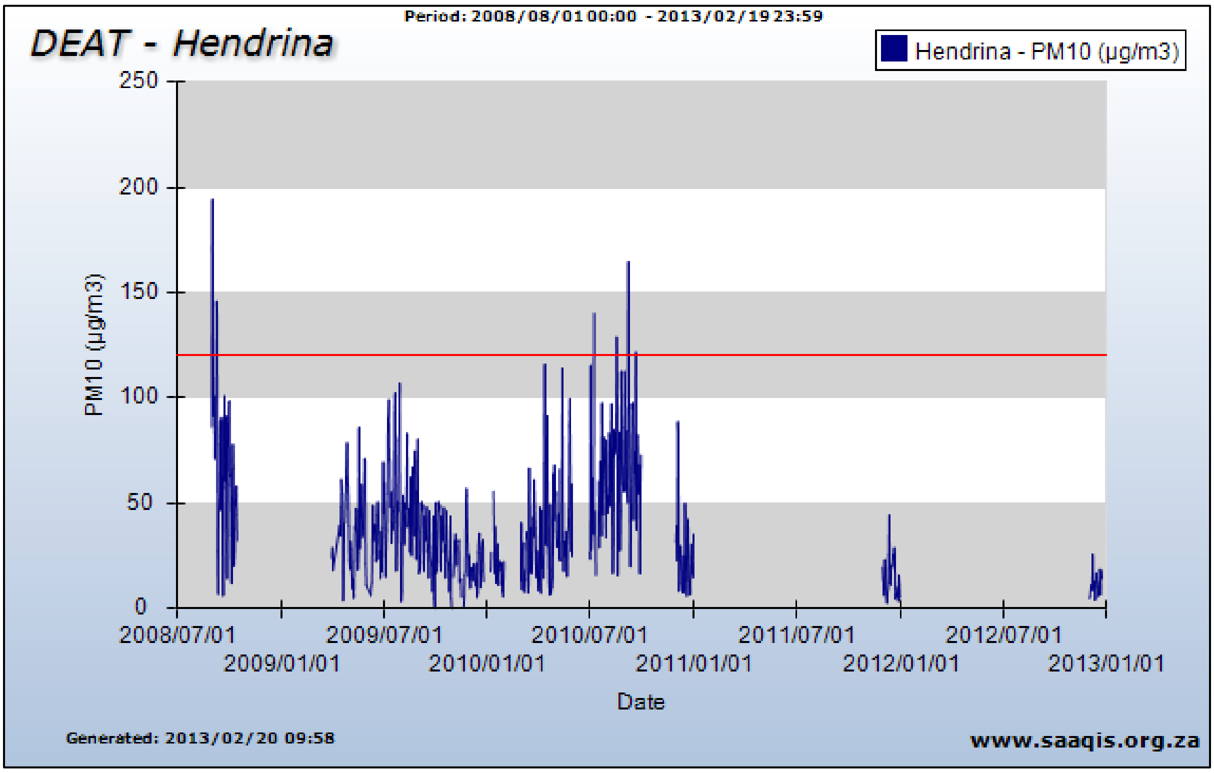

Figure 2.6-11: PM10 Daily Average 2008-2013 Hendrina AQM Station

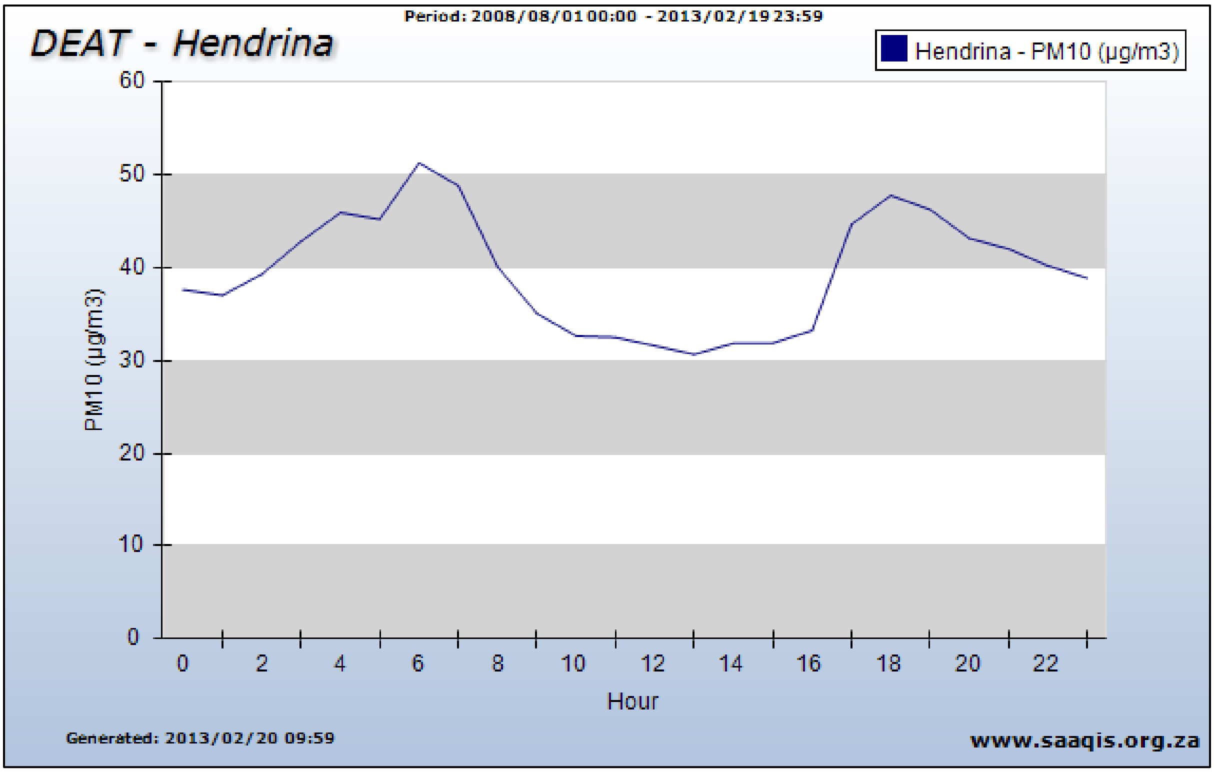

Figure 2.6-12: PM10 Diurnal Profile 2008-2013 Hendrina AQM Station

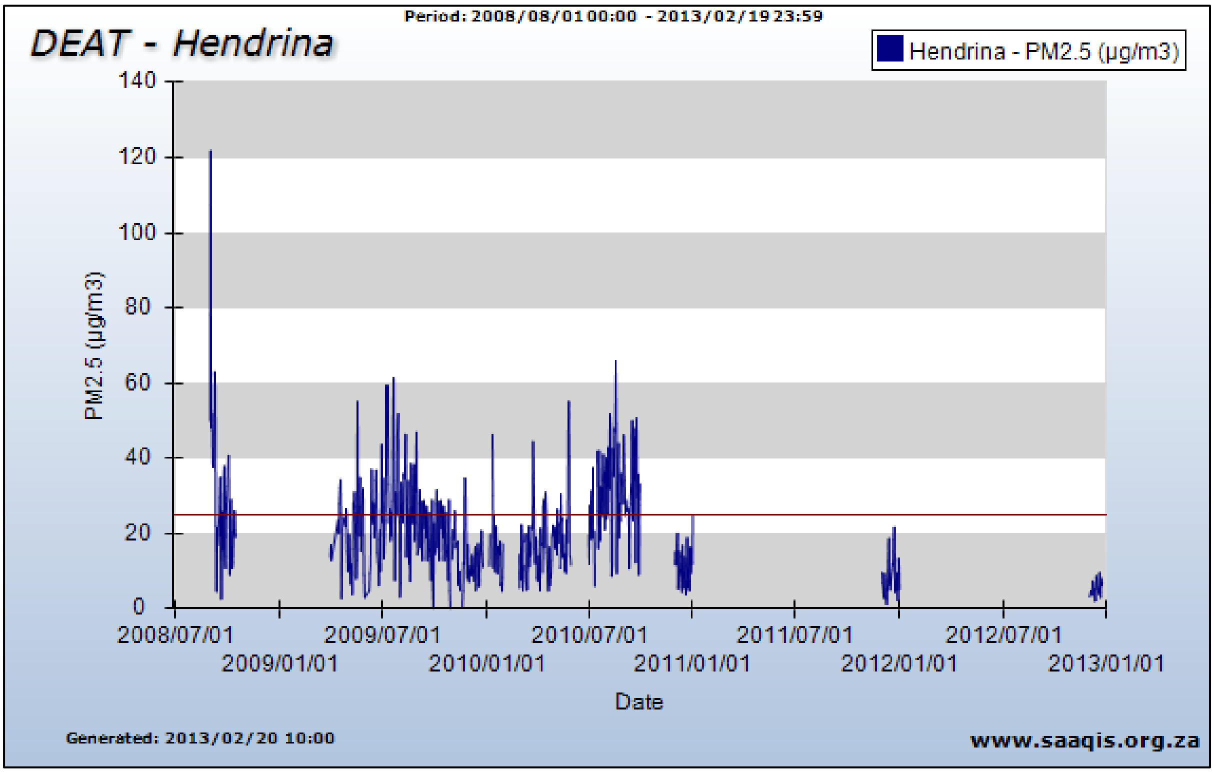

Figure 2.6-13: PM2.5 Daily Average 2008-2013 Hendrina AQM Station

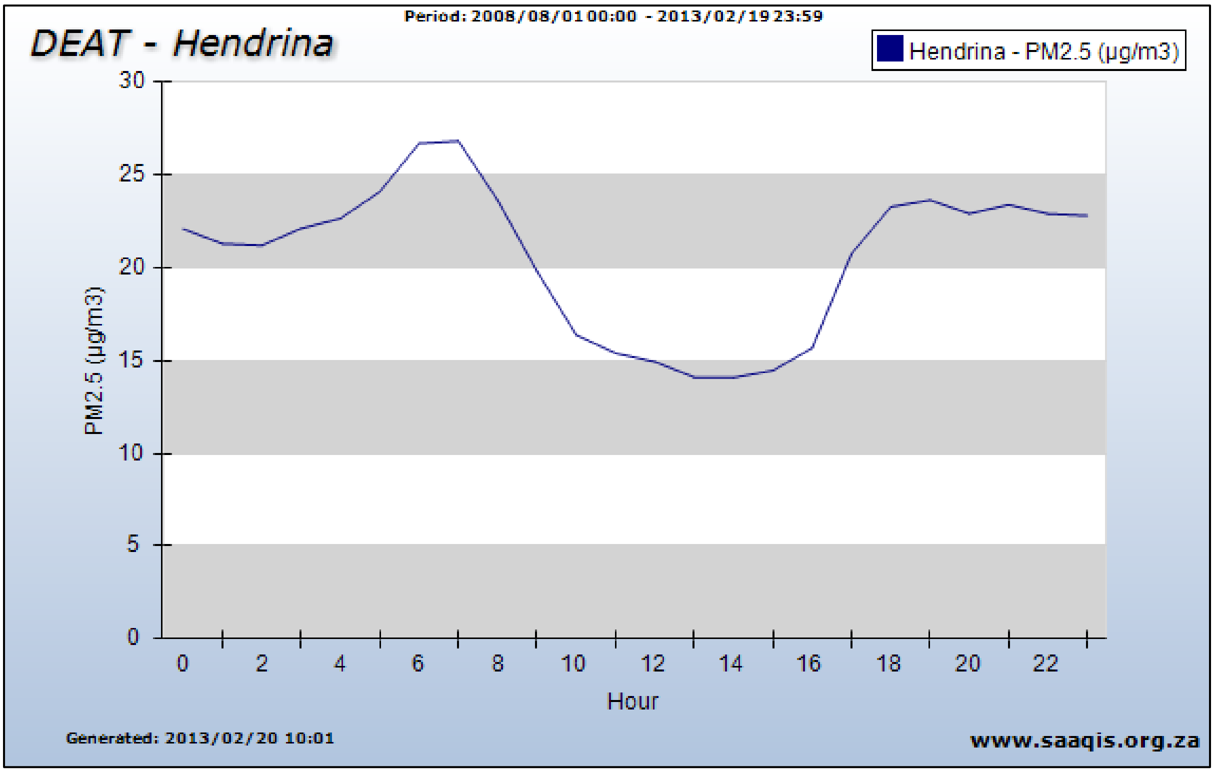

Figure 2.6-14: PM2.5 Diurnal Profile 2008-2013 Hendrina AQM Station

This data was used to establish baseline ground level concentrations for above mentioned pollutants in the vicinity of proposed Consbrey operation since the distance from the operation to the AQM station is approximately 10 km and is deemed representative of existing air quality in the area.

2.6.15 Noise

The current ambient noise levels on the property to be mined are minimal and do not extend beyond what is generally associated with farming activities. The N11 provincial road traverses the south westerly portion of the project area and other farm roads traverse the area. The R542 traverses the southerly portion of the project area.

The R38 runs about 5 km from the southern portion of the project area and the R36 runs about 500 m from the eastern portion of the project area. These roads are unlikely to impact on the areas surrounding the proposed area due to the distant proximity.

Blasting from surrounding mining activities can also impact on the noise levels, but this is infrequent and will influence the significance of the impact.

2.7 Provide any relevant additional information.

Existing specialist baseline studies were used to describe the baseline environment. These studies were conducted in 2008 for the proposed Consbrey Colliery and could not be updated with more relevant data, due to time constraints. Therefore, the existing information was adapted into the above baseline description, in order to provide a description and understanding of the baseline environment.

The specialist investigations for the EIA phase will include a detailed, site specific description of the receiving environment and assessment of the potential impacts. In light of this, the significant knowledge gaps that were identified for the scoping phase will be addressed in the EIA phase (more detail is provided in Section 6, Terms of Reference for the EIA phase):

3 IDENTIFICATION OF THE ANTICIPATED ENVIRONMENTAL, SOCIAL OR CULTURAL IMPACTS, INCLUDING THE CUMULATIVE IMPACTS, WHERE APPLICABLE

3.1 Provide a description of the proposed prospecting or mining operation including a map showing the spatial locality of infrastructure, extraction area, and any associated activities.

3.1.1 Resources and Reserves

Bituminous coal will be mined covering a total area of 9146.7 ha. Coal seams B and C. are proposed to be mined during a 30 year Life of Mine (LoM). The coal depth ranges from 120 m to 180 m below the surface. The mine plan is depicted on plan 12 below.

A total of 292 Million tonnes (Mt) of Indicated resources are present in the Consbrey area.

3.1.2 Mining Method

The coal seams will be mined with the use of the open pit (truck and shovel) and underground (bord and pillar) methods. As the coal resource becomes inaccessible through open pit mining due to the depths of the coal seam, the resources will be mined through the use of underground bord and pillar method with the use of continuous miners. The continuous miners will feed coal onto shuttle cars which will in turn deliver the coal to the conveyor belt system conveying coal to the surface where it will be stockpiled. The mined coal will be transported via the use of trucks and/or a conveyor belt to the Spitzkop plant for processing. Therefore, there will be no coal processing plant on the proposed Consbrey Colliery. However, there will be some crushing using mobile screens and crushers.

Plan 12: Consbrey Colliery Mine Plan

3.1.3 Mineral Processing

The coal from Consbrey will be transported to the Spitzkop Colliery by truck and/or a conveyor belt system. The coal will be washed at the Spitzkop Colliery's beneficiation facility. The Spitzkop Colliery plant is a dense medium, single-stage wash plant with a feed capacity of 450 tons/ hr.

3.1.4 Transportation

After the beneficiation of coal at the Spitzkop Colliery Plant, the coal products will be loaded onto dedicated trains for transport either to the Richards Bay Terminal Facility (export) or to a regional power station and other domestic consumers.

3.1.5 Coal Markets

Some areas of the B and C lower seams can be beneficiated to supply an export quality steam coal. The C upper seam is of poorer quality and is suited for the domestic power generation market.

3.1.6 Infrastructure

The proposed infrastructure associated with the open pit and underground activities on Consbrey Colliery include:

- Temporary construction facilities and infrastructure;
- Waste management temporary handling and storage of general and hazardous waste, on-site change house and ablution facilities with sewage treatment plant;
- Process water management facilities through the use of pollution control dams;
- Storage and handling of hazardous substances such as fuel, lubricants, various process input chemicals, raw material stockpiles/ bunkers, gas, burning oils, explosives; and
- Services such as power lines, pipelines, conveyors, roads, telephone lines, communication and lighting masts.

3.2 Describe any listed activities (in terms of the NEMA EIA regulations) which will be occurring within the proposed prospecting or mining operation.

Currently only authorisation in terms of the MPRDA is sought. However, if any listed activities are triggered according to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), the necessary applications will be compiled in terms of the NEMA. This approach will be taken for the Water Use Licence and the Waste Licence applications, and no activities will commence prior to receiving said authorisations.

The Environmental Management Act's (NEMA) as amended, EIA regulations GN R543 ("NEMA EIA Regulations") were published on the 18 June 2010 and came into effect on 2 August 2010. Together with the NEMA EIA Regulations, the Minister also published the following Regulations in terms of sections 24 and 24D of the NEMA:

- Regulation GN R544 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow the basic assessment process as described in section 21 to 25 of the NEMA Regulations;
- Regulation GN R545 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an environmental impact assessment process as describer in section 26 to 35 of the NEMA Regulations; and
- Regulation GN R546 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process as described in section 21 to 25 of the NEMA Regulations will need to be followed.

The typical NEMA activities that could be triggered for the proposed Consbrey colliery underground mining activities are listed below. If the activities in Listing Notice 2 and 3 are triggered during the EIA phase, they will be added to the list in Table 3.2-1.

Table 3.2-1: Listing notice 1 (GNR 544) - Typical NEMA Activities that could be Triggered

Activity Number	Activity Description
9	The construction of facilities or infrastructure exceeding 1000 metres in length for the bulk transportation of water, sewage or storm water: (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more, excluding where: a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or b. Where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
10.	The construction of facilities or infrastructure for the transmission and distribution of electricity – i. Outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or ii. Inside urban areas or industrial complexes with a capacity of 275 kilovolts or more.
11	The construction of: (i) canals; (ii) channels; (iii) bridges; (iv) dams; (v) weirs; (vi) bulk storm water outlet structures; (vii) marinas; (viii) jetties exceeding 50 square metres in size; (ix) slipways exceeding 50 square metres in size; (x) buildings exceeding 50 square metres in size; or (xi) infrastructure or structures covering 50 square metres or more where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such

	construction will occur behind the development setback line.
12	The construction of facilities or infrastructure for the off-stream storage of water including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 19 of Notice 545 of 2010.
13	The construction of facilities or infrastructure for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 but not exceeding 500 cubic metres.
22	The construction of a road, outside urban areas, (i) with a reserve wider than 13,5 meters or, (ii) where no reserve exists where the road is wider than 8 metres, or (iii) 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 Notice 545 of 2010.
26	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).
47	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (i) Where the existing reserve is wider than 13.5 meters; or (ii) Where no reserve exists, where the existing road is wider than 8 metres – excluding widening or lengthening occurring inside urban areas.

3.3 Specifically confirm that the community and identified interested and affected parties have been consulted and that they agree that the potential impacts identified include those identified by them.

The PPP has been initiated. Please refer to Section 0 which provides details around stakeholder comments associated with the consultation process. All stakeholders on the database have been provided with comment and registration sheets were distributed on Friday, 1 March 2013 (see Section 5.1) together with the BID and announcement letter. This sheet can be used to submit formal comments and suggestions about the proposed project. Furthermore, meeting minutes and the comments received have been included, and will be continuously updated, in a Comment and Response report (CRR) which will accompany the Draft EIA Report.

3.4 Provide a list and description of potential impacts on the cultural environment, if applicable.

3.4.1 Construction Phase

Potential impacts may occur during the construction phase which will entail substantial excavations into the superficial sediment cover as well as the underlying bedrock. These notably include:

- Site clearing and the removal of topsoil and vegetation;

- The construction of infrastructure such as haul roads, pipelines and storm water diversion berms; and
- The excavations for the open pit and underground mining activities.

All these developments may adversely affect potential fossil heritage within the study area by destroying, disturbing or permanently sealing-in fossils that are then no longer available for scientific research or other public good.

During the construction phase, the impact on sites directly affected by construction activities would be high due to surface disturbances and destruction. If cemeteries, graves and burial grounds are affected by construction, these sites should be mitigated according to the NHRA (Act 25 of 1999), and if exhumation is required, as well as the National Health Act (Act 61 of 2003), the Provincial Department of Health and any ordinances of the Provincial Department of Health.

The impact on the cultural environment will depend on the value or significance of the identified heritage resources during the EIA phase. Taking the above into consideration, where an identified heritage resource has a low value, the destruction of the identified resource will have a low significance.

3.4.2 Operational Phase

During the operational phase, impacts resulting from open pit operations on cultural sites would be high, depending on the nature and location of sites identified in the Archaeological Impact Assessment (AIA). If sites of heritage significance are conserved and effectively managed, impacts would be low as long buffer zones are provided to protect sites from mining activities. Specifically, mining activities could pose significant impacts on the De Wittkrans Complex (Msobo Coal is located approximately 500 m from the De Wittekrans Complex) as the forms of the rock are significant at a local, regional and national level. The mining activities that could impact on these rock art forms are dust from blasting and movement of haul trucks on access roads and vibrations form blasting activities.

Underground mining operations would not have significant impacts on identified sites unless subsidence occurs. Should further sub-surface archaeological and heritage discoveries be made not previously identified/ documented in the AIA, operations must be ceased and a qualified archaeologist be contacted for an assessment of the discovery.

3.4.3 Decommissioning Phase

The removal of infrastructure and decommissioning and closure related operations are not anticipated to have any additional impact on sites of archaeological and heritage significance, conditional to the effective implementation of management measures determined during the EIA Phase and will be outlined in the AIA report.

Impacts on these sites could be severe if areas are not properly documented, fenced off, demarcated, managed and provided a buffer zone to prevent accidental damage. The potential impacts will be investigated and reported on in more detail during the EIA phase, once the required studies have been completed.

3.5 Provide a list and description of potential impacts identified on the heritage environment, if applicable.

The potential impacts are described in section 3.4 above.

3.6 Provide a list and description of potential impacts identified on the socio-economic conditions of any person on the property and on any adjacent or non-adjacent property who may be affected by the proposed prospecting or mining operations.

The potential impacts on the socio-economic environment during the construction, operational and decommissioning phases are described below:

3.6.1 Construction Phase

The construction phase will likely give rise to a number of socio-economic impacts, both positive and negative. Positive impacts may include the following:

- Creation of temporary job opportunities for local and regional labourers and contractors. If Xstrata SA endeavours to contract local labourers and contractors, the significance of this positive impact will be enhanced (also see Section 3.7);
- Multiplier effects on the local economy as a result of increased spending power of employees and services providers of the mine, rates and taxes payable by Xstrata SA to the municipality, as well as Local Economic Development (LED) and Human Resource Development (HRD) spent by Xstrata SA (also see Section 3.7); and
- Increased markets for local entrepreneurs, partially due to an influx of job-seekers who may become customers of local SMMEs and other businesses.

Negative socio-economic impacts during the construction phase of the proposed project may include the following:

- Physical and economic displacement of land owners and farm workers. Associated with this is the loss of agricultural land which may have a minor, albeit cumulative impact on food security at a national level;
- Competition between newcomers and the incumbent population for job-opportunities and other scarce social resources;
- Increased pressure on local services and resources, partially attributable to the proposed project's water and electricity requirements, and partially attributable to an influx of job-seekers who will require housing and other basic services, and who may make use of local health and educational facilities, amongst other services;
- Increased social pathologies, largely as a result of an influx of people into the area in search of employment or other economic opportunities. Such pathologies may include prostitution and petty theft;
- Safety impacts and a decrease in quality of life of land owners and workers as a result of construction activities, which may give rise to increased traffic, noise and dust levels; and
- Loss of farm labourers to the mine, which is likely to offer better wages than local farmers.

3.6.2 Operational Phase

Positive socio-economic impacts that may arise during the operational phase of the proposed project may include both job creation and community development (as part of the proponent's LED strategy). Both these impacts may serve to alleviate community needs prevalent in the surrounding areas. In addition, given the proposed project's LoM, the benefits of multiplier effects on the local economy and increased markets for entrepreneurs may continue beyond the construction phase and persist for the duration of the operational phase. Finally, as the proponent envisages exporting some of its coal products, a small positive impact on the national economy could be anticipated.

Potential negative impacts that may arise during the proposed project's operational phase may include the following:

- Economic dependency on the proposed project, which could be detrimental to those employed by the mine if employment is terminated during the course of the expected LoM due to uncontrollable external factors; and
- Decreased quality of life for those residing in the surrounding areas, mainly due to an increase in mining-related activities such as traffic, dust, noise, blasting and the possible presence of an (initial) foreign workforce.

3.6.3 Decommissioning & Closure

During the decommissioning phase of the Consbrey operation, rehabilitation of agricultural land will take place, and decreased levels of dust, noise, and traffic will be experienced in the areas surrounding the project area. In other words, the area will be returned to as close to its original condition as possible.

A significant negative impact will also be experienced in the area (Xstrata SA SLP, 2012); a large number of individuals will inevitable lose their jobs upon decommissioning, which will adversely impact on the local economy and employment rate, which could in turn result in an increase of social pathologies such as theft, alcoholism and domestic violence. An important source of income will thus be lost for many families in the area and people may start to move out of the town, thereby possibly creating a "ghost town". Although possible, the probability of the area becoming a "ghost town" is low as there are a number of other mining operations in the area. Another negative effect may be experienced locally through a weakening of the multiplier effect when Xstrata SA retracts its spending power from the area. Nationally, a decrease in total coal product will also be experienced.

3.6.4 Post Closure

It is not likely that any post closure effects will be felt within the socio-economic environment.

3.7 Provide a list of potential impacts (positive & negative) on: employment opportunities, community health, community proximity, and links to the Social and Labour Plan.

3.7.1 Socio-economic Impact of the Operation

According to Xstrata SA's Social and Labour Plan (Xstrata SA SLP, 2012) for the Consbrey operation, the anticipated impact of the proposed project on surrounding communities is expected to be positive in nature.

These employees will be offered the opportunity to partake in skills and education programmes, as well as other benefits available within a large company.

3.7.2 Regional and Local Development

The Consbrey operation will positively influence development opportunities within the Msukaligwa Municipality; it will contribute to the local economy through the provision of a large number of employment and income generating opportunities, as well as through creating a demand for services both for the project itself, and members in the surrounding areas. The proposed project could also have a positive impact on development in the Gert Sibande District Municipal area, and through the implementation of preferential procurement policies, there may be an increase in opportunities for local organisations and individuals to provide services and commodities to the operation and its workforce. However, in light of the fact that mineral resources are finite, it is essential to identify alternative catalysts for LED, whereby a diversified economy can be created (Xstrata SA SLP, 2012).

3.7.3 Sustainable community livelihoods

Consbrey is expected to have a positive impact on livelihoods and subsistence strategies in the general project area. The proposed project will provide employment opportunities for an estimated 400 individuals, enabling these individuals to have a stable and regular income for many years. Through this income generation, the probability for dependents of the employees to also become involved in profitable employment is enhanced, thereby contributing positively to the economic sustainability of a larger portion of the population, which could ultimately result in higher standards of living and a reduction of poverty in the project-affected areas (Xstrata SA SLP, 2012).

3.7.4 Implementation of Local Economic Development Projects

The sustainability of local communities and employees after mine closure is tentative. Accordingly, the following impacts or scenarios may potentially occur, and should be premeditated during LED project planning (Xstrata SA SLP, 2012):

- Once sustainable development initiatives and projects have been established, the businesses may start to fail due to a number of potential factors. For example, skilled people may leave the area to find employment elsewhere, or technical and financial resources may be gradually lost to the area. The result of this is that poverty may in fact increase significantly in the area after mine closure if projects are not properly managed and sustained.

- Alternatively, sustainable initiatives and projects may prove successful, and the self-reliance of the community may be significantly enhanced. Access to capital would then be improved, with the result being an increase in the wealth of the community and the region. Entrepreneurs and job seekers may thereafter be attracted to the area, causing an influx in the local population and a boost to the economy. A strong multiplier effect would follow this, and the standard of living would gradually increase.
- Lastly, capacity-building strategies and structures may prove to be effective, leading to community members developing their own business ideas, which eventually extend into sustainable projects and businesses. Hereby, the community would become increasingly sustainable.

3.8 Provide a list and description of potential impacts identified on the biophysical environment including but not limited to impacts on: flora, fauna, water resources, air, noise, soil etc.

The sections below describe the potential impacts identified during the construction, operational, decommissioning and post-closure phase.

A brief overview of the project activities likely to take place during each phase of the project is described below. These activities may result in potential impacts on the receiving environment. These were determined from desktop studies and based on experience in the project area. Detailed investigations will be carried out to refine the potential impacts and mitigations measures and make them project specific.

<u>Construction Phase</u>

The area is a greenfields site in terms of coal mining and as such, the following activities will take place in order to gain access to prepare the area for operations. During the construction phase, the area will be cleared and vegetation and topsoil will be removed in preparation for the surface infrastructure such as the construction of haul roads to and from the site.

<u>Operational Phase</u>

The operational phase will entail the removal of soil and overburden during open pit operations, the temporary stockpiling of these, and the filling of the voids of mined out areas as the open pit operations proceed.

The operational phase will include underground mining with the use of Continuous miners. The vent shaft will be fully operational. Haul roads will be used to transport coal to domestic markets.

Decommissioning Phase

The decommissioning phase will include demolition and removal of all infrastructure on site and rehabilitation. Final voids will be filled with overburden and topsoil and sub-soils will be replaced.

The potential impacts on the receiving environment during the construction, operational and decommissioning phase are described below:

3.8.1 Geology Potential Impacts

3.8.1.1 Construction Phase

The impact on the geology will be insignificant. The rock strata will not be disrupted or excavated during construction as the activities will be limited to surface preparation.

3.8.1.2 Operational Phase

The mining of the natural coal seams will result in the permanent removal of the coal seam and therefore utilisation of the economic value thereof. The coal is a finite resource with a predicted lifespan. There will be a significant, long term impact on the geology of the mining area. No mitigation for this geological impact is possible. (DWA, 2005)

In underground mining areas adequate pillar support will be left in the underground workings to prevent collapse of the roof and therefore there will be no impact on the geological strata above the mined seams. Subsidence is unlikely to happen in the medium to long term.

In open pit areas the materials in the overburden and parting that may give rise to deterioration in water quality are the pyritic bioturbated sandstones and shales and black carbonaceous shales that are associated with the coal seams and occur close to the coal seams (DWA, 2005).

3.8.1.3 Decommissioning Phase

Parts of the area will be undermined/ removed. For underground mining there will be no other impacts on the geology and no mitigation is required. For open pit mining the surface area needs to be rehabilitated to a stable slope and to minimise water infiltration into the rehabilitated area.

The haul roads have no impact on the geology.

3.8.1.4 Post Closure Phase

The geology is no longer disturbed during post closure and hence there is no mitigation required.

3.8.2 Topography Potential Impacts

3.8.2.1 Construction Phase

During construction, there will be surface disturbance in the form of diversion berms and trenches to divert surface water flow, soil stripping and stockpiling and levelling of areas in preparation of the boxcut and open pit areas. All these activities will have an impact on the natural topography, albeit more site specific in extent. The impact on the topography will be long term.

3.8.2.2 Operational Phase

During operations, open pit mining will take place, resulting in a progressive impact on the natural topography. There will be overburden stockpiles, soil stockpiles and open pits which will also increase the secondary impacts such as disturbance to catchment area and erosion. These impacts will occur for the life of the mine. The final impact on topography will depend on the rehabilitation measures practised.

The underground mining will have a limited impact on topography, however if pillars are removed, subsidence could occur resulting in an alteration to the surface topography and secondary impacts such as areas of depressions where ponding could occur. These impacts could be significant but are possible to mitigate.

3.8.2.3 Decommissioning Phase

During decommissioning phase, the open pit areas and the boxcuts areas will be filled, levelled and rehabilitated, resulting in a neutral impact on topography as areas are rehabilitated as far as possible to their natural state. If subsidence occurs, this will need to be monitored and surface users be made aware of the possible impacts on the local topography.

3.8.2.4 Post Closure Phase

If rehabilitation is not successful, it could result in erosion. Subsidence could also continue to occur years after the mine has closed, therefore monitoring of surface rehabilitation and subsidence will be required.

3.8.3 Visual Potential Impact Assessment

3.8.3.1 Construction Phase

The increase of activity, generation of dust and disturbance to surface area will negatively affect the current visual environment. The activities are likely to be visible from the N11 and main and other access roads which pass through the project area, although the topography and clumps of trees may help screen the activities.

3.8.3.2 Operational Phase

During operations, the open pit mining area will be most visible to locals in the area and traffic on the farm roads. The generation of dust and the trucks transporting the coal will also create a visual impact. The overburden stockpiles are likely to be visible to local land users and people visiting the area. Screening in the form of fences and tree lines can help reduce the significance of the impact.

The underground operations will have a minimal impact on the visual environment unless subsidence takes place, in which case the surface topography may be affected, and the visual environment changed slightly.

3.8.3.3 Decommissioning Phase

Initially visual impacts will increase as the area is rehabilitated and overburden replaced. There will be additional machinery in the area and dust levels are expected to increase. Once rehabilitation is complete, the visual impact will be reduced.

3.8.3.4 Post Closure Phase

Post closure visual impacts will be neutral. Monitoring is required to ensure rehabilitation is effective.

3.8.4 Soil Potential Impact Assessment

3.8.4.1 Construction Phase

The impact on soils during construction is expected to be negative due to the earth moving around the open pit underground workings, as well as preparation of haul roads where required. Topsoil will be stripped and stockpiled could result in disruption to the strata, fertility and volume. The soils will also be susceptible to erosion, especially during the rainy season. Mitigation is possible and can reduce the significance of the impact.

The use of haul roads will result in the soils compaction along the roads. Spillages of diesel and hydrocarbons will result in contamination of soil which will require remediation.

3.8.4.2 Operational Phase

open pit mining results in a constant removal of soil and overburden, which could increase erosion and loss of soil fertility. This impact will remain for the duration of the mining activities. If soil stockpiles are not handled, stored or stockpiled correctly, the impact will be negative and long term. Soil erosion is a major problem in South Africa as soil takes a long time to regenerate, thus mitigation is required and monitoring should be undertaken to ensure impacts are minimised.

Underground mining will result in minor impacts on soil, however if subsidence occurs, this could result in a disturbance to the natural soil strata which could then impact on drainage and erosion. Mitigation will be required.

The hauling of coal via trucks has the potential to contaminate soil along the roads and monitoring will be required to identify and clean up spillages. Soil compaction and contamination from trucks will remain a potential impact for the duration of the mine.

3.8.4.3 Decommissioning Phase

During decommissioning, the overburden and topsoil will be replaced and all mining areas will be rehabilitated. This will include seeing and establishing pioneer species in order to reduce erosion. This will have a positive impact on the local area. Monitoring will continue to ensure rehabilitation is successful. Haul roads will be ripped and re-vegetated.

Subsidence from underground mining may continue and impacts on soil are possible.

3.8.4.4 Post Closure Phase

Impacts on soil post closure are minimal if rehabilitation has been successful. Subsidence may continue to impact on soil however this impact is not expected to be significant.

3.8.5 Land Use and Land Capability

3.8.5.1 Construction Phase

During construction the land affected by mining is unavailable to other land uses. Mine infrastructure such as haul roads, open pit mining, stockpiles and underground infrastructure (such as air vents) all require space on land. These occupied and impacted areas are then unavailable to agricultural activities for the duration of mining activities. The cumulative land capability may also be reduced in the region as the land could be bought by the mine and land use permanently changed from agricultural to mining use.

3.8.5.2 Operational Phase

The land use in the open pit area and areas of mining infrastructure will change from the current land use to mining. The land capability in the open pit areas will be negatively affected for the duration of the activities.

Current land use above underground mining can continue throughout the mining activities. Land capability will also not be affected above the underground mine. In the event of subsidence, however, surface land use activities may be restricted and land capability may be affected, depending on the level of subsidence, which is currently undetermined.

Where underground mining undermines infrastructure such as roads and railway line, a safety factor will need to be applied to ensure the structure above does not collapse.

As the open pit areas are rehabilitated, the land use will be restored to at least grazing potential; however, the land capability will need to be determined.

3.8.5.3 Decommissioning Phase

Once stockpiles are removed and open pit areas, haul roads, and the boxcut are rehabilitated, the land use will be restored to at least grazing, however the agricultural potential will be unknown until land capability tests are undertaken. The land capability will need to be determined as it may have been affected by the mining activities.

3.8.5.4 Post Closure

Post closure impacts on land use and land capability may be experienced from secondary mining related impacts such as deterioration in water quality, subsidence and poor rehabilitation. Mitigation will be required to ensure that these secondary impacts are mitigated during mining so as to prevent them post mining. The severity of the impact is uncertain and will depend on the severity of the secondary impacts.

3.8.6 Flora Potential Impact Assessment

3.8.6.1 Construction Phase

The preparation of mining activities will have a negative impact on the local flora as vegetation will be cleared for the construction of surface infrastructure. The areas of disturbance are not large, however in areas close to streams the vegetation is sensitive and mitigation will be required to ensure minimal impacts are experienced in these areas. The removal of invasive species, if present, will be a positive impact.

The local fauna will be able to move into surrounding areas which will reduce the significance of this impact.

3.8.6.2 Operational Phase

In the open pit areas, the impact on flora will continue to be negative as more land will be stripped to get to the coal seam. However, as each open pit cut is mined, the area will be rehabilitated and vegetation will be restored. Large portions of the project area are currently cultivated with limited natural vegetation. Monitoring will be required to ensure invasive species do not become established and to ensure that erosion is minimised and the slopes are of a suitable angle to allow for adequate drainage while discouraging erosion.

Underground areas will have a minimal impact on flora as mining takes place underground. In the event of subsidence from pillar removal, however, there may be a negative impact, but of low significance, depending on the depth of mining and safety factors applied.

3.8.6.3 Decommissioning Phase

The removal of infrastructure, replacement of overburden and rehabilitation of mining areas will result in a positive impact on the local flora. Monitoring will be required to ensure rehabilitation is effective and habitats are restored.

3.8.6.4 Post Closure Phase

Impacts on fauna post closure are due to secondary impacts such as deterioration of water quality, increased erosion from poor rehabilitation and alteration to drainage lines from subsidence. These impacts can all be mitigated which will reduce the significance. If no subsidence occurs, the impacts are minimal.

3.8.7 Fauna Potential Impact Assessment

3.8.7.1 Construction Phase

The preparation of mining activities will have a negative impact on local fauna as natural habitats will be destroyed. There will be an increase in noise and activity, which will result in disturbance to fauna habitat. The local fauna will be able to move into surrounding areas which will reduce the significance of this impact.

3.8.7.2 Operational Phase

Noise created by the mining activities could cause the animals to move causing a negative impact. As more land is stripped to get to the coal seam, the removal of vegetation will result in the destruction of habitats and force animals to move away.

Underground areas will have a minimal impact on fauna as mining takes place underground. In the event of subsidence from pillar removal, however, there may be a negative impact, but of low significance, depending on the depth of subsidence.

3.8.7.3 Decommissioning Phase

The removal of infrastructure, replacement of overburden and rehabilitation of mining areas will result in a positive impact on the local fauna and flora. Monitoring will be required to ensure rehabilitation is effective and habitats are restored.

3.8.7.4 Post Closure Phase

Impacts on fauna post closure are due to secondary impacts such as deterioration of water quality, increased erosion from poor rehabilitation and alteration to drainage lines from subsidence. These impacts can all be mitigated which will reduce the significance. If no subsidence occurs, the impacts are minimal.

3.8.8 Aquatic Environment Potential Impact Assessment

3.8.8.1 Construction Phase

A number of activities will occur during the construction phase. These activities and their various associated impacts on the aquatic integrity are discussed below.

<u>Clearance of land, removal of topsoil and vegetation:</u>

Impacts associated with land and vegetation clearance include the occurrence of increased rainfall runoff with reduced seepage. This negatively effects aquatic ecosystems through the alteration of flow types and associated habitat loss. Additionally to this the erosion potential of the catchment/watercourse is increased.

3.8.8.2 Operational Phase

During the operation phase of the mine, a different set of impacts will be expected. These activities and their associated impacts are listed below.

<u>Placement of mine infrastructure:</u>

The incidence of mining infrastructure allows for the creation of hard permanent features on which rain runoff force is increased. This may serve to increase erosion capabilities as well as increase flow velocities. This may result in habitat loss associated with increased sedimentation and erosion.

Stockpiles and waste:

During rainfall periods solutes present in exposed stockpiles and waste storage facilities dissolve into runoff and enter into nearby aquatic systems. Stockpiles and waste often contains various potentially harmful compounds once dissolved into the aquatic ecosystems. The presence of these compounds serve to deteriorate the quality and integrity of the aquatic ecosystems to an extent in which no life can survive or be supported by the aquatic system. Due to the potential for deterioration in environmental quality mitigation is recommended.

Potential spillage from pollution control facilities:

During the underground mining operation groundwater will be pumped into pollution control dams. This groundwater is typically basic in nature with high concentrations of dissolved solids. The presence of pollution control dams presents the potential for spillages due to human error or natural events. If spillage does occur a deterioration of environmental quality of the associated or effected water courses will occur.

Potential contamination of surface water:

During the open pit mining operation the runoff of rainfall into the open pit area has the potential to contaminate and reduce water flowing into nearby streams. This has a negative impact on the quality and quantity of water flowing into the nearby aquatic ecosystems.

The mitigation of this impact will entail the following:

- Stormwater Management.

3.8.8.3 Decommissioning Phase

Potential contamination during closure activities:

During the decommissioning and closure phase, there is increased potential for surface water contamination from spillages and siltation these may impact the water quality and thus the state of the aquatic biota.

3.8.8.4 Post Closure Phase

Potential decant and Acid Mine Drainage (AMD)

After the closure of the mine the underground mine workings will become flooded with water. Due to chemical reactions in underground between water and the newly exposed mine workings there is a potential for groundwater to become acidic. Once the levels of groundwater reach a threshold there is potential for this water to exit the mine workings and enter into the surrounding aquatic systems. This will effectively lower the pH of these aquatic systems and serve to decrease the quality/state of the environment.

3.8.9 Wetlands Potential Impact Assessment

The proposed Consbrey Colliery project area is located within the Chrissiesmeer Lake District which comprises of over 230 pans within a 20 km radius. The Endengered Wildlife Trust is currently involved in two biodiversity conservation projects for the Chrissiesmeer

Lake District. These are the application for the Lake District to declared a Wetland of International Importance through the Ramsar Convention and secondly to use biodiversity stewardship to legally protect the land in the area.

Over the Consbrey project area a number of valley bottom wetlands and pans and dams exist.

3.8.9.1 Construction Phase

The preparation of mining activities will result in a direct destruction of wetland areas that are deemed irreplaceable and are unique at a provincial scale. The loss of wetland areas associated with the project area will results in a direct loss of wetland integrity and wetland functionality such as the maintenance of biodiversity. The areas of disturbance are not large, however these areas are regarded as sensitive and unique. The impacts associated with the construction phase of the project are regarded as very significant.

3.8.9.2 Operational Phase

Open pit mining of the coal will results in a direct destruction of some wetland areas within the project area. This will result in the destruction of habitat and the loss of sensitive fauna and flora species associated with the wetland systems within the project area. Furthermore, contaminated water originating from the open pit mining area as well as the associated infrastructure will result in the contamination of surrounding near pristine wetland areas therefore loss of biodiversity. the loss of biodiversity, wetland integrity and wetland functionality is regarded as very significant since the present Ecological Status of the wetland areas within the area is regarded as near pristine.

3.8.9.3 Decommissioning Phase

The removal of infrastructure, replacement of overburden and rehabilitation of mining areas will result in a positive impact. However due to the disturbance of the local geomorphology and the hydrology as a result of open pit mining the wetland areas cannot be restored.

3.8.9.4 Post Closure Phase

The destruction of wetland areas during open pit mining will result in an everlasting loss of the wetlands capacity to attenuate floods, enhance water quality and maintain biodiversity in the region. The loss of such functionality will occur as a result of the change in the local hydrology and geomorphology of the wetlands within the project area. These changes will effect a change in the way in which water moves in, through and out of the wetland areas within the project area.

3.8.10 Surface Water

The surface water impacts that could arise from the proposed project will affect both the quality and quantity of the water resources.

3.8.10.1 Construction Phase

Surface Water Quality Impacts

The removal of vegetation and increased vehicular movement will result in dust deposition into the non-perennial streams and drainage lines (as construction is often carried out in the dry season). The deposited dust and silt may result in negative surface water quality impacts at the onset of the rainy season. It is essential that dust suppression measures are implemented to reduce the significance of such dust and subsequent siltation.

During construction, there will be heavy machinery on site which increases the chances of accidental (onset of pro-longed) spillages of construction and hazardous materials including those containing hydrocarbons such as diesels and oils. This could result in negative water quality impacts if the spillage is not contained on-site and cleaned up immediately. The surface water quality impacts from hydrocarbon contamination could reach a regional extent.

Surface Water Quantity Impacts

When the separation of clean and dirty water areas is implemented (by placing isolation berms and trenches) a volume of run-off will be contained within the dirty areas and be prevented from reporting to the catchment. This requires minimization of the dirty area in order to reduce the negative water quantity impact.

Stream crossings that are constructed such as roads has to be in a manner that does not impede the flow of stormwater within the catchment as this would result in negative surface water quantity impacts such as damming of water. The structures such as culverts should be constructed to enable the free drainage/ flow of surface run-off.

There is a potential for extreme rainfall events to flood the mining area particularly where the area is close to water resources. This could result in negative surface water quality (such as pollution of stormwater) and quantity impacts (such as the containment of the contaminated water on-site). As such, the location of stockpiles, infrastructure and any other mining activities should be in line with the National Water Act (Act 36 of 1998) (NWA) amendment of Regulation GN R 704. The regulation governs the use of water in mining including location of infrastructure, use of materials and the design, operation and maintenance of the water containment and conveyance infrastructure. Where such infrastructure such as stockpiles is located on site, it is essential to isolate the associated surface water from the general stormwater so as to prevent contamination and subsequent reduced stormwater flow to the catchment.

3.8.10.2 Operational Phase

Surface Water Quality

Negative surface water quality impacts in the operational phase could arise from the spillage (accidental/ pro-longed leakages), improper use and storage of hazardous and hydrocarbon containing materials.

Dust deposition could result in surface water resource pollution and siltation.

Dirty water within the mining area should be contained or could result in pollution of the nearby water resources. Mitigation will be required to ensure the pits are drained accordingly and dirty water is contained and re-used where possible.

Surface Water Quantity

The open pit workings will receive run-off, precipitation and seepage that will be prevented from reporting to the catchment resulting in negative water quantity impacts.

Regarding undermining of streams could potentially result in subsidence or alteration of stream beds. The safety factors prescribed in GN R 704 and other environmental legislation should be applied unless there is exemption approved for such activities.

The operational water uses such as human consumption, domestic use and process water could be sourced from surface water (streams, dams and pans) and this could result in the negative surface water quantity impacts as most of the dams are relied upon for urban water supply by the water service providers.

3.8.10.3 Decommissioning & Closure

There potential for negative surface water quality impacts are increased in the decommissioning phase as this entails dismantling of structures and workshops. This could result in accidental spillages and where inexperienced contractors are used these materials could be disposed incorrectly.

However, there will be a neutral impact on surface water quality and quantity once the area is cleaned out and restored to a condition that best resembles pre-mining.

3.8.10.4 Post Closure

Post-closure when rehabilitation is implemented, the surface water quantity impacts will be minimised as the runoff will be restored to the catchment. However, improper contouring of the surface and over compacting the surface could result in damming and increased surface runoff respectively.

The cumulative surface water quality impacts may still exist in the water resources and it could take a long-period before the surface water quality returns to baseline/ pre-mining conditions.

The flooding of mine workings and the decant to surface could further impact on surface water quality, especially if Acid Mine Drainage forms.

Thus, monitoring of quality and the on-going rehabilitation should continue for at least three years post-mining to detect any subsequent negative impacts and to trigger implementation of mitigation measures.

3.8.11 Groundwater Potential Impacts

3.8.11.1 Construction Phase

The impact on the groundwater will be insignificant. Small scale dewatering around the pit preparation area might start. No mitigation will be required, however groundwater monitoring needs to start before mining commences.

3.8.11.2 Operational Phase

The local aquifer systems are classified as minor aquifer systems and the regional utilisation thereof coincides with the principle land uses of grazing and to provide domestic water supply. The changes induced by mining may lead to a dewatering cone in the immediate vicinity of the mine, an increase in recharge, storage capacity (open pit workings) and deterioration in water quality.

The mining activities will open the areas to oxidation and the possible formation of acid mine drainage that will have to be contained. Open pit mining could have a significant impact on groundwater quality. Mitigation is required to minimise recharge to groundwater over the open pit mined areas by making the rehabilitated pit free-draining.

Monitoring of both groundwater levels and quality is required, for management and compliance purposes, as well as rainfall, to determine changes in recharge that might occur.

3.8.11.3 Decommissioning Phase

The quality of this water will be impacted upon by mining. Although not much can be done about the actual groundwater quality, mitigation is required against its surface water quality impact. The mining area might produce a seepage zone or decant as the recharge to open pit workings have increased by the disturbance of the strata. There are no large scale groundwater users in the area but poor quality groundwater emerging as seeps into the surface water environment can be seen as a negative, long term impact. Mitigation could take the form of passive treatment, active treatment of the containment and evaporation on site. The most suitable option would depend on the water quality and quantity that is released post closure.

Monitoring of both groundwater levels and quality is required, for management and compliance purposes, as well as rainfall, to determine changes in recharge that might occur.

3.8.11.4 Post Closure Phase

The impact on groundwater levels will be negative because of enhanced recharge. This will lead to seepage or decant of mine water. Mitigation to control groundwater levels is not economically feasible.

The potential for AMD is of significant concern due to the long time frame associated with it and the large financial expenditure associated with the handling of water contaminated in this fashion. Mitigation measures can include flooding of old mine workings to decrease the amount of oxygen available and therefore neutralising conditions will occur. Any seepage or decant should be contained and treated before released into the surface water environment.

Monitoring of groundwater levels and quality is required until set objectives have been achieved

3.8.12 Air Quality Potential Impact Assessment

Projects of this nature will generally present a number of air pollution sources that can have a negative impact on ambient air quality and downwind communities/land uses if unmanaged. Typically, the following air pollution sources may exist: dust clouds from blasting, wind erosion of exposed RoM stockpiles, wind erosion of exposed surface areas, unpaved roads, crushing and screening in the beneficiation plant, wind erosion of the discard dump facilities, and materials handling. The findings, impact assessment and associated management measures will be included in the EMPR report.

3.8.12.1 Construction Phase

Site clearing, which will include removal of topsoil and vegetation, may result in dust emissions impacting people living in and around the site, as well as construction of any surface infrastructure e.g. haul roads, pipes, storm water diversion berms (including transportation of materials & stockpiling). The dust levels may increase due to increased activity of heavy machinery and due to the removal of vegetation, thus impacting areas around the project area. The dust levels may also increase due to blasting activities (blasting and development of initial boxcut for mining (incl. stockpiling from initial cuts) causing an impact on the people living on and around the site, and due to drilling activities rock for preparation of vent shaft and decline shaft.

3.8.12.2 Operational Phase

Vehicle entrainment on unpaved roads is one of the main sources of particulate emissions.

The dust levels may also increase due to removal of coal via open pit mining and underground mining (mining process) and, as well as stockpiling of topsoil, overburden, RoM coal and discard dump. The mining operations will mainly comprise of fugitive dust releases, including materials handling operations (loading, tipping and offloading).

3.8.12.3 Decommissioning Phase

The dust levels may increase due to demolition and removal of all infrastructure (incl. transportation off site). Demolition activities may result in dust emissions impacting people living in and around the site. Rehabilitation (spreading of soil, re-vegetation and profiling/contouring) have potential to increase dust levels in the area and impact people living around the site.

3.8.13 Noise Potential Impact Assessment

3.8.13.1 Construction Phase

Noise levels during construction are expected to increase due to increased vehicular activity and use of machinery to clear areas. This impact, however, will be short term. Noise in the area currently exists from the R542, N11, R36 and R38 and the dirt roads in the area. Areas in the Consbrey area further away from these main roads will experience increased noise levels as their environment is predominantly rural in nature.

3.8.13.2 Operational Phase

During operations, the open pit areas will contribute to noise levels from the constant use of machinery to remove overburden and recover the coal. Trucks transporting the coal will also add to noise levels in the area, as well as on the main roads.

The underground mining activities will not contribute significantly to noise levels, however blasting for the underground and open pit areas will have a local impact in the area but of short duration. Mitigation will be required to help reduce the significance of the impact.

3.8.13.3 Decommissioning Phase

Initially noise levels will increase as machinery is used to rehabilitate the area. Once rehabilitation is completed, the noise levels will decrease significantly.

3.8.13.4 Post Closure Phase

Noise levels are not expected to increase post closure.

3.9 Provide a description of potential cumulative impacts that the proposed prospecting or mining operation may contribute to, considering other identified land uses which may have potential environmental linkages to the land concerned.

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

During the EIA phase cumulative impacts will be assessed in order to determine how the proposed Consbrey Coal Mine will contribute to the already existing and potential future environmental impacts occurring in the area. A geographical area will be identified in order to access the cumulative impacts and various aspects will be considered within this geographical zone. A historical approach will be taken to assessing the aspects together with current and proposed activities with the use of available information to establish the possible occurring cumulative impact within the geographical zone. Related consequences of identified cumulative impacts will be determined through a cause and effect relationship approach.

The following potential cumulative impacts have been determined during the scoping phase and will be investigated further during the EIA phase:

3.9.1 Geology Cumulative Impacts

The cumulative effect needs to be evaluated against the mining impacts on the remainder of the coal field.

Cumulative impacts on the geology are likely due to the increase in mining activities in the region. With more coal mining opening up in the Ermelo – Carolina area, the local geological conditions will be permanently disturbed. This impact cannot be mitigated however the resulting cumulative secondary impacts will need to be considered, such as impacts on groundwater quality and surface disturbance.

The MPRDA has as one of its aims to maximise the benefit of mining and utilise it as a catalyst in the local development of areas. In this context the mining of the proposed area will be beneficial to the town of Breyten, and surrounding towns. A number of other mining ventures currently exist in the area which will add to the development of the Breyten and Ermelo areas. Thus, while the local geology will be disturbed, it is for the betterment of the local community and the regional economy. The coal, however, is a finite resource with a predicated lifespan. Cumulative impacts are therefore permanent. (DWA, 2008)

3.9.2 Topography Cumulative Impacts

There will be a cumulative impact on the topography due to the activities occurring in the surrounding areas, which include mining, as well as farming activities. These activities have the potential to alter drainage lines, increase erosion, which leads to donga's and alter the natural lie of the land. While difficult to mitigate, the impacts need to be managed to minimise their cumulative significance in the region.

3.9.3 Visual Cumulative Impacts

The area is currently affected by existing mining activities. In this regard the visual impact is negatively increased; however the severity is not as great as for a predominantly rural region. The cumulative impact is difficult to mitigate and will require co-operation from all the mining houses in the region.

3.9.4 Soil Cumulative Impacts

There will be a cumulative impact on soil in the area due to the current and future activities taking place. Both mining and agriculture have the potential to result in soil erosion and contamination through surface disturbance, fertilizers, contamination of water and overgrazing. The combination of the mining and agriculture will result in a negative cumulative impact on the soil. Early mitigation and monitoring is required to reduce these impacts.

3.9.5 Land Use and Land Capability Cumulative Impacts

Due to the increase of mining activities in the area, land use and land capability will experience a negative cumulative impact. Where open pit activities are taking place, this impact is more significant. Mining, however, is a temporary activity and thus at some point the land used for mining will be rehabilitated and alternative land uses can occur. There is a possibility, however, that land capability may experience a long term negative impact from contamination to soil and water.

3.9.6 Flora and Fauna Cumulative Impacts

The local fauna and flora are expected to experience a cumulative impact from the surrounding farming and mining activities. The removal of natural vegetation for crops and grazing, and the surface disturbance from open pit mining, results in a negative impact for local flora and fauna as natural habitats are removed. It is difficult to restore the natural habitats post mining, although rehabilitation efforts will attempt to restore habitats as far as possible so that local fauna will start to move back into the area.

3.9.7 Aquatic Environment Cumulative Impacts

Due to the location of the proposed project being in the upper reaches of a quaternary catchment the cumulative impacts associated with the project will be felt downstream of the project area. The current project will be seen as adding to the extensive mining operations within the Ermelo coalfield. Therefore the cumulative impacts brought about through the proposed project can be described as high due to the existing industrial activities occurring catchment area.

3.9.8 Wetland Cumulative Impacts

The loss of wetland areas within the project area will also result in the cumulative loss of wetland functions such as water quality enhancement. The loss of the capacity to enhance water quality will therefore result in increased water contamination and higher water purification costs for the downstream users. It is difficult to restore the natural wetland habitats and the associated wetland functionality post mining, therefore these qualities will be lost from the system.

3.9.9 Surface Water and Sensitive Areas Cumulative Impacts

The Ermelo, Breyten and the Carolina areas are dominated by coal mining and agriculture activities as the main economic activities. As such, the impacts on the surface water quality and quantity have been increasing over time and are of a negative nature particularly as they are both water intensive activities. Historic water quality data of sites within the region indicate that there is on-going deterioration of quality (from both mining and agricultural activities) including the decrease in dilution capacity of the streams and rivers. The rehabilitation backlog from mines within the area and washing out of fertilizer contaminants into the surface water resources further exacerbates the water quality deterioration and in some cases AMD generation resulting from historical mining has been reported. This has subsequently resulted in reduced quantity available for further development.

Thus, the proposed activity will contribute towards the already existing cumulative impacts of both quality and quantity. These impacts will be assessed in the EIA phase and the proposed Terms of Reference are detailed in Section 6 of this report.

However, since both mining and agriculture are strategic socio-economic activities for the country, it is important that their required water demands are met sustainably by the government through water use allocation/ licensing. However, there is an onus on the water users (mines and farmers) to use the allocated water more efficiently and to prevent deterioration as well as to implement cleaner technologies that can use less water and release the excess to the environment for further development opportunities that can benefit the socio-economic needs of the country.

3.9.10 Groundwater Cumulative Impacts

The local aquifer systems are classified as minor aquifer systems and the regional utilisation thereof coincides with the principle land uses of grazing and to provide domestic water supply. Irrigation and water supply to the mine also occur on a smaller scale. The changes induced by mining may lead to an increase in storage capacity (open pit workings) and deterioration in water quality.

The area has a history of coal mining and as such there is potential for a negative cumulative impact on local groundwater quality and quantity. Monitoring points around the mine sites will assist in determining the extent of this impact and therefore the significance. Groundwater users in the area will be affected if the water quality is poor, as well as downstream users if this water decants to the surface. Consultation with DWA and the creation of forums for the area could assist in determining effective mitigation measures to control and prevent negative cumulative impacts.

The management of cumulative impacts and even the closure planning of existing operations need to be done on a regional level. The mining companies, DWA and water users associations need to be approached to establish a working relationship to allow the cumulative impacts from being determined and regional management measures from being implemented.

3.9.11 Air Quality Cumulative Impacts

Cognisance must be taken of the fact that there are existing open pit mines in the area (Spitzkop and Tselentis) which can contribute to the cumulative impact on ambient air quality of the area.

3.9.12 Noise Cumulative Impacts

Noise levels in the area are expected to increase cumulatively due to the increase in trucks and traffic on the main roads, additional mining activities taking place in the area will also contribute to the impact on ambient noise levels in the area. Noise levels fluctuate and monitoring will be required to establish the significance of the noise on the local area.

3.9.13 Archaeological and Cultural Cumulative Impacts

Heritage resources are finite and irreplaceable. Cumulative impacts need to be identified and assessed.

Negative cumulative impacts on archaeological and heritage sites that may result from industrial and mining developments in the area generally include structural damage resulting from blasting or vibrations, pollution (AMD/ acid rain), vandalism and property damage (influx of workers), amongst others. It is important to preserve and raise awareness of the importance of archaeological and heritage conservation, including the conservation and monitoring of graves and historical buildings in the surrounding area.

Cumulative impacts of industrial developments may also be positive. Positive impacts may include contributions towards archaeology and heritage disciplines through research and effective documentation and mitigation of relevant heritage sites in the area. Ultimately, the developer should minimise or avoid all anticipated negative impacts and optimise and promote positive impacts, where possible.

3.9.14 Traffic and Safety Cumulative Impacts

Due to the increasing mining activities in the area the local roads are being affected by coal trucks. This cumulative impact is expected to increase as additional mines open in the area. The R36 and R542 roads are expected to be the most affected from the Spitzkop Greenfields project. Mitigation is difficult. There is an alternative to create a separate haul road, however this has its own negative impacts and is economically unfeasible.

3.9.15 Socio-economic Cumulative Impacts

The development of the remaining coal reserves in the Ermelo coal field will lead to the amplification of the positive as well as negative impact identified for the project. The economic stimulus during the operational phase, in conjunction with current planned and active mining will benefit the communities in the medium term. Negative impacts, like an increase in social ills, are also expected to occur if not managed. The policies towards labour, housing, labour sending areas etc. are of vital importance.

The impact of job losses after the closure may potentially cause a cumulative impact, if combined with other mine closures in the nearby area. The long life of mine for the Consbrey project will lead to an element of stability; however dependence of industries on mining needs to be managed.

4 LAND USE OR DEVELOPMENT ALTERNATIVES, ALTERNATIVE MEANS OF CARRYING OUT THE PROPOSED OPERATION, AND THE CONSEQUENCES OF NOT PROCEEDING WITH THE PROPOSED PROSPECTING OR MINING OPERATION.

4.1 Provide a list of and describe any alternative land uses that exist on the property or on adjacent or non-adjacent properties that may be affected by the proposed prospecting or mining operation.

4.1.1 Land Use and Development Alternatives

There are three main alternatives to the proposed mining operation. The first alternative is to continue to use the land for agriculture, mainly for grazing and fodder production with limited crop production. Grazing occurs in the immediate surroundings and this practice will incur limited disruption by the proposed mining operation which will be predominantly underground workings with surface activity only taking place on a small portion of land.

It must be noted that due to the nature of the proposed operation agricultural activities will be temporarily disrupted on the area to be mined with open pits. Final rehabilitation will aim to return the land to its previous use and capability. Other land not directly required by mining can continue to be used for agriculture.

The second alternative is to use the land for residential purposes. This use would require municipal services and access to water and electricity. Due to the project area being located in a predominantly rural are, it is unlikely that this alternative would occur.

The third land use alternative is tourism (including ecotourism). Tourism is an alternative to the current land use in the region, and includes guest houses and tourism activities in the area. It is however not likely to be an attractive proposition in the immediate vicinity of the proposed Consbrey Colliery; however the provision of accommodation to contract workers etc. (business tourism) into the area is expected to be viable.

The close proximity of the De Wittekrans archaeological complex is a further tourism attraction that could support tourism in the area.

While most of the above activities currently exist in the area, there is potential for additional growth and thus these activities are considered as a feasible alternative to mining. Mining is a temporary land use and it is possible that all of the above options can be pursued in conjunction with mining and after mining has ceased.

4.2 Provide a list of and describe any land development identified by the community or interested and affected parties that are in progress and which may be affected by the proposed prospecting or mining operation.

At this stage there have been no land developments identified by the community or interested and affected parties. However, should any surface during further PPP, it will be included in the documentation.

4.3 Provide a list of and describe any proposals made in the consultation process to adjust the operational plans of the mine to accommodate the needs of the community, landowners and interested and affected parties.

The PPP process has been initiated. During the PPP all recommendations and suggestions made by the community were recorded and will be considered during the EIA phase. The issues and concerns list will continuously be updated. The comments and response report will record anything in this regard.

Please refer to *Section 0* which provides details around stakeholder comments associated with the consultation process.

4.4 Provide information in relation to the consequences of not proceeding with proposed prospecting or mining operation.

The no go alternative entails the maintenance of the status quo. If the proposed mining takes place it will have a number of positive impacts on the immediate surroundings as well as for the country. The bituminous coal will be for export and local markets.

The mining operation will also have an effect on the local population in terms of employment. The project will have a multiplier effect on the local economy through economic empowerment of the communities of Carolina, Hendrina and Breyten.

If the project were not to proceed, the benefits described would not be created. If Xstrata SA were not to proceed with the proposed operation, it will not stop mining according to the MPRDA as another application can be made by another company (ies).

Without the coal mine, the current land use and capability would remain and the coal resource would remain untapped.

4.5 Provide a description of the most appropriate procedure to plan and develop the proposed prospecting or mining operation. The applicant must:

4.5.1 Provide information on its response to the findings of the consultation process and the possible option to adjust the prospecting or mining project proposal to avoid potential impacts identified in the consultation process.

Xstrata SA intends on building and maintaining good relationships with the local communities and their leadership and will always strive to include them in their entire decision making.

During the EIA phase, the potential impacts and management and mitigation as well as recommendations will be proposed in order to prevent environmental and socio-economic potential impacts from occurring. The Scoping Report was made available for public review under Reference Number MP 30/5/1/1/2/10060 MR, between 6 March 2013 and 9 April 2013. A public meeting took place on 26 March 2013. The key issues and concerns raised thus far for potential impacts stem from water quality degradation, increase in dust levels, sustainability as well as the socio-economic environment.

4.5.2 Describe accordingly the most appropriate procedure to plan and develop the proposed prospecting or mining operation with due consideration of the issues raised in the consultation process.

The consultation process is an ongoing process. Through PPP, I&APs are given the opportunity to raise any concerns and comments regarding the proposed project.

Announcement of the proposed project was done on Friday, 1 March 2013. Proof of the formal announcement of the proposed project, which included the distribution of a Background Information Document (BID) accompanied by an announcement letter and registration and comment sheet, was provided to the DMR. This was done by means of email and post to all stakeholders on the database (see Section 5.1*)*.

During the EIA phase, feedback meeting with the I&APs will take place and the CRR will be updated to include responses to issues and comments received the I&Ps. The mitigation and management measures of the potential impacts will be explored and provided in the EMPR document.

5 A DESCRIPTION OF THE PROCESS OF ENGAGEMENT OF IDENTIFIED INTERESTED AND AFFECTED PARTIES, INCLUDING THEIR VIEWS AND CONCERNS.

5.1 Provide a description of the information provided to the community, landowners, and interested and affected parties to inform them in sufficient detail of what the proposed prospecting or mining operations will entail on the land, in order for them to assess what impact the prospecting will have on them or on the use of their land.

A summary of the information provided during the PPP for the EIA process which is also discussed in further detail in this section is shown in Table 5.1-1.

Table 5.1-1: Public Participation Information

Activity	Details	Reference in Scoping Report
	Scoping Phase	
Distribution of proposed project announcement letter and Background Information Document (BID).	BID and announcement letter was emailed and posted to all stakeholders on the database on 1 March 2013.	***Appendix 1*** BID, announcement letter, registration and comment sheet, pamphlets
Placing of newspaper adverts.	Adverts were placed in the Highvelder (Thursday, 7 March 2013, in Afrikaans and English) and Mpumalanga News (Thursday, 7 March 2013, in English) newspapers.	***Annexure 2*** Newspaper adverts
Putting up of site notices.	Site notices were placed at the locations as stipulation for the proposed colliery in the MRA. Additional site notices were also placed at libraries and the municipal offices in Breyten, Ermelo, Kwa-Zanele, Carolina and Chrissiesmeer.	***Annexure 3*** Site notices
Making the Scoping Report available.	Availability of the Scoping Report was communicated by the distribution of the announcement letter and SMS on 1 March 2013 together with the BID and registration and comment sheet. The Scoping Report was made available at the following places for public review: • Ermelo Public Library;	***Annexure 1*** BID, announcement letter, registration and comment sheet, pamphlets

Activity	Details	Reference in Scoping Report
	• Kwa-Zanele Public Library; • Breyten Public Library; • Carolina Public Library; and • Chrissiesmeer Community hall. • www.digbywells.com Public review period of the Scoping Report was from 6 March – 9 April 2013.	

The BID (see Appendix 1) provided more detail on the following:

- Background of the proposed project;
- The project description;
- Locality map;
- Anticipated specialist studies to be conducted;
- Applicable legislative requirements;
- The PPP and associated dates;
- Next steps of the EIA process; and
- Contact details for submission of comments and registration as an I&AP.

The BID was accompanied by an announcement letter, registration and comment sheet and pamphlets (see Appendix 1) which contained the following information:

- Brief background to the proposed project;
- Details about the EIA and PP processes;
- Milestones and associated dates for the EIA and PP process;
- Legislative requirements;
- Details about availability of the Scoping Report;
- Invitation to an Open House meeting;
- Invitation to formally register as an I&AP; and
- Contact details for I&AP registration and submission of comments.

Pamphlets were used to create awareness in the applicable communities which will be distributed via the community leadership structures.

The adverts placed (see Appendix 2) and site notices (see Appendix 3) put up included the following specific information:

- Location of the proposed sites under the MRA;
- Brief project background and description;
- Applicable legislation and competent authority;
- The independent Environmental Assessment Practitioner (EAP);
- Contact details for I&AP registration and submission of comments; and
- Public review date for the Scoping Report.

Various focus group, public and community meetings were held with stakeholders during the Scoping Report public review period (6 March – 9 April 2013). Announcement of the public meetings was sent to all stakeholders on the database via email and post on 1 March 2013. Comments received from stakeholders during these meetings will be included in the CRR with responses being provided by the project team. One-on-one meetings were held with landowners between 2 and 11 April 2013.

At the various stakeholder meetings, BIDs together with registration and comment sheets, were made available. Detailed information was provided about the proposed project in the form of posters, presentations and various maps (locality, land tenure, environmental sensitivity etc) (see appendix A).

5.2 Provide a list of which of the identified communities, landowners, lawful occupiers, and other interested and affected parties were in fact consulted.

Appendix 4 provides a stakeholder database which will be updated throughout the PPP. Detailed stakeholder consultation information will be provided as part of the Draft EMPR which will incorporate all consultation activities conducted during the public review period of the Scoping Report. These consultation activities will be captured in Maximizer 12, an electronic stakeholder information management system and database.

5.3 Provide a list of their views in regard to the existing cultural, socio-economic or biophysical environment, as the case may be.

Please refer to Section 0 which provides details around stakeholder comments associated with the consultation process.

5.4 Provide a list of their views raised on how their existing cultural, socio-economic or biophysical environment potentially will be impacted on by the proposed prospecting or mining operation.

Please refer to Section 4.5.1 which provides details around stakeholder comments associated with the consultation process.

5.5 Provide a list of any other concerns raised by the aforesaid parties.

Please refer to 4.5.1 which provides details around stakeholder comments associated with the consultation process.

5.6 Provide the applicable minutes and records of the consultations.

The minutes and records of consultation have been attached to Appendix 5.

5.7 Provide information with regard to any objections received.

No objections have been received thus far.

6 DESCRIBE THE NATURE AND EXTENT OF FURTHER INVESTIGATIONS REQUIRED IN THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT, INCLUDING ANY SPECIALIST REPORTS THAT MAY BE REQUIRED.

These investigations will result in the compilation of various technical reports and will be included as appendices to the EIA Report. The report will also include an impact assessment using a quantitative impact matrix. Cumulative impact assessment will also be compiled. The EIA/ EMP report will be developed to satisfy the MRPDA guidelines. An in depth PPP will also be conducted so that I&APs are afforded the opportunity to raise any concerns and comments. This will then be addressed in the EIA/ EMP report submitted to the DMR

6.1 Specialist Terms of Reference during EIA Phase

6.1.1 Topography Assessment

Topography is the study of the earth's surface and it includes both natural and man-made features. In order to assess the topography of the area, ArcGIS 3D Analyst Extension will be used. A Digital Elevation Model (DEM) will be created using 5 metre contours, spot heights and trig beacons. The resultant topographical model will be used to create slope and aspect models. The pre-mining and post mining topography will be discussed, and mitigation measures will be provided.

6.1.2 Visual Assessment

A Visual Impact Assessment is a specialist study performed to identify the visual impacts of the proposed project on the surrounding landscape. Visual, scenic and cultural components of the environment can be seen as a resource, much like any other resource, which has a value to individuals, to society and to the economy of the region (Oberholzer, 2005).

The DEM created for the Topography assessment will be used for the Visual assessment. Additional relief data in the form of spot heights and trig beacons are available for the proposed project and surrounding area and will be included in the model. The DEM will be used to visualise the current landscape of the project area and the immediate surrounds. Further impacts which the development may pose on the landscape and topography will be investigated and quantified. The DEM will further be used in various specialist studies including surface water and groundwater assessments of the proposed development.

A viewshed model will be developed utilising the DEM. Infrastructures size, location and height are utilised with the DEM to create a viewshed which determines where within the surrounding landscape the development will be visible.

Once the viewshed has been performed the infrastructures visibility is assessed by the following criteria:

- Visual exposure;
- Visual sensitivity;
- Visual receptors;
- Visual absorption capacity (VAC); and

- Visual intrusion.

The above criteria as well as the proposed impacts are rated and tabulated. Mitigation methods are provided to minimise the impact of the proposed development.

6.1.3 Soil, Land Use and Land Capability Investigation

This specialist study aims to characterise the soils in the study area that are to be affected by the proposed mining and its related infrastructure. It will provide an indication of the existing soil and land capabilities for the survey area and give a characterization of the land capability with in the study area.

A reconnaissance soil survey study of the soils present at the proposed coal mine site is proposed. The soil survey assessment will be conducted during field visits. A more detailed survey approach is needed at open pit and planned infrastructure locations once a detailed mine plan is available. The proposed mine site will be traversed by vehicle and on foot. A hand soil auger will be used to determine the soil type and depth. The soils will be augered to the first restricting layer or 1.5 m depth.

Survey positions will be recorded as waypoints using a handheld GPS. The soil forms (types of soil) found in the landscape will be identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification working group, 1991).

6.1.3.1 Soil Sampling

The topsoil (0 mm - 300 mm) and subsoil (300 mm – 600 mm) of the dominant soil forms will be sampled. Samples will be analysed for soil acidity, fertility and textural indicators as follows:

- pH (water);
- Extractable cations and Na, K, Ca, Mg (Ammonium Acetate);
- Cation exchange capacity;
- Carbon content;
- Phosphorus (Bray1); and
- Soil texture namely sand, silt and clay.

6.1.3.2 Land Use

The extent of land use practices will be surveyed and mapped.

6.1.3.3 Land Capability

Soil properties of soil units mapped during the soil survey will be evaluated and categorized in land capability classes of arable land, grazing, and wilderness land.

6.1.4 Flora and Fauna Survey

A two season survey is required, and will be performed during the months of October to April for the wet season and May to September for the dry season.

6.1.4.1 Vegetation Survey

This phase of the project will only commence once the detailed EIA studies have taken place and areas of concern identified. A floristic site visit will be conducted preferably during the growing season of all species that may potentially occur (this may require more than one seasons survey) with a possible two visits undertaken (± May and ±March). Visits during other seasons will be determined by the flowering and fruiting times of species that do not occur during the summer season. The Braun Blanguet sampling method will be used during vegetation survey. Using the data sampled during the Braun Blanquet surveys the following can be compiled:

- Species list;
- Dominant species;
- Invasive species (if present);
- Exotic species (if present); and
- Rare or endangered species (if present).

6.1.4.2 Animal Survey

Characterization of the faunal environment and habitat, related biota and the extent of site related effects would be conducted. The major goal of the characterization procedure is to determine the current status of the faunal environment and to evaluate the extent of site - related effects in terms of certain ecological indicators, as well as to identify specific important ecological attributes such as rare and endangered species, as well as sensitive species. The following will be recorded during an animal survey:

- Mammals;
- Birds;
- Invertebrates;
- Reptiles; and
- Amphibians.

6.1.5 Air Quality and Dust Monitoring Investigation

The following activities will be carried out to determine the regional climate and to assess the baseline conditions, as well as the local (site-specific) prevailing weather conditions, and its influence on the climatic and atmospheric dispersion and dilution potential of pollutants released into the atmosphere (if available).

- Site-specific meteorological data will be obtained and evaluated to determine local prevailing weather conditions. The PSU/ NCAR mesoscale model (known as MM5) is a limited-area, non-hydrostatic, terrain following sigma co-ordinate model designed to simulate or predict meso-scale atmospheric circulation. MM5 modelled meteorological data set for full three calendar years will be obtained from Lakes Environmental in Canada. This dataset consists of surface data, as well as upper air meteorological data that is required to run the dispersion model. It is required if site specific surface and upper air meteorological data is not available. Site-specific meteorological data will be obtained from the closest South African Weather Service station for comparison and ambient air quality data will be requested from South African Air Quality Information System (SAAQIS) for regulatory purposes.

- Identification of existing sources of emissions and characterisation of ambient air quality within the airshed using available monitoring data (Client to provide any existing ambient monitoring data);
- Review of the current South African legislative and regulatory requirements;
- Detailed literature review of emissions from all activities on site. Where information is not available on emission rates, US EPA AP42 emission factors or Australian NPI emission factors will be used. Other emission sources in the area will also be included in the emission inventory if relevant information can be sourced (Client to assist in the provision of this information);
- Review of potential health effects associated with these activities; and
- Define the potential sensitive receptors, such as local communities, as well as environmental constraints relative to air quality.

6.1.5.1 Emissions Inventory

Digby Wells will develop an air emission inventory taking into account minimum standards/ criteria limits for certain point source emissions.

The operations at an open pit and underground coal mine project are likely to result in a range of emissions including particulate matter being emitted into the atmosphere from the ROM stockpiles, topsoil stockpiles, overburden stockpiles, product stockpiles, crusher, material handling points, as well dust generated by vehicles movement on mine site, which could have an impact in terms of human health and will require detailed assessment.

Compiling a comprehensive emissions inventory for the operational phases of the mine will take into account emissions during routine conditions, including coal handling facilities and vehicle emissions.

6.1.5.2 Dispersion Modelling

Emissions from the mine will be modelled to determine the ambient air quality concentrations. The result of the dispersion modelling will be contour plots (maps) presenting the results of the assessment and comparison of the predicted concentrations will be made with the ambient monitoring data (if available) and with the SA NAAQS standards to determine compliance.

Dispersion models compute ambient concentrations as a function of source configurations, emission strengths and meteorological characteristics, thus providing a useful tool to ascertain the spatial and temporal patterns in the ground level concentrations arising from the emissions of various sources. All emission scenarios would be simulated using the USA Environmental Protection Agency's Preferred/ Recommended Models: AERMOD modelling system (as of December 9, 2006, AERMOD is fully promulgated as a replacement to ISC3 model).

AERMOD modelling system incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

There are two input data processors that are regulatory components of the AERMOD modelling system: AERMET, a meteorological data pre-processor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP, a terrain data pre-processor that incorporates complex terrain using USGS Digital Elevation Data. Other non-regulatory components of this system include: AERSCREEN, a screening version of AERMOD; AERSURFACE, a surface characteristics pre-processor, and BPIPPRIME, a multi-building dimensions program incorporating the GEP technical procedures for PRIME applications.

AERMOD model is capable of providing ground level concentration estimates of various averaging times, for any number of meteorological and emission source configurations (point, area and volume sources for gaseous or particulate emissions), as well dust deposition estimates.

6.1.5.3 Impact Assessment – Analysis and Interpretation

Dispersion simulations of ground level particulate matter and gaseous emissions will be carried out. The anticipated and cumulative impacts of the activities on the ambient air quality of the area will also be identified and discussed. The impact assessment will be undertaken looking at the construction and operations of the proposed developments (based on available measured ambient air quality data if available).

Analysis of dispersion modelling to highlight:

- Predicted zones of maximum ground level impacts (PM and Gases);
- The zone of maximum predicted cumulative ground level;
- Evaluation of potential for human health and environmental impacts;
- Evaluation of predicted air pollutant concentrations will be based on SA ambient NAAQS standards.
- Number of times standards for criteria pollutants will be exceeded; and
- Recommendations of buffer zones and impact management zones.
- Assessment of the cumulative effects of the proposed mine's additive contributions and align information with respect to the Highveld High Priority Area Air Quality Management Plan;
- Mitigation measures incorporating Best Practicable Environmental Option that would prevent, control, abate or mitigate pollution.

6.1.5.4 Dust Fallout Monitoring

In order to determine the background dust situation in the proposed Consbrey Colliery area before any development takes place, a dust monitoring network, comprising at least eight single dust fallout buckets (whole of Consbrey Colliery), should be established by the whole of Mine.

The proposed National Dust Control Regulations state that:

"Any person that conducts an activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dust fall standard set out in regulation 3 of the National Dust Regulations must, within a year after publication of these regulations, submit a dust monitoring report to the air quality officer."

When it comes to the air quality monitoring type and frequency, data on emissions and ambient air quality generated through the monitoring programme should be representative of the emissions discharged by the project over time.

The monitoring of fall-out dust utilising the bucket collection is internationally recognised and documented as an accepted method of determining fall-out dust from various sources.

Single dust bucket samplers will be used to measure the fugitive dust levels which will make it possible to interpret the baseline dust levels at the relevant sensitive receptors around the mining and plant area (Figure 6.1-1). The results could also be used at a later stage to ascertain whether the activities at the mine and processing plant have an effect on the air quality of the area.

Figure 6.1-1: Dust fallout Sampling Unit

The position of the samplers is essential to the interpretation of the results, and needs to take into account the locations of sensitive receptors, historical directional wind data for the area, and topographical features that may affect the wind direction. The locations of the dust buckets will be determined taking into account predominant wind direction and location of sensitive receptors, but can be relocated if needed, according to the standard siting procedures. The buckets should be placed at the relevant receptors and positioned to capture impact of dust to the surrounding environment.

The buckets will be filled with distilled water mixed with a copper sulphate solution (to stop algae growth inside the bucket) and the stations will be left out on site for a period of 12 months. The buckets will be collected and replaced with new ones on a monthly basis and transported to a certified laboratory for analysis.

The results of dust fallout monitoring will be analysed and placed into various graphs and tables that best indicate the dust fallout situation on site and compared with the proposed acceptable rates as per draft national dust control regulations, together with the analysis of available meteorological data. Quarterly reports will be compiled, detailing all findings and will include a full assessment of the results collected during the quarter, along with conclusions and recommendations for future monitoring on site.

6.1.5.5 Air Quality Monitoring Programme

Recommendations will be provided regarding the mitigation and management of the identified impacts in the form of a monitoring programme.

6.1.6 Noise Investigation

The study will assess, via predictive noise modelling, the potential impact of the noise emissions from the proposed coal mining activities on the surrounding environment. The study will include baseline noise measurements and also provide recommendations in terms of the mitigation and monitoring measures.

In order to assess ambient noise levels, baseline noise monitoring will be conducted at various noise sensitive receptors surrounding the proposed mining project.

All measurements will be taken in accordance with the guidelines of the SANS 10103:2008 “The measurement and rating of environmental noise with respect to annoyance and to speech communication”. The measurements will be taken for a 24hr period, taking into account the daytime as well as night time noise characteristics. According to the SANS 10103:2008 guidelines, daytime is between 06:00 and 22:00 and night time is between 22:00 and 06:00. Monitoring should be taken at a measurement of 1.5 m above ground level.

The baseline information will be included in an environmental noise impact assessment report, along with the quantification of the noise sources that will be produced by the proposed mining project. The impacts of the proposed mining project on the ambient noise levels of the area will be assessed by comparing the baseline information with the propagated noise levels from the proposed mining project. The propagated noise levels will be calculated by means of the dispersion modelling software ‘Soundplan’. This model will depict in detail, what the expected noise levels are to be at sensitive receptors, and can predict, per receptor, the intensity of the noise impact. The report will also include recommended mitigation measures as well as recommended action plans.

6.1.7 Wetlands Investigation

The wetland delineation will be based on soil, vegetation and the hydrological components of the wetland system. An integrated wetland specialist study will be conducted to identify and characterise wetland systems associated with the project area. The overall wetland integrity (health), ecological services and importance will be assessed and described. This will be achieved with the implementation of the WET-Management series. Furthermore existing impacts and threats to the wetland systems within the project area will be identified and described. A wetland management plan and a monitoring programme will be formulated for the respective wetland systems.

6.1.7.1 Desktop Wetland Assessment

A desktop wetland assessment will be undertaken using 1:50 000 topographic maps and aerial photographs where preliminary wetland boundaries will be delineated. Each of the identified wetlands will be classified according to their hydrogeomorphic (HGM) determinants based on modification of the system proposed by Brinson (1993), and modified for use by Marneweck and Batchelor (2002) and subsequently revised by Kotze *et al* (2004).

6.1.7.2 On-site Wetland Assessment

The actual site wetland assessment will include an evaluation of the wetlands condition and the associated vegetation structure. This includes the ecological state assessment of the wetlands as well as the general functions provided by the wetlands. The wetland delineation procedure takes into account (according to DWA guidelines for wetland delineations, 2005) the following attributes to determine the limitations of the wetland:

- Terrain Unit Indicator – helps to identify those parts of the landscape where wetlands are more likely to occur;
- Soil Form Indicator – identifies the soil forms, which are associated with prolonged and frequent saturation;
- Soil Wetness Indicator – identifies the morphological “signatures” developed in the soil profile as a result of prolonged and frequent saturation; and
- Vegetation Indicator – identifies hydrophilic vegetation associated with frequently saturated soils.

6.1.8 Aquatic Survey

The River Health Programme is the national monitoring programme used to monitor and assess the freshwater resources within South Africa. In order to determine the ecological integrity of the aquatic environment, individual biophysical attributes of the streams will be assessed. These biophysical attributes refer to the drivers and biological responses of an aquatic ecosystem. The selected drivers and biological responses for this study include:

- The abiotic driver assessment:
  - The assessment of physio - chemical variables of the water; and
  - Invertebrate Habitat Assessment System (IHAS).
- The biotic response indicator assessment:
  - South African Scoring System version 5 (SASS5); and
  - The Average Score Per Taxon (ASPT).

The identified river FEPAs achieve biodiversity targets for river ecosystems and threatened/ near-threatened fish species, and were identified in rivers that are currently in a good condition (WRC, 2011). These selected FEPAS should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources.

River FEPAs make reference to the entire sub-quaternary catchment, although FEPA status applies to the actual river reach within such a sub-quaternary catchment. The surrounding land and smaller stream network need to be managed in a way that maintains the good condition of the river reach (WRC, 2011). Recommendations have been proposed in light of the associated FEPAs for the respective mining operation and land uses.

6.1.8.1 Biomonitoring

The biomonitoring programme will include a low flow and high flow survey. The low flow assessment will be conducted between July/ August 2013, with the high flow assessment being conducted between November/ December 2013. A memorandum will be submitted to the client after the low flow survey describing initial findings and project components. The final consolidated biomonitoring report will be submitted during December 2013.

6.1.9 Surface Water Investigation

A desktop assessment will be conducted to achieve the following objectives:

- Catchment description including the water users downstream of the site and the land use (and water use) practices in the area around the site;
- Surface water environment characterization using available information such as Water Research Commission (WRC) Reports and Geographical information Systems (GIS) to determine the regional and local drainage network;
- Selection of water quality sampling location (6 water samples to be collected) up and downstream of the site to determine the baseline of the surface water environment pre-mining. The baseline will be used to evaluate the impacts that arise from the project on the downstream surface water resources and water users; and
- Hydrological assessment will be conducted to determine the base flow, 1:50 and 1: 100 year flood volumes.

The site visit will be conducted to confirm the site characterization and to collect surface water quality samples. The collected samples will be submitted to a South African National Accreditation Systems (SANAS) accredited laboratory for physical and chemical analysis.

The report compilation process will detail the following:

- Site characterization, catchment and water use description;
- Hydrology report on the base flow, 1:50 and 1:100 peak flow flood volumes;
- Water quality baseline status of the laboratory data benchmarked against the South African National Standard (SANS) 241 for drinking water or Resource Water Quality Objectives set out by the Department of Water Affairs (DWA) if available;
- Impact assessment of the impacts that could arise from the proposed project description and weighting of the significance of the impacts (using a Digby Wells developed methodology);
- Recommendation of mitigation measures to minimise or reduce the significance of the impacts on the surface water quantity and quality;

- Development of a surface water management plan indicating where possible the placement of water conveyances and containment facilities guided by the DWA Best practise guidelines; and
- Development of a surface water quality monitoring programme indicating areas to be monitored, frequency of monitoring, database management and reporting.

6.1.10 Groundwater Investigation

The report will include all data, information and findings, recommendations and a full risk assessment derived from the transient simulations for life of project and post closure, as well as a groundwater monitoring protocol.

6.1.10.1 Hydrocensus:

A hydrocensus of the study area will be overseen by Digby Wells. During the hydrocensus important data pertaining to the current groundwater conditions and use will be collected. This will include localities of current groundwater abstraction points (boreholes, hand dug wells or springs), ownership, current usage volumes and types, equipment and groundwater levels. Hydrochemical samples will also be taken from selected boreholes. The data collected will serve as a reference point against historical and future groundwater conditions in the area.

The area covered will span a suitable radius from the proposed mining area and will take into account the sub-catchment boundaries in which mining and processing activities takes place.

6.1.10.2 Detailed Baseline Study

This phase comprises detailed investigations to a definitive level to enable accurate project planning and to comply with regulatory requirements. All the previous work conducted is culminated into a decision tool used to plan the intrusive stage where more accurate characterisation of the hydrogeological system is conducted to outline and define the aquifer system/s in the area.

6.1.10.3 Geophysics

A ground geophysical survey is necessary to complete the study to delineate weathered zones and identify possible linear structures that could act as preferred groundwater flow paths. Digby Wells proposes to apply the magnetic and electromagnetic (EM34 - 3) geophysical techniques. This should not exceed three days field surveying. Interpretation and processing will then be conducted to finalise the drilling targets necessary for the study.

6.1.10.4 Drilling

The drilling programme will be performed using the rotary air percussion method with initial drilling performed at a diameter of 165mm inner diameter (ID) and reamed or enlarged if high yielding boreholes are intercepted. The depth for characterisation boreholes will not exceed 60m. The method of construction for the characterization boreholes is based on previous experience of drilling in similar lithologies to similar depths

6.1.10.5 Aquifer Testing

It is imperative that the most strategic and successful boreholes drilled during this investigation be aquifer tested to determine responses and to calculate the parameters presenting the aquifer hydro dynamics underlying the investigation area. All boreholes will be calibration tested prior to conducting the constant discharge tests.

6.1.10.6 Chemical Analyses

Water quality samples will be collected following each aquifer test for chemical analysis and will be sent to a SANAS accredited laboratory.

6.1.10.7 Conceptual Model

This is a vital step in the process, and the development of a good conceptual model will ensure reasonable results. The conceptual model aims to describe the groundwater environment in terms of the following:

The groundwater system:

- Aquifers - these are rock units or open faults and fractures within rock units that are sufficiently permeable (effectively porous) to allow water flow;
- Interconnections between aquifers;
- Boundaries that result in the change or interruption of groundwater flow; and
- Hydrostratigraphic units - these are formations, parts of formations, or a group of formations displaying similar hydrologic characteristics that allow for a grouping into aquifers and associated confining layers.

The groundwater flow system;

- Precipitation, evapotranspiration;
- Runoff, groundwater head data which yields groundwater flow;
- Hydraulic parameters;
- Recharge and discharge areas, exchange of groundwater and surface water; and
- Geochemical data.

6.1.10.8 Numerical Modelling

The conceptual hydrogeological model will be encoded into a numerical model. It is proposed to utilise MODFLOW as modelling code and PM - WIN 8 will be used as data pre and post processor. This will allow future upgrading of the numerical model as MODFLOW is the most widely used modelling code.

A numerical model must be viewed as an asset that is maintained over the life of the project and upgraded as required.

The model domain will extend to the closest groundwater boundaries not expected to be impacted by construction. These could be groundwater divides (the same as surface water in the absence of dewatering) or groundwater controls.

The model will be calibrated to the latest water levels (steady state), as well as historic water level monitoring (transient). Once calibrated the model will be utilised to run the required scenario's to determine the likely impacts from the mine or later seepage; impacts from the open pit mining, as well as water resources well fields of the project. The scenario modelling will cover all current and future project plans as well as a period over the next 50 years.

6.1.10.9 Hydrogeological Monitoring

Continued monitoring of the boreholes in the area will be recommended following the intrusive phase. This will involve the quarterly sampling of the boreholes

6.1.10.10 Reporting

A comprehensive report, including all relevant EIA/ EMP sections, will be compiled detailing:

- Findings and results of the field investigation, including current water use, aquifer and geology characterisation and groundwater quality;
- Update on the hydrogeological conceptual model (regional hydrology and hydrogeology of the area);
- Results of the numerical modelling process, including expected groundwater inflow volumes, drawdown cones, contaminant migration, and interaction between mine receiving environment;
- Impact assessment, including the cumulative impacts on the region by the proposed project;
- Discussion on best management practises, advantages and mitigation measures; and
- Proposed monitoring programme.

6.1.11 Heritage Resources Management

As part of the EIA, a Heritage Statement is required as part of the Scoping Process. Once the Heritage Statement has been compiled; the relevant heritage authority will be notified with a Notice of Intent to Develop (NID) which will be informed by the Heritage Statement.

The Heritage Impact Assessment process can be divided into four stages, namely:

- NID;
- Phase 1 Heritage Impact Assessment;
- Phase 2 Heritage Impact Assessment; and
- Phase 3 Heritage Site Management Plans

Each stage above can – and should – be implemented within certain stages of the EIA process. For instance, the first stage, Notification, should be undertaken and completed at the earliest moment possible and coincide with general public announcement of the project. The second stage, Phase 1 HIA should be undertaken during the specialist assessment stage of the EIA phase and included in the EMPR. Findings and recommendations that result from the Phase 1 HIA must be included in the EMP phase, as implementable activities. In addition, should certain heritage resources be considered highly valuable or significant, Phase 3 Heritage Site Management Plans may need to be compiled, submitted to SAHRA for comment and acceptance, and included in the EMP phase.

6.1.12 Social Investigation

A social impact assessment (SIA) will be conducted during the impact assessment phase of the EIA. The objectives of the SIA will be as follows:

- To describe the baseline socio- economic conditions of the project-affected area;
- To identify and assess the likely social impacts of the proposed project; and
- To design appropriate mitigation measures to reduce and, where possible, avoid negative impacts, as well as to enhance positive impacts.

These objectives will be met by employing the following methodology:

- Conducting a reconnaissance site visit in order to gain an understanding of the socio-economic conditions surrounding the proposed project site, as well as an indication of the density and number of human settlements in the vicinity of the proposed project;
- During the site visit, collecting primary data from key informants by means of interviews and/ or focus group discussions. Key informants could include directly and indirectly affected community members, land owners, land occupants, local authorities and if relevant, traditional leaders.
- Based on primary information collected, compiling a baseline socio-economic profile of the project-affected area, including a spatially-referenced exposition of the site-specific area. The baseline profile will consider, inter alia, the demographics of the project-affected populations, educational levels, employment and income statistics, the availability of basic and social services, as well as common land uses and prominent economic sectors and activities.
- On the basis of the baseline socio-economic profile, identifying, describing and assessing potential social impacts that may arise as a result of the proposed project.
- Developing feasible and cost-effective mitigation/ enhancement measures in order to reduce the severity of negative impacts and enhance the positive ones.

6.1.13 Closure Costing

Rehabilitation is the process used to repair the impacts of mining on the environment.

In order to set objectives and manage and rehabilitate the mine to obtain a closure certificate at the end of the decommissioning phase of the mine, a closure guideline will be compiled (Closure Costing Guideline Document) taking legislation and regulations into consideration.

The closure cost assessment involves the quantification of mining and infrastructure components and applying rates to rehabilitate each component. One of the aims of the closure cost assessment is to determine the cost to rehabilitate the mine as it stands at present, in order to achieve a “lights-out” or a “snapshot” scenario.

The environmental liability will be described in monetary terms in order for a financial provision to be set-aside in a dedicated fund for closure rehabilitation purposes for the lights out scenario.

B. IDENTIFICATION OF REPORT

The report on the results of consultation must, at the end of the report include a certificate of identification as follows:

Herewith I, the person whose name and identity number is stated below, confirm that I am the person authorised to act as representative of the applicant in terms of the resolution submitted with the application, and confirm that the above reports comprises the result of consultation as contemplated in Section16 (4) (b) or 27 (5) (b) of the act, as the case may be.	
Full name and surname	Thomas Andrew Marshall
Identity number	5412315004087

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Appendix A: PPP