DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR THE PROPOSED

XSTRATA AMERSFOORT UNDERGROUND COAL MINE

Prepared for:

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Submitted to:

Mpumalanga Department of
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S · E · F
STRATEGIC ENVIRONMENTAL FOCUS

JUNE 2013

MDEDET REF NO: 17/2/3 GS 142
DMR REF NO: MP 30/5/1/2/2/10052 MR
SEF Project Code: 502296

PURPOSE OF DOCUMENT

A period of 40 calendar days **(Monday, 24 June 2013 – Monday, 5 August 2013)** has been provided for the review and commenting phase of the Draft Environmental Impact Assessment Report (DEIR). All registered Interested and Affected Parties (I&APs) as well as State Departments have been notified of this review period.

The Draft EIR contains the following information:

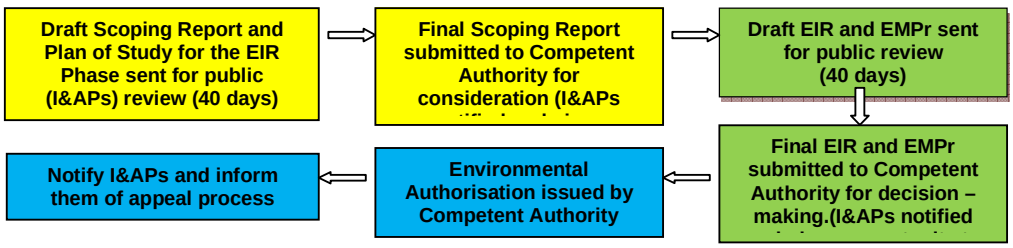
- A description of the project, including project motivation;
- A description of the environment affected by the project;
- An outline of the public participation process;
- Discussion of applicable alternatives;
- Assessment of impacts for the construction and operational phases; and
- The EAP's recommendations.

The Draft EIR can be viewed at the following venues:

Name of public venue	Name of Contact Person	Contact Number(s)	Viewing Times
Amersfoort Public Library	Ms Zanele Ngobese	(017) 753 1006	8:00 – 16:30 (Weekdays)
Volksrust Public Library	Ms Helen Verviers	(017) 734 6100	8:00 – 16:30 (Weekdays)

Should you wish to participate in the EIR process by contributing issues of concerns/comments, please register as an I&AP by completing the enclosed Registration and Comment Sheet or you can visit SEF's website at http://www.sefsa.co.za. To register as an I&AP or comment on the project, click on "Stakeholder Engagement". Select your own username and password and click on the "register" button and complete the compulsory fields to register. Once registered, click on the stakeholder engagement tab, login using your username and password and you may then view the Draft Environmental Impact Report for the proposed **502296 Xstrata Amersfoort Underground Coal Mine** and associated appendices. Should you have any problems in obtaining the information from the Internet, please feel free to contact SEF for assistance.

Following the commenting period, the EIR will be updated and submitted to the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET) for consideration. The flow diagram below highlights the phases in the project where I&APs have the opportunity to participate within the process.



PROJECT SUMMARY	
Project Name	Xstrata Amersfoort Underground Coal Mine
Preferred Site	VERMAAKSKRAAL 532 IS ROLFONTEIN 536 IS DRIEFONTEIN 2 HT KROMHOEK 371 IT SCHULPSPRUIT 60 HS SCHULPSPRUIT 60 HS SCHURVEPOORT 63 HS OUHOUTKRAAL 62 HS
Surveyor-General 21 Digit Codes	T0IS00000000053200000 T0IS00000000053600000 T0HT00000000000200000 T0IT00000000037100000 T0HS00000000006000000 T0HS00000000006100000 T0HS00000000006300000 T0HS00000000006200000
Development Footprint	Approximately 4000 ha (excluding associated infrastructure)
Significant Developments / Infrastructure Height	Rock dump: Approx. 20 meters Vertical shaft: Approx. 15 – 20 meters Incline shaft: Approx. 10 – 12 meters Coal processing plant: Approx. 10 - 12 meters Offices: Approx. 5 – 6 meters
Lay Down Area Dimensions	To be addressed within the Environmental Impact Report
Site Photographs	Refer to Appendix 2
Supply Option (to be confirmed):	
Potable water (Construction & Operational Phases)	Construction Phase = To be supplied by contractor Operational Phase = Approximately 372 kl/day Supplier: Zaaihoek Water Supply Scheme
Service Water (Construction & Operational Phases)	Construction Phase = To be supplied by contractor Operational Phase = Approximately 2249kl/day Zaaihoek Water Supply Scheme
Sewage (Construction & Operational Phases)	Construction Phase = Chemical units to be supplied by contractor Operational Phase = Approximately 450kl/day Supplier: Packaged Treatment Plant
Electricity (Construction & Operational Phases)	Construction Phase = To be supplied by contractor Operational Phase = Quantity to be confirmed (MW per month) Supplier: ESKOM
Solid Waste (Construction & Operational Phases)	Construction Phase = Contractor to manage and remove from site Operational Phase = Local Municipality to remove Receiver: Pixley Ka Seme Municipal Landfill Site

ENVIRONMENTAL ASSESSMENT PRACTITIONER

Strategic Environmental Focus (Pty) Ltd (SEF) is a privately owned company and was formed in 1997 with the objective of providing **expert solutions to pressing environmental issues. SEF is one of Africa's largest multi-disciplinary consultancies**, offering innovative sustainable environmental solutions to private and public sector clients. With our integrated services approach in the management of natural, built and social environments, and with over a decade of experience, we bring a wealth of knowledge and expertise to each project.

SEF's Mission

SEF is a national sustainability consultancy which provides integrated and innovative Social, Biophysical & Economic solutions while fostering strategic stakeholder relationships, underpinned by SEF's core values.

SEF's Vision

SEF offers holistic and innovative sustainable solutions in response to global challenges.

SEF has assembled a team of professionals, consisting of a core of environmental experts with extensive experience in dealing with Environmental Impact Assessments (EIAs), Public Participation Processes, Architectural and Landscape Architecture, Mining and Environmental Management. SEF also has a team of specialist practitioners such as specialists in Heritage Impact Assessments (HIA), Wetland Delineation and Functional Assessments; Wetland/ Riparian Rehabilitation, Aquatic Assessments; Ecological (Fauna, Avifauna and Flora) Assessment, Visual Impact Assessments (VIAs), Soils and Agricultural Potential Assessments, Socio-Economic Assessments, etc.

SEF is a Qualifying Small Enterprise and a **Level 3 contributor in terms of the Broad Based Black Economic Empowerment** Act, 2003 (Act No. 53 of 2003) and has a procurement recognition level of 110%.

SEF commits itself to comply with the requirements and the implementation of a Quality Management System. The Quality Management System will be reviewed and implemented to continually improve efficiency and effectiveness of the organisation.

SEF uses a "green" approach to anything we embark on. We believe in using technology to our and the environment's best advantage. We encourage the use of green alternatives such as telephone and video conferencing instead of travelling for workshops and meetings and CDs instead of printed material, where possible.

The following project team members are involved in this S&EIR application process.

Table 1: Project Team Members

Name	Organization	Project Role
Mr Dave Rudolph	SEF	Project Director
Mr Craig Allen	SEF	Project Manager
Ms Hanlie van Greunen	SEF	Environmental Manager
Ms Poogendri Reddy	SEF	Public Participation/ Environmental Assistant
Ms Karin van der Walt	SEF	Terrestrial Ecologist
Mr Byron Grant	SEF	Senior Natural Scientist/ Aquatic Ecologist
Ms Mamoluoane Seliane	SEF	Heritage Specialist
Ms Robyn Phillips	SEF	Terrestrial Ecologist

Mr Riaan van der Merwe/ Ms Sinethemba Mchunu	SEF	Soil Scientist
Mr Willem Lubbe	SEF	Wetland Specialist
Mr Pieter Labuschagne	GCS	Senior Geohydrologist
Mr Stuart Dunsmore	Fourth Element	Senior Hydrologist
Mr Billy van Rooyen	SEF	Visual Impact Assessor
Mr Isaiah Sibanda	SEF	Air Quality Specialist
Ms Kelly Alexander	SEF	Social Scientist

Mr Dave Rudolph

Dave Rudolph has 20 years of experience in the field of environmental management and resource planning. The experience relates to large scale spatial planning and assessment initiatives at a National, Provincial and Local level. He has managed numerous large scale Environmental Assessments both nationally and internationally.

Mr Craig Allen

Craig has been an Environmental Assessment Practitioner (EAP) for 6 years during which he has managed projects ranging in size and scope from small BAs to large-scale mining related EIAs throughout Southern Africa. Craig has excellent working knowledge of the NEMA and MPRDA Regulations and is the Executive Director of Mining & Environment for SEF. As such he provides technical supervision for projects, project leadership on large-scale environmental assessments and quality assurance on EIAs, EMPs, EMPRs and Basic Assessments (BAs).

Ms Hanlie van Greunen

Hanlie has 8 years of professional experience as a Landscape Technician and holds a BSc LArch degree. She also completed a BSc Hons in Environmental Monitoring and Modelling in 2010. Hanlie spent 5 years in the UK working as a Landscape Architect at a charitable environmental regeneration organisation where she gained skills in community consultation along with the design and implementation of community led landscape projects. Hanlie also has 3 years experience in the compilation of Basic Assessments and Scoping and EIA's in terms of NEMA as well as compliance monitoring of waste streams and the handling and storage of hazardous chemicals in terms of the MPRDA.

Ms Poogendri Reddy

Poogendri has obtained a BSc Honours in Zoology from Rhodes University. She is currently registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions. She has worked for the South African Institute for Aquatic Biodiversity undertaking research in freshwater and marine ichthyology and has worked on numerous local and international research projects in the fields of molecular systematics and estuarine ecology. She has recently joined SEF as an environmental assistant and public participation practitioner.

Table 2: Contact Details of Environmental Assessment Practitioner

Name	Contact Details
Mr Craig Allen	Strategic Environmental Focus (Pty) Ltd Postal Address: PO Box 74785, Lynnwood Ridge, PRETORIA, 0040 Tel: +27 12 349 1307 Fax: +27 12 349 1229 Email: craig@sefsa.co.za

EXECUTIVE SUMMARY

1 INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF) has been appointed by Xstrata Coal South Africa (Pty) Ltd to undertake an environmental application process for the proposed Xstrata Amersfoort Underground Coal Mine.

A Scoping and Environmental Impact Reporting (S&EIR) process is being conducted for this project based on triggered listed activities within the Environmental Impact Assessment (EIA) Regulations of 2010 (Government Notice (GN) No's 543; 544; 545 and 546) promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as well as the Minerals and Petroleum Resources Development Act (Act No. 28 of 2002).

The Scoping Phase for the proposed project has been completed and the Final Scoping Report (FSR), including the Plan of Study for the EIR, was submitted to the **Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET)** on the 16th April 2013. MDEDET approved the FSR on 14 May 2013.

The purpose of this Draft Environmental Impact Report is to provide all interested and affected parties (I&APs) and relevant State Departments with an opportunity to comment and provide input into the process going forward. All comments received during the review and commenting phase will be incorporated into the Final Environmental Impact Report for consideration by the approving authority, MDEDET.

2 BRIEF PROJECT DESCRIPTION

The proposed Xstrata Amersfoort Underground Coal Mine study area will extend from the town of Amersfoort in the Gert Sibande District Municipality, Mpumalanga Province, to the farm of Ouhoutkraal 62 HS in the south west. The Skulpspruit runs along the western boundary of the study area and the Wielspruit runs through the centre of the study area in a north-south direction. Please refer to Appendix 1 for the locality plan of the proposed Amersfoort Underground Coal Mine study area.

The area for which Xstrata South Africa (Pty) Ltd was granted a Prospecting Right by the DMR in 2007, covers a total area of approximately 4557 hectares (ha), this being referred to as the study area. Within this study area, the mine surface infrastructure will have a footprint of approximately 117 ha (including linear infrastructure).

The coal seam, which is between 1.5m and 3m thick, contains a resource of 84 Mt of coal in-situ within the project area. 47 Mt of Run of Mine (RoM) coal is planned to be extracted at a rate of up to 5 Million tonne per annum (Mtpa). Please refer to Appendix 3 for a plan of the proposed Amersfoort Underground Coal Mine surface infrastructure.

3 KEY IMPACTS

The following key impacts were initially identified and, amongst others, will be carried forward into the EIR phase for further investigation and assessment.

Biophysical Impacts:

- Potential impacts on soil and surface water resources that occur in close proximity to the proposed surface infrastructure **(during the construction, operational and decommissioning phases)**;
- Potential impacts on wetlands **(during the construction, operational and decommissioning phases)**;
- Potential impacts on groundwater as a result of underground mining **(during the construction,**

operational and decommissioning phases);
- Destruction of flora within the proposed area, stemming from activities such as vegetation clearance and topsoil stripping **(mainly during the construction phase)**; and
- Faunal displacement and/or destruction **(mainly during the construction phase)**.

Socio-Economic Impacts:
- Increased dust and noise generation as a result of the mining activities **(during the construction, operational and decommissioning phases)**;
- Change in the visual character of the area **(during the construction, operational and decommissioning phases)**;
- Potential impacts on existing cultural and heritage resources **(mainly during the construction phase)**; and
- Job creation during the construction and operational phases of the proposed project **(during the construction, operational and decommissioning phases)**.

Cumulative Impacts:
- Increased loss of viable and high potential agricultural/ grazing land; and
- Increased visual impacts associated with change of landscape character.

4 PROJECT ALTERNATIVES

To give effect to the principles of NEMA and Integrated Environmental Management (IEM), an EIA should assess a number of reasonable and feasible alternatives that may achieve the same end result as that of the preferred project alternative. Three alternatives have been identified in the Scoping phase and the following two alternatives are being assessed further in the EIR phase (Conveyor Route 2 has been omitted from the EIR phase):

Alternative 1: Site Location and Conveyor Route 1 (Preferred)

The Applicant holds the prospecting rights for the mine study area as outlined on the locality plan in Appendix 1. Prior to the commencement of the environmental process, the Applicant undertook a feasibility assessment to identify the best location for the mine plant. The proposed area (as outlined on the layout plan in Appendix 3) was selected based on the topography and the depth of the coal seam, which is relatively shallow compared to other areas within the mine study area. No other site location alternatives for the surface infrastructure have been considered to be viable, however the infrastructure layout will be further assessed during the impact assessment phase and any changes will be reflected as such

The proposed Conveyor Route 1 will transport coal from the mine along a 20.5km Greenfield section and then to the old Majuba colliery. Export coal would use the same conveyor and will then be conveyed to a rail loading silo suitably situated in the vicinity of the Majuba Power Station tipplers. From here the coal will be dispatched to Ermelo to link up with the Richards Bay Coal Terminal (RBCT) line.

Alternative 2: No Development Alternative:

This option assumes that a conservative approach would ensure that the environment is not impacted upon as is currently the case. It is important to state that this assessment is informed by the current condition of the area. Should the MDEDET and/ or DMR decline the application, the 'No-Go' option will be followed and the status quo of the site will remain.

5 CONCLUSIONS AND RECOMMENDATIONS

In accordance with GN No. 543, the Environmental Impact Phase is aimed at identifying and assessing potential impacts caused by the proposed development. The ability to mitigate any of the identified impacts are also addressed and summarised into a working / dynamic Environmental Management Programme (EMP) for consideration by I&APs and ultimately by the MDEDET.

Comments and/or concerns identified by Interested and Affected Parties (I&APs) during the review period of the Draft Environmental Impact Report will be incorporated into the Final Environmental Impact Report which will then be submitted to the MDEDET for consideration.

Having assessed all the potential environmental impacts associated with the proposed development it is the opinion of the EAP that the proposed Xstrata Amersfoort Underground Coal Mine is issued with a positive Environmental Authorisation from MDEDET for the following reasons:

- The proposed mine will promote economic growth and mineral and petroleum resources in the Republic which is in line with Section 2(e) of the MPRDA;
- The proposed development will also contribute to local economic development and provide various employment opportunities to the people residing in the area; and
- Although a number of potential negative biophysical and social impacts where identified, with appropriate and recommended mitigation, there are no fatal flaws that should prevent the development from proceeding.

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LIST OF ABBREVIATIONS AND ACRONYMS

DMR	Department of Mineral Resources
DWA	Department of Water Affairs
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIR	Environmental Impact Reporting
EMPr	Environmental Management Programme
GN	Government Notice
ha	Hectares
I&APs	Interested and Affected Parties
IEM	Integrated Environmental Management
IRP	Integrated Resource Plan
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
ME	Mitigation Efficiency
MPRDA	Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MW	Mega Watt
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
RBCT	Richards Bay Coal Terminal
SAHRA	South African Heritage Resources Agency
SEF	Strategic Environmental Focus (Pty) Ltd
SFM	Significance Following Mitigation
S&EIR	Scoping and Environmental Impact Reporting

WOM	Without Mitigation Measures
WM	With Mitigation Measures

GLOSSARY OF TERMS

Applicant	Any person who applies for an authorisation to undertake an activity or to cause such activity to be undertaken as contemplated in sections 24(5), 24M and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).
Ecology	The study of the interrelationships between organisms and their environments.
Environment	The surroundings within which humans exist and that are made up of – (i) the land, water and atmosphere of the earth; (ii) micro-organisms, plant and animal life; (iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and (iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Environmental Impact Assessment	Systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and S&EIR.
Environmental Management Programme	A working document on environmental and socio-economic mitigation measures, which must be implemented by several responsible parties during all the phases of the proposed project.
Interested and Affected Party	Any person or groups of persons who may express interest in a project or be affected by the project, positively or negatively.
Key Stakeholder	Any person who acts as a spokesperson for his/ her constituency and/ or community/ organisation, has specialised knowledge about the project and/ or area, is directly or indirectly affected by the project or who considers himself/ herself a key stakeholder.
Stakeholder	Any person or group of persons whose live(s) may be affected by a project.
Study Area	Refers to the entire study area encompassing all the alternatives as indicated on the study area or locality map.
Succession	The natural restoration process of vegetation after disturbance.
State Department	Any department or administration in the national or provincial sphere of government exercising functions that involve the management of the environment.

SECTION A: INTRODUCTION

Strategic Environmental Focus (Pty) Ltd (SEF) has been appointed by Xstrata Coal South Africa (Pty) Ltd to undertake an environmental application process for the proposed Xstrata Amersfoort Underground Coal Mine situated east of the town of Amersfoort within the Gert Sibande District Municipality in the Mpumalanga Province.

Please refer to details of the Applicant: Mr Stefan Venter, on behalf of Xstrata Coal South Africa (Pty) Ltd. below:

Name of Applicant	Postal Address	Relevant Numbers
Mr Stefan Venter on behalf of Xstrata Coal South Africa (Pty) Ltd.	1st Floor, Nedbank Building, Melrose Arch, Johannesburg	Tel: 011 772 0603 Fax: 011 772 0697 E-mail: sventer@xstratacoal.co.za

A-1 DESCRIPTION OF PROPOSED ACTIVITY

A-1.1 Locality

The proposed Xstrata Amersfoort Underground Coal Mine study area will extend from the town of Amersfoort in the Gert Sibande District of Mpumalanga Province, to the farm of Ouhoutkraal 62 HS in the south west. The Skulpspruit River runs along the western boundary of the study area and the Wielspruit River runs through the centre of the study area in a north-south direction. Please refer to figure 1 for the locality map of the proposed Amersfoort Underground Coal Mine study area. (A3 size locality map attached in Appendix 1).

The proposed mine study area is approximately 4557 hectares in extent while the mine surface infrastructure will have a footprint of 117 hectares (including associated linear infrastructure).

The site can be accessed via gravel roads from the N11 and R35. The central co-ordinates of the Mine study area are: 27º 0.969' S and 29º 57.241' E. Two Eskom powerlines traverse the mine study area.

A-1.2 Surrounding Land Use

To further place the site in context, the land uses within all four major compass directions are described in the table below:

Direction	Land Use	Distance (m)
North	Vacant Land	Adjacent to the mine study area
	Agriculture/ Farming	Adjacent to the mine study area
East	Vacant Land	Adjacent to the mine study area
	Agriculture/ Farming	Adjacent to the mine study area
South	Vacant Land	Adjacent to the mine study area
	Agriculture/ Farming	Adjacent to the mine study area
West	Agriculture/ Farming	Adjacent to the mine study area
	Town of Amersfoort (approx. 1 km away)	Adjacent to the mine study area
	Vacant Land	Adjacent to the mine study area

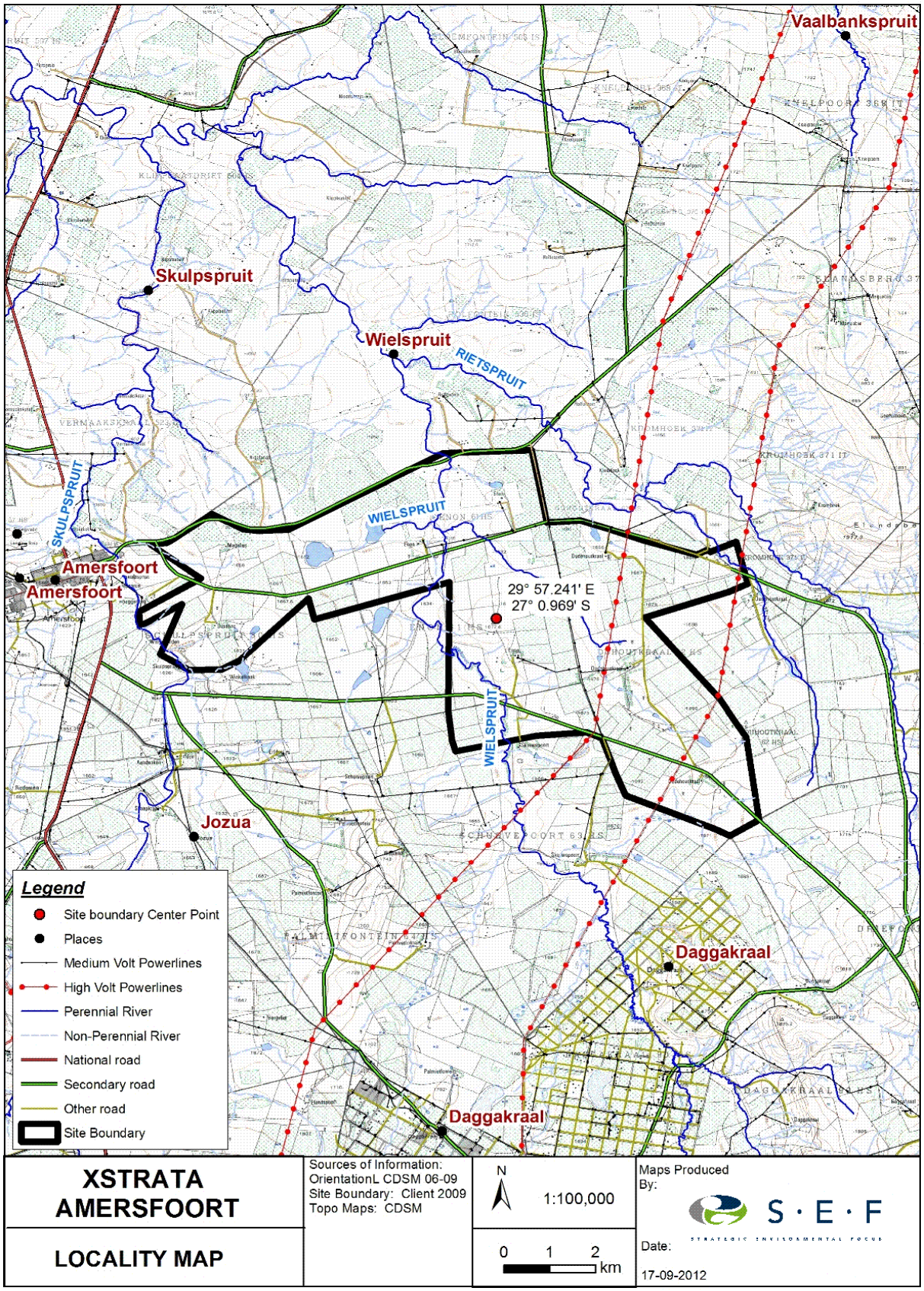

Figure 1: Xstrata Amersfoort Underground Coal Mine Study Area

A-1.3 The Mineral Resource

The Amersfoort resource is located within the southern portion of the Ermelo coalfield in the Mpumalanga province of South Africa. The Ermelo coalfield has a recorded occurrence of six coal seams (A, B, C, D, E & F) which vary in thickness, continuity and extent (Refer to Table 3). The C seam is the only economically minable seam.

The A Seam is thin and ranges in thickness from 0.10 to 0.91 m with an average thickness of 0.39m, while the average depth to roof is 142.60m. It is mainly developed in the high lying areas and possibly affected by the weathering. The seam thickness (0.39m on average) is too thin to be of economic importance.

At Amersfoort the B seam occurs at an average depth of 190.43m, with an average thickness of 0.70 m. The seam's average thickness indicates it to be very thin to be of any economic importance.

The average depth to the roof of the C seam at Amersfoort is 198.16m, with an average thickness of 1.95 m. This is the only well-developed seam in the study area and the only one that was sampled. The C Seam group has a wide distribution over the area with its overall extent being limited by the present erosion surface. The C Seam group is normally composed of two plies, comprising an upper CU and a lower CL member. A parting of variable composition and thickness separates the two units. The CL Seam is usually thin, while the thicker CU Seam may locally split into two separate units. In Seam partings, especially within the lower portion of the CU, are common. At Amersfoort the parting between the upper CU and a lower CL member is very thin or absent. The mineable horizon comprises the entire C seam.

The D seam is present in most of the area and is relatively thin (0.37m on average). The D Seam can have up to four members in some areas but normally consists of two members separated by a shale parting. It is invariably thin and is not of economic significance.

The E Seam is also relatively thin with its thickness ranging from 0.01 to 0.73m with an average thickness of 0.34m, while the average depth to the roof is 255.01m.

The F Seam thickness ranges from 0.12 to 0.64m with an average thickness of 0.32m and can be classified as the thinnest seam in the area. The average depth to the roof is 226.50m.

It is estimated that the Main Seam contains a resource of 84 Mt of in-situ coal within the mine study area. 47Mt of Run of Mine (RoM) coal is planned to be extracted at a rate of up to 5 million tonne per annum (Mtpa). Refer to Figure 2 for a typical borehole section – showing the thickness and depth of the coal resource at Amresfoort.

Table 3: Seam thickness summary

Seam ID	Average Depth to Seam Roof (m)	Average Seam Thickness (m)
A	142.60	0.39
B	190.43	0.70
C	198.16	1.95
D	213.95	0.37
E	225.01	0.34
F	226.50	0.32

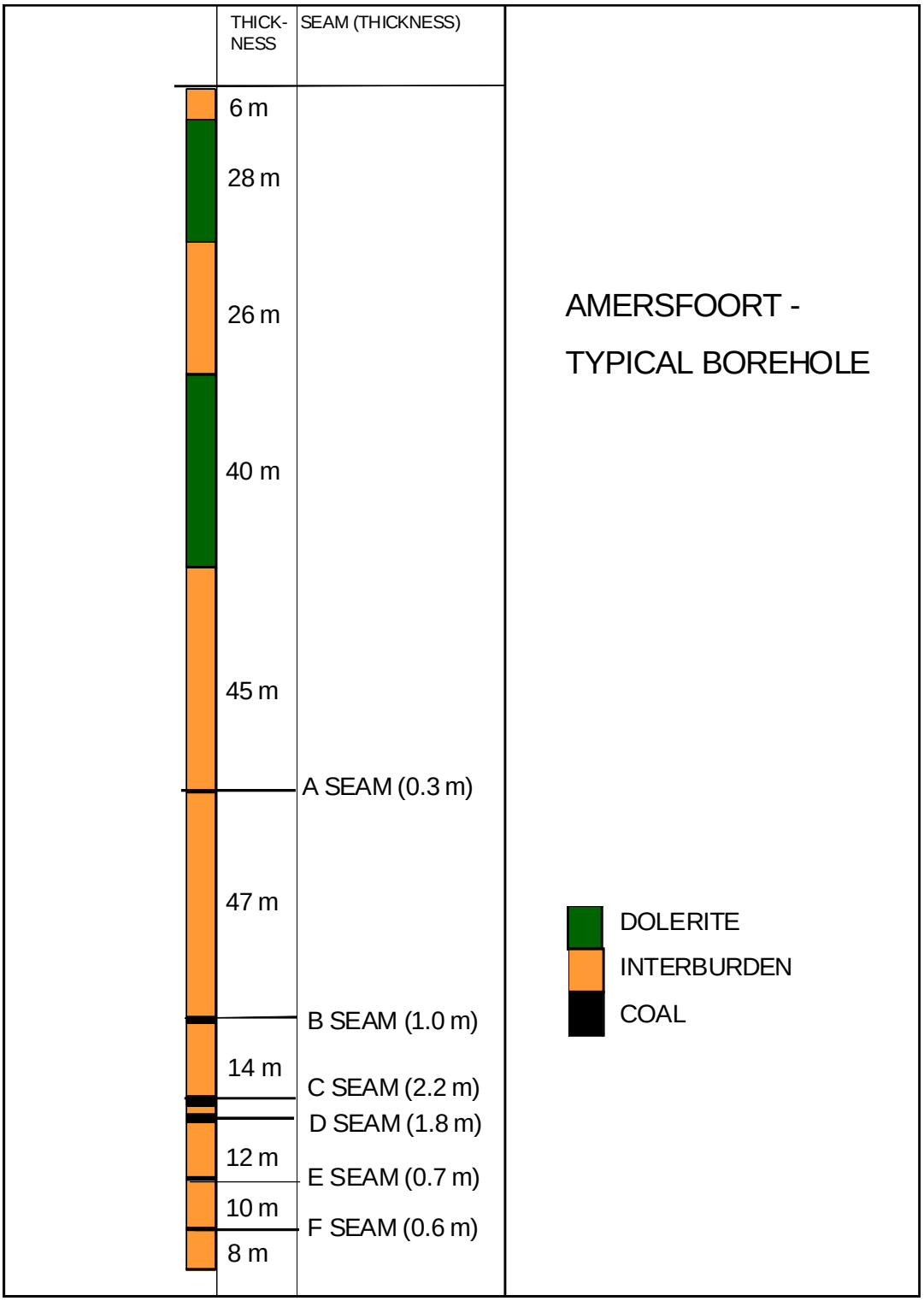

Figure 2: Amersfoort typical borehole section

A-1.4 The proposed Mining Method

The Amersfoort resource will be mined underground, using a mechanised bord and pillar mining method and utilising Continuous Miners. In mechanised bord and pillar mining, extraction is achieved by developing a series of roadways (bords) in the coal seam and connecting them by splits (cut-throughs) to form pillars. These pillars are left behind as part of primary roof support system. Refer to Figure 3 for an example of bord and pillar mining.

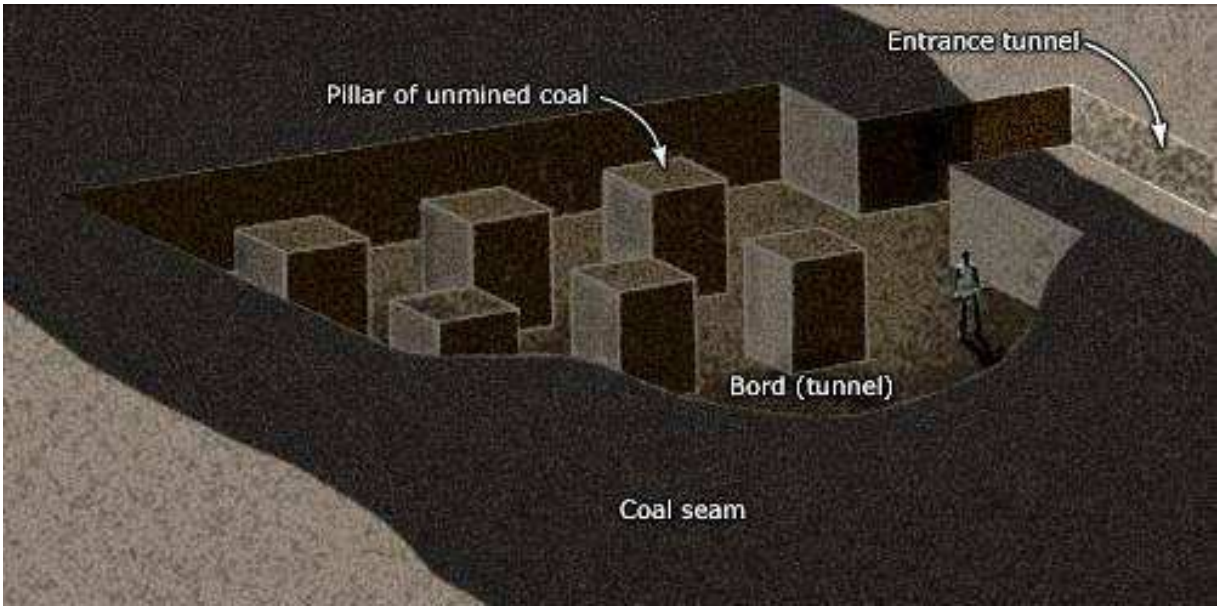

Figure 3: Example of Bord and Pillar Mining (Source: The Encyclopaedia of New Zealand)

A-1.5 Coal transporting and processing

An incline shaft will be developed to the coal seam approximately at the centre of the reserve.

The layout of the mine will be a Bord and Pillar design which will be maintained throughout. Main trunk lines will be developed towards the extremities of the reserve. Production sections will mine as pit room is established and ultimately 9 sections will be operating.

The Mining operation will be done by Continuous Miners feeding Shuttle cars which will haul the coal to the Conveyor belt system for conveyance up the incline to the surface where a crushing plant will be utilised to size ROM coal. Coal will then be stacked on a 120 000 tonne stockpile. From here the coal will be reclaimed to a Coal Processing Plant (CPP) where two products will be generated i.e. Export quality coal and Eskom coal.

The two coal products (Export and domestic Eskom quality coal) will be stockpiled on two separate stockpiles with stackers and re-claimers. From here coal will be conveyed to the Majuba Power Station by means of conveyor belts totalling 20.5km in length. The Export coal will then be conveyed to a rail loading silo suitably situated in the vicinity of the Majuba Power Station tipplers. From here the coal will be transported to Richards Bay for export. Refer to Figure 4 for a mechanical flow diagram and to

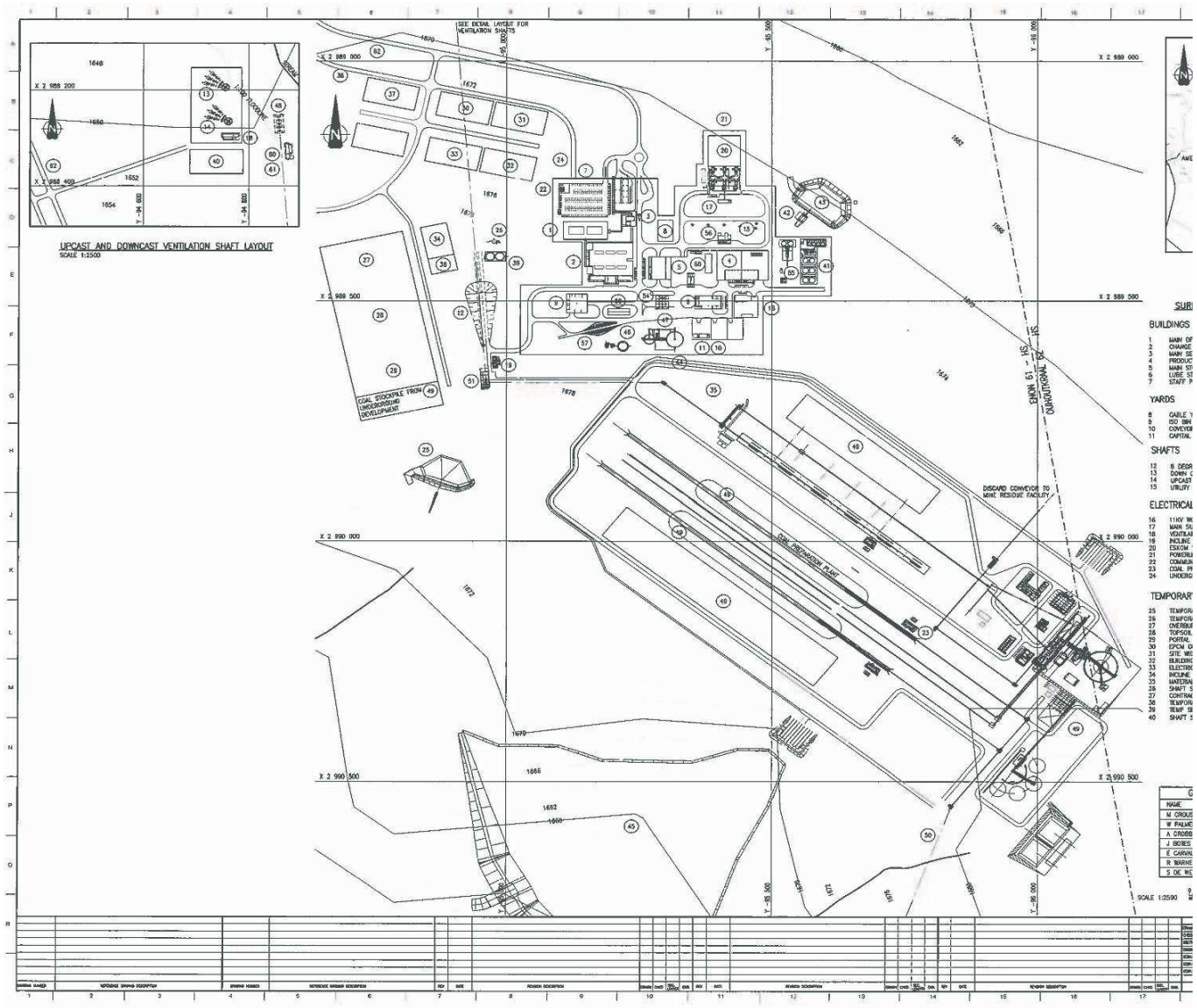

Figure **5** for a layout plan of the proposed surface infrastructure.

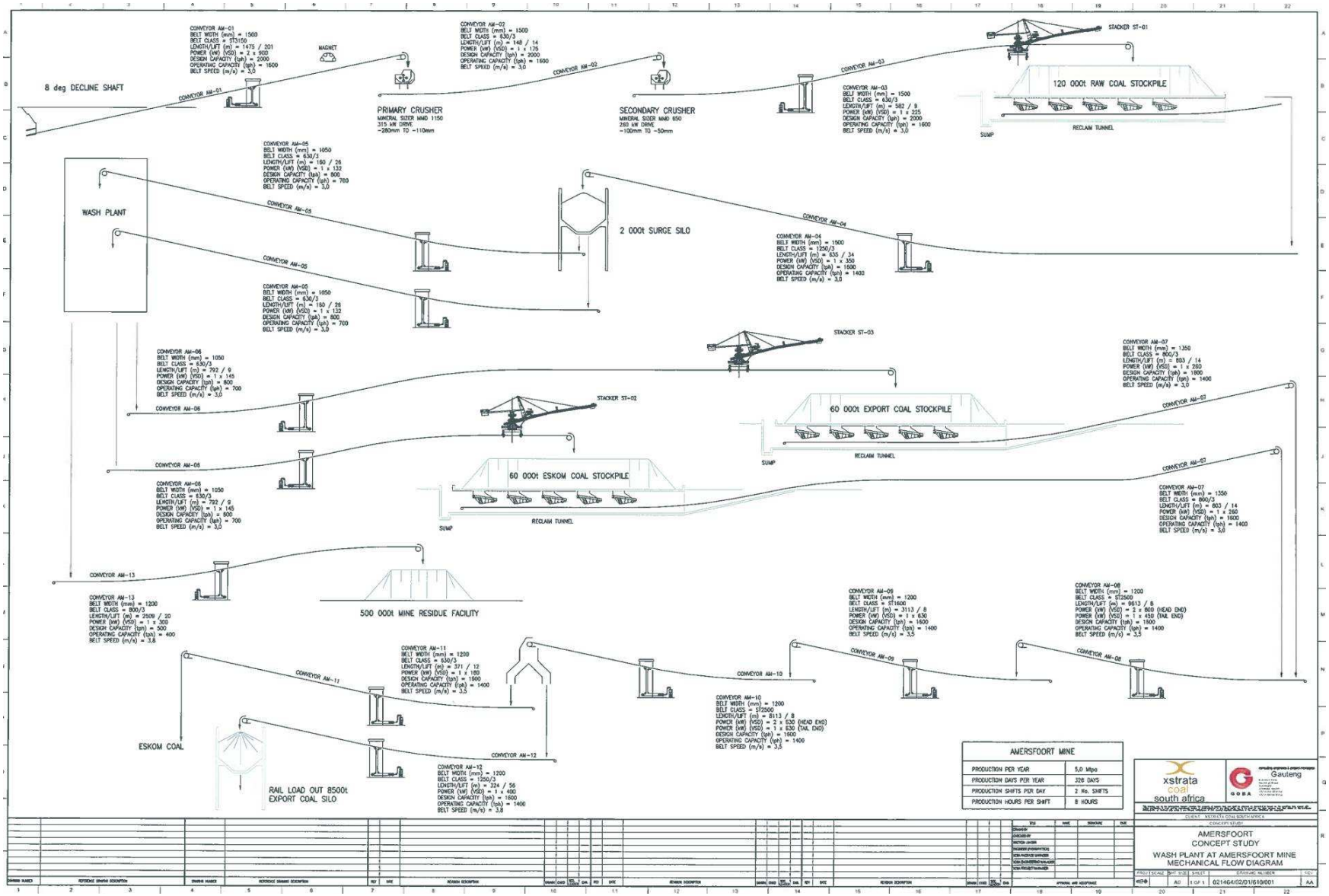

Figure 4: Mechanical Flow Diagram of the proposed mine plant

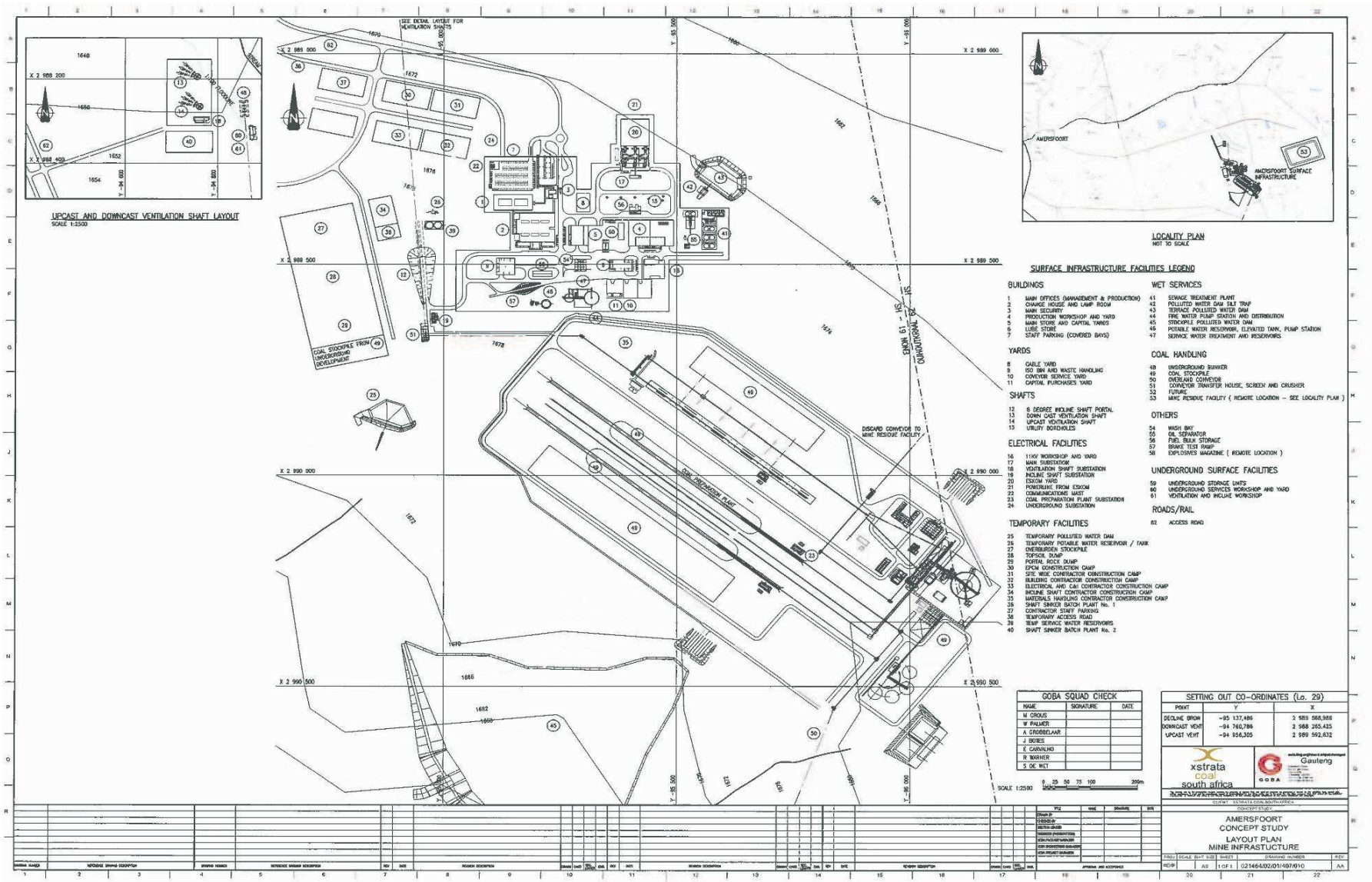

Figure 5: Amersfoort Surface Infrastructure Conceptual Layout Plan

Bulk quantities of Magnetite and Flocculent will be utilised at the CPP and will be imported via road transport. The magnetite will be offloaded into a dedicated bunker from where it will be introduced into the process via a purpose designed magnetite mixing system. The Flocculent will be made up in batches and introduced into the process as required via a purpose designed Flocculent make-up and dosing system. Sufficient access has been allowed in the process plant and road design to allow for bulk vehicle access to the dedicated offloading areas.

Coarse and fine tailings will not be delivered and will be conveyed to a dedicated rejects bin at the ROM ramp. Slime tailings (from the CPP) will be thickened prior to being pumped to the Mine Residue Facility. In addition the use of a filter press will be investigated in order to recover water from the tailings. Refer to Figure 6 for a detailed diagram of the product handling section.

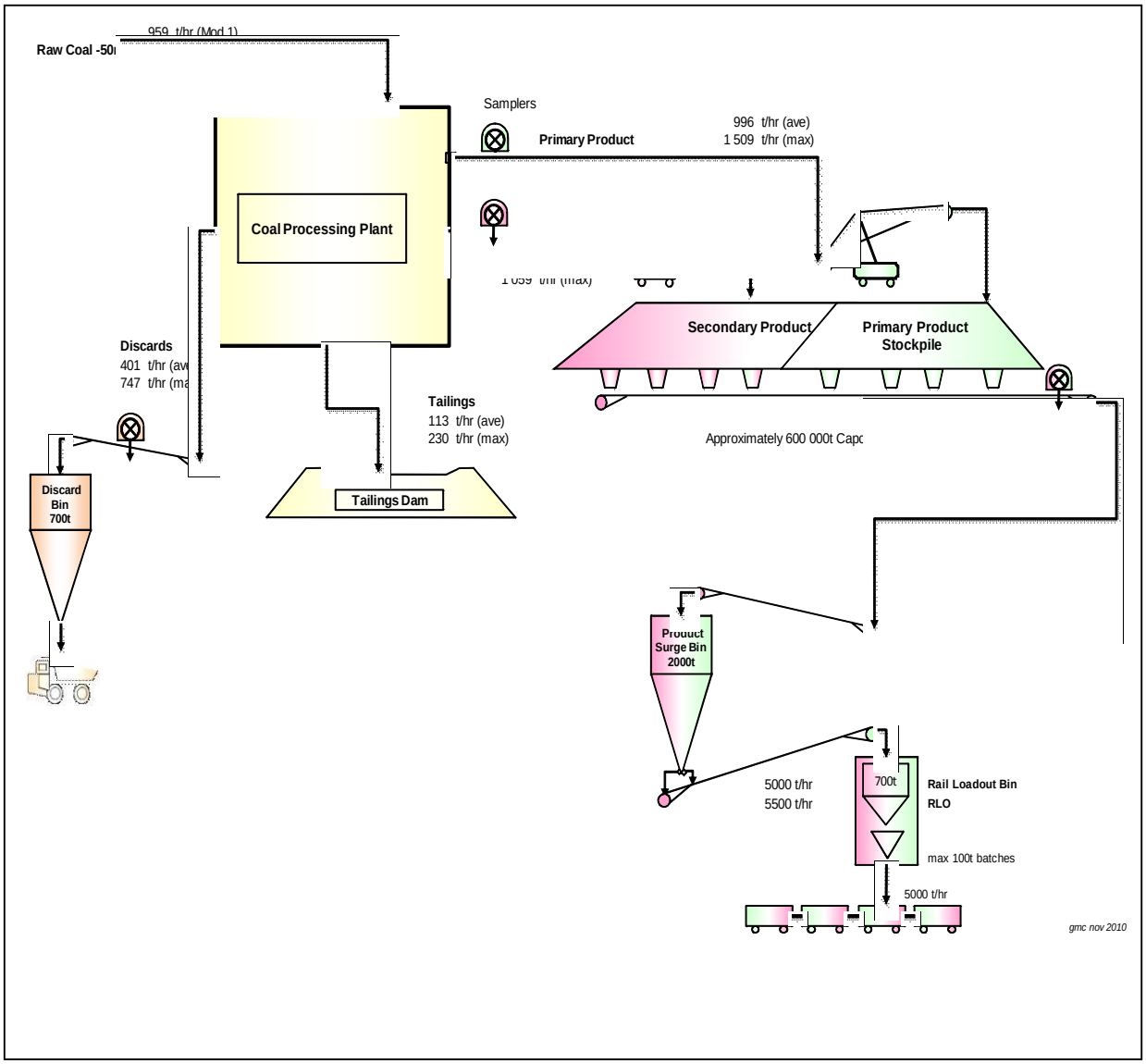

Figure 6: Product Handling Section

A-1.6 Surface Infrastructure

A-1.6.1 Access

Access to the proposed Amersfoort mine site is from provincial Road P97-2. The mine surface infrastructure is around 7.4km from this road along Road D279. It will be necessary to construct a 2km long access road to gain access to the site for construction purposes.

A-1.6.2 Electricity supply

Energy efficiency has to be an integral part of the installation by incorporating a "fit/sized for purpose" philosophy during the design and specify stage and equipment and plant systems employing the latest available technologies will be implemented.

The following activities would require electricity supply:

- ***Heating, Ventilation and Cooling:*** HVAC equipment, space or infrared heating, water heating (geysers, boilers and calorifiers etc.)
- ***Lighting****:* Underground, Shaft, Area, Office, Workshops, Change houses and Security lighting
- ***Processing Plant:*** Electric motors, electrical reticulation (transformers etc.), conveyor belts, pumps, ventilation fans, milling, etc.

The total estimated electricity demand for the proposed Amersfoort mine is 38 650kVA.

The Bulk Power Supply will be from Eskom by means of 132 kV overhead power lines from a location to be selected by Eskom to a 132 kV Eskom transformer yard. Eskom will take responsibility for servitude acquisition and is likely to place the line alongside existing power lines in the vicinity.

Bulk Power at Majuba will be from the existing Eskom bulk power supply point at Majuba Mine.

The Eskom 132 kV transformer yard at Amersfoort Mine will step the voltage down to 22 kV (preferred voltage) for distribution within the plant complex and also to the distribution network supplying underground mining, overland conveyor and rail load-out networks. This transformer yard will have a separate entrance so as to be accessible by Eskom without entering the mine external fence.

A-1.6.3 Water Supply

Please take notice that the proposed option as outlined below has not been discussed with Eskom and other Stakeholders to date.

Before mining activities commence that can produce make-up water from underground, raw water must be obtained from a remote source. Supply of sufficient raw water is challenging for the project. The Zaaihoek Water Supply Scheme has been identified as the only potential water source in the area. Eskom currently pumps water from Zaaihoek Dam to Majuba Power Station, some 20km from Amersfoort. Water will gravitate from the Majuba Power Station to deliver raw water to Amersfoort from the Zaaihoek Scheme. The pileline will be sized 1.5 x total raw water demand (46 l/s). A 5 Ml reservoir will be constructed with a division wall to reserve 1 Ml for potable water storage and 4 Ml for service water storage.

The total water demand for the proposed mine is 2621kl/day, of which 372kl/day is the potable water demand and 2249kl/day is the service water demand for all the underground and above ground facilities.

Potable water will be used for domestic supply and fire fighting purposes. A potable water treatment plant will be fed from the reserved storage in the raw water reservoir. A 150 kl elevated tank will be provided for treated water. Potable water will be supplied to the following areas:

- Administration block
- Change rooms
- Workshops
- Store rooms
- Wash bays

Service Water will be supplied to the following areas:

- Underground mining activities
- Conveyor transfer houses
- Rail load out facilities
- Stockpiles
- Wash plant
- Remote firefighting equipment

Once excess water is generated from mining operations, the make-up service water will be obtained from the balancing dam via a pre-treatment plant.

A-1.6.4 Oily water containment

The dirty water emanating from the wash plant area (CPP) will be channelled to a silt trap prior to flowing to an oily water separator. The oil will be separated from the effluent through an oil separator into a drum.

A-1.6.5 Domestic Sewage

A package treatment plant of 450 kl/day will be required.

Final Effluent from the sewage treatment facility will be allowed to discharge into the environment or will be returned to the balancing dam for re-use.

A-1.6.6 Polluted Storm Water Drainage

No infrastructure is to be constructed within the 1:100 flood lines or within 100 m of a river centre line. A 50 Ml terrace pollution control dam will be constructed to hold runoff from the “dirty” areas of the terrace. A 500 Ml wash plant pollution control dam will be constructed to hold 350 Ml runoff from the wash plant complex under flood conditions as all runoff landing on this area will be treated as polluted water. This dam will also provide 150 Ml balancing storage for make-up water generated by mining activities or surface run-off from other areas for re-use in coal washing and dust suppression.

A-2 LEGAL REQUIREMENTS APPLICABLE TO THIS APPLICATION

SEF registered the proposed Xstrata Amersfoort Underground Coal Mine with the MDEDET and the DMR and the project has been assigned the reference numbers 17/2/3 GS-143 and MP 30/5/1/2/2/10055 MR respectively. The legislation, guidelines and policies applicable to this project are as follows:

A-2.1 NEMA and the Environmental Impact Assessment Regulations

The EIA Regulations, promulgated under NEMA, focus primarily on creating a framework for co-operative environmental governance. NEMA provides for co-operative environmenPaatal governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by State Departments and to provide for matters connected therewith.

In terms of the EIA Regulations of 2010 and activities listed in GN No. 544 and 546 (requiring a Basic Assessment process) and GN No. 545 (requiring a S&EIR process), the following listed activities are deemed by the EAP to be applicable to the proposed mine based on the information provided by the Xstrata and their consulting engineers.

GN No & Activity Number		Activity Description
GN No. 544 of 18 June 2010	2	The construction of facilities or infrastructure for the storage of ore or coal that requires an atmospheric emissions license in terms of the National Environmental Management: Air Quality Act (Act No. 39 of 2004).
	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 where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.
	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 meters of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.
	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 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.
	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.
GN No. 546 of 18 June 2010	4	The construction of a road wider than 4 metres with a reserve less than 13,5 metres. **(a)** In Eastern Cape, Free State, KwaZulu-Natal, Limpopo, **Mpumalanga** and Northern Cape provinces: i. In an estuary; ii. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve; (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined.
	14	The clearance of an area of 5 hectares or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation. **(a)** In Eastern Cape, Free State, KwaZulu-Natal, Gauteng, Limpopo, **Mpumalanga,** Northern Cape, Northwest and Western Cape: i. All areas outside urban areas.
GN No. 545 of 18 June 2010	3	The construction of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.
	6	The construction of facilities or infrastructure for the bulk transportation of dangerous goods - (i) in gas form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity of more than 700 tons per day; (ii) in liquid form, outside an industrial complex, using pipelines, exceeding 1000 metres in length, with a throughput capacity more than 50 cubic metres per day; or (iii) in solid form, outside an industrial complex, using funiculars or conveyors with a throughput capacity of more than 50 tons day.
	8	The construction of facilities or infrastructure for the transmission and distribution of electricity with a capacity of 275 kilovolts or more, outside an urban area or industrial complex.
	11	The construction of railway lines, stations or shunting yards, excluding - (i) railway lines, shunting yards and railway stations in industrial complexes or zones; (ii) underground railway lines in a mining area; and additional railway lines within the reserve of an existing railway line;
	15	Physical alteration of undeveloped, vacant or derelict land for residential, retail, commercial, recreational, industrial or institutional use where the total area to be transformed is 20 hectares or more;

		except where such physical alteration takes place for: (i) linear development activities; or agriculture or afforestation where activity 16 in this Schedule will apply.
	19	The construction of a dam, where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more.
	20	Any activity which requires a mining right or renewal thereof as contemplated in sections 22 and 24 respectively of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

It must be noted that activities requiring a Basic Assessment process, as well as activities requiring a S&EIR process are triggered by the proposed development. Therefore, according to the above listed activities, a situation arises, whereby the legal requirements of the activity listed in terms of GN No. 545 of 2010 supersede those of the activities listed in terms of GN No. 544 and 546 of 2010, and as such **this application shall undergo a S&EIR process**.

The aforementioned listed activities are deemed to include activities that could potentially have a detrimental impact on the social and biophysical state of an area and as such, are required to undergo an environmental impact assessment process.

A-2.2 Mineral and Petroleum Resources Development Act, 2000 (Act No. 28 of 2000)

The MPRDA provides that the environmental management principles set out in the National Environmental Management Act No. 107 of 1998 shall apply to all prospecting and mining operations and serve as a guideline for the interpretation, administration and implementation of the environmental requirements of the MPRDA. Any prospecting or mining operations must be conducted in accordance with generally accepted principals of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects in order to ensure that the exploitation of mineral resources serves both present and future generations.

Xstrata Coal South Africa (Pty) Ltd (XCSA) was the holder of the rights to coal in terms of the common law which applied until the Mineral and Petroleum Resources Development Act 28 of 2002 ("MPRDA") came into operation on 1 May 2004. In terms the transitional provisions in schedule 2 of the MPRDA, XCSA relied on its exclusive right to apply for a prospecting right in respect of coal in terms of section 17 of the Act, which was granted in 2006. The initial prospecting right expired on the 1st November 2008 and XCSA applied for a 3 year extension of the prospecting right, which was granted in December 2009. The extension of the prospecting right will expire in December 2012.

A-2.3 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in responsible ways.

Of specific importance to this application is Section 19 of the NWA, which states that an owner of land, a person in control of land or a person who occupies or uses the land which thereby causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring and must therefore comply with any prescribed waste standard or management practices.

Due to the various process involved in underground coal mining, as well as the presence of streams, tributaries and drainage lines in the study area, the proposed mine may trigger the following water uses listed in Section 21 of the NWA:

21(a) taking water from a water resource;
21(b) storing water;
21(c) impeding or diverting the flow of water in a watercourse;
21(f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;
21(i) altering the bed, banks, course or characteristics of a watercourse; and
21(j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.

Accordingly, the proposed mine plant will thus require a water use licence, which is administered by the Department of Water Affairs (DWA).

A-2.4 Other Legal Requirements

A-2.4.1 Acts

Constitution of the Republic of South Africa
The Constitution of the Republic of South Africa has major implications for environmental management. The main effects are the protection of environmental and property rights, the change brought about by the sections dealing with administrative law, such as access to information, just administrative action and broadening of the locus standi of litigants. These aspects provide general and overarching support and are of major assistance in the effective implementation of the environmental management principles and structures of the NEMA. Section 24 in the Bill of Rights of the Constitution specifically states that:

Everyone has the right -

- To an environment that is not harmful to their health or well-being; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that -
    - Prevent pollution and ecological degradation;
    - Promote conservation; and
    - Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

This Act is applicable to this application for environmental authorisation, in the sense that it requires the project applicant to consider the protection and management of local biodiversity.

National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development; to provide for institutional arrangements and planning matters; to provide for

national norms and standards for regulating the management of waste by all spheres of government; to provide for specific waste management measures; to provide for the licensing and control of waste management activities; to provide for the remediation of contaminated land; to provide for the national waste information system; to provide for compliance and enforcement; and to provide for matters connected therewith.

National Heritage Resources Act, 1999 (Act No. 25 of 1999)
This Act legislates the necessity for cultural and heritage impact assessment in areas earmarked for development, which exceed 0.5 hectares (ha) and where linear developments (including roads) exceed 300 metres in length. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA).

National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
The purpose of this Act is to provide for the protection, conservation and management of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes.

Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970)
The purpose of the Act is to control the subdivision and, in connection therewith, the use of agricultural land. The Minister of Agriculture, Forestry and Fisheries ("Minister of Agriculture") must consent to the proposed subdivision.

Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
To provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.

Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)
To provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; to establish an advisory council for occupational health and safety; and to provide for matters connected therewith.

Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)
The Act recognises that everyone has a Constitutional right of access to any information held by the state and by another person when that information is required to exercise or protect any rights. The purpose of the Act is to foster a culture of transparency and accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their rights

A-2.4.2 Provincial Policies and/or Guidelines

Integrated Environmental Management (IEM)
IEM is a philosophy for ensuring that environmental considerations are fully integrated into all stages of the development process. This philosophy aims to achieve a desirable balance between conservation and development (DEAT, 1992). The IEM guidelines intend encouraging a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels.

The DEA Integrated Environmental Management Information Series guidelines are also considered during this S&EIR application process.

National Spatial Biodiversity Assessment
The National Spatial Biodiversity Assessment (NSBA) classifies areas as worthy of protection based on its biophysical characteristics, which are ranked according to priority levels.

Protected species – Provincial Ordinances
Provincial ordinances were developed to protected particular plant species within specific provinces. The protection of these species is enforced through permitting requirements associated with provincial lists of protected species. Permits are administered by the Provincial Departments of Environmental Affairs.

A-3 NEED AND DESIRABILITY OF THE PROJECT

Coal is used worldwide in many day-to-day goods and services that we might sometimes take for granted in our modern society – such as electricity generation, steel production and cement manufacturing.

There are two main types of coal, which have different uses:

- Thermal coal – mainly used for the generation of electricity; and
- Coking coal - mainly used in the production of steel.

Xstrata Coal (XC) is the world's largest producers of thermal and coking coal (http://www.xstratacoal.com).

Coal mining is a significant contributor to the South African GDP and the sector is becoming more important from a total growth point of view.

Over the past 10 years coal prices increased steadily and peaked during 2008 at levels of roughly four times the 2001 price. During the past two years, prices have softened to close to 75% of 2008 peak levels.

Economic growth in China and India remained the main drivers behind global coal demand in 2009/2010 and the switch of exports out of the Atlantic region and into the Asian and Pacific markets remains a significant trend. Trade data from the Richards Bay Coal Terminal (RBCT) provide a vivid example of how large the switch has been. In January last year, the Atlantic region accounted for 50% of exports, with India accounting for 25% and Pacific countries for the remaining 25%. The push into India and the Pacific countries has intensified since the start of the calendar year, with India now accounting for 50% of shipments, Pacific countries for 25% and the Atlantic region for the remaining 25%.

XC has a sustainable mining approach and strongly believes that mining can be conducted in a way that is economically, socially and environmentally sustainable over the long term. To achieve this, XC believes that sustainability must be fully integrated into all business practices.

Whilst realising that mining inevitably has some impact on the natural environment XC aims to minimise these impacts, rehabilitate the areas they disturb during operations and preserve or restore the long-term health and viability of the environment around their mines. Steps they take include (http://www.xstratacoal.com):

- Restore mine areas to conditions as much as possible like those before mining started and, where possible, creating protected areas;
- Reduce mining contributions to climate change by being more energy efficient and using more renewable energy;
- Use water more efficiently to ensure there is enough for everyone who needs it;
- Manage waste and closed mines to avoid contamination of land; and
- Research ways to reduce the carbon dioxide emissions during coal combustion.

The development and submission of a Social Labour Plan (SLP) is a requirement of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) and sets out social and labour programmes to be in place for the life of every mining right.

The objectives of the SLP (Regulation 41 of the MPRDA) are to:

- Promote economic growth and mineral and petroleum resources in the Republic (Section 2(e) of the MPRDA);
- Promote employment and advance the social and economic welfare of all South Africans (Section 2(f) of the MPRDA);
- Ensure that holders of mining rights contribute towards the socio-economic development of the areas in which they are operating as well as the areas from which the majority of the workforce is sourced (section 2(i) of the MPRDA, and the Charter); and
- To utilise and expand existing skill base for the empowerment of Historically Disadvantaged South Africans (HDSA's) and the serve the community.

At Amersfoort colliery there will be a strong focus on local recruitment and skills development programmes will be aligned in such a manner that unskilled prospective employees (especially from the local areas) have the opportunity for career development. For more detail refer to Appendix 7: Amersfoort Social and Labour Plan Submission, October 2012.

SECTION B: THE RECEIVING ENVIRONMENT

In order to, with any level of confidence, assess the potential impacts of the proposed Xstrata Amersfoort Underground Coal Mine on the receiving environment, one need to first assess the baseline conditions found over the study area. Using this *Status Quo* one can then, broadly speaking, determine the likely impacts that will emanate from a specific development typology on a well-defined receiving environment.

B-1 BIOPHYSICAL ENVIRONMENT

B-1.1 Climate

The mine study area is located within the Highveld ecoregion and is characterised by a mean annual precipitation of 500mm to 800mm per annum, with rainfall seasonality being early to mid-summer. Mean annual temperatures range from 12℃ to 18℃, with m ean daily maximum temperatures in February ranging from 20℃ to 26℃, and mean daily minimum temperat ures in July ranging from 0℃ to 3℃ (Kleynhans *et al*., 2007).

B-1.2 Geology and Geotechnical Suitability

The proposed Amersfoort mine study area is underlain by the Vryheid formation and the Volksrust formation of the Ecca Group which is part of Karoo Supergroup. The Vryheid formation comprises a lower fluvial-dominated deltaic interval, a middle fluvial interval and an upper fluvial-dominated deltaic interval while the Volksrust Formation consists of silty Shale, mudstone and siltstone or sandstone lenses towards its upper and lower boundaries (Johnson, M.R at al 2006). The local lithology of the proposed Amersfoort study area is predominantly made up of shale and subordinate sandstone and dolerite in the northern part and sandstone, shale and coal beds are found in the southern part.

B-1.3 Soils, Erosion and Agricultural Potential

B-1.3.1 Dominant Soil Types

The surveyed infrastructure footprint comprised of sandy loam and loamy sand textured plinthic soils; including Avalon (Av), Longlands (Lo), Pinedene (Pn), Westleigh (We), and Katspruit (Ka) soil forms. The unique morphological feature of the surveyed area is the repeated horizon sequence across the landscape, with most depicting intermittent signs of wetness. Plinthic soils are generally characterized by their susceptibility to seasonal wetness due to slow drainage and/or fluctuating water table, which creates reducing conditions that are expressed as mottles, and sometimes Iron (Fe) and Manganese (Mn) concretions.

Non-plinthic soils were also identified on site, for instance Arcadia (Ar) and Rensburg (Re) soil forms characteristically found along the erosion gullies on the railway route, south-west of the infrastructure footprint.

B-1.3.2 Soil Erodibility

The proposed infrastructure footprint at Amersfoort lies on a relatively flat gently sloping surface on a landscape plateau, thus, soil morphological characteristics were the main criterion used as a determining factor to infer soil erodibility. Shallow (<40 cm), sandy, and/or leached soils landed in the higher, more susceptible erodibility classes. On the other hand, deeper soils, with more clay content and low leaching status ultimately landed in low erodibility classes.

The majority of the soils in the area of the infrastructure footprint had moderate susceptibility to erosion risk and mostly comprised of Av, Lo, and Pn soils. Higher erosion sensitivity classes constituted a mixture of We, Lo, Ka, and some alluvial/colluvial soils, occurring on foot-slopes and/or towards valley bottoms and erosion channels. Arcadia (Ar) and Rensburg (Re) soils are severely prone to erosion, attributed to their shrinking and swelling character. On the contrary, some Av, Lo, and Pn soils occurring on relatively flat and/or gently sloping land (0-10%) slope gradient constituted lower erosion sensitivity classes.

Refer to Figure 7 for a map of the soil erosion sensitivity in the vicinity of the surface infrastructure site.

B-1.3.3 Agricultural Potential / Land Capability

The majority of the pre-mining area including the infrastructure footprint and conveyor route, has below average agricultural potential, with moderately productive land suited to grazing and pasture improvement.

Arable Land:
Conservation tillage methods of soil preparation are highly recommended for erosion control and to prevent plough layer formation. Shallow rooted crops e.g. vegetables are suitable for these soils. If disturbed, land use capability can be easily rehabilitated to a class suited for grazing pasture.

Grazing:
Grazing pastures dominate the final land use, constituting almost 90% of the non-wetland areas. Controlled grazing is advised to maintain a dense vegetation cover for erosion control during post-mining land use. Although climatic variables (precipitation and temperature) permit agricultural use, waterlogging and/or former impacts of soil and sediment loss through erosion creates unfavourable conditions for crop growth.

Temporal/Seasonal Wetlands:
This unit consists of hillslope seeps that drain into wetlands downstream. Prolonged soil wetness due to surface water saturation restricts agricultural use of these soils. This land use class would be most impacted by the mining activities, and its primarily contribution to wetland habitats and their various ecosystem functions would be lost. Thus considerable conservation, monitoring, and rehabilitation efforts should be considered throughout the mining operation to maintain its ecological health.

Refer to

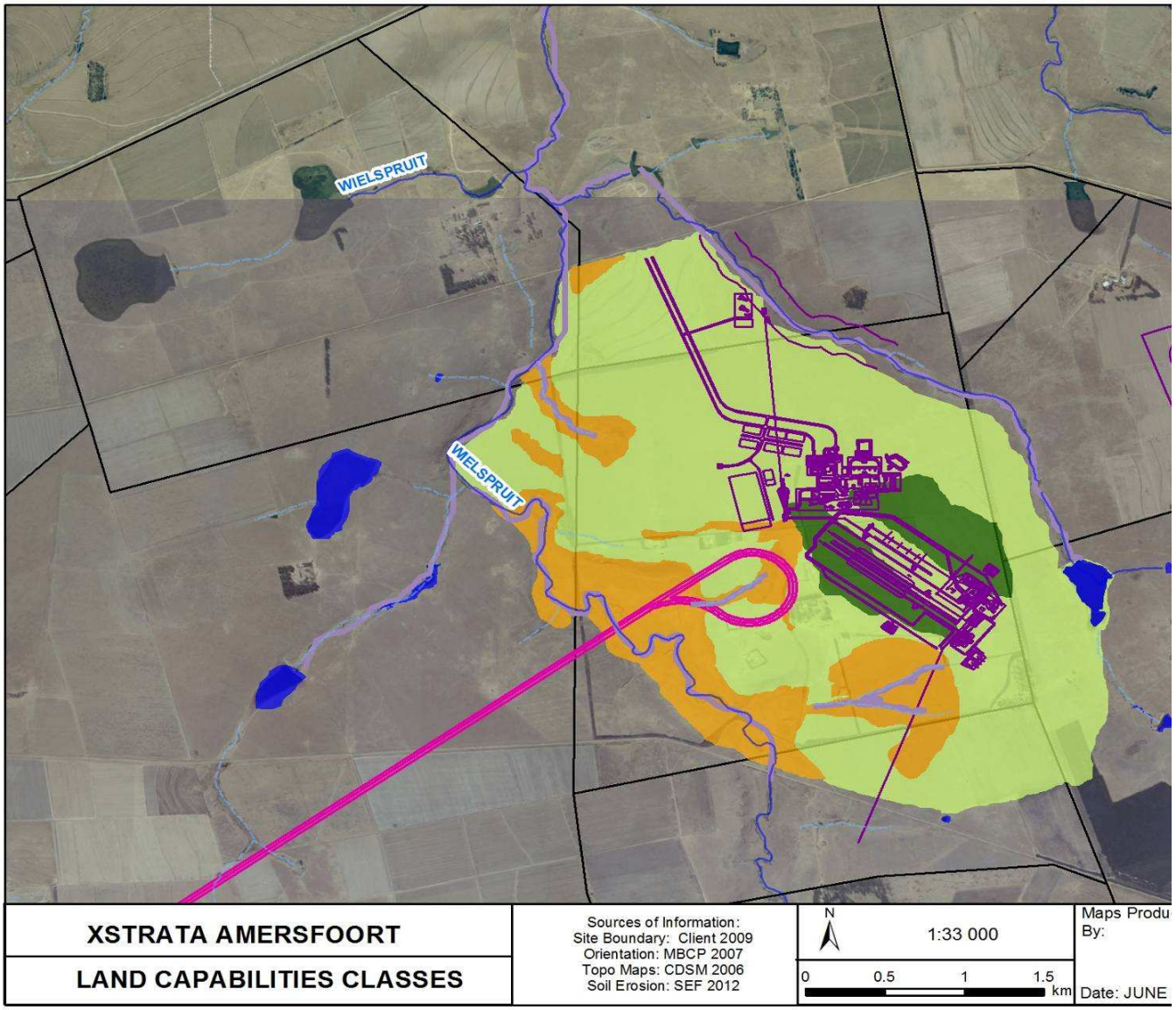

Figure 8 for a map of the land capability in the vicinity of the surface infrastructure site.

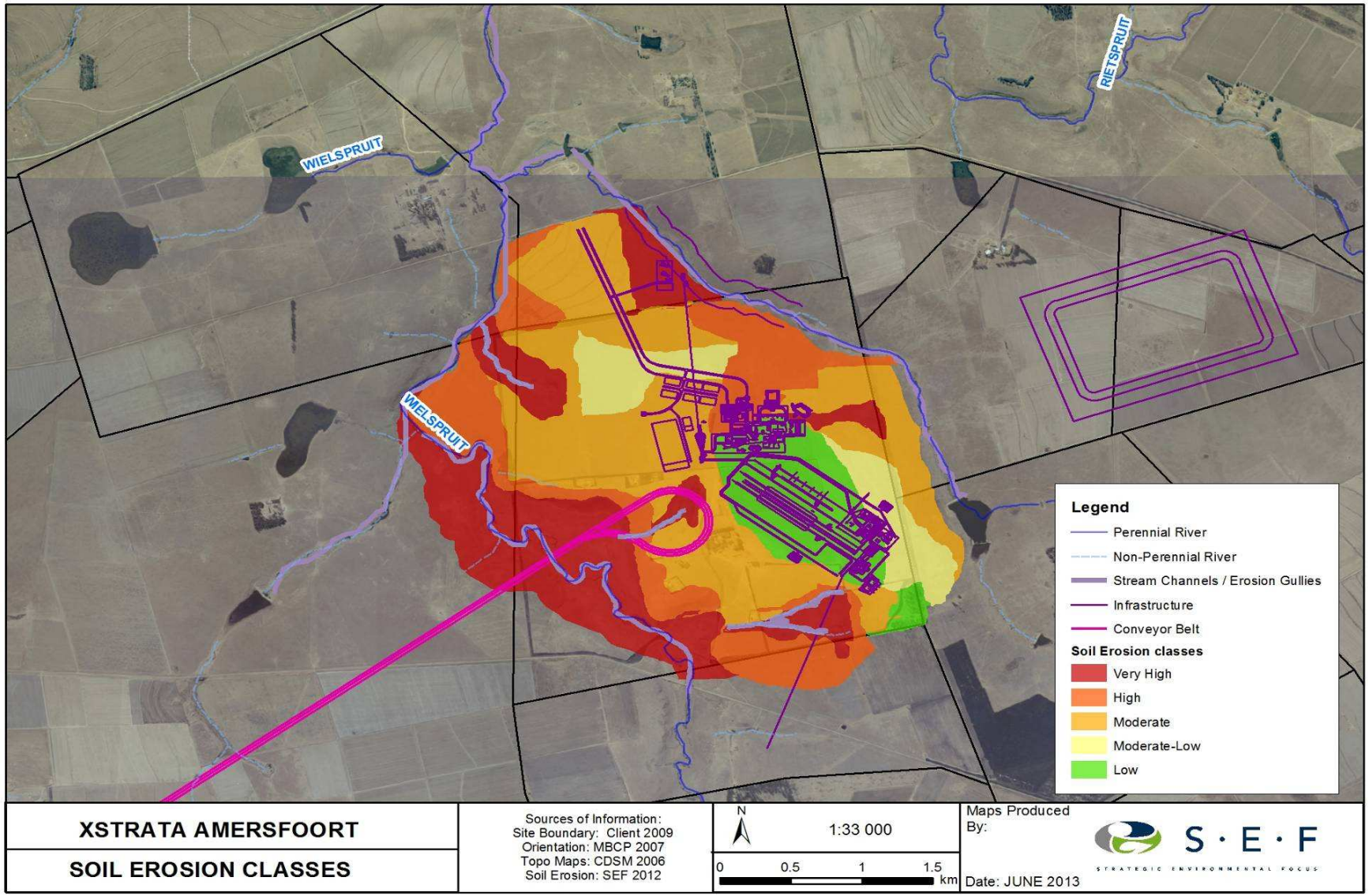

Figure 7: Soil erosion sensitivity within the infrastructure footprint

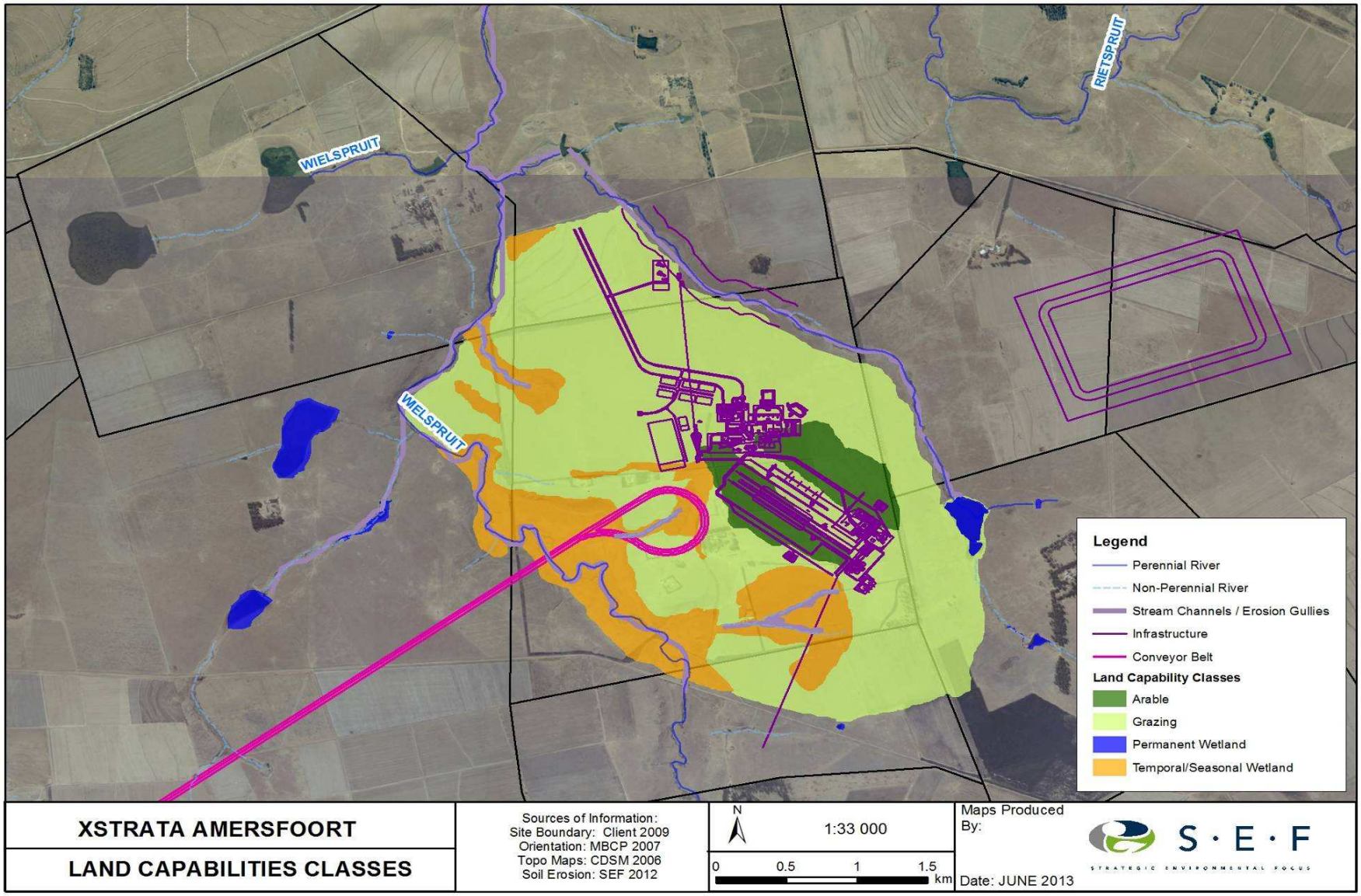

Figure 8: Land capability within the infrastructure footprint

B-1.4 Surface Water

B-1.4.1 Hydrology

From the baseline studies (Fourth Element, 2011), it was seen that the Vaal River is one of the most regulated rivers in the country. It has high urban and industrial demands in the upper and middle regions, and high agricultural demands on the lower regions, and in the Orange River downstream. The Upper Vaal WMA provides almost 70% of the catchment yield of the entire Vaal River catchment. The tertiary catchment in which the proposed mine is located (C11) (Amersfoort) contributes to the total Vaal catchment yield. This catchment therefore play an important role in the water balance for the Vaal catchment, which includes inter-basin transfers from neighbouring catchments in Lesotho, KwaZulu-Natal and Mpumalanga, as well as committed transfers to the Crocodile and Olifants catchment to the north. Even with the inter-basin transfers into the Vaal catchment, the positive water balance (i.e. water surplus) has continued to diminish over time as the economy and demand has grown, and the need is fast approaching for planned future augmentation schemes such as the next phase of the Lesotho Highlands scheme, and the potential development of the Klip River water resources.

The tertiary catchment (C11) is therefore a key contributor to the water balance in the Vaal River catchment and this assessment will look at the potential impact of the mine on catchment yield as follows:

- Reduction or change in catchment runoff,
- Potential impacts due to abstraction from surface water systems.

Another concern arising from the baseline studies is the potential impact of mining on water quality in the Vaal River system. Urban discharges, mining and agriculture are the main sources of pollution in the catchment, and high salt levels have particular influence on both water quality and water demand – the latter due to the need for the Vaal Dam to release water to dilute high salt levels in the Vaal Barrage and further downstream. Acid mine drainage is also severe problem in the Upper Vaal WMA, and coal mining produces both acid mine water and high salt levels. As a result, this study has considered:

- Potential implications of discharge of acid mine water and high TDS into the receiving streams, and
- Potential storage requirements for “dirty water” discharges, including storm runoff, from the mine areas.

Observations on the location of the mine within the local environment, and relevant to managing surface water impacts, are as follows:

- The mining site is located on a ridge between the Wielspruit (to the west) and a small tributary to the east, and will then impact on both watercourses.
- The Mine Residue Facility – MRF (tailings) is located further east on a ridge between the small tributary and the Rietspruit, and will impact on both watercourses.
- Therefore a total of three surface watercourses will be directly affected by the proposed layout. All the watercourses appear to be in good condition; stable channels, limited erosion and good water quality (from baseline assessment).
- Pollution control facilities are shown on the preliminary mine layout. They still need to be integrated into a site stormwater management and process water system. However, given the number of catchments affected, additional pollution control facilities may be required.
- The location of the vertical shafts correctly shows the need to plan for flood lines. However, the shafts are located upstream of a broken small farm dam and the flood lines will be wider than the natural flood width of the channel.

- In general the soils are fairly shallow and easily erodible of the vegetation cover is disturbed. Control of stormwater discharges will be important.

B-1.4.2 Water Quality and Biodiversity

Water Quality

A baseline study conducted in 2011 of the area included a water quality analysis. Four water quality samples were taken from the Wielspruit and sent for laboratory analysis. The results can be seen in Table 4. The water was also found to be slightly alkaline with pH levels of 8.2.

Table 4: Water quality variables for the quaternary catchment at Amersfoort (WR2005)

Variable	Units	AMF04	Rating
Nitrate	(mg/l) as N	<0.1	Acceptable
Ammonia	(mg/l) as N	<0.1	Acceptable
Sulphate	(mg/l)	26	Tolerable
TDS	(mg/l)	274	Unacceptable
Phosphate	(mg/l) as P	1.1	Unacceptable

Fish species encountered

A total of nine indigenous fish species are likely to occur within the catchments associated with the study area (Table 5). However, many of the watercourses within the study area represent wetland systems and are not likely to support diverse fish species due to limited water depth, although at times of high rainfall some fish species may move into the wetlands. It is only when these wetland systems confluence and give rise to streams with sufficient water depth, longitudinal connectivity and diverse biotopes such as cascades, riffles, runs, pools, etc. that diverse fish species are sustained (e.g. Skulpspruit and Wielspruit). During the course of the field surveys, a total of six indigenous fish species of the nine species expected to occur within the catchments associated with the study area were collected, with an additional species confirmed to occur based on interviews with local fishermen. One alien fish species was identified within the Skulpspruit during the field surveys, namely *Cyprinus carpio* (Carp). A brief description of each fish species sampled during the field surveys is provided below.

In addition, farm dams constructed within the wetland systems of the study area presented sufficient depth, vegetated cover and extended inundation for the occurrence of fish species, but were only likely to support fish species that have a particular preference for standing water and do not require flowing water for stages within their lifecycle. Worthy of note was the fact that, according to local land owners, farm dams with the area contain large specimens of *Cyprinus carpio* which are utilised for recreational purposes.

Table 5: Indigenous fish species expected to occur within the catchments associated with the study area and fish species confirmed to occur during field surveys

Scientific Name	Common Name	Expected	Confirmed - Wielspruit	Confirmed - Skulpspruit
Indigenous species				
Austroglanis sclateri	Rock Catfish	X	X	
Barbus anoplus	Chubbyhead Barb	X	X	X
Barbus pallidus	Goldie Barb	X		
Clarias gariepinus	Sharptooth Catfish	X	X	
Labeo capensis	Orange River Mudfish	X	X	
Labeo umbratus	Moggel	X	X	
Labeobarbus aeneus	Vaal-Orange Smallmouth Yellowfish	X	X	X
Labeobarbus kimberlyensis	Vaal-Orange Largemouth Yellowfish	X		X
Pseudocrenilabrus philander	Southern Mouthbrooder	X		
Alien species				
Cyprinus carpio	Carp			X
Total number of species		**9**	**6**	**4**

Species of conservation importance

The following species considered to be of conservation importance were identified or expected to occur within the study area:

- Austroglanis sclateri (Rock Catfish) – Listed as Rare in Mpumalanga (Engelbrecht & Roux, 2002), this species is endemic to the Vaal-Orange river system.

Labeobarbus kimberlyensis (Vaal-Orange Largemouth Yellowfish) – Listed as Vulnerable within the Threatened or Protected Species (TOPS) regulations of the National Environmental Management: Biodiversity Act (Act 10 of 2004), and as Near Threatened in the southern African region (Darwall *et al.*, 2009).

Present Ecological State

Present Ecological State (PES) refers to the current state or condition of a watercourse in terms of all its characteristics and relects the change the change to the watercourse from its reference condition. Refer to Table 6 for PES category descriptions.

According to results obtained following the application of the MIRAI method, the aquatic macroinvertebrate assemblage within the Wielspruit represented a minimally to moderately impaired state (i.e. PES Category B/C), with values obtained suggesting that the Wielspruit may go into a minimally impaired state (i.e. PES Category B) during times of good rainfall should no additional impacts occur within the catchment. In contrast, the aquatic macroinvertebrate assemblage within the Skulpspruit represented a moderately to largely impaired state (i.e. PES Category C/D), with values obtained suggesting that any further impacts within the Skulpspruit catchment will push the ecological state down to a largely impaired state (i.e. PES Category D).

Table 6: Allocation protocol for the determination of the Present Ecological State for aquatic macroinvertebrates following application of the MIRA

MIRAI Percentage	Category	Description
>89	A	Excellent Unimpaired; community structures and functions comparable to the best situation to be expected. Optimum community structure for stream size and habitat quality.
80-89	B	Very Good – Minimally impaired; largely natural with few modifications. A small change in community structure may have taken place but ecosystem functions are essentially unchanged
60-79	C	Good – Moderately impaired; community structure and function less than the reference condition. Community composition lower than expected due to loss of some sensitive forms. Basic ecosystem functions are still predominantly unchanged.
40-59	D	Fair – Largely impaired; fewer families present then expected, due to loss of most intolerant forms. An extensive loss of basic ecosystem function has occurred.
20-39	E	Poor – Seriously impaired; few aquatic families present, due to loss of most intolerant forms. An extensive loss of basic ecosystem function has occurred.
<20	F	Very poor – Critically impaired; few aquatic families present. If high densities of organisms, then dominated by a few taxa. Only tolerant organisms present.

B-1.5 Ground Water

B-1.5.1 Aquifer description

The conceptual hydrogeological model of the study area is generally based on the accepted model for the Mpumalanga coal fields. Three aquifers were identified including the upper weathered aquifer, the fractured Karoo aquifer, and the Pre-Karoo aquifer (aquifer below the coal seam) (Hodgson & Krantz, 1998). It was determined that the Pre-Karoo aquifer is in no way connected to the upper weathered and the fractured Karoo aquifers.

B-1.5.2 Hydro-census and water quality

For the Amersfoort study area twenty-two (22) boreholes were visited and six groundwater samples were collected. The farms were visited in December 2010 and a follow-up visit was completed in January 2011 and April 2013. Samples were collected using a bailer, and where boreholes were equipped, pumped samples were taken on surface at the outlets. A total of eleven (11) groundwater samples were collected during the field investigations. These included five (5) samples from the newly drilled monitoring boreholes and randomly selected regional boreholes. In terms of South African guideline for domestic water, groundwater is generally within the good quality class, except groundwater sampled from one of the newly drilled boreholes where the pH was high.

It is evident from the regional hydrocensus survey (Figure 9) that groundwater is mainly used for small scale and local domestic and livestock supply. No major water supply or irrigation systems were observed. It is fair to assume that groundwater is used according to aquifer capabilities.

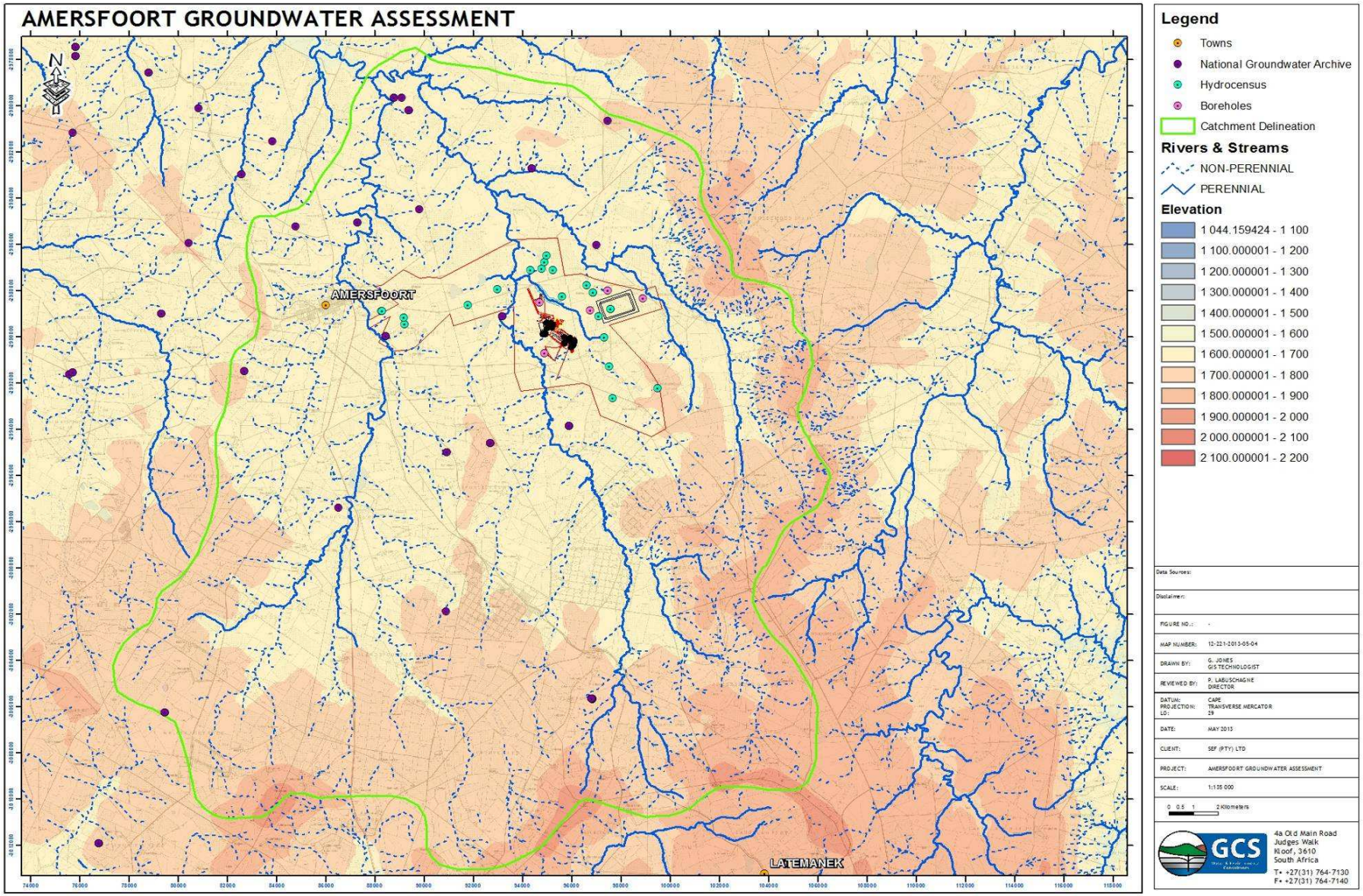

Figure 9: Topographical setting of the proposed Amersfoort Area and sub-catchment to be used for the numerical groundwater model

B-1.5.3 Predicted dragdown levels (dewatering)

During the construction of the mine portal (incline shaft) and ventilation shafts a certain degree of groundwater will be intersected this may vary and will be between 0.2 to 2 l/sec or around 100m3/day (as discussed above). The development of the mine portals and further mine development will require a certain degree of de-watering. Normally the de-watering is either re-used during construction and future operations.

Mine dewatering may cause dewatering of the surrounding aquifers, and a subsequent drawdown in groundwater levels. It is evident that de-watering will impact regional groundwater levels and it appears if groundwater levels in close proximity of the proposed mine shaft area can decrease with about 4m.

It is important to note that proposed mining at Amersfoort will be at 1422 to 1480 mamsl, topography is between 1620 and 1680 mamsl which means that mining depth will be on average around 200m below surface. It is therefore highly unlikely that any de-watering of the shallow exploitable aquifer will occur, but this needs to be confirmed through continuous monitoring.

Aquifers will supply groundwater at varying fluxes according to relative hydraulic gradients and conductance. The resultant cone of depression will expand over time due to the increasing area of the underground mining and continued dewatering of the mine workings.

The extent and shape of the drawdown cone will be influenced by the geological and hydrogeological characteristics of the area. Due to the relatively low transmissivity of the rock material, the extent of the drawdown cone will be limited in extent, displaying steep flow gradients.

The dewatering of the proposed underground mining development was simulated using drain nodes. These nodes allow the setting of a reference level to which the mining area will be dewatered over a specified time period. The level was determined by applying the coal floor elevation data for the C-Lower Seam.

The results of the flow model dewatering simulations can be viewed as follows:

Figure 10: Maximum predicted zone of de-watering for the upper weathered aquifer at mine closure (2028). It is evident that existing farm boreholes falls within the predicted zone of influence.

Figure 11: Maximum predicted zone of de-watering for the deep coal seam level aquifer at mine closure (2028). Although high drawdown values are predicted these are all within a deeper aquifer and it is unlikely that it will impact on the shallow exploitable aquifer as discussed in the previous paragraph. The occurrence of regional horizontal dolerite sills will act as a buffer between the deep and shallow aquifers and it is assumed that these are not connected. However, monitoring of all farm boreholes will be continuing on an annual basis as mining progress to confirm.

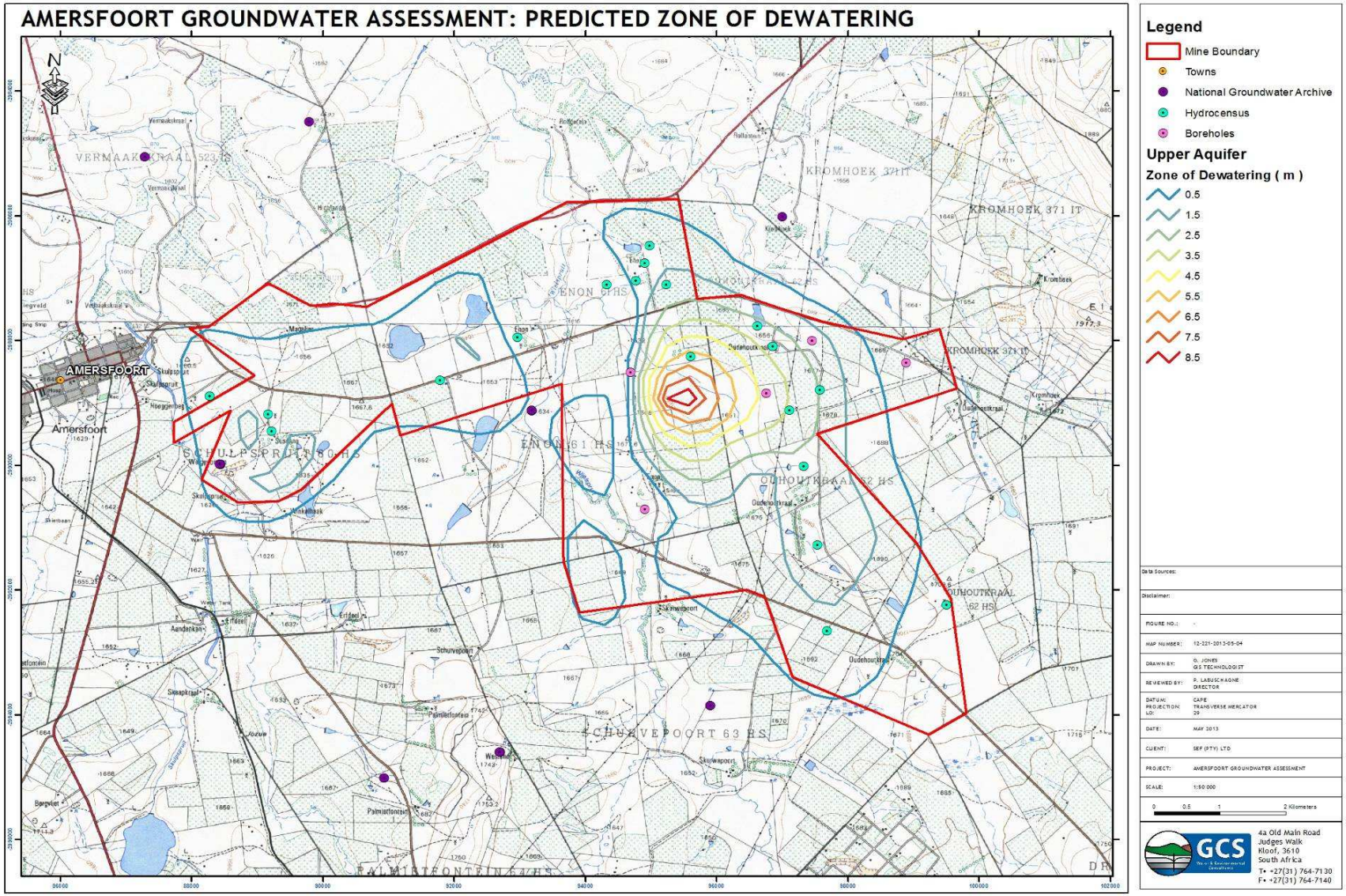

Figure 10: Predicted maximum zone of de-watering for the upper weathered aquifer at mine closure

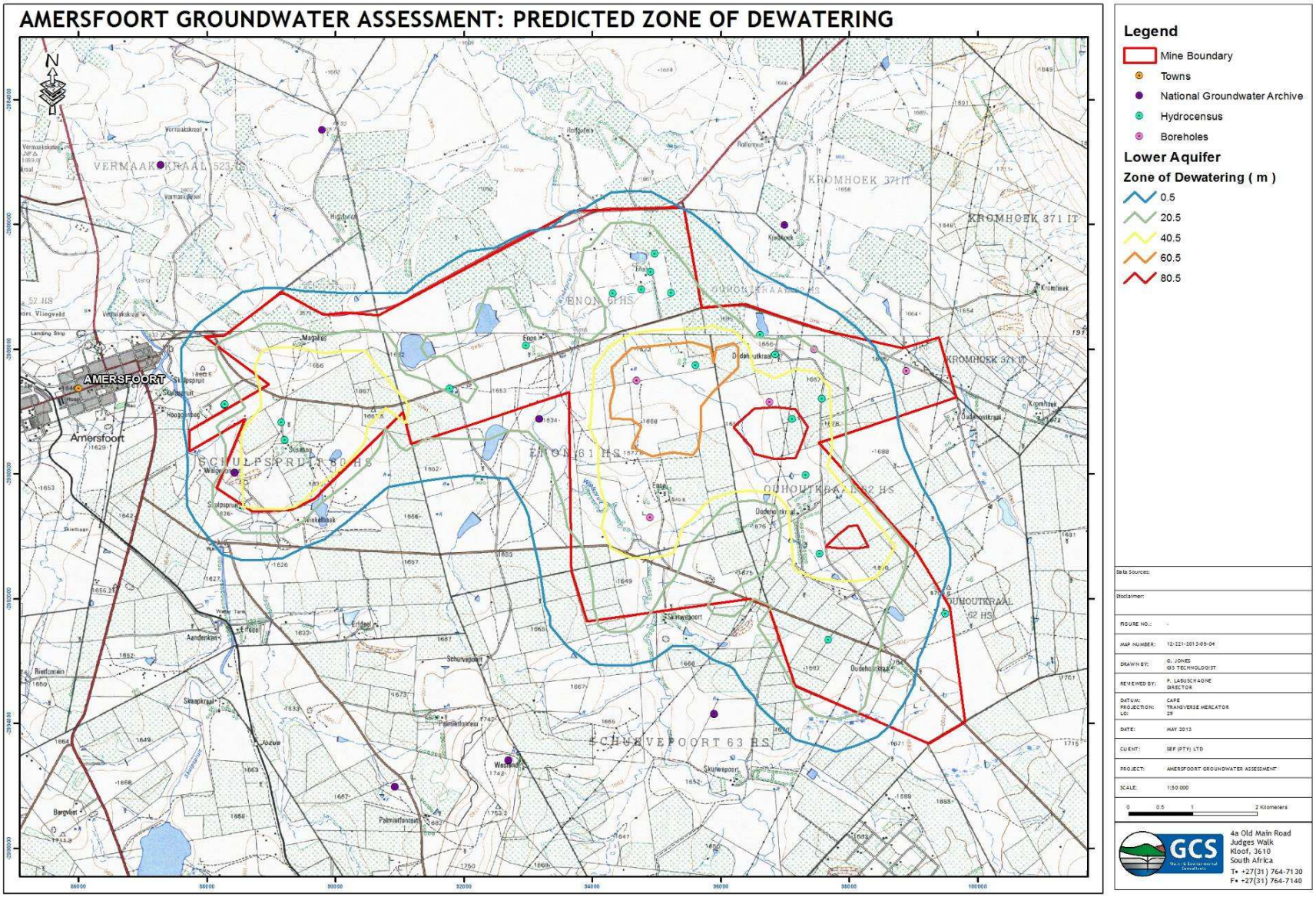

Figure 11: Predicted maximum zone of de-watering for the deep fractured aquifer at mine closure

B-1.5.4 Potential and Predicted Contaminant Transport

Following the calibration of the flow model, a contaminant transport model was constructed for the mining area and especially for the proposed surface infrastructure, like the waste storage facilities. In order to determine the long-term effect of the proposed storage of waste (i.e. discard and slurry) on groundwater quality, the post-operational migration of contamination was simulated. Sulphate (S04) was chosen as the parameter to be modelled. Sulphate would be one of the end-products of acid rock drainage (which the ABA testing shows as a good possibility) and is therefore a chemical of concern and comprises usually about 50% of the Total Dissolved Solids (TDS). To determine the specific input parameters for mass transport modelling, the ABA and leach test results will be applied as preliminary input values.

Modeling of potential mass transport from the proposed underground workings will also be preliminary and indicative only.

The numerical model was used to determine how far the contamination will extend from the mining areas, and which flow direction it will use. A starting mass concentration of 2000mg/l was used in order to simulate the worse-case scenario.

Observation points were added to the model grid to determine the breakthrough period (time for SO4 plume to reach certain observation points) and order of magnitude. These points were located to represent the newly drilled monitoring boreholes.

1. A worst case scenario where a maximum concentration of sulphate was applied. 2000 mg/l of sulphate was applied as a constant concentration. This also include no mitigation methods to possible impacts; for example no lining to the PCD (pollution control dam) were applied and it is assumed that discard and slurry will seep maximum sulphate concentrations due to poor management. Refer to Figure 12.
2. A scenario where all possible mitigation to the surface infrastructure were applied. This include lining of the PCD and allowing for proper management of the waste storage facilities. Refer to Figure 13.

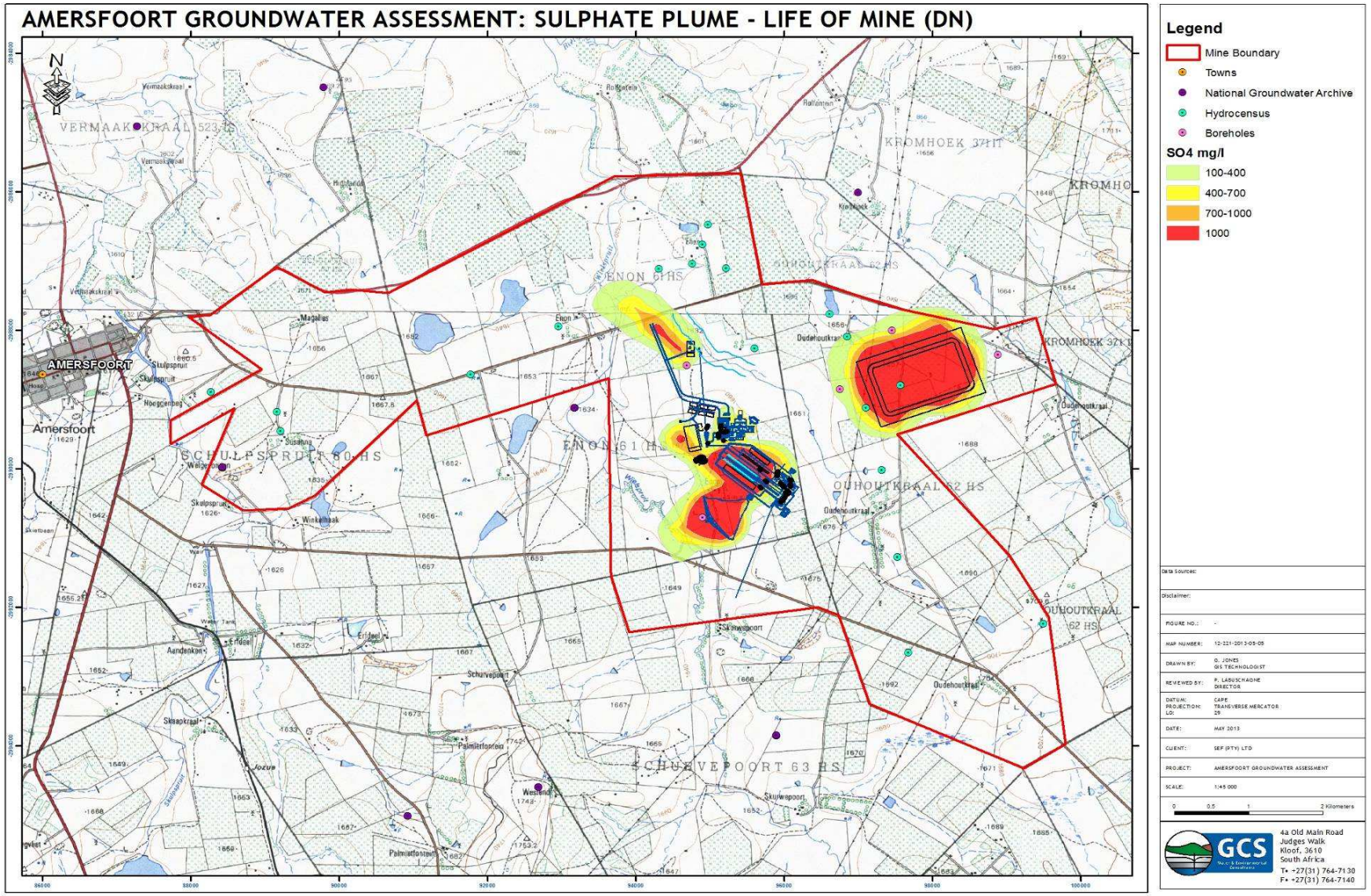

Figure 12: Predicted worst case sulphate migration plume at LOM

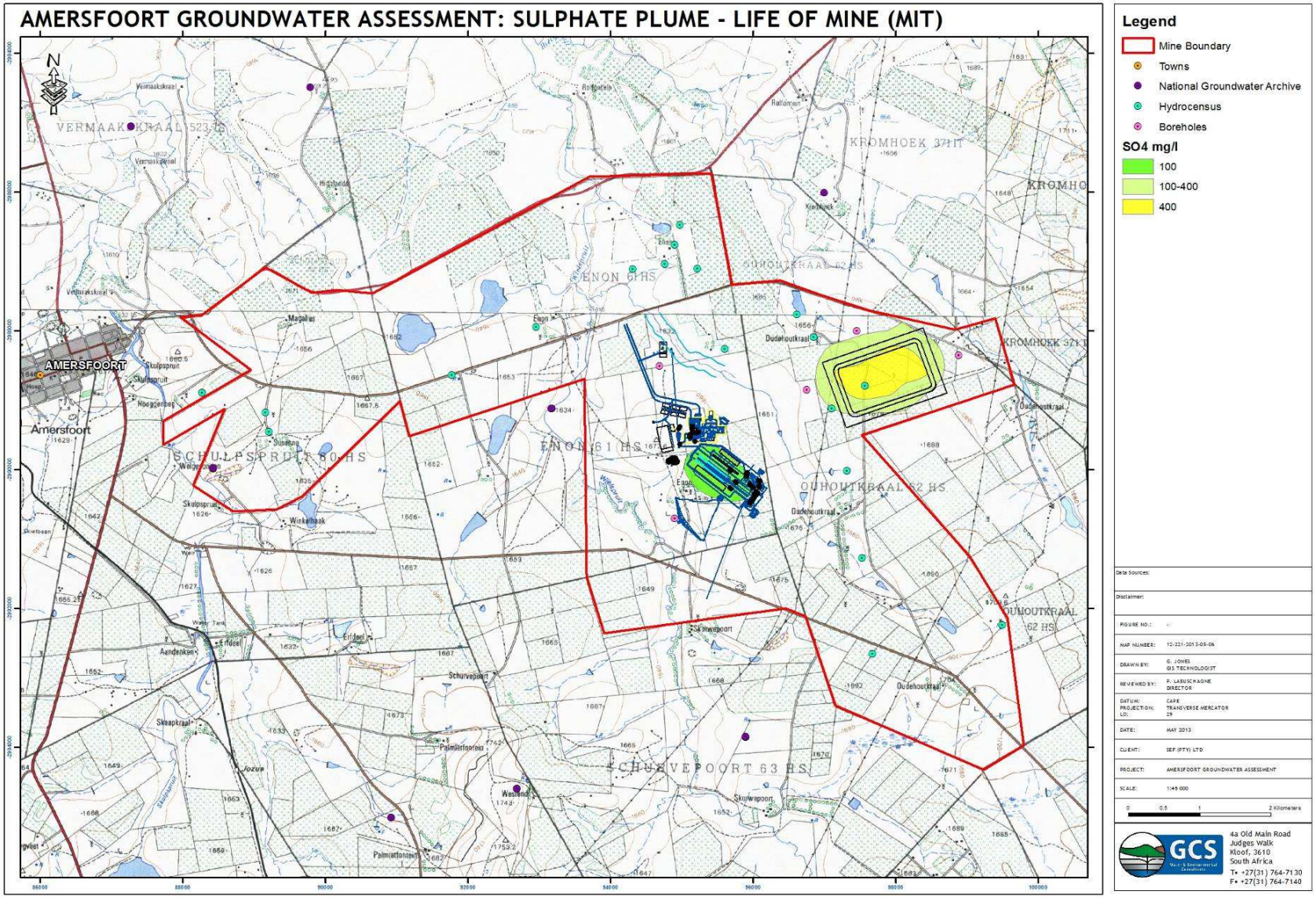

Figure 13: Predicted sulphate plume for mitigation and management during LOM

B-1.6 Wetlands

B-1.6.1 NFEPA Status

The National Freshwater Ecosystem Priority Areas (NFEPA) project is a project currently underway, and represents a multi-partner project between the Council for Scientific and Industrial Research (CSIR), South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), Department of Water Affairs (DWA), Department of Environmental Affairs (DEA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). More specifically, the NFEPA project aims to:

- Identify Freshwater Ecosystem Priority Areas (hereafter referred to as 'FEPAs') to meet national biodiversity goals for freshwater ecosystems; and
- Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers.

The catchments associated with the study area also have the following National Freshwater Ecosystem Priority Areas (NFEPA) status:

- Skulpspruit catchment is identified as a Freshwater Ecosystem Priority Area for its representation of the heterogeneity signature and longitudinal zone (Highveld – Lower Foothill);
- Wielspruit catchment is identified as an upstream management catchment required to prevent the downstream degradation of Freshwater Ecosystem Priority Areas and Fish Support Areas; and
- Rietspruit catchment is identified as a Freshwater Ecosystem Priority Area for its representation of the heterogeneity signature and longitudinal zone (Highveld – Mountain Stream, Upper Foothill and Lower Foothill).

B-1.6.2 Wetland delineation, PES and EIS

Five different types of wetlands were classified within the surface infrastructure area and were categorised into twenty seven different hydro-geomorphic (HGM) units. These include channelled valley bottom wetlands, floodplain, hillslope seepage wetlands connected to a watercourse, isolated hillslope seepage wetlands and pans (Refer to Figure 14 and Figure 15). Altogether, delineated wetlands occupy approximately 1267.57 ha within the study area. Due to the largely natural wetlands present on site and the associated functions the wetlands perform healthy hectare equivalents were calculated to be 890.20 ha.

Each wetland's ability to contribute to ecosystem services within the study area is dependent on the particular wetland's Present Ecological Status in relation to a benchmark or reference condition. A Wet-Health level 2 assessment of wetlands within the study area assigned Present Ecological Status scores for the hydro-geomorphic units. Combined area weighted Wet-Health results indicated that wetlands within the study area are moderately altered as a result of changes in water inputs (derived from its catchment) and water retention and distribution patterns within the wetland unit itself, as well as vegetation changes due to the cultivation of crops and overgrazing. The floodplain system and associated hillslope seepage wetland are largely natural and are ecologically sensitive. They provide habitat for a number of diverse floral and faunal species.

The valley bottom wetlands still perform a number of functions through the provision of various ecosystem services such as streamflow regulation, flood attenuation, groundwater recharge, nitrogen, phosphate and toxicant removal, sediment trapping and provision of natural resources. Many of these functional benefits contribute directly or indirectly to increase biodiversity within the study area, through the provision and maintenance of appropriate habitat and associated ecological processes.

The Ecological Importance and Sensitivity assessment was undertaken to rank water resources in terms of:

- Provision of goods and service or valuable ecosystem functions which benefit people;
- Biodiversity support and ecological value; and
- Reliance of subsistence users (especially basic human needs uses);

The moderate Ecological Importance and Sensitivity assigned to the valley bottom wetland within the study area can primarily be attributed to the wetlands retaining a number of functions and providing habitat for faunal and floral diversity. Human benefits were associated with cattle grazing, the cultivation of crops in the temporary zone of some hillslope seepage wetlands and the abstraction of water from dams.

The impact assessment identified destruction of wetland habitat, surface water pollution, and changes to the hydrological as major potential impacts during the construction and operational period.

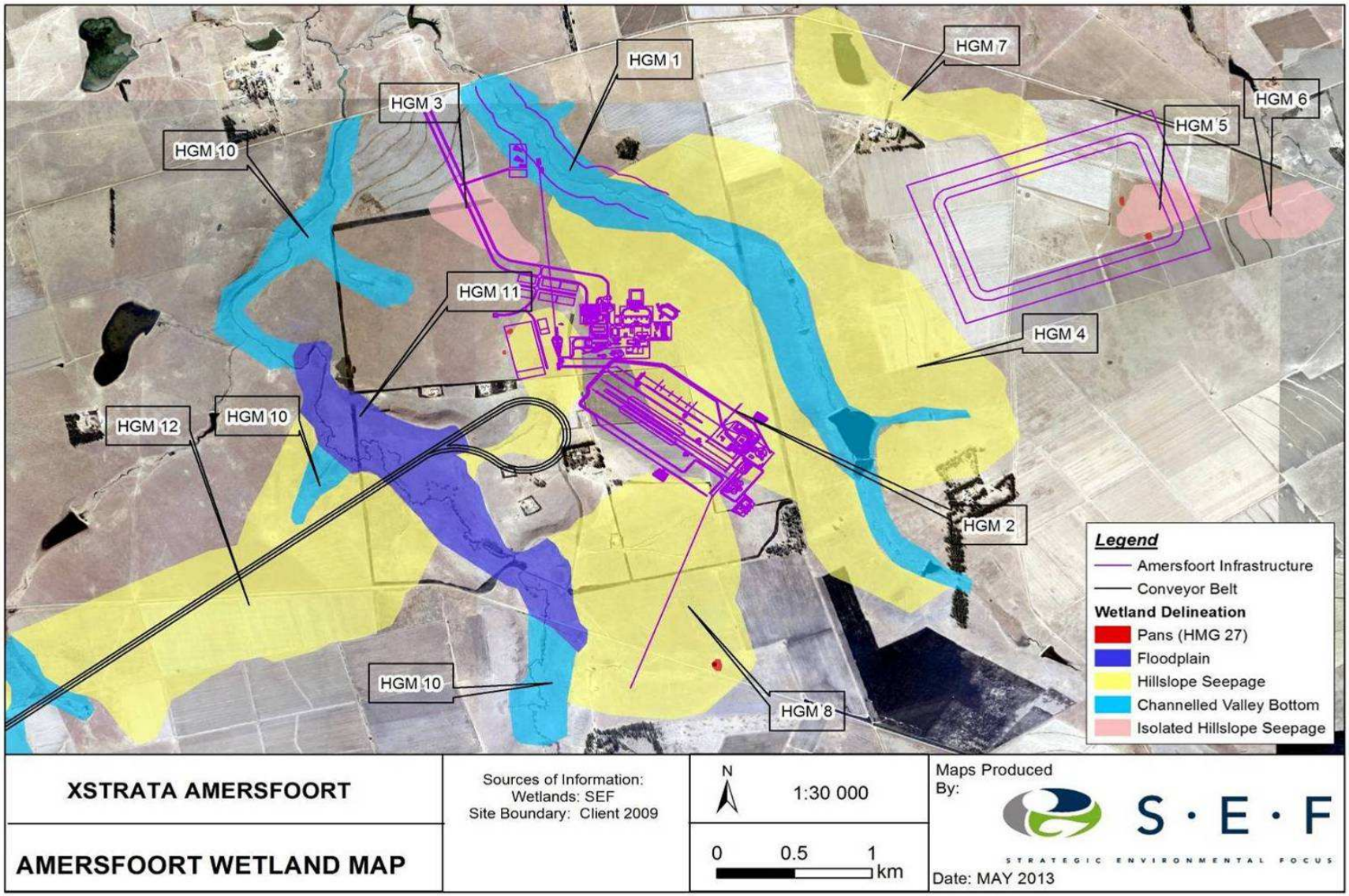

Figure 14: Wetlands identified within the surface infrastructure area

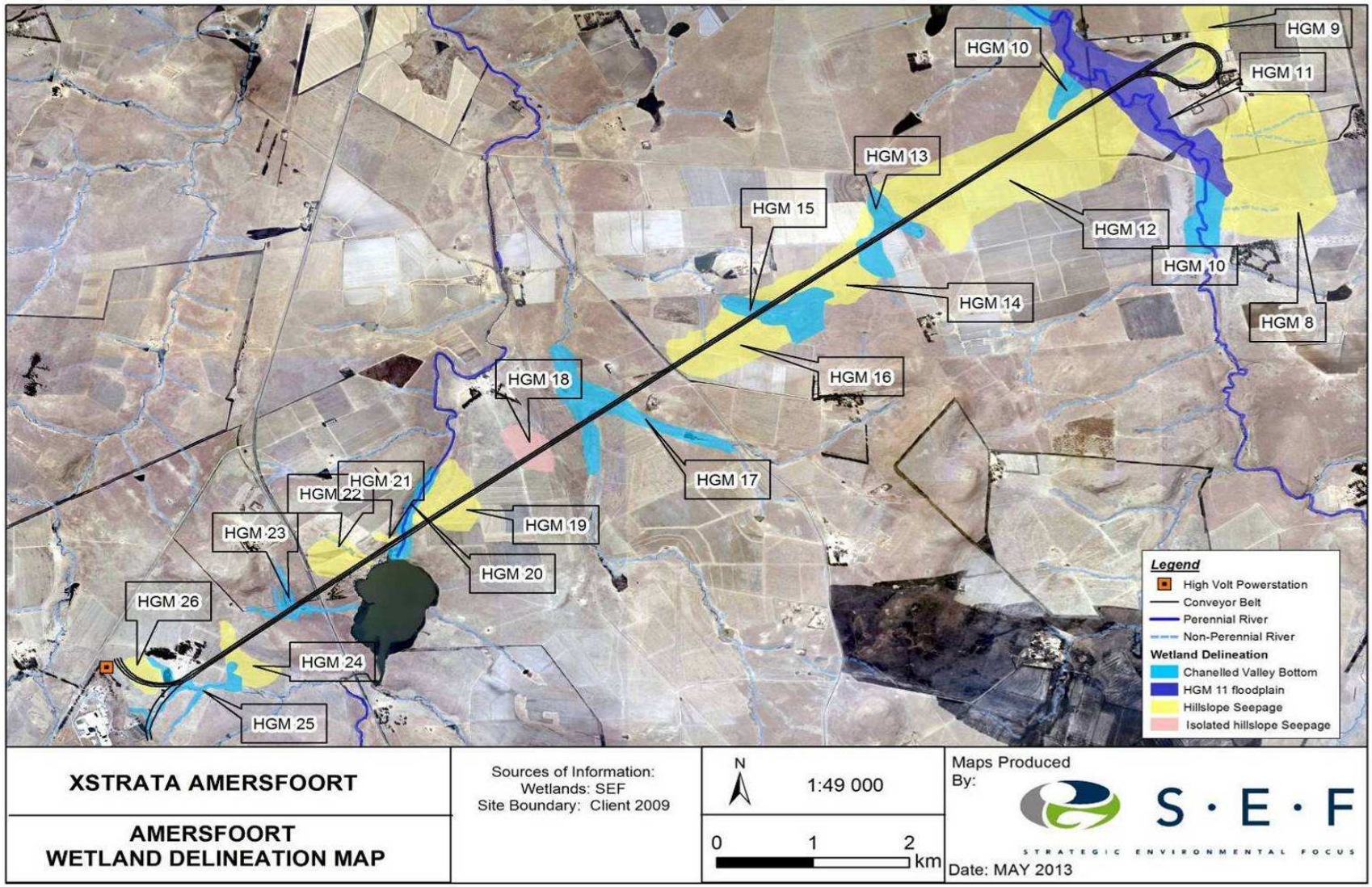

Figure 15: Wetlands identified within the conveyor area

B-1.7 Flora and Fauna

B-1.7.1 Vegetation Communities in the Study Area (Flora)

The vegetation in the study area is characterised by grasslands, wetlands and riparian vegetation. The grasslands comprise natural grasslands that are grazed, secondary grasslands in fallow lands and pasture grasslands. Where the grassland is in a natural state, it should support a high diversity of species. However, in the majority of grassland areas, the grazing pressure and annual or bi-annual burning maintains a largely dominant stand of *Themeda triandra* (Red Grass), while the forb diversity is relatively low.

Rocky outcrops were present, especially in proximity to watercourses. The rocky outcrops, as well as natural grasslands, were observed to include numerous protected plants as well as plants of conservation concern (Red Data Plants). Common protected plants on the study site included *Gladiolus crassiflorus, Watsonia densiflorus, Boophane distichia* and *Eucomis autumnalis*. In addition, grass orchid species were also observed. These orchids were not in flower which hampered positive identification.

Along the perennial rivers that flow through the study site, riparian vegetation was encountered. The riparian vegetation varied from grazed grassland with the exotic *Salix babylonica* (Weeping Willow) to rocky areas with a high potential as habitat for threatened plant species.

B-1.7.2 Faunal Communities in the Study Area (Fauna)

Avifauna

Approximately 300 bird species occur within the study area and of these, approximately 277 species are associated with grassland (including wetlands and other inland water systems) and farmlands. A total of 90 bird species were identified within the study area during the baseline field survey. Of the species observed, 56 were associated with the farm dams and wetlands while 51 were observed within natural grassland and farmlands in the area.

The region supports a high level of endemism with 53 endemic bird species occurring in the study area while 37 species are of conservation concern either provincially, nationally or globally. Of these species, 7 were observed within the study area, namely the Vulnerable Blue Crane (*Anthropoides paradiseus*), Blue Korhaan (*Eupodotis caerulescens*), and Southern Bald Ibis (*Geronticus calvus*), the Near Threatened Secretarybird (*Sagittarius serpentarius*), Black-winged Pratincole (*Glareola nordmanni*), and Lanner Falcon (*Falco biarmicus*), and the globally Near Threatened Maccoa Duck (*Oxyura maccoa*).

Mammals

Approximately 88 mammal species are expected to occur within the study area. A total of 13 mammal species were identified within the study area during the baseline field survey and confirmed by sight or field evidence such as spoor, droppings or burrows. Three of the observed species were of conservation concern; the Serval (*Leptailurus serval*) is listed provincially and nationally as Near Threatened, while the Cape Clawless Otter (*Aonyx capensis*) and Aardvark (*Orycteropus afer*) are provincially protected species.

Herpetofauna

According to the Southern African Reptile Conservation Assessment (SARCA), 25 reptile species are expected to occur within the study area. Two species have a conservation status higher than Least Concern, namely the Spotted Harlequin Snake (*Homoroselaps lacteus*) which has a provincial listing of Near Threatened and the Giant Girdled Lizard or “Sungazer” (*Smaug giganteus*) which was confirmed to occur in the study area and is listed as Vulnerable on the provincial, national and global red lists.

According to the Southern African Frog Atlas Project (SAFAP), approximately 22 amphibian species have been confirmed to occur within study area. Two species were identified during the field survey while 14 others (none of which are of conservation concern) were given a high probability of occurring in the area due to the presence of suitable habitat. The Giant Bullfrog (*Pyxicephalus adspersus*) has a provincial listing of Vulnerable and a national listing of Near Threatened.

B-1.7.3 Mpumalanga Biodiversity Conservation Plan (MBCP)

Provincial Conservation Plans aim to build on national plans at the provincial level. It is intended to be used by all who are involved in land-use and development planning, most particularly those specialists who need a comprehensive source of biodiversity information. The plan, and resulting land-use guidelines, are intended to supplement other spatial planning tools such as municipal Integrated Development Plans and Spatial Development Frameworks.

The Mpumalanga Province developed the Mpumalanga Biodiversity Conservation Plan (MBCP) which is a comprehensive environmental inventory and spatial plan that is intended to guide conservation and land use decisions in support of sustainable development (Lötter & Ferrar, 2006). It is a spatial rather than an operational plan and forms part of a wider set of national biodiversity planning initiatives supported by South African National Biodiversity Institute (SANBI). The MBCP maps the distribution of the Province's known biodiversity into six categories. These are ranked according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature:

1. Areas with No Natural Habitat Remaining (areas with development options);
2. Areas of Least Concern with development options;
3. Important and Necessary ecosystems (protection needed);
4. Ecological Corridors;
5. Highly Significant; and
6. Irreplaceable Ecosystems.

Areas that have already been transformed are classified as "No Natural Habitat Remaining" or areas of "Least Concern", while most of the remnant patches of indigenous vegetation, including those within the study area, have been classified as "Highly Significant" and "Important and Necessary" in the MBCP. The MBCP is accompanied by land-use planning guidelines to guide planning and development within each of the biodiversity conservation categories throughout the Province. In each category, there are different land uses and development consequences (Table 1). The Amersfoort study site includes areas of "Least Concern", "No Natural Habitat Remaining" and "Important and Necessary" (Table 7 and Figure 16).

Table 7: Biodiversity categories for Mpumalanga (Ferrar & Lotter, 2007)

Biodiversity category	Biodiversity importance	Permissible land use	Land use
Protected areas	already protected and managed for conservation;	Land use types 1 and 2 only permitted, type 3 allowed under restriction;	1. Conservation management 2. Extensive game farming 3. Extensive livestock production 4. Rural recreational development 5. Rural (communal) settlement 6. Dry land crop cultivation 7. Intensive animal farming 8. Irrigated crop cultivation 9. Timber production 10. Urban & business development 11. Major development projects 12. Linear engineering structures 13. Water projects & transfers 14. Underground mining 15. Surface mining, dumping, dredging
Irreplaceable areas	no other options available to meet targets—protection crucial;	Land use types 1 to 3 permitted, unavoidable developments require strict controls ;	
Highly Significant areas	protection needed, very limited choice for meeting targets;	Land use types 1 to 3 permitted, type 4 and *unavoidable developments / impacts requires strict controls*	
Important and Necessary areas	protection needed, greater choice in meeting targets;	Land use types 1 to 3 recommended, types 4 and 5 allowed under restriction;	
Ecological Corridors	mixed natural and transformed areas, identified for long term connectivity and biological movement such as river lines, altitudinal gradients and mountain ranges;	Land use types 1 to 3 recommended, all other land uses permitted only under restriction; timber production (9) and urban development (10) not permitted in corridors;	
Areas of Least Concern	natural areas with most choices, including for development;	All land uses permitted, although several require restrictions.	
Areas with No Natural Habitat Remaining	transformed areas that make no contribution to meeting targets	All land uses permitted, although several require restrictions.	

Biodiversity categories relevant to this study

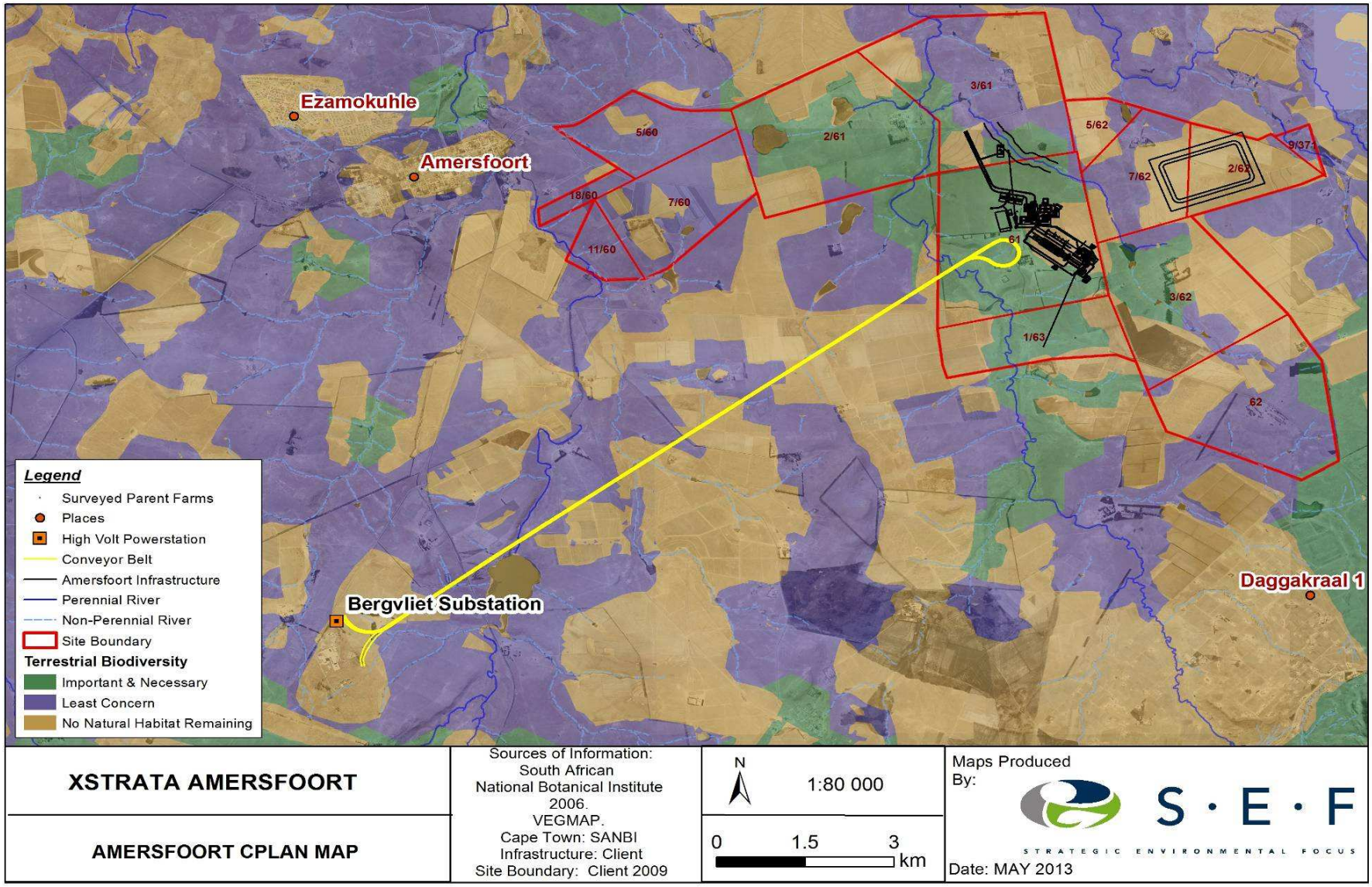

Figure 16: The Mpumalanga C-Plan in relation to the study area

B-1.7.4 Floral Sensitivity

Areas of High Sensitivity:

From a vegetation perspective, the natural grasslands as well as moist grasslands and riparian vegetation are the main areas of high sensitivity (Refer to Figure 17and Figure 18). The natural grasslands are contained in the areas not previously cultivated or overgrazed and include all rocky outcrops and rocky grasslands areas. The natural grasslands that were found on the study site were habitat to plants of conservation concern such as *Boophone disticha* and *Eucomis autumnalis*, as well as provincially protected plants such as *Gladiolus* species. Furthermore, although the Amersfooort Highveld Clay Grassland is not a Listed Ecosystem, the vegetation unit is nationally classified as a Vulnerable vegetation unit and therefore all remaining, natural patches of this grassland should be conserved.

The moist grasslands which included riparian vegetation, plays an important role in water catchment, assimilation of phosphates, nitrates and toxins, soil stability, as well as a possible role in flood attenuation. The future quality, quantity and sustainability of water resources in South Africa are fully dependent on good land management practices within the catchment areas. The moist grasslands and riparian vegetation thus have a high ecological function as it maintains ecological integrity while providing suitable habitat to threatened plant species. Therefore all the moist grasslands and associated riparian vegetation are designated as highly sensitive.

Areas of Medium to High Sensitivity:

Numerous overgrazed grasslands were noted during the field surveys. Although the grass cover was good, the forb diversity was relatively low, possibly due to annual burning practices. In addition, the majority of these overgrazed grasslands correspond to the MBCP's areas of "Least Concern". However, the occurrence of numerous protected plants as well as some species of conservation concern cannot be ignored and the connectivity of the grasslands to wetlands and large un-fragmented open spaces that provide habitat to faunal species affords it a medium to high ecological function and sensitivity.

Areas of Medium Sensitivity:

Overgrazed grasslands in the study area, which supported indigenous vegetation but not any provincially protected species or species of conservation concern were classified as medium floral sensitivity.

Areas of Low Sensitivity:

Large portions of the study site were cultivated. These areas correspond to the MBCP's areas with "No Natural Habitat Remaining" and are devoid of natural plant communities. Although these areas could be important from a faunal perspective (especially avifauna), they are of a low vegetation sensitivity and unlikely to support any plant species of conservation concern and were therefore classified as low floral sensitivity.

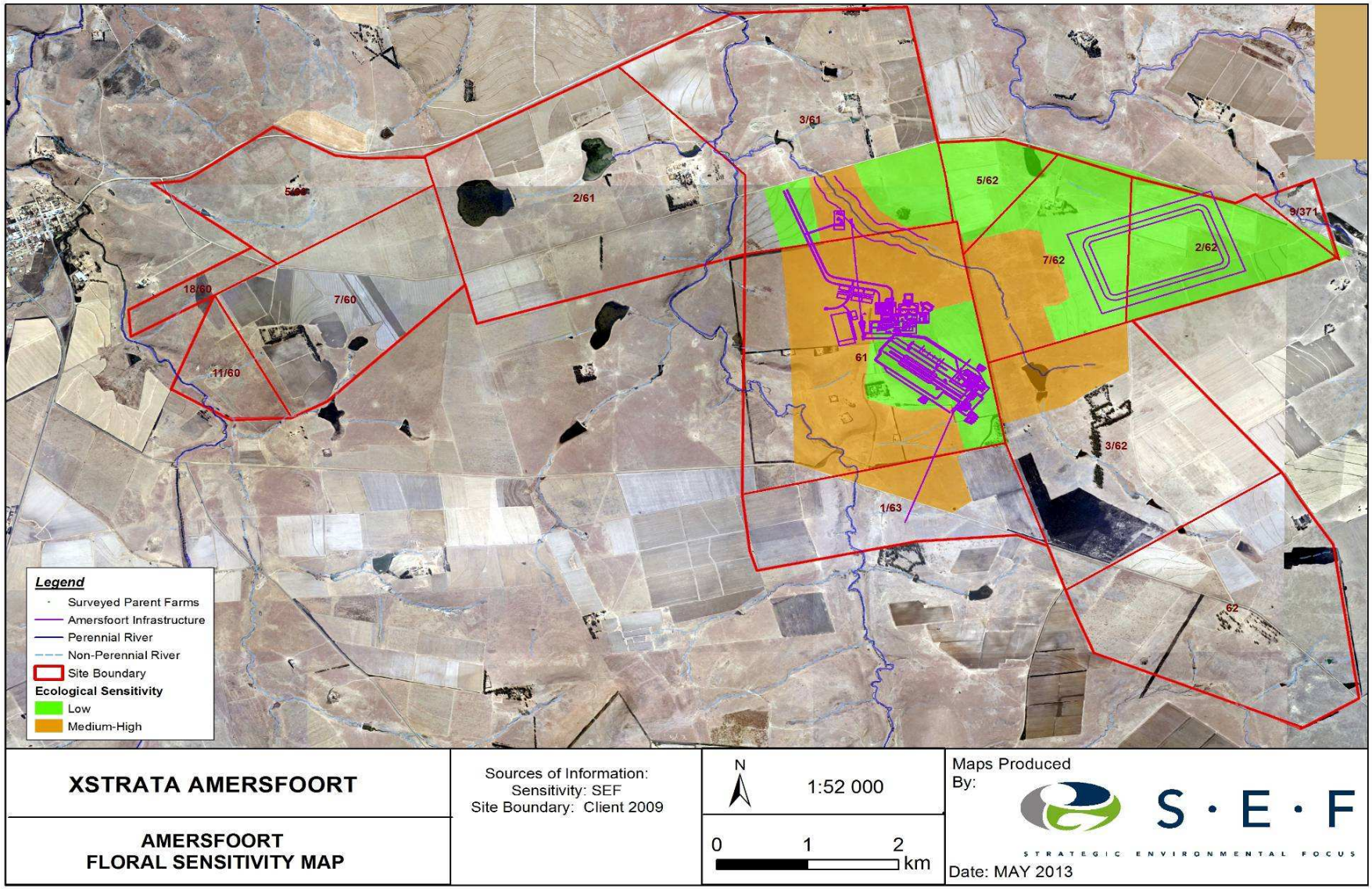

Figure 17: Floral sensitivity in relation to the area associated with the infrastructure

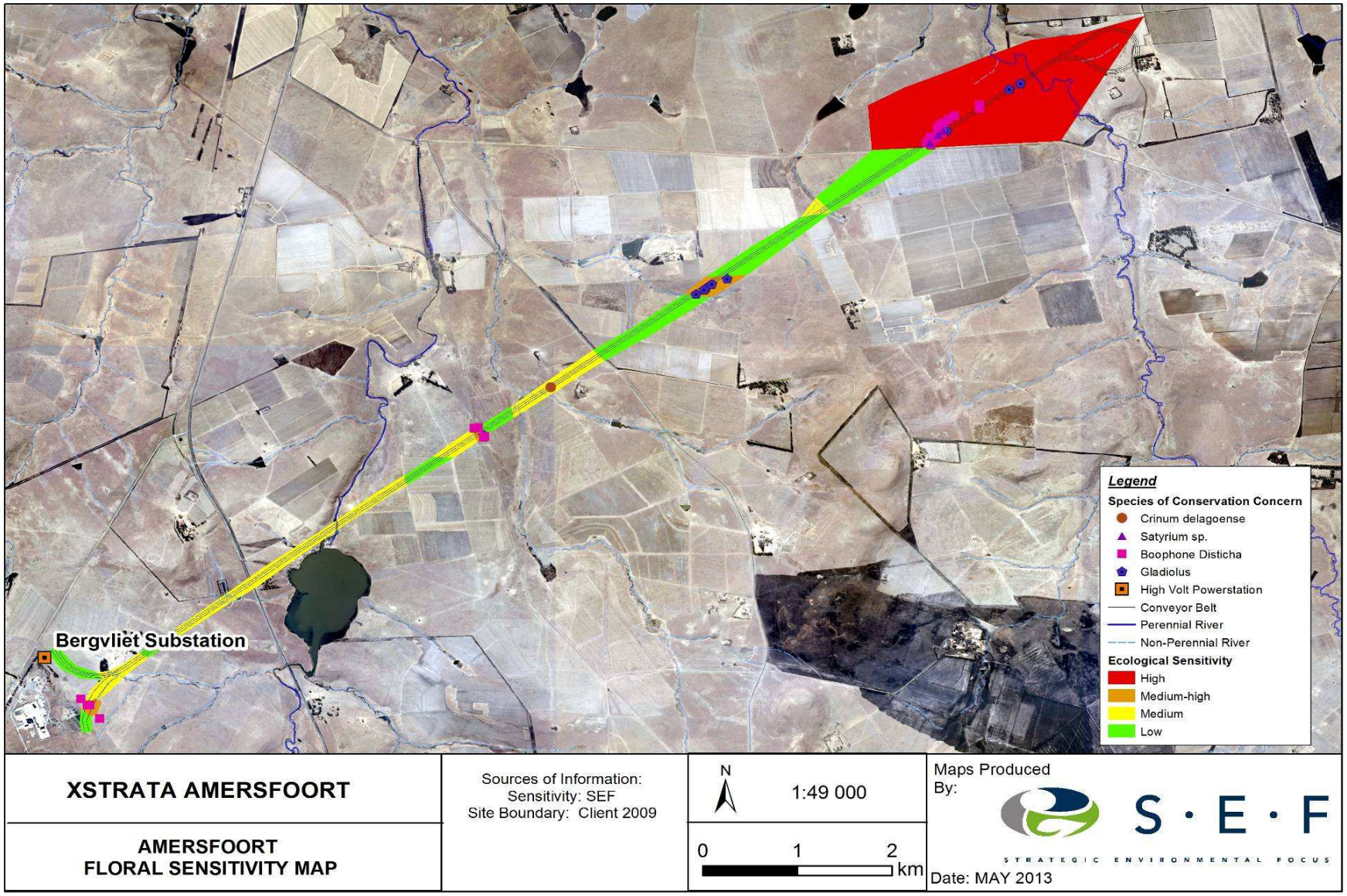

Figure 18: Floral sensitivities associated with the proposed conveyor system

B-1.7.5 Faunal Sensitivity

Areas of High / Medium-high Sensitivity:

Natural grassland incorporating rivers and wetlands: The majority of the study area falls within Important Bird Area (IBA) ZA016 Grassland Biosphere Reserve (SA020) (Refer to Figure 19). This vast IBA is centred on the towns of Volksrust and Wakkerstroom and comprises around 800 private farms, several municipalities and conservancies and a considerable amount of state-owned land. The reserve area constitutes six of the seven IBA criteria. The function of BirdLife's IBA Programme is to identify, protect and manage a network of sites that are significant for the long-term viability of naturally occurring bird populations. The continued ecological integrity of these sites will be decisive in maintaining and conserving such birds. Legal protection, management and monitoring of these sites are all important targets for action, and many (but not all) bird species may be effectively conserved by these means. The grassland habitat in the study area, which includes rivers and wetlands, was given a high or medium-high sensitivity rating as it supported the majority of the faunal species in the area, including many of conservation concern. It was also found to provide connectivity in the regional context by providing corridors for movement to the surrounding natural areas.

Rocky outcrops, ridges and koppies: Many areas of rocky habitat such as ridges, outcrops and river gullies were observed in the study area. Such features increase the habitat diversity of an area by providing refuge for floral species as well as faunal species thereby increasing the ecological diversity and habitat heterogeneity of the area. Such areas added to the faunal diversity where specialised species such as the Mountain Wheatear (*Oenanthe monticola*), Greater Striped Swallow (*Cecropis cucullata*), South African Cliff-Swallow (*Petrochelidon spilodera*), Malachite Sunbird (*Nectarinia famosa*) and Cape Crag Lizard (*Pseudocordylus microlepidotus*) were observed utilising this habitat for foraging and breeding. Such areas were therefore given a high sensitivity rating.

Areas of Medium Sensitivity:

Agricultural fields and pastures: The study area is essentially a mosaic of natural grassland and wetlands associated with watercourses, interspersed between agricultural fields and pastures. Many faunal species, including some of conservation concern have adapted to utilise the agricultural areas as foraging habitat. Such areas in the study area were therefore given a medium sensitivity rating.

Stands of exotic trees: A few stands of exotic trees are scattered throughout the study area. These areas provide breeding and foraging habitat as well as shelter to a number of bird species. They also enabled savanna or woodland species to colonise the area. The stands of exotic trees in the study area were given a medium sensitivity rating as destruction of this habitat would mean a displacement of faunal species from the immediate area, although none of these are species of conservation concern.

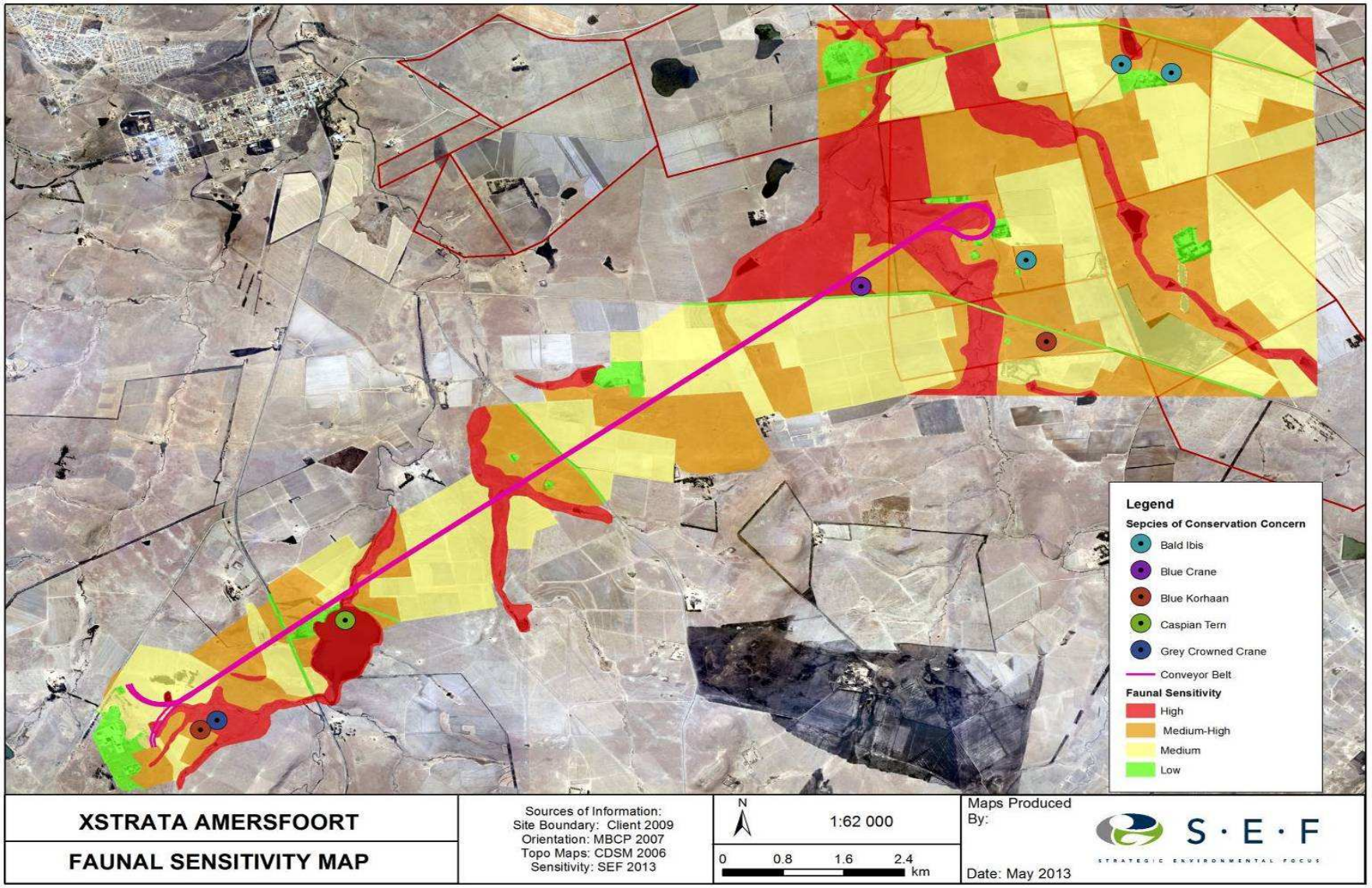

Figure 19: Areas of important and sensitive faunal habitat within the study area

B-2 SOCIAL ENVIRONMENT

B-2.1 Social Assessment

B-2.1.1 Regional Social Context

The HDI (Human Development Index) measures the life expectancy, literacy and income levels of a particular group. The HDI figures, as outlined in Global Insight statistics, August 2011, indicates very low HDI figures for the District (Gert Sibande) as well as the Local (Pixley Ka Seme Local Municipality) Municipalities in which the proposed project is located. This reflects that the majority of the community in this region are not particularly healthy, well-educated or in a financially secure position.

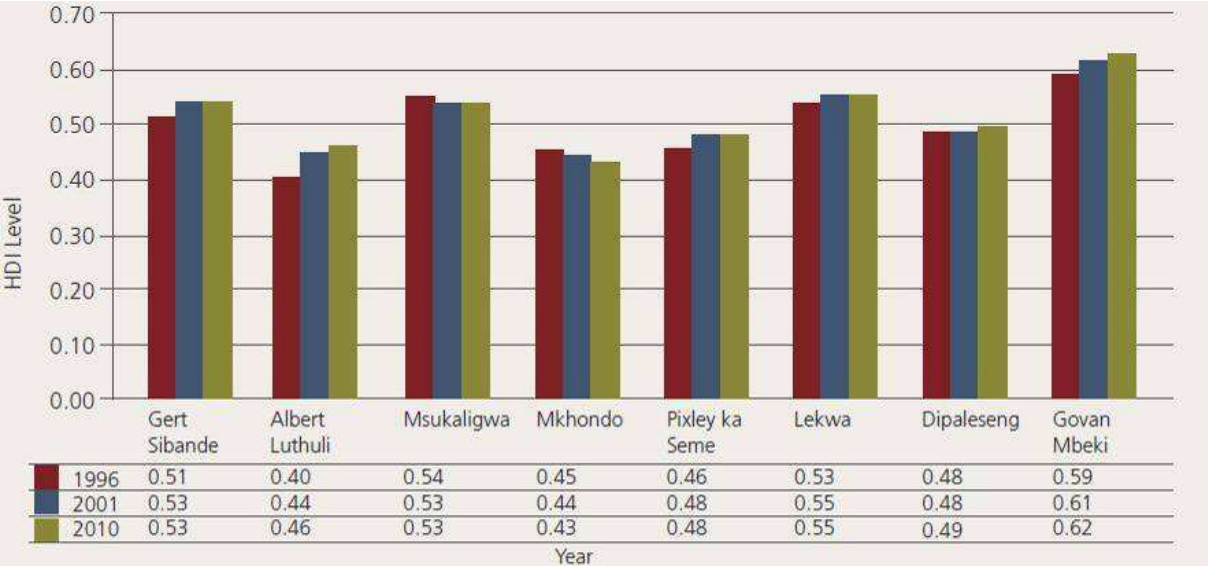

Figure 20: HDI Figures for the Gert Sibande District Municipality *(Global Insight, August 2011)*

When focusing on the HDI and poverty figures for the Gert Sibande District Municipality (GSDM) by racial group it is evident that the white population is almost twice as likely to be better educated, have a longer life expectancy and a higher income than their other racial groups.

POPULATION GROUP	1996	2001	2010
African	0.42	0.45	0.47
White	0.84	0.86	0.88
Coloured	0.62	0.67	0.65
Asian	0.73	0.75	0.77
Total	**0.51**	**0.53**	**0.53**

Figure 21: HDI figures for the GSDM by racial group *(Global Insight, August 2011)*

From the above, it is evident that job creation is an important element that is missing from these communities at present. There is a high level of poverty, just under 50%, with a total of 521 087 people living in poverty in the GSDM in 2010. This is a trend that is evident in many places in South Africa and is addressed in the New Growth Path (NGP), which informs the national strategic policy direction. The GSDM IDP 2012 - 2017 highlights that core elements of the NGP aim to target job creation through mining and mining related

activities. Decent work and sustainable livelihoods are high on the NGP's agenda and these must be considered in the assessment of the proposed mine.

B-2.1.2 Local Social Context

The Amersfoort area largely comprises of a farming community, and a small local economy. The majority of the farmers are white Afrikaans speaking individuals who take residence on their farms.

In terms of the nature of the town, there is a large RDP housing settlement, which is orderly and well laid out. These houses are largely brick structures and cover a large area. There is the provision of electricity to these houses and there is a certain level of basic subsistence farming at the household level. There are a large number of unpaved roads.

In the traditionally white and more affluent area of the town, there is a large formal suburb. This is clearly a more affluent area. There are also silos in the town, which highlight the agricultural focus of the town. The town is bisected by the N11 and the R35. The locality of the coal resource falls outside of the town, to the West. And as a result the infrastructure will not affect the town, nor its visual character.

There are a number of services available in the town, however the town of Amersfoort does rely on other centers such as Volksrust and Ermelo.

The tables below (8 – 13) highlight the demographic information for Ward 7 in which Amersfoort is located. It is evident that the ward is characterised by residential accommodation in the town of Amersfoort, as well as a large number of farms. The town has a larger percentage of employed individuals, than unemployed, however the unemployment rate (including those who are discouraged) is almost equivalent to the number of employed people.

The Amersfoort area has a large Black African population, followed by White individuals (representing 7.7% of the total population) and decreasing numbers of Indian/ Asian, Coloured and Other groups. There are a variety of water sources in the area, with the majority of households receiving serviced water. Finally, in terms of income, the majority of the Amersfoort population earn less than R38 200 per annum.

Table 8: Amersfoort land use (Source Demarcation Board)

Formal Residential	Farms	Vacant	Commercial
6 372	391	13	171

Table 9: Amersfoort Employment data (Source: Demarcation Board)

Employed	Unemployed	Discouraged work seeker	Other not economically active	Employment not applicable
1 505	746	288	1 813	2 596

Table 10: Amersfoort gender demographics (Source: Demarcation Board)

Male	Female
3 437	3 510

Table 11: Racial demographics, Amersfoort (Source: Demarcation Board)

Black African	Coloured	Indian or Asian	White	Other	Total Population
6 157	12	178	543	58	6 947

Table 12: Water source, Amersfoort (Source: Demarcation Board)

Serviced water	Borehole	Spring	Rain water tank	Dam/pool/stagnant water
1 957	29	34	3	1
River/stream	**Water vendor**	**Water tanker**	**Other**	**Total Households**
5	11	5	14	2 060

Table 13: Income brackets, Amersfoort (Source: Demarcation Board)

No income	R 1 - R 4800	R 4801 - R 9600	R 9601 - R 19 600	R 19 601 - R 38 200	R 38 201 - R 76 400
262	156	302	445	409	221
R 76 401 - R 153 800	**R 153 801 - R 307 600**	**R 307 601 - R 614 400**	**R 614 001 - R 1 228 800**	**R 1 228 801 - R 2 457 600**	**R 2 457 601 or more**
136	70	47	8	2	1

B-2.1.3 Social Interviews

SEF conducted in-depth, semi-structured interviews, in the language of choice of the respondents as a primary data collection tool. These interviews included affected landowners and representatives of the Local Municipality as outlined below:

- Mr Sibryco - Renting a farm
- Mr Mufamadi - Representing Mrs Semelane, the farm owner
- Mr E. Deacon - Farmer
- Mr JJ. Deacon - Employed at Eskom
- Mr van Niekerk - Farmer
- Mr Engelbrecht - Farmer
- Mr Beeslaar - Employed at Eskom
- Mr Nyembe - LED Manager: Pixley Ka Seme Municipality
- Mr Ndlhela - Communications Manager: Pixley Ka Seme Municipality

Comments made during the above interviews and relevant responses will be included in the Comment and Response Report to be submitted with the Final EIR.

B-2.2 Heritage

The Mpumalanga Province has a rich landscape which has provided people with resources for utilization and exploitation for more than 1,7 million years. Archaeological evidence indicates that people were initially attracted to the region by its diverse and abundant plants and animals and later on by the exploitation of the rich variety of minerals such as ochre, copper and iron, which is a practice that can be traced back thousands of years (Esterhuysen and Smith, 2007).

The heritage investigation focused on the footprint of the main mine infrastructure, including the conveyor belt for the transportation of coal as well as the area where construction site layouts are being proposed. The study area is mainly farmlands, and as such the heritage resources revealed by the study conform to agricultural land heritage and archaeology. The two major types of heritage resources found on site constitute graves and various farm buildings/structures and ruins.

The heritage survey revealed the following (Refer to Figure 22 and Table 14):

- 10 structures constituting farm buildings/ structures and ruins of various ages; and
- 11 grave sites containing approximately 124 graves of various ages.

The significance of the old settlement would first need to be established through archaeological test excavations before mitigation measures can be provided as to if permits would be required if the intention is to destroy the settlement.

All structures that are older than 60 years are located over 20 m from the construction corridor of the conveyor belt or the development boundary of the infrastructure, so there will be no demolishment permits required.

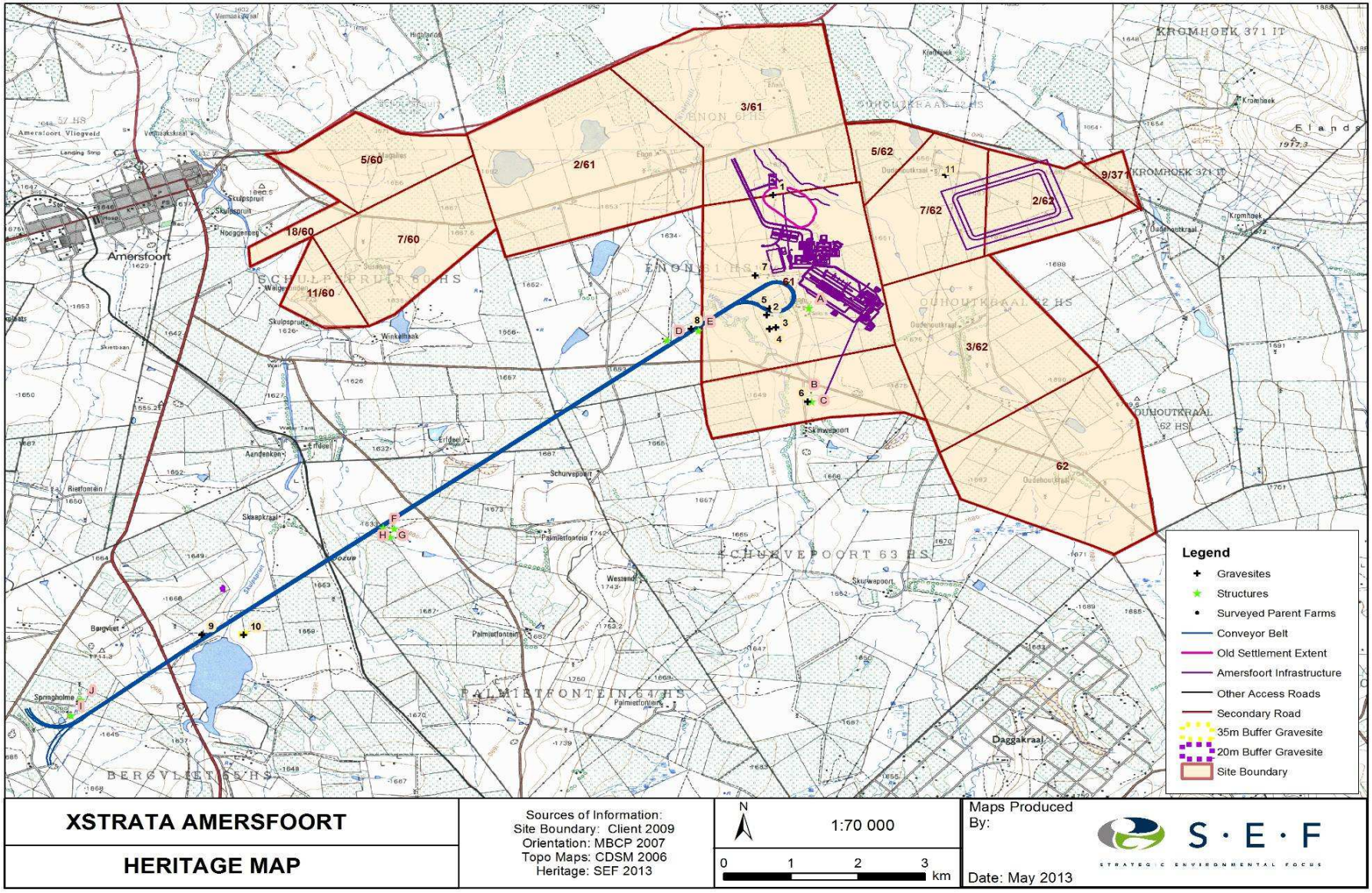

Figure 22: Location of Heritage Features in close proximity of the main infrastructure for Amersfoort Underground Coal Mine

Table 14: Summary of heritage features and their construction/development constraints/opportunities in line with the proposed Amersfoort Underground Coal Mine infrastructure

Heritage Feature	Distance from proposed infrastructure – will feature be impacted upon negatively?	Location	No of graves and age/ Age of structure	Risk Level before mitigation	Permit from SAHRA required for relocation of graves/demolition of structures?	Proposed mitigation measure	Risk Level after mitigation
Grave Site 1	0 m –on footprint – negative impact	27˚0'26.1"S; 29˚57'15.1"E	4 graves – without inscriptions hence of an undetermined age	high	Yes if the intention is to relocate these graves	Shift the infrastructure such that there is a 20m buffer from the edge of the grave site to the outer edge of the construction boundary or development boundary. Fence off the site if the infrastructure only shifted less than 50 m away from the grave site and prohibit access by construction crew to the grave site. If the infrastructure cannot be shifted, the gravesite should be relocated through SAHRA's grave relocation policy and permit application. This will constitute a Phase II Heritage Assessment to be undertaken by an archaeologist.	Low
Grave Site 2	62 m south of the conveyor belt loop	27˚1'29"S; 29˚57'12"E	2 graves of undetermined age	Medium-Low	No	However, because this grave site occurs less than 50 m to the construction corridor of the conveyor belt, it would need to be visible during both the installation and operational phases to avoid accidental disturbance of the site, thus the site must be demarcated at a radius of 20 m. Access to the site by the construction crew must be prohibited. The construction activities must be limited to the construction corridor. No construction equipment should be placed within 20 m from graves	Low
Grave Site 3	241 m south of the conveyor belt – no	27˚1'35.5"S; 29˚57'16.5"E	At least 20 graves in total– less than 60	Low	No	The construction activities must be limited to the proposed construction corridor and no heavy drilling or other	Low

	impact		years			construction activities to take place within a distance of 20 m from the edge of the grave site No construction equipment should be placed within 20 m from graves The grave site must be fenced off at 1 m from the edge of the outermost grave and a lockable gate installed Access to the grave site by the construction crew must be prohibited.	
Grave Site 4	271 m south of conveyor belt loop – no impact	27˚01'36.3"S; 29˚57'19.8"E	2 graves of undetermined age	Low	No	None	Low
Grave Site 5	13 m inside the conveyor loop.– negative impact	27˚01'25.5"S; 29˚57'13.5"E	At least 42 graves of older and younger than 60 years	High	Yes	Shift the conveyor belt such that there is a 20 m buffer from the edge of the grave site to the outer edge of the construction boundary or development boundary. Fence off the site if the infrastructure only shifted less than 50 m away from the grave site and prohibit access by construction crew to the grave site. If the infrastructure cannot be shifted, the gravesite should be relocated through SAHRA's grave relocation policy and permit application. This will constitute a Phase II Heritage Assessment to be undertaken by an archaeologist.	Low
Grave Site 6	179 m west of the incline shaft – no impact	27˚02'14.4"S; 29˚57'31.9"E	At least 6 graves of undetermined age	Low	No	None	Low
Grave Site 7	187 m – north of the conveyor belt loop. infrastructure foot print – negative	27˚01'08.2"S; 29˚57'06.5"E	At least 10 graves of undetermined age	Low	No	None	Low

	impact						
Grave Site 8	8 m west of conveyor belt – Negative impact	27˚01'36.2"S; 29˚56'35.6"E	At least 10 graves of undetermined age	High	Yes if the intention is to relocate this grave site	Shift the conveyor belt such that there is a 20 m buffer from the edge of the grave site to the outer edge of the construction boundary or development boundary. Fence off the site if the infrastructure only shifted less than 50 m away from the grave site and prohibit access by construction crew to the grave site. If the infrastructure cannot be shifted, the gravesite should be relocated through SAHRA's grave relocation policy and permit application. This will constitute a Phase II Heritage Assessment to be undertaken by an archaeologist.	Low
Grave Site 9	40 m west of conveyor belt	27˚04'16.5"S; 29˚52'39.5"E	At least 7 graves – the only inscribed grave seems to have a mistake in the birth/ death dates. Hence age of site unknown	Medium – Low as the site occurs just over 20 m from the edge of the proposed construction corridor	No	The construction activities must be limited to the proposed construction corridor and no heavy drilling or other construction activities to take place within a distance of 20 m from the edge of the grave site No construction equipment should be placed within 20 m from graves The grave site must be fenced off at 1 m from the edge of the outermost grave and a lockable gate installed	Low
Grave Site 10	263 m east of the conveyor belt	27˚04'16.6"S; 29˚52'59.7"E	Between 50 – 60 years old	Low	No	None	Low
Grave Site 11	245 m north of the mine residue facility	27˚00'14.9"S; 29˚58'38.3"E	Less than 60 years old	Low	No	None	Low
Structure A (Farm buildings)	191 m – No impact	27˚01'25.3"S; 29˚57'32.4"E	Possibly over 60 years	Low	No	None	Low
Structure B (Ruin)	282 m – no impact	27˚02'10.1"S; 29˚57'29.5"E	Possibly younger than 60 years old	Low	None	None	Low

Structure C (Big Kraal)	127 m– No impact	27˚02'14.4"S; 29˚57'33.8"E	Younger than 60 years old	Low	No	None	Low
Structure D (Rock pile)	58 m - No impact	27˚01'42.1"S; 29˚56'24.0"E	Younger than 60 years	Low	No	No	Low
Structure E(Kraal, circular structure)	36 m - No impact	27˚01'37.2"S; 29˚56'39.2"E	Younger than 60 years	Low	No	No	Low
Structure F (Kraal with entrance pillars)	21 m – Negative impact	27˚03'20.6"S; 29˚54'07.0"E	Younger than 60 years	Low	No	No	Low
Structure G (Kraal ruin)	194 m – No impact	27˚03'25.3"S; 29˚54'10.5"E	Less than 60 years	Low	No	None	Low
Structure H (Kraal, circular structure)	121 m – No impact	27˚03'21.0"S; 29˚54'12.4"E	Younger than 60 years	Low	No	None	Low
Structure I (Old farm house)	93 m – No impact	27˚04'58.9"S; 29˚51'36.5"E	Possibly over 60 years old	Low	No	None	Low
Structure J (Barn ruin)	213 m – no impact	27˚04'50.7"S; 29˚51'41.2"E	Possibly over 60 years old	Low	No	None	Low
Old farm settlement	0 m _ negative impact	The extent of the settlement is shown on Figure 1	Possibly over 60 years old	High	Yes in order to establish the significance of the settlement	Shift the infrastructure such that there is a 20 m buffer all around the perimeter of these structures to the outer edge of the construction/ development boundary. If the infrastructure cannot be shifted, a permit application to undertake test excavations to investigate the significance of the settlement ruins should be lodged with the SAHRA online. This will constitute a Phase IB Heritage Assessment undertaken by an Archaeologist	Low

B-2.3 Air Quality

B-2.3.1 Regional Ambient Air Quality

The Mpumalanga Highveld (formerly known as the Eastern Transvaal Highveld) has frequently been the focus of air pollution studies for two reasons. Firstly, elevated air pollution concentrations have been noted to occur in the region itself. Secondly, various elevated sources of emission located in this region have been associated with long-range transportation of pollutants and with the potential for impacting on the air quality of adjacent and more distant regions (Piketh, 1996).

The Minister of Environmental Affairs and Tourism declared the Highveld Priority Area (HPA) on 23 November 2007 (Highveld Priority Area Air Quality Baseline Assessment, 2010). Xstrata Amersfoort falls within the Pixley Ka Seme local municipality which according to the HPA is not considered a Hot-spot due to the fact that only elevated ground-level concentrations for ozone have been measured (HPA, 2011).

B-2.3.2 Dispersion Modelling

Dispersion modelling was undertaken to determine highest hourly, highest daily and annual average ground level concentrations or dust fall rates for each of the pollutants considered in the study. Averaging periods were selected to facilitate the comparison of predicted pollutant concentrations with relevant NAAQS and dust fall limits.

Predicted PM10 concentrations were compared against the NAAQS of 50 µg/m3 (currently effective) and 40 µg/m3 (effective 2015) concentration per year and the maximum daily concentration of 120 µg/m3 (currently effective) and 75 µg/m3 (effective 2015). Dust fallout deposition rates were compared against the draft dust control regulations. The purpose of this comparison is to see the extent of the dispersion of pollutants on sensitive receptors and the surrounding environment as a whole.

The heading of predicted annual average refers to the highest concentration of emissions over the period modelled three and half years (2009-2012) and the predicted daily average refer to the second highest concentration of all the modelled data and frequency of exceedence indicate the amount of days in a year the concentration of the pollutant will be above the limit of 75 µg/m3.

Xstrata Amersfoort underground mine atmospheric modelling results indicate no exceedence of either the annual and daily NAAQ standards. GLC are low; with the highest annual predicted concentration being below 5µg/m3. From dispersion modelling figures it is observed that the impacts are localised within the mine's boundary. Dust fall deposition rates plots indicate no exceedence of the draft dust fall standards (Figure 23). The rates are relatively low and the impacts do not extend to any identified sensitive receptors.

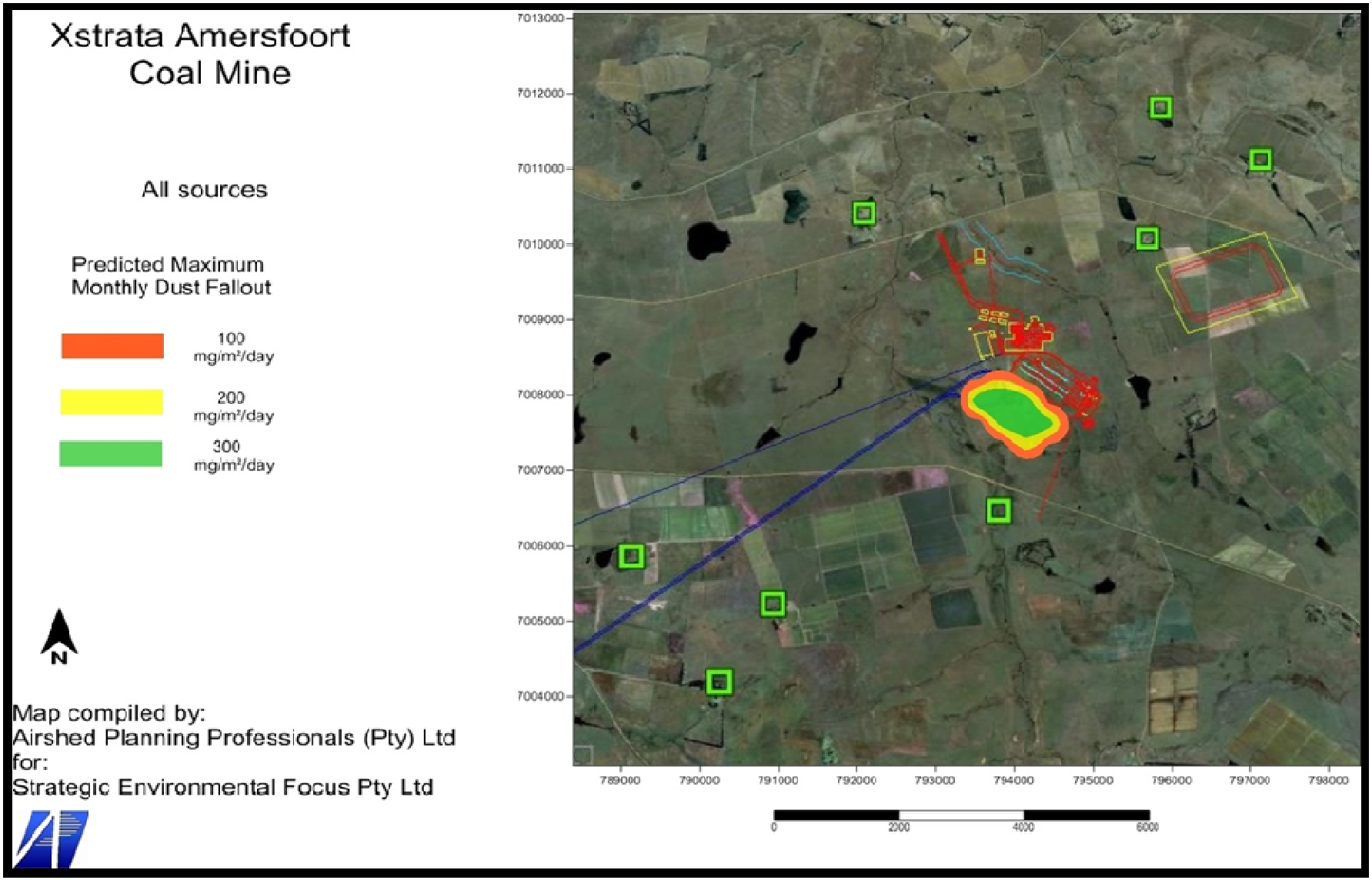

Figure 23: Xstrata Amersfoort dustfall deposition rate (All sources)

B-2.4 Noise

B-2.4.1 Noise Sources and Sound Power Levels

The extent and character of construction and decomissioning phase noise will be highly variable as different activities with different equipment will take place at different times, over different periods, in different combinations, in different sequences and on different parts of the construction site. In the absence of a detailed construction/closure schedule, these phases omitted from the assessment and are only mentioned qualitatively. Operational phase impacts are expected to be most significant. The following sources of noise were included in the study:

- Man and material vertical shaft (MAMS);
- Upcast ventilation shaft;
- Transfer house, screen and crusher;
- Stacking at the RoM stockpile, the Eskom stockpile and the export stockpile;
- Coal handling and processing plant (CHPP);
- Rail load stations;
- Conveyors:
    - From decline shaft to transfer house, screen and crusher;
    - From transfer house, screen and crusher to RoM stockpile;
    - From RoM stockpile to surge silo;
    - From Surge silo to CHPP;
    - From CHPP to Eskom and export stockpiles;
    - From Eskom and export stockpiles to rail load stations; and
    - CHPP to mine residue facility.
- Sewage treatment plant (STP) and pump stations, incl. the potable water reservoir elevated tank pump station, the terrace pollutant water dam pump station and MAMS polluted water dam pump station.

B-2.4.2 Noise Propagation Modelling and Predicted Noise Levels

The propagation of noise from the operational phase was calculated in accordance with SANS 10103. Meteorological and site specific acoustic parameters along with source data were applied in the model. The propagation of noise was calculated over a 7 km east-west by 7 km north-south area at 200 m intervals. To facilitate comparison with guidelines the following were calculated for the operational phase:

- Equivalent continuous day-time, night-time and day-night rating levels ($L_{Req,d}$, $L_{Req,n}$ and $L_{R,dn}$);
- The increase in environmental noise levels when compared to existing baseline noise levels.

B-2.4.3 Predicted Day-time Noise Levels

The expected increase in day-time noise levels over the baseline level is provided in Figure 24.

Cumulatively noise levels as a result of the operational phase exceed 55 dBA only in the immediate vicinity of operations and will result in a 3 dBA increase over the baseline up to 730 m from the CHPP. It is expected that, during the day, the overland convenor will audible over a downwind distance of approximately 400 m.
In increase of less than 5 dBA is expected at noise receptors in close proximity to the overland conveyor. According to SANS 10103, little community reaction with sporadic complaints may be expected.

B-2.4.4 Predicted Night-time Noise Levels

The expected increase in night-time noise levels over the baseline level is provided in Figure 25.

Cumulatively noise levels as a result of the operational phase exceed 45 dBA up to 950 m north-west of the ventilation shaft area and will result in a 3 dBA increase over the baseline up to 2.7 km. The increased impact area is as a result of the combined effect of poor nigh-time noise attenuation and very low baseline night-time noise levels. Because of very quiet background night-time noise levels, it is expected that, the overland convenor will audible over a downwind distance of approximately 1.9 km.The increase in night-time noise levels the closest noise receptors (those locate directly west of the CHPP and along the conveyor) is more than 15 dBA. According to SANS 10103, medium to strong reaction with threats of community action can be expected at these locations.

B-2.4.5 Predicted Day-night Noise Levels

The expected increase in day-night noise levels over the baseline level is provided in Figure 26.

Cumulatively, day-night noise levels as a result of the operational phase exceed 55 dBA up to 680 m and will result in a 3 dBA increase over the baseline up to 1.2 km surface operations. Over a 24-hour period an increase of 3 dBA in ambient noise level is expected up to approximately 850 m from the conveyor. Over a 24-hour period an increase of 15 dBA is expected at the NSR's located directly west of operations along the conveyor. According to SANS 10103, medium to strong reaction with threats of community action can be expected from people residing at these locations.

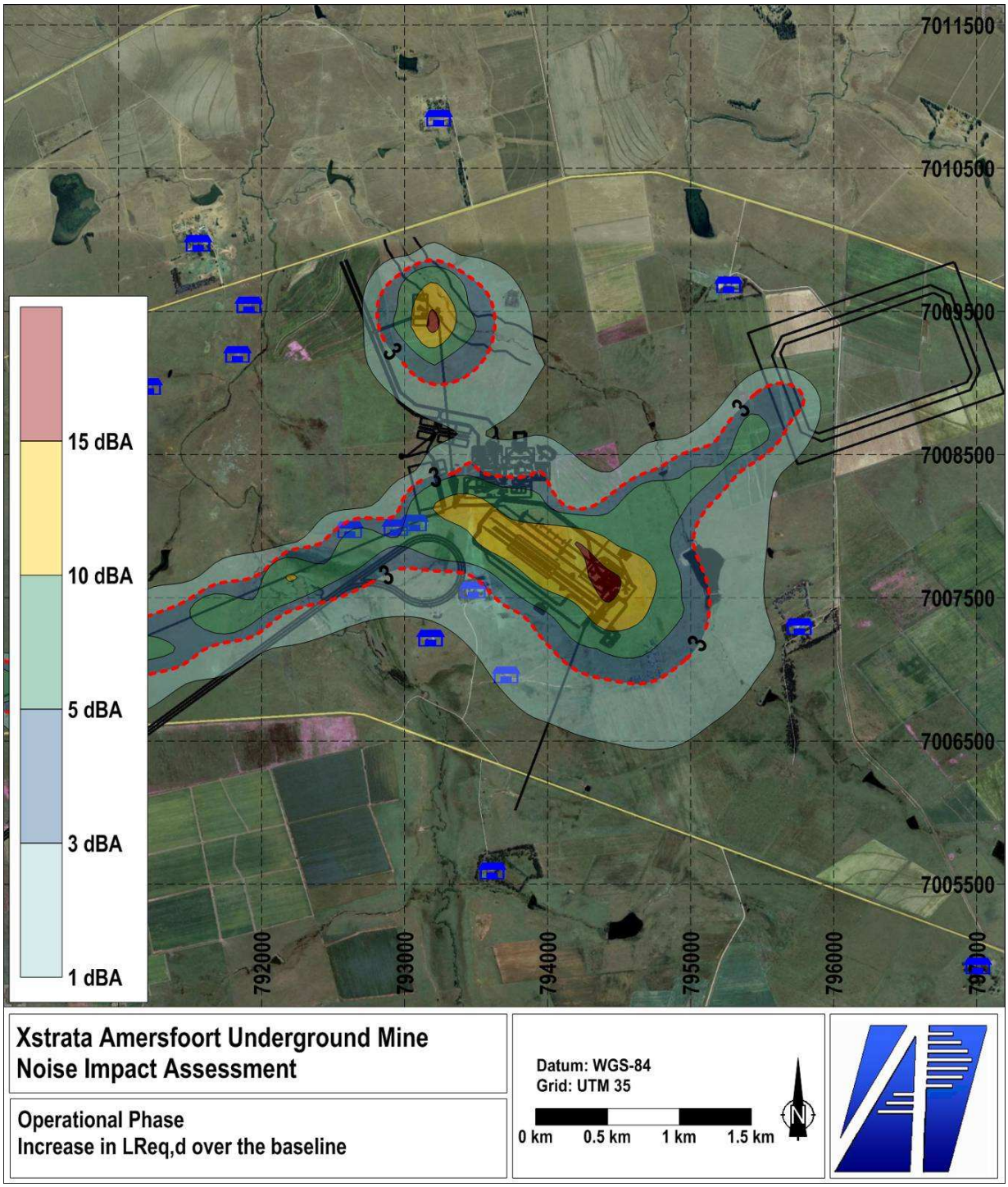

Figure 24: Operational phase – Increase in $L_{Req,d}$ over the baseline (Day-time)

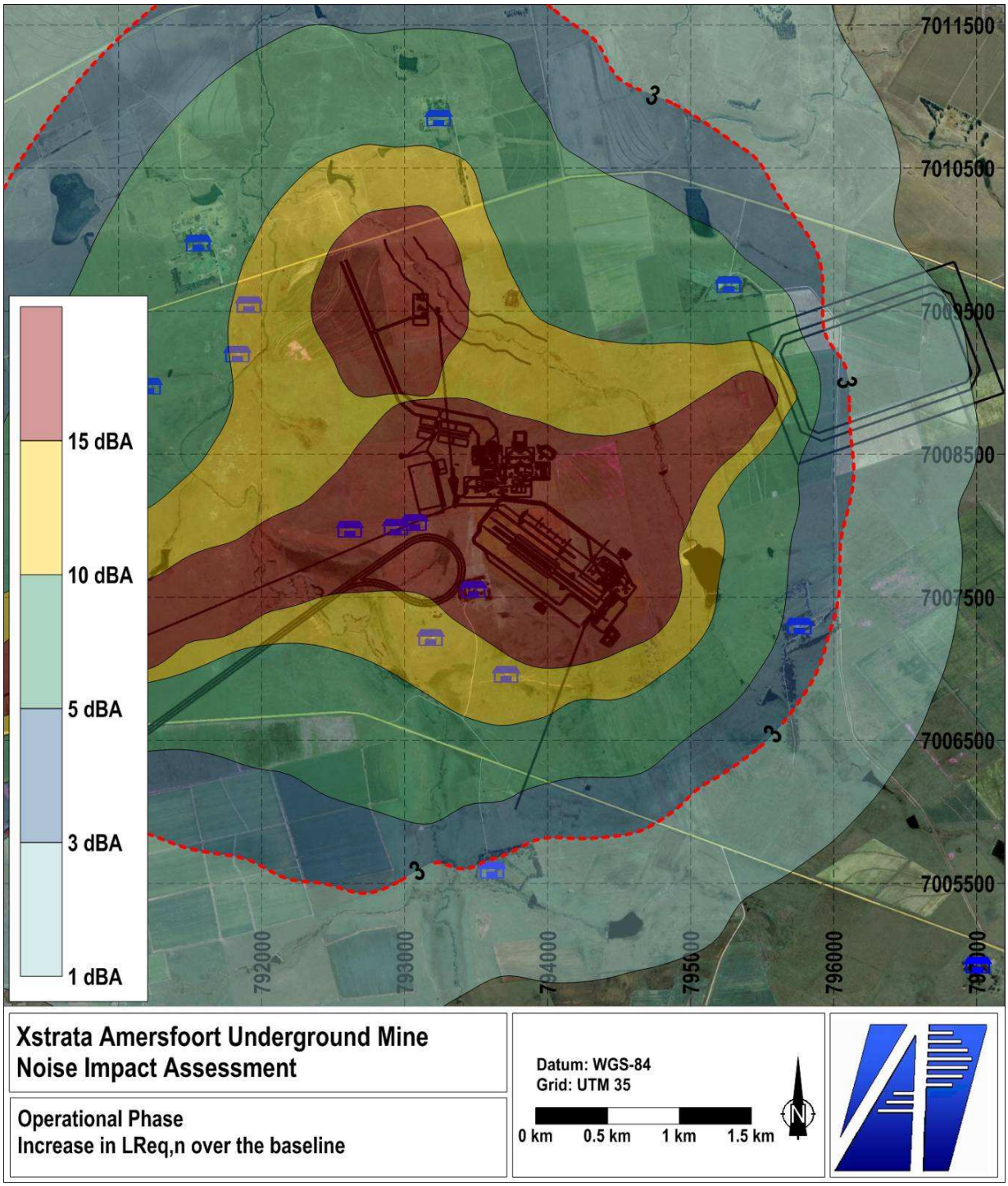

Figure 25: Operational phase – Increase in $L_{Req,n}$ over the baseline (Night-time)

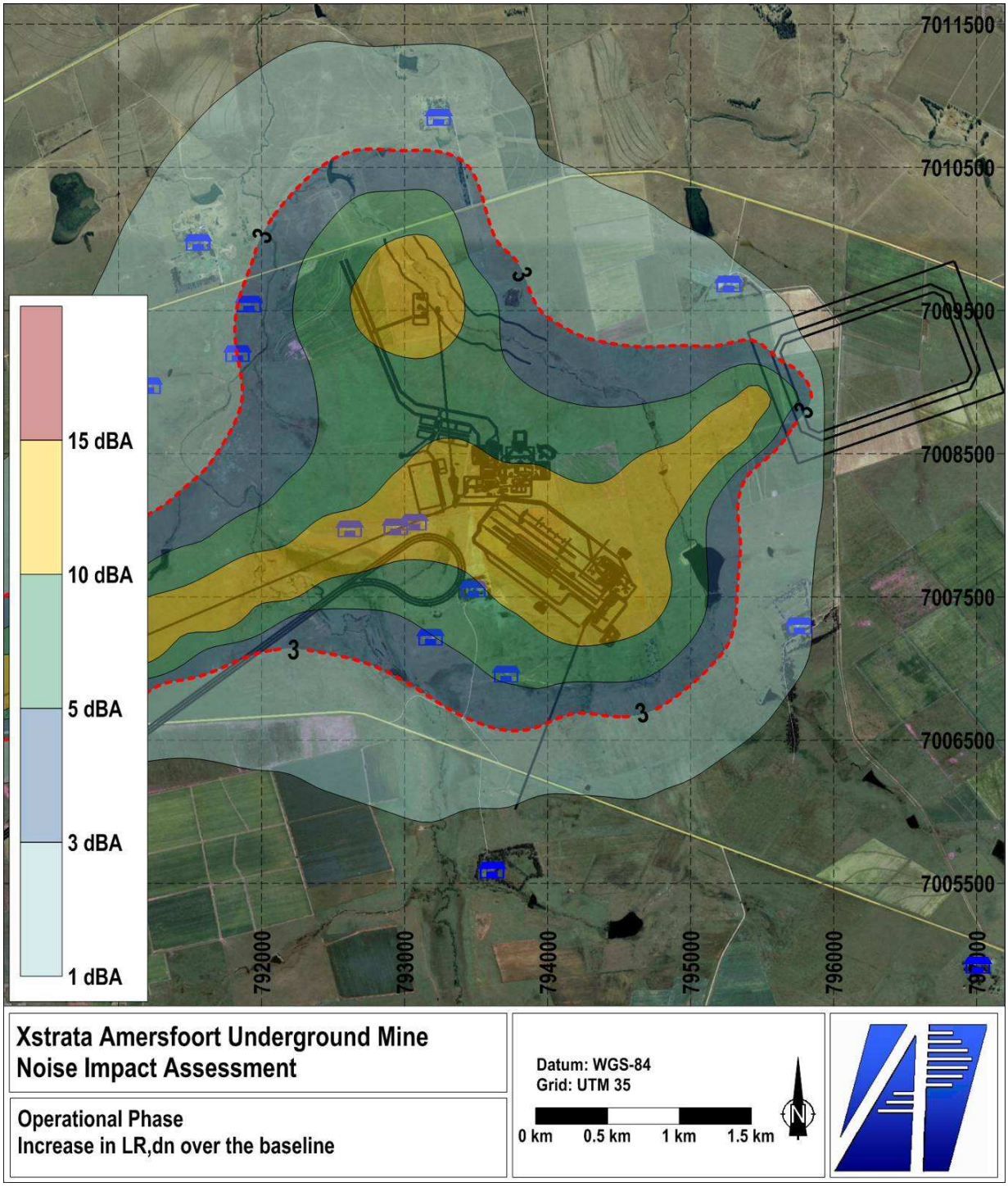

Figure 26: Operational phase – Increase in $L_{R,dn}$ over the baseline (Day-night)

B-2.5 Visual

Visual impacts generally occur as a result of changes to the landscape (i.e. development). A distinction, however, should be made between impacts on the visual resource (physical landscape) and impacts on the visual receptor (viewer).

B-2.5.1 Landscape Character

Landscape Character can be classified as elements, components and features within a landscape that individually and collectively define the landscape's characteristics. These characteristics include Topography, Hydrology, Vegetation Cover, Land use and the Built Environment.

B-2.5.2 Visual Character

Visual character relates to the human perception and the observer's response to the relationships between and composition of the landscape, the land uses and identifiable elements in the landscape. The description of the visual character includes an assessment of the scenic attractiveness regarding those landscape attributes that have aesthetic value and contribute significantly to the visual quality of the views, vistas and/or viewpoints of the study area.

The study area has a rural character with large rolling stretches of crops and grassland. The unpaved roads and limited man-made structures add to the rural character.

Figure 27: Visual Character of the Amersfoort Study Area

B-2.5.3 Visual Aspects

This section outlines aspects to be considered in order to establish the intensity of the impact that the proposed development would have on identified visual receptors. These aspects include: visual receptor sensitivity, visual exposure, viewing distance, visual absorption capacity of the landscape, visual contrast, critical views, visual value, sense of place and obtrusive lighting.

Visual Exposure

The visual envelope demarcates the zone of visual influence (ZVI) and includes the area within which views to the proposed mine surface infrastructure are expected to be of concern. The visual envelope for the study area is limited to a 4km radius around the location of the proposed mine, which is considered an adequate distance to assess the significance of the potential visual impact.

Based on the graphical representation of the Visibility Map (Figure 28) the receptors that will experience visibility towards the site include Residents, Recreational Users and Motorists.

Residents: Residents within a 4km range will have limited visibility of the development and its impact from their homes. This is mainly due to the relative large sizes of the farms (great viewing distance) as well as the topography of the site (moderately sloped). Therefore, although Residents are classified as highly sensitive visual receptors the intensity of the impact that will be experienced by residents in the study area is considered to be ***medium***

Motorists: Motorists travelling on the provincial P97-2 road as well as along the N11 will not experience views of the mine infrastructure due to the distance from the road (approximately 8km) as well as the topography (moderately sloped). Clear views of the mine infrastructure will however be experienced from the D297 gravel road (short viewing distance) which are mostly used by residents (farmers). Due to their low sensitivity the intensity of the impact that will be experienced by Motorists in the study area is considered to be ***medium.***

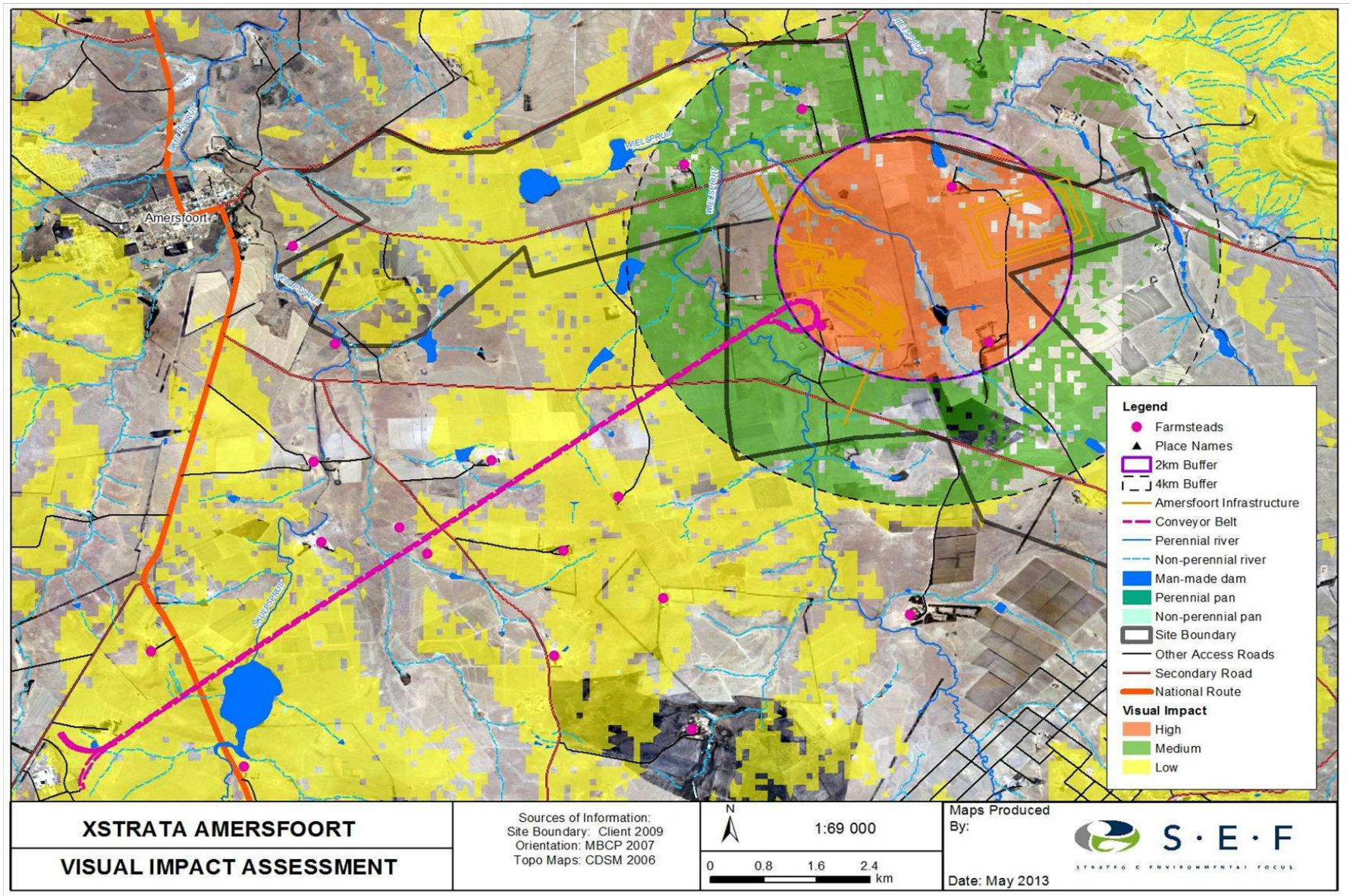

Figure 28: Visibility Map

SECTION C: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) PROCESS

C-1 APPROACH TO THE EIA

An Environmental Impact Assessment (EIA) is an effective environmental planning tool. It identifies the environmental impacts of a proposed project and assists in ensuring that a project will be environmentally acceptable and integrated into the surrounding environment in a sustainable way.

The EIA for this project complies with the requirements of the National Environmental Management Act, 1998 (Act 107 of 1998) (in accordance with the NEMA EIA Regulations of June 2010) as well as the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (in accordance with the MPRDA Regulations of April 2004).

Definition of the term "environment"

The term "environment" is used in the broadest sense in an environmental impact assessment. It covers the physical, biological, social, economic, cultural, historical, institutional and political environments.

The guiding principles of an EIA are listed below.

C-2 GUIDING PRINCIPLES FOR AN EIA

The EIA must take an open participatory approach throughout. This means that there should be no hidden agendas, no restrictions on the information collected during the process and an open-door policy by the proponent. Technical information must be communicated to stakeholders in a way that is understood by them and that enables them to meaningfully comment on the project.

There should be ongoing consultation with Interested and Affected Parties (I&APs) representing all walks of life. Sufficient time for comment must be allowed. The opportunity for comment should be announced on an on-going basis. There should finally be opportunities for input by specialists and members of the public. Their contributions and issues should be considered when technical specialist studies are conducted and when decisions are made.

The eight guiding principles that govern the entire process of EIA are as follows (see Figure below):

- **Participation:** An appropriate and timely access to the process for all interested parties.
- **Transparency:** All assessment decisions and their basis should be open and accessible.
- **Certainty:** The process and timing of the assessment should be agreed in advance and followed by all participants.
- **Accountability:** The decision-makers are responsible to all parties for their action and decisions under the assessment process.
- **Credibility:** Assessment is undertaken with professionalism and objectivity.
- **Cost-effectiveness:** The assessment process and its outcomes will ensure environmental protection at the least cost to the society.
- **Flexibility:** The assessment process should be able to adapt to deal efficiently with any proposal and decision making situation.
- **Practicality:** The information and outputs provided by the assessment process are readily usable in decision making and planning.

A S&EIR process is considered as a project management tool for collecting and analysing information on the environmental effects of a project. As such, it is used to:

- Identify potential environmental impacts;
- Examine the significance of environmental implications;
- Assess whether impacts can be mitigated;
- Recommend preventive and corrective mitigating measures;
- Inform decision makers and concerned parties about the environmental implications; and
- Advise whether development should go ahead.

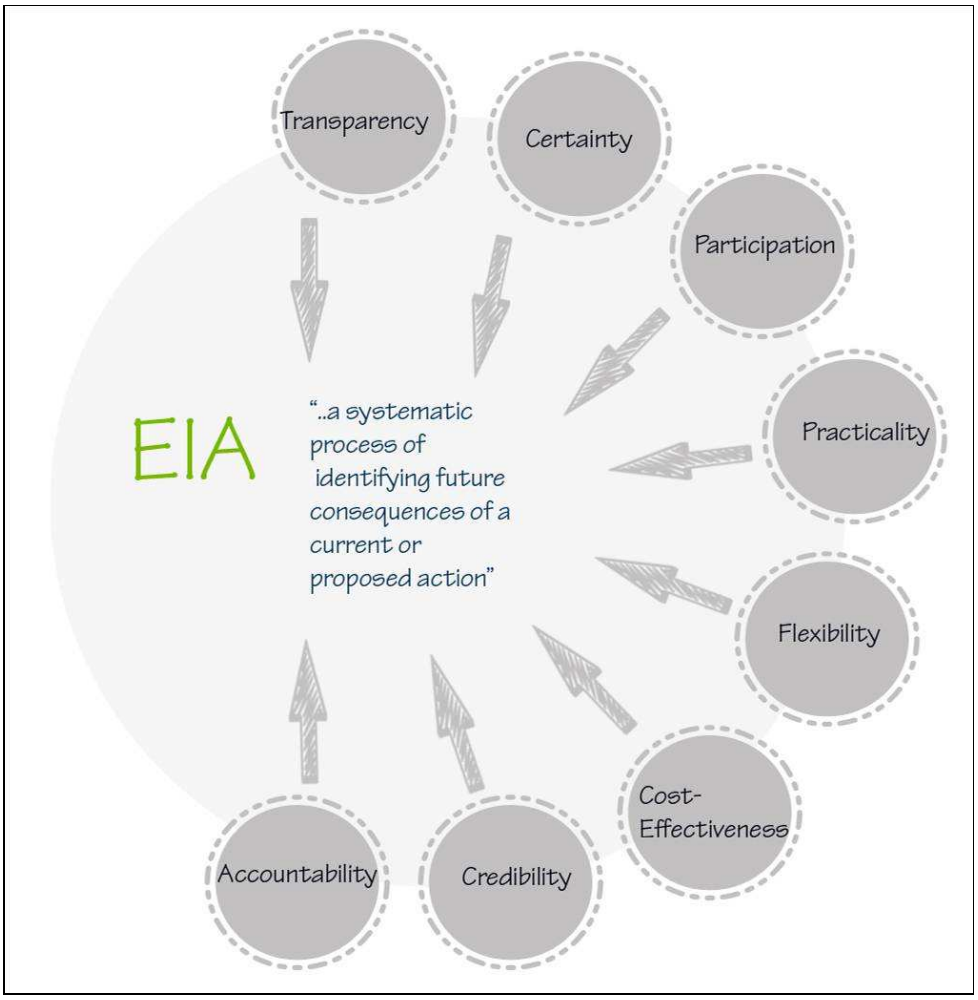

Figure 29: The Eight Guiding Principles for the EIA Process

A S&EIR process typically has four phases, as illustrated in the figure below. The Public Participation process forms an integral part of all four phases and is discussed in greater detail in Section C – 4 of this final Scoping Report.

C-3 S&EIR TECHNICAL PROCESS

This section provides a summary of the technical process to be followed for this S&EIR process.

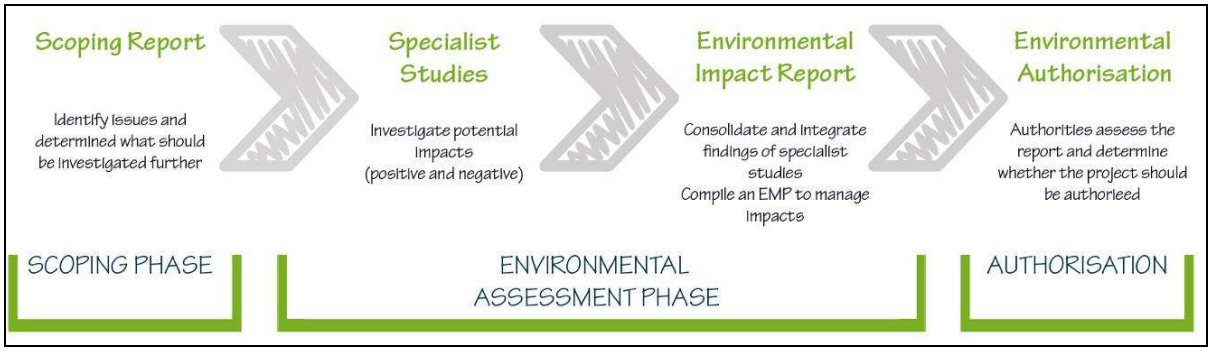

Figure 30: Flow Diagram of the Scoping and EIR Process

C-3.1 Pre-application Consultation with the Competent Authorities

No pre-consultation meeting was held between SEF and MDEDET or DMR. The EAP conducting the S&EIR process for the applicant, in support of their application for an environmental authorisation, is deemed to have a good understanding of the information requirements of both Departments for the proposed underground mine, such that the Department's specific information requirements are deemed to have been met for the scoping phase of this project. Subsequently, both authorities will be approached to meet during the EIR Phase.

C-3.2 Application for Authorisation

The application form informing the Department of intent to obtain an environmental authorisation was submitted to the MDEDET on 28 September 2012 and to the provincial DMR on 15 November 2012. The project was subsequently registered and assigned the reference numbers MDEDET Ref: 17/2/3 GS 142 and DMR Ref: MP 30/5/1/2/2/10052 MR..

C-3.3 Information Gathering

Early in the EIA process, the technical specialists identified the information that would be required for the impact assessment and the relevant data was subsequently obtained. In addition, the specialists sourced available information about the receiving environment from reliable sources, I&APs, previous documented studies in the area and previous EIA Reports.

C-3.4 Specialist Studies

The following specialist studies have been undertaken:

- Soil and Agricultural Potential Assessment;
- Wetland Delineation and Functional Assessment;
- Aquatic Assessment;
- Floral Impact Assessment;
- Faunal (including Avifaunal and Herpetofaunal) Impact Assessment;
- Heritage Impact Assessment;
- Surface Hydrology Assessment;
- Geohydrological Assessment;
- Visual Impact Assessment;

- Social & Economic Impact Assessment;
- Noise Impact Assessment; and
- Air Quality Impact Assessment.

C-4 PUBLIC PARTICIPATION PROCESS

The principles of NEMA govern many aspects of the S&EIR process, including consultation with I&APs. These principles include the provision of sufficient and transparent information to I&APs on an ongoing basis, to allow them to comment and ensure the participation of historically disadvantaged individuals, including women, the disabled and the youth.

The principal objective of public participation is thus to inform and enrich decision-making. This is also the key role in the scoping phase of the process.

C-4.1 Identification of Interested and Affected Parties

I&AP's representing the following sectors of society have been identified in terms of Regulation 55 of the EIA Regulations R543 of 2010 (see Appendix 5 for a complete preliminary I&AP distribution list):

- Provincial Authorities;
- Local Authorities;
- Ward Councillors;
- Parastatal/ Service Providers;
- Non-governmental Organisations;
- Local forums/ unions; and
- Adjacent Landowners.

C-4.2 Public Announcement of the Project

The project was announced on **Monday, 18 February 2013** in the following manner (see Appendix 5 for public announcement documentation):

- Publication of media advertisements (in English) in two regional newspapers;
- On-site notices (in English and Afrikaans) advertising the S&EIR process were placed on and around the site, as well as in the public venue where reports were made available for review and comment; and
- Distribution of letters by fax/ by hand/ post/ email to I&APs including Registration and Comment Sheets.

C-4.3 Draft Scoping Report

I&APs and relevant State Departments had the opportunity to raise issues either in writing, by telephone or email on the Draft Scoping Report for a period of 40 days **(from Monday, 18 February 2013 until Tuesday, 2 April 2013)**. The availability of the Draft Scoping Report has been announced by means of personal letters to all the registered I&APs on the distribution list, and by adverts placed in the Standerton Advertiser and the Volksrust Recorder.

In addition, the Draft Scoping Report was distributed for comment as follows:

- Left in public venues (Amersfoort Public Library and Volksrust Public Library);

- Hand-delivered/ couriered to the relevant authorities; and
- Posted on SEF's website at http://www.sefsa.co.za

All the comments and concerns raised by I&APs during the Draft Scoping Report review period were captured in a Comment and Response Report (C&RR) – Appendix 5.

C-4.4 Final Scoping Report

The Final Scoping Report (FSR) was updated with comments and/or concerns raised by I&APs during the commenting period of the Draft Scoping Report. The FSR was submitted to the MDEDET and registered I&APs simultaneously for review and comment for a period of 30 days **(Friday, 12 April 2013 – Tuesday, 14 May 2013)**. Registered I&AP's was advised to submit any additional comments on the FSR directly to the MDEDET prior to the lapsing of the 30 day review period. MDEDET approved the FSR on 14 May 2013.

C-4.5 Draft Environmental Impact Report

The finding of the Impact Assessment Phase are presented in this Draft EIR and EMP (including the specialist studies conducted) and is available for public review and comment.

The following public participation activities have been conducted:

- Publication of media advertisements (in English) in two regional newspapers;
- Distribution of letters by fax/ by hand/ post/ email to all registered I&AP's.

A period of **40 calendar days** (**Monday, 24 June 2013 – Monday, 5 August 2013**) has been provided to the **State Departments**, and the **general public** for the review and commenting phase of the Draft Environmental Impact Report (EIR). The availability of the Draft EIR was announced by means of personal letters to all the registered I&APs on the distribution list.

In addition, the Draft EIR was distributed for comment as follows:

- Left in public venues (Amersfoort Public Library and Volksrust Public Library);
- Hand-delivered/ couriered to the relevant authorities; and
- Posted on SEF's website at http://www.sefsa.co.za

All the comments and concerns raised will be captured in the C&RR. I&APs will be sent letters acknowledging their contributions.

C-4.6 Final Environmental Impact Report

The EIR will be updated with comments and/or concerns raised by I&APs. The CRR will be attached to the Final EIR. The Final EIR will be submitted to the MDEDET and registered I&APs simultaneously for review. Registered I&APs will advised to submit any additional comments on the Final EIR directly to the MDEDET for consideration towards an Environmental Authorisation.

SECTION D: ALTERNATIVES

D-1 IDENTIFICATION OF ALTERNATIVES

The EIA procedures and regulations stipulate that the environmental investigation needs to consider feasible alternatives for any proposed development. Therefore, a number of possible proposals or alternatives for accomplishing the same objectives should be identified and investigated. During the EIR phase of the project, the identified alternatives will be assessed, in terms of environmental acceptability as well as socio-economic feasibility. To define the term alternatives as per Government Notice No. 543 of the NEMA EIA Regulations 2010 means:

"…in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to:

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

Three alternatives have been identified in the Scoping phase and the following two alternatives are being assessed further in the EIR phase (Conveyor route 2 has therefore been omitted from the EIR phase):

Alternative 1: Site Location and Conveyor Route 1 (Preferred)

The Applicant holds the prospecting rights for the mine study area as outlined on the locality plan in Appendix 1. Prior to the commencement of the environmental process, the Applicant undertook a feasibility assessment to identify the best location for the mine plant. The proposed area (as outlined on the layout plan in Appendix 3) was selected based on the topography and the depth of the coal seam, which is relatively shallow compared to other areas within the mine study area. No other site location alternatives for the surface infrastructure have been considered to be viable, however the infrastructure layout will be further assessed during the impact assessment phase and any changes will be reflected as such

The proposed Conveyor Route 1 will transport coal from the mine along a 20.5km Greenfield section and then to the old Majuba colliery. Export coal would use the same conveyor and will then be conveyed to a rail loading silo suitably situated in the vicinity of the Majuba Power Station tipplers. From here the coal will be dispatched to Ermelo to link up with the Richards Bay Coal Terminal (RBCT) line.

Alternative 2: No Development Alternative:

This option assumes that a conservative approach would ensure that the environment is not impacted upon as is currently the case. It is important to state that this assessment is informed by the current condition of the area. Should the MDEDET and/ or DMR decline the application, the 'No-Go' option will be followed and the status quo of the site will remain.

SECTION E: ASSESSMENT CRITERIA

E-1 IMPACT IDENTIFICATION AND ASSESSMENT

The assessment criteria must clearly identify the environmental impacts of the proposed development. The environmental impacts identified will be quantified and the significance of the impacts assessed according to the criteria set out below. The EAP must make a clear statement, identifying the environmental impacts of the construction, operation and management of the proposed development. As far as possible, the EAP must quantify the suite of potential environmental impacts identified in the study and assess the significance of the impacts according to the criteria set out below. Each impact will be assessed and rated. The assessment of the data must, where possible, be based on accepted scientific techniques, failing which the specialist is to make judgements based on his/ her professional expertise and experience.

E-1.1 Assessment Procedure: Proposed Impact Assessment Methodology

For the purpose of assessing impacts during the EIR phase of the project to follow, the project will be divided into three phases from which impacting activities can be identified, namely:

Construction Phase:	All the construction related activities on site, until the contractor leaves the site.
Operational Phase:	All activities, including the operation and maintenance of the proposed mine.
Decommissioning Phase:	All activities, including the decommissioning of the proposed mine development.

The activities arising from each of these phases will be included in the impact assessment tables. This is to identify activities that require certain environmental management actions to mitigate the impacts arising from them.

The assessment of the impacts will be conducted according to a synthesis of criteria required by the integrated environmental management procedure.

Extent The physical and spatial scale of the impact.	Footprint	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
	Site	The impact could affect the whole, or a significant portion of the site.
	Regional	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
	National	The impact could have an effect that expands throughout the country (South Africa).
	International	Where the impact has international ramifications that extend beyond the boundaries of South Africa.

Duration The lifetime of the impact, that is measured in relation to the lifetime of the proposed development.	Short Term	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
	Short-Medium Term	The impact will be relevant through to the end of a construction phase.
	Medium Term	The impact will last up to the end of the development phases, where after it will be entirely negated.
	Long Term	The impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.
	Permanent	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.
Intensity Is the impact destructive or benign, does it destroy the impacted environment, alters its functioning, or slightly alter the environment itself?	Low	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
	Medium	The affected environment is altered, but functions and processes continue, albeit in a modified way.
	High	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Probability The likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time.	Improbable	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0%).
	Possible	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.
	Likely	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.
	Highly Likely	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.
	Definite	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100%.

Mitigation – The impacts that are generated by the mine can be minimised if measures are implemented in order to reduce the impacts. The mitigation measures ensure that the mine considers the environment and the predicted impacts in order to minimise impacts and achieve sustainable development.

Determination of Significance – Without Mitigation – Significance is determined through a synthesis of impact characteristics as described in the above paragraphs. It provides an indication of the importance of the impact in terms of both tangible and intangible characteristics. The significance of the impact "without mitigation" is the prime determinant of the nature and degree of mitigation required. Where the impact is positive, significance is noted as "positive". Significance will be rated on the following scale:

No significance: The impact is not substantial and does not require any mitigation action;
Low: The impact is of little importance, but may require limited mitigation;
Medium: The impact is of importance and is therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels; and
High: The impact is of major importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

Determination of Significance – With Mitigation – Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. Significance with mitigation will be rated on the following scale:

No significance: The impact will be mitigated to the point where it is regarded as insubstantial; Low: The impact will be mitigated to the point where it is of limited importance;
Low to medium: The impact is of importance, however, through the implementation of the correct mitigation measures such potential impacts can be reduced to acceptable levels;
Medium: Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw;
Medium to high: The impact is of major importance but through the implementation of the correct mitigation measures, the negative impacts will be reduced to acceptable levels; and
High: The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

Assessment Weighting – Each aspect within an impact description was assigned a series of quantitative criteria. Such criteria are likely to differ during the different stages of the project's life cycle. In order to establish a defined base upon which it becomes feasible to make an informed decision, it will be necessary to weigh and rank all the identified criteria.

Ranking, Weighting and Scaling – For each impact under scrutiny, a scaled weighting factor will be attached to each respective impact. The purpose of assigning such weightings serve to highlight those aspects considered the most critical to the various stakeholders and ensure that each specialist's element of bias is taken into account. The weighting factor also provides a means whereby the impact assessor can successfully deal with the complexities that exist between the different impacts and associated aspect criteria.

Simply, such a weighting factor is indicative of the importance of the impact in terms of the potential effect that it could have on the surrounding environment. Therefore, the aspects considered to have a relatively high value will score a relatively higher weighting than that which is of lower importance (See Figure 31 below):

Extent	Duration	Intensity	Probability	Weighting Factor (WF)	Significance Rating (SR)	Mitigation Efficiency (ME)	Significance Following Mitigation (SFM)
Footprint 1	Short term 1	Low 1	Probable 1	Low 1	Low 0-19	High 0,2	Low 0-19
Site 2	Short to medium 2		Possible 2	Low to medium 2	Low to medium 20-39	Medium to high 0,4	Low to medium 20-39
Regional 3	Medium term 3	Medium 3	Likely 3	Medium 3	Medium 40-59	Medium 0,6	Medium 40-59
National 4	Long term 4		Highly Likely 4	Medium to high 4	Medium to high 60-79	Low to medium 0,8	Medium to high 60-79
International 5	Permanent 5	High 5	Definite 5	High 5	High 80-100	Low 1,0	High 80-100

Figure 31: Description of Bio-Physical Assessment Parameters

Identifying the Potential Impacts Without Mitigation Measures (WOM) – Following the assignment of the necessary weights to the respective aspects, criteria are summed and multiplied by their assigned weightings, resulting in a value for each impact (prior to the implementation of mitigation measures).

Equation 1: Significance Rating (WOM) = (Extent + Intensity + Duration + Probability) x Weighting Factor

Identifying the Potential Impacts With Mitigation Measures (WM) – In order to gain a comprehensive understanding of the overall significance of the impact, after implementation of the mitigation measures, it will be necessary to re-evaluate the impact.

Mitigation Efficiency (ME) – The most effective means of deriving a quantitative value of mitigated impacts is to assign each significance rating value (WOM) a mitigation effectiveness (ME) rating. The allocation of such a rating is a measure of the efficiency and effectiveness, as identified through professional experience and empirical evidence of how effectively the proposed mitigation measures will manage the impact.

Thus, the lower the assigned value the greater the effectiveness of the proposed mitigation measures and subsequently, the lower the impacts with mitigation.

Equation 2: Significance Rating (WM) = Significance Rating (WOM) x Mitigation Efficiency
Or
WM = WOM x ME

Significance Following Mitigation (SFM) – The significance of the impact after the mitigation measures are taken into consideration. The efficiency of the mitigation measure determines the significance of the impact. The level of impact will, therefore, be seen in its entirety with all considerations taken into account.

E-1.1.1 Integration of Specialist's Input

In order to maintain consistency in the impact assessment, it is suggested that all potential impacts to the environment (or component of the environment under review) should be listed in a table similar to the example shown below (more than one table will be required if impacts require assessment at more than one scale). The assessment parameters used in the table should be applied to all of the impacts and a brief descriptive review of the impacts and their significance will then be provided in the text of the specialist reports and consequently in the EIR. The implications of applying mitigation are reviewed in Section C-2.4 below.

Table 15: Example of an Impact Table

Nature			Status	-
Impact source(s)				
Affected stakeholders				
Magnitude	*Extent*			
	Intensity			
	Duration			
	Reversibility			
	Probability			
Significance	*Without mitigation*			H
	With mitigation			L
Confidence				

E-1.1.2 Mitigation Measures

Mitigation measures will be recommended in order to enhance benefits and minimise negative impacts and they will address the following:

- Mitigation objectives: what level of mitigation must be aimed at: For each identified impact, the specialist must provide mitigation objectives (tolerance limits) which would result in a measurable reduction in impact. Where limited knowledge or expertise exists on such tolerance limits, the specialist must make an "educated guess" based on his/ her professional experience;
- Recommended mitigation measures: For each impact the specialist must recommend practicable mitigation actions that can measurably affect the significance rating. The specialist must also identify management actions, which could enhance the condition of the environment. Where no mitigation is considered feasible, this must be stated and reasons provided;
- Effectiveness of mitigation measures: The specialist must provide quantifiable standards (performance criteria) for reviewing or tracking the effectiveness of the proposed mitigation actions, where possible; and
- Recommended monitoring and evaluation programme: The specialist is required to recommend an appropriate monitoring and review programme, which can track the efficacy of the mitigation objectives. Each environmental impact is to be assessed before and after mitigation measures have been implemented. The management objectives, design standards, etc., which, if achieved, can eliminate, minimise or enhance potential impacts or benefits. National standards or criteria are examples, which can be stated as mitigation objectives.

Once the above objectives have been stated, feasible management actions, which can be applied as mitigation, must be provided. A duplicate column on the impact assessment tables described above will indicate how the application of the proposed mitigation or management actions has reduced the impact. If the proposed mitigation is to be of any consequence, it should result in a measurable reduction in impacts (or, where relevant, a measurable benefit).

E-1.2 Approach to the Assessment of Cumulative Impacts

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

Possible cumulative impacts of the project will be evaluated in the EIR. In addition, various other cumulative impacts e.g. other external impacts that could arise from the project will be further investigated in the EIR phase of the project.

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

E-1.2.1 Steps in Assessing Cumulative Impacts

The assessment of cumulative impacts will not be done separately from the assessment of other impacts. Cumulative impacts however, tend to have different time and space dimensions and therefore require specific steps. This may even mean that some of the actions in the assessment process, that preceded general impact identification, may have to be revisited after potential cumulative impacts have been identified. This will ensure that the scope of the EIR process is adequate to deal with the identified cumulative impacts.

Three (3) general steps, which are discussed below, will be recommended to ensure the proper assessment of cumulative impacts.

E-1.2.2 Determining the Extent of Cumulative Impacts

To initiate the process of assessing cumulative impacts, it is necessary to determine what the extent of potential cumulative impacts will be. This will be done by adopting the following approach:

- Identify potentially significant cumulative impacts associated with the proposed activity;
- Establish the geographic scope of the assessment;
- Identify other activities affecting the environmental resources of the area; and
- Define the goals of the assessment.

E-1.2.3 Describing the Affected Environment

The following approach is suggested for the compilation of a description of the environment:

- Characterise the identified external environmental resources in terms of their response to change and capacity to withstand stress;
- Characterise the stresses affecting these environmental resources and their relation to regulatory thresholds; and
- Define a baseline condition that provides a measuring point for the environmental resources that will be impacted on.

E-1.2.4 Assessment of Cumulative Impacts

The general methodology which is used for the assessment of cumulative impacts should be coherent and should comprise of the following:

- An identification of the important cause-and-impact relationships between proposed activity and the environmental resources;
- A determination of the magnitude and significance of cumulative impacts; and
- The modification, or addition, of alternatives to avoid, minimize or mitigate significant cumulative impacts.

SECTION F: ASSESSMENT OF IMPACTS

F-1 IDENTIFICATION OF IMPORTANT ENVIRONMENTAL IMPACTS

The key environmental impacts listed in the following section have been determined through:

- Legislation; and
- Experience of the Environmental Assessment Practitioner (EAP).

The following issues were initially identified and, amongst others, will be carried forward into the EIR phase for further investigation and assessment:

F-1.1 Biophysical Impacts

- Potential impacts on soil and surface water resources that occur in close proximity to the proposed surface infrastructure **(during the construction, operational and decommissioning phases)**;
- Potential impacts on wetlands **(during the construction, operational and decommissioning phases)**;
- Potential impacts on groundwater as a result of underground mining **(during the construction, operational and decommissioning phases)**;
- Destruction of flora within the proposed area, stemming from activities such as vegetation clearance and topsoil stripping **(mainly during the construction phase)**; and
- Faunal displacement and/or destruction **(mainly during the construction phase)**.

F-1.2 Socio-Economic Impacts

- Increased dust and noise generation as a result of the mining activities **(during the construction, operational and decommissioning phases)**;
- Change in the visual character of the area **(during the construction, operational and decommissioning phases)**;
- Potential impacts on existing cultural and heritage resources **(mainly during the construction phase)**; and
- Job creation during the construction and operational phases of the proposed project **(during the construction, operational and decommissioning phases)**.

F-1.3 Cumulative Impacts:

- Increased loss of viable and high potential agricultural/ grazing land; and
- Increased visual impacts associated with change of landscape character.

F-2 IDENTIFICATION OF CUMULATIVE IMPACTS

Cumulative impacts, as illustrated below, occur as a result from the combined effect of incremental changes caused by other activities together with the proposed mine development. In other words, several developments with insignificant impacts individually may, when viewed together, have a significant cumulative adverse impact on the environment (see Figure 32 below).

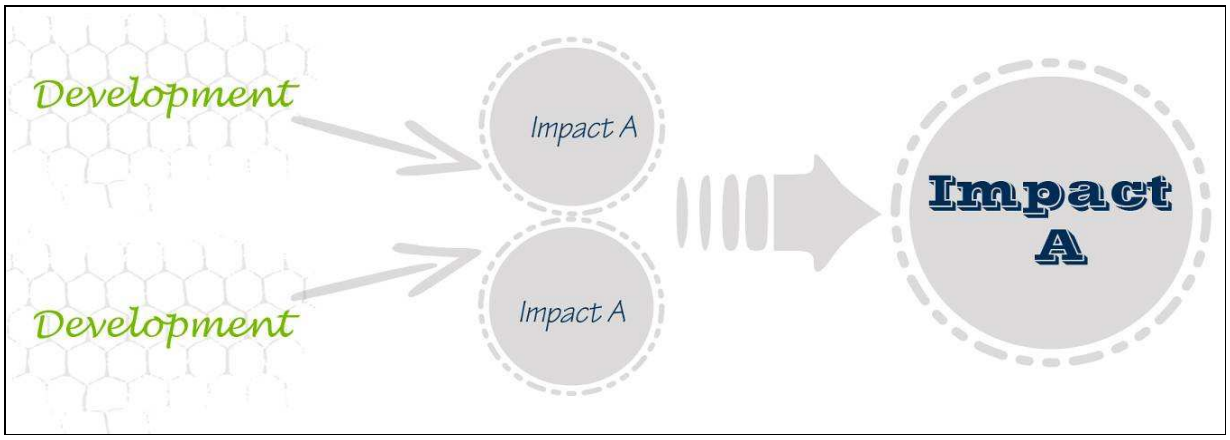

Figure 32: The Identification of Cumulative Impacts

F-3 CONSTRUCTION / DECOMISSIONING PHASE

F-3.1 Biophysical Environment

F-3.1.1 Potential impacts on soil and surface water resources that occur in close proximity to the proposed surface infrastructure

Source and nature of the impact:

Construction and decommissioning activities could potentially cause a reduction in streamflow of the Wielspruit and Rietspruit and their associated tributaries which could ultimately affect the entire Vaal Water Catchment Management Area.

Hydrocarbon (oil, petrol and diesel) spills and/or leakages could occur from construction vehicles and/or equipment. These spills could contaminate the surface and ground water should they occur simultaneously with a heavy rainfall event.

Construction activities such as vegetation clearance could cause erosion which will lead to high volumes of sediment entering streams. This could again lead to increased silt loads entering the Grootdraai dam, especially under flood conditions (decreasing storage capacity).

Table 16: Potential impacts on surface water resources

Impact source(s)	• Rreduction in streamflow; • Decrease in water quality (Hydrocarbon and other chemical spillages) and • Erosion risk.		Status	-
Nature of impact	Potential impacts to soil and surface water resources that occur in close proximity to the proposed surface infrastructure during construction and decommissioning of the mine infrastructure.			
Reversibility of impact	The impact is reversible through the implementation of appropriate mitigation measures.			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Surrounding and downstream land owners			
Magnitude	*Extent*	Regional -4		
	Intensity	High – 5		
	Duration	Short – Medium Term - 2		
	Probability	Likely – 3		

Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (4+5+2+3) x 5 = 70 Medium - High	**M - H**
	With mitigation	*WOM x ME = WM* 70 x 0.4 =28 Low - Medium	**L - M**

Mitigation measures:

- Centralise the mine layout to affect as few surface watercourses as possible, and ideally only one;
- Capture and contain all dirty water from the construction operations;
- Treat and reuse dirty water within construction activities;
- Treat as a water resource all surplus dirty water. Consider this water for treatment and discharge to receiving streams, or to third party users.
- Given the sensitive nature of the receiving watercourses and the potentially far reaching effects within the Vaal River system, these recommendations should be coupled with the requirements of GN704.
- Construction should preferably take place during the dry season.
- All construction vehicles should be kept in good working condition.
- All construction vehicles should be parked in demarcated areas when not in use and drip trays should be placed under vehicles to collect any spillages/ leaks.

Significance of the impact:

The significance of this impact is regarded as medium to high without mitigation, however, if the above mitigation measures are implemented successfully, the significance will be reduced to ***low - medium.***

F-3.1.2 Impacts on Wetlands

Source and nature of the impact:

Potential impacts on wetlands, related to the construction and decommissioning of the mine surface infrastructure, includes the following:

- Degradation and/or loss of wetlands: Removal of hydric soils, hydrophytic vegetation and changes to the topography and hydrological functioning of the catchment.
- Sedimentation of wetland and increased erosion. Runoff from construction activities associated with clearing of natural vegetation.
- Surface and groundwater pollution: Mobilisation of sediments, excavations, removal and disturbances to vegetation, mobilisation of sulphur, hydrocarbon and pyrite compounds.

These impacts may lead to loss of wetland function and decreased downstream water quality.

Table 17: Potential impacts on wetlands

Impact source(s)	• Degradation of wetlands; • Sedimentation of wetland and increased erosion; and • Surface and groundwater pollution.	Status	-
Nature of impact	Potential impacts on surface wetlands during construction and decommissioning of the mine infrastructure which may lead to loss of wetland function and decreased downstream water quality.		
Reversibility of impact	The impact is reversible through the implementation of appropriate mitigation measures		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	Surrounding and downstream land owners		
Magnitude	*Extent*	National -4	

	Intensity	High – 5	
	Duration	Short – Medium Term - 2	
	Probability	Likely – 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (4+5+2+3) x 5 = 70 Medium - High	**M - H**
	With mitigation	*WOM x ME = WM* 70 x 0.4 =28 Low - Medium	**L - M**

Mitigation measures:

- De-activate head cuts and gully erosion processes: Utilise structures e.g. concrete weirs/ gabions to halt erosion advance, capture sediments and raise water level where necessary. Install flow diffusing structures with baffles.
- Stabilise eroding stream banks: Sloping and re-vegetation of banks to reduce erosion hazard. Some sections to be refilled behind weir structures.
- Increase surface roughness within wetlands areas: In areas that have been affected by large sheet erosion re-introduce natural species to increase surface roughness and allow for the colonisation of wetland species.
- Distribute water across the catchment to protect the floodplain: Rehabilitate wetlands on other side of the valley in the same catchment as wetlands to be affected by the proposed mine. This will help ensure sustained water yields into the floodplain which will aid in the dilution of pollutants from the mine before reaching the floodplain. Silt yields will also be reduced entering the floodplain.
- Slope stabilisation along the length of the valley bottom wetlands were large erosion processes are taking place. Eroding embankments need to be sloped to a gradient of not more than 1:3 and appropriately re-vegetated according to the zone of wetness it is positioned in.
- Large earth work movements will take place for the building of infrastructure and this soil can be used to refill gullies to halt the erosion process.
- Attenuation facilities to be installed for stormwater coming from the proposed infrastructure. The attenuation facility will retain clean water runoff and then allow the water to diffuse into wetlands at a slower velocity. This should help limit further erosion processes from being initiated, allow for sediment deposition within the attenuation facility, and re-distribute water more evenly within the seepage areas and valley bottom wetlands.

Significance of the impact:

The significance of this impact is regarded as medium to high without mitigation, however, if the above mitigation measures are implemented successfully, the significance will be reduced to ***low - medium.***

F-3.1.3 Potential impacts on groundwater as a result of shaft construction activities

Source and nature of the impact:

Impacts on groundwater quality and/or quantity may occur as a result of the following construction activities:

Shaft construction: Mining and associated dewatering activities will result in some inflow of groundwater into the mine which could reduce the groundwater available. The extent of dewatering of the upper aquifer, where landusers are currently getting their water from, is limited. The impact on groundwater quality during the operational phase will be limited. Due to the cone of the depression around the Adit system, contaminants will rather flow back to the adit.

Table 18: Potential impacts on groundwater

Impact source(s)	Shaft construction		Status	-
Nature of impact	Potential impacts on surface wetlands during construction of the shafts which may lead to impacts on the quality and quantity of groundwater			
Reversibility of impact	The impact is reversible through the implementation of appropriate mitigation measures			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Surrounding and downstream land owners			
Magnitude	*Extent*	Regional -3		
	Intensity	High – 5		
	Duration	Short – Medium Term - 2		
	Probability	Likely – 3		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+5+2+3) x 4 = 52 Medium		M
	With mitigation	*WOM x ME = WM* 52 x 0.4 =20.8 Low - Medium		L - M

Mitigation measures:

Construction:

- Separate clean and dirty runoff and contain dirty water in adequately sized pollution control dams. Ensure that pollution control dams are adequately sized according to the specifications in DWAF's GN704 or other applicable regulations.
- Prevent dirty water runoff from leaving the box cut and adits in the general mining area.
- Keep dirty areas as small as possible; and,
- Compact the base of dirty areas, like the ROM coal stockpile, workshops and oil and diesel storage areas to minimise infiltration of poor quality water to the underlying aquifers.
- Have oil/diesel spill kits on site.
- Confirm groundwater and surface water monitoring protocol and plans. Recommended that groundwater monitoring be undertaken on a quarterly basis.

Closure:

- Close all old vent shafts and adits;
- Multiple-level monitoring wells must be constructed to monitor base-flow quality within the identified sensitive zones and to monitor groundwater level behaviour in the underground workings. The deep underground boreholes will only be required towards mine closure. Use the results of the monitoring programme to confirm/validate the predicted impacts on groundwater availability and quality after closure;
- Update existing predictive tools to verify long-term impacts on groundwater, if required; and
- Present the results to Government on an annual basis to determine compliance with the closure objectives set during the Decommissioning Phase.

Significance of the impact:

The significance of this impact is regarded as medium without mitigation, however, if the above mitigation measures are implemented successfully, the significance will be reduced to ***low - medium.***

F-3.1.4 Destruction of flora within the proposed area, stemming from activities such as vegetation clearance and topsoil stripping

Source and nature of the impact:

The construction of infrastructure, access roads, conveyor systems as well as stockpiling of topsoil, overburden (during construction) and pollution control dams will lead to destruction of natural vegetation resulting in the mortality of plants including provincially protected species as well as species of conservation concern. The western portion of the proposed infrastructure (including the conveyor belt) is located on a rocky ridge, valley bottom floodplain and natural habitat supporting large populations of plant species of conservation concern as well as several provincially protected species.

Table 19: Destruction of flora within the proposed area

Impact source(s)	Ground clearing and construction of infrastructure and roads and unsuccessful rehabilitation		Status	-
Nature of impact	Destruction of vegetation and stripping of topsoil on site			
Reversibility of impact	The impact is irreversible for the development footprint, but reversible for impacted natural/ areas to remain undeveloped.			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	NA			
Magnitude	*Extent*	Regional -3		
	Intensity	Medium – 3		
	Duration	Long-term – 4		
	Probability	Definite – 5		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+3+4+5) x 3 = 45 Medium		M
	With mitigation	*WOM x ME = WM* 45 x 0.4 =18 Medium		L

Mitigation measures:

Set-aside areas:

According to the IFC (2012) "set-asides", are natural areas which are preferably within the same project area or adjacent areas over which the client has control that will be excluded from development and targeted for the implementation of conservation enhancement measures. It is however important to note that "set-aside areas" and biodiversity offsets are related but different concepts, "set-asides" are a voluntary process where land is not developed but retained for conservation purposes, while biodiversity offset areas are intended to compensate for significant impacts and must demonstrate no net loss. During initial fieldwork phases conducted in the larger study area, highly sensitive areas such as rocky ridges and grasslands which were in pristine condition were recorded (SEF, 2012) and it is recommended that set-aside areas are identified and where necessary, purchased through appropriate specialist studies as well as stakeholder consultation.

Plant rescue and relocation programme:

The removal and relocation of plant species of conservation concern or provincially protected species does not qualify under the first step of the mitigation hierarchy, namely "avoid or prevent the loss of biodiversity" but can be considered as a mitigation to minimize loss. This should however be the last consideration since the protection of species in situ is preferred. The following is recommended for a plant rescue and relocation programme:

- Plant rescue and relocation should be conducted by a suitably qualified botanist with proven relocation experience;

- Relocations should be conducted during the summer months, and if possible should include extensive surveys during early and late summer periods in order to identify and relocate as many species as possible; and
- Plant should be relocated within the same property. Should that prove not to be a viable option, permits will be required from Mpumalanga Tourism and Parks Agency.

Additional mitigation measures:

- If the diversion berms are constructed in areas containing natural vegetation, these berms should be vegetated with the same species dominating the surrounding vegetation and the revegetation of these berms should be overseen by a suitably qualified botanist;
- All species of conservation concern or species which are nationally or provincially protected which will not be directly affected by the developments, should be cordoned off as no go areas during construction and mining operations, these areas which are cordoned off should however not prevent movement of indigenous fauna;
- An independent Environmental Control Officer (ECO) should be appointed to oversee all construction and mining activities;
- No open fires should be allowed in areas containing natural vegetation, especially during the dry season;
- Formalise access roads and make use of existing roads and tracks where feasible, rather than creating new routes through naturally vegetated areas; and
- Offices and change rooms should be landscaped with indigenous plant species that will be beneficial to faunal species such as bats and birds. Bat and owl nesting boxes could be erected to encourage these species to reside in the area which will result in environmentally friendly insect and rodent control.
- Linear structures, especially the railway lines should not traverse areas containing natural vegetation;
- Where this proves not to be possible, the railway lines should be constructed as close to roads or other disturbed areas as possible; and
- Linear structures should be designed to limit impact on dispersal of floral species, this could include raising the structure off the ground at intervals and avoid the use of fences.

Significance of the impact:

Due to the large scale removal of vegetation to make space for the development, this impact is regarded as medium without mitigation. Implementation of mitigation measures will decrease the significance of the impact to ***low.***

F-3.1.5 Faunal displacement and/or destruction

Source and nature of the impact:

The construction of infrastructure, access roads and the conveyor belt will lead to the destruction of faunal habitat and will result in the possible mortality of animals. Sensitive faunal habitats that are at risk include a rocky ridge and large wetland area associated with the Wielspruit River, located in the northern section of the study area as well as a natural pan and wetland area that the proposed conveyor route traverses.

Table 20: Faunal displacement and/or destruction

Impact source(s)	Destruction of faunal as a result of construction.	Status	-
Nature of impact	Migration and possible mortality of animals.		
Reversibility of impact	The impact is partially reversible in that fauna will naturally return to natural areas adjacent to the site once activities and disturbances have ceased or are significantly reduced		
Degree of irreplaceable loss of resource	Medium		
Affected stakeholders	Surrounding land owners		

Magnitude	*Extent*	Regional -3	
	Intensity	High – 5	
	Duration	Medium Term - 3	
	Probability	Highly likely - 4	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+5+3+4) x 5 = 75 Medium - High	**M - H**
	With mitigation	*WOM x ME = WM* 75 x 0.6 =45 Medium	**M**

Mitigation measures:

- Infrastructure and the conveyor route should be located outside areas containing highly sensitive faunal habitat. An alternative location for the mine shaft located in the Wielspruit River catchment in the north of the study area should be sought. Please refer to the wetland assessment for accurate wetland delineations and recommended buffers (SEF, 2013b);
- Construction activities should commence during the winter months to minimise the impacts on breeding fauna;
- Any faunal species located on the site, which cannot relocate themselves (e.g. burrowing mammals and reptiles), should be moved in an ecologically acceptable manner to a more suitable location. This should be undertaken by a faunal relocation expert;
- As suitable habitat as well as evidence of the threatened Smaug giganteus (Sungazer) was found in the area, it is recommended that the footprint of the mine infrastructure be searched for the presence of any burrows before construction commences. If burrows are located, relocation must be done in consultation with the Sungazer Working Group, which forms part of the Endangered Wildlife Trust's (EWT) Threatened Grassland Species Programme;
- No fires should be allowed on site, especially during the dry season;
- Access roads must be formalised and use of existing roads and tracks where feasible must be made, rather than creating new routes through naturally vegetated areas;
- Offices should be landscaped with indigenous plant species that will be beneficial to faunal species such as bats and birds. Bat and owl nesting boxes could be erected to encourage these species to reside in the area which will result in environmentally friendly insect and rodent control;
- Any areas that require re-vegetating, e.g. diversion berms, must be re-vegetated with the same floral species dominating the surrounding vegetation (please refer to the floral impact assessment; SEF, 2013a). The re-vegetation of these areas should be overseen by a suitably qualified botanist; and
- An independent Environmental Control Officer (ECO) should be appointed to oversee all construction and mining activities.

Significance of the impact:

Due to the occurrence of Smaug giganteus (Sungazer) in the study area as well as evidence of other faunal species, the significance of the impact without mitigation is regarded to be medium to high. Implementation of the mitigation measures will decrease the significance of the impact to ***medium.***

F-3.2 Socio-Economic Impacts

F-3.2.1 Impacts on ambient air quality

Source and nature of the impact:

Construction activities, such as transportation vehicles travelling on exposed surfaces, earthworks as well as wind, will result in elevated ambient dust levels within the area. Increased dust levels may adversely affect persons working and/or residing in the nearby area.

Table 21: Increase in ambient dust levels

Impact source(s)	Construction activities: Transportation vehicles travelling over exposed surfaces, earthworks and the wind.		Status	-
Nature of impact	Increased levels of ambient dust			
Reversibility of impact	The impact is irreversible but can be mitigated to a large extent			
Degree of irreplaceable loss of resource	Low			
Affected stakeholders	Surrounding land owners			
Magnitude	*Extent*	Regional -3		
	Intensity	Medium – 3		
	Duration	Medium Term – 3		
	Probability	Highly likely – 4		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+3+3+4) x 4 = 52 Medium		M
	With mitigation	*WOM x ME = WM* 52 x 0.6 =31.2 Low to Medium		L - M

Mitigation Measures:

- Appropriate dust suppression methods must be applied.
- Exposed soil stockpiles shall be covered, kept damp or protected using organic binding agents or alternative techniques that are not water intensive.
- The clearing of vegetation must be kept to a minimum and only where required.
- Avoid unnecessary movement of construction vehicles.
- Vehicles travelling on unsurfaced roads must travel at a speed that creates minimal dust entrainment.

Significance of the impact:

The significance of this impact, without mitigation, is regarded to be medium. Implementation of the mitigation measures will decrease the significance of the impact to ***low - medium.***

F-3.2.2 Increase in ambient noise levels

Source and nature of the impact:

Construction activities and movement of construction vehicles will increase the ambient noise levels within the area during the construction and decommissioning phase. This may impact on adjacent landowners as well as sensitive faunal species within the study area.

Table 22: Increase in ambient noise levels

Impact source(s)	Construction and decommissioning activities (incl. blasting, bulk earthworks, traffic, demolition etc.)		Status	-
Nature of impact	Increased level of ambient noise			
Reversibility of impact	The impact is irreversible			
Degree of irreplaceable loss of resource	Low			
Affected stakeholders	Surrounding land owners and faunal species			
Magnitude	*Extent*	Site -2		
	Intensity	Medium – 3		
	Duration	Sort-Medium term – 2		
	Probability	Likely – 3		

Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (2+3+2+3) x 3 = 30 Low to Medium	**L-M**
	With mitigation	*WOM x ME = WM* 30 x 0.6 =18 Low	**L**

Mitigation measures:

Good Engineering Practice:

- All diesel powered equipment must be regularly maintained and kept at a high level of maintenance. This must particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment must serve as trigger for withdrawing it for maintenance.
- To minimise noise generation, vendors can be required to guarantee optimised equipment design noise levels.
- During the planning and design stages of the project, possibly related noise aspects should always be kept in mind. The enclosure of major sources of noise, such as compressor or pump systems, fans etc. must be included in the design process, since they represent basic good engineering practice.
- Vibrating structures are known to be noisy and good design philosophies should be followed for equipment of this nature. The mentioned equipment must be installed on vibration isolating mountings.
- By enclosing the tipper discharge and lowering the conveyor drop height, noise emissions may be reduced. Mechanical and electrical design also influences the amount of noise from stacking and reclaiming operations.
- Re-locate noise sources to less sensitive areas to take advantage of distance and shielding.
- Site permanent facilities away from community areas if possible.
- Develop a mechanism to monitor noise levels, record and respond to complaints and mitigate impacts.

Overland conveyor:

- The overland coal conveyor and drive stations can be enclosed/sheeted and roofed to reduce noise transmitted. All conveyors should be constructed with machined/balanced idlers to reduce noise generation.

Operational Hours:

- It is recommended that, as far is as practicable, noise generating activities such as maintenance , construction and decommissioning, be limited to day-time hours since noise impacts are most significant during the night.

Noise Management Zone:

- It is recommended that a noise management zone of be considered around the operations. This area should correspond to the area over which noise levels may result in annoyance i.e. complaints and occasional community action and was estimated to be approximately 3 km from activities. Complaints and noise levels in this area should be recorded and monitored and results communicated to interested and affected parties.

Acoustic Barriers:

- An acoustic barrier is not considered as part of the design of the Xstrata Amersfoort Underground Coal Mine. Acoustic barriers should however be considered should ambient noise measurements conducted during the operational phase indicate unacceptable noise levels at nearby NSR's.

Significance of the impact:

Due to the limited number of noise receptors (adjacent landowners) the impact associated with increased ambient noise levels during the construction phase is predicted to be of a low to medium significance, however the implementation of mitigation measures will reduce the significance of the impact to ***low***.

F-3.2.3 Temporary change in the visual character of the area

Source and nature of the impact:

The construction activities and camps will alter the current visual character of the area, from one of open field to a construction site associated with people, vehicles and equipment. There are a limited number of visual receptors (adjacent landowners) in the area, however, most of them will have a direct view of the construction activities.

Table 23: Change of visual character of the area

Impact source(s)	Construction activities and placement of construction equipment		Status	-
Nature of impact	Visual character of the area will be altered by construction activities and equipment			
Reversibility of impact	The impact is irreversible but will be less visually intrusive if appropriate mitigation measures are adopted			
Degree of irreplaceable loss of resource	Medium			
Affected stakeholders	Surrounding land owners			
Magnitude	*Extent*	Regional -3		
	Intensity	Medium – 3		
	Duration	Short to Medium term – 2		
	Probability	Highly likely – 4		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+3+2+4) x 4 = 48 Medium		M
	With mitigation	*WOM x ME = WM* 48 x 0.6 =28.80 Low to Medium		L - M

Mitigation measures:

- The construction area must at all times be neat and tidy.
- All litter must be collected and removed (daily) and disposed of appropriately.
- Equipment and construction vehicles must be stored or parked in designated areas.
- The construction camp must be screened with shade cloth.
- If construction is necessary during night-time, light sources should be directed inwards and downwards to prevent obtrusive lighting and light pollution.
- Dust suppression techniques should be implemented especially on windy days. Exposed soil stockpiles shall be covered, kept damp or protected using organic binding agents or alternative techniques that are not water intensive.

Significance of the impact:

The visual impact associated with construction activities during the construction phase is predicted to be of a medium significance; however the implementation of mitigation measures will reduce the significance of the impact to a low-medium.

F-3.2.4 Potential impacts on existing cultural and heritage resources

Source and nature of the impact:

The two major types of heritage resources found on site constitute graves and various farm buildings/structures and ruins (old settlement). The Applicant will aim to move infrastructure to avoid interference with these heritage resources, however, where infrastructure cannot be moved graves will be exhumed and structures will be demolished by following the relevant legislated processes.

Table 24: Impacts on heritage resources

Impact source(s)	Construction activities such as demolition and earthworks		Status	-
Nature of impact	Impacts on heritage resources (ancestral graves and farmsteads)			
Reversibility of impact	The impact is irreversible			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Families of ancestral graves / landowners			
Magnitude	*Extent*	Site – 2		
	Intensity	Medium – 3		
	Duration	Permanent - 5		
	Probability	Definite - 5		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (2+3+5+5) x 3 = 45 Medium		M
	With mitigation	*WOM x ME = WM* 45 x 0.4 =18 Low		L

Mitigation measures:

- Construction activities should be limited to the proposed development boundary for the main infrastructure and to the proposed construction corridors for the railway line. If the size of the footprint, its orientation or the construction corridors of the conveyor belt is increased at a later stage, a heritage specialist should be involved in order to assess how the changes will affect heritage resources.
- The infrastructure must be shifted such that there is a 20 m buffer from significant heritage resources to the outer edge of the construction / development boundary. However, a heritage specialist must still be involved after the suggested shift in order to assess how the new shift might affect new and other existing sites of significance.
- Conduct a Phase 1B investigation on the old settlement in order to establish its significance prior to recommending mitigation measures.
- If the infrastructure cannot be shifted, then a permitting process either for grave relocation or archaeological test excavation constituting a Phase 1B for the old settlement) will be required for heritage resources found within the infrastructure footprint.
- All grave sites that are found within 50 m from the construction corridors should be demarcated as stipulated under each site description for ease of identification during construction and operational phases.
- Access to grave sites by the construction crew must be prohibited and the relatives of the deceased must be allowed access as and when they would like to visit the grave site during both construction and operational phases.

Significance of the impact:

The impact associated with the removal of heritage resources during the construction phase is predicted to be of a medium significance without mitigation measures, however, this impact can be reduced to a ***low*** significance if appropriate measures are adopted.

F-3.2.5 Job creation during the construction and decommissioning phases

Temporary employment opportunities will be created during the construction phase, via construction related activities. This will positively impact on the surrounding community and local economy due to possible skills development and income generation. This impact is predicted to have a **medium positive significance**.

F-4 OPERATIONAL PHASE

F-4.1 Biophysical Environment

F-4.1.1 Potential impacts on soil and surface water resources that occur in close proximity to the proposed surface infrastructure

Source and nature of the impact:
Operational activities could potentially cause a reduction in streamflow of the Wielspruit and Rietspruit and their associated tributaries which could ultimately affect the entire Vaal Water Catchment Management Area.

Hydrocarbon (oil, petrol and diesel) spills and/or leakages could occur from vehicles and/or equipment. These spills could contaminate the surface and ground water should they occur simultaneously with a heavy rainfall event.

Operational activities such as the establishment of increased hard surfaces could cause erosion which will lead to high volumes of sediment entering streams. This could again lead to increased silt loads entering the Grootdraai dam, especially under flood conditions (decreasing storage capacity).

The mine's pollution control dams also pose a risk of contamination of surface water during flood events.

Table 25: Potential impacts on surface water resources

Impact source(s)	• Rreduction in streamflow; • Decrease in water quality (Hydrocarbon and other chemical spillages); • Erosion risk; and • Flood risk		Status	-
Nature of impact	Potential impacts to soil and surface water resources that occur in close proximity to the proposed surface infrastructure during the operation of the mine.			
Reversibility of impact	The impact is reversible through the implementation of appropriate mitigation measures.			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Surrounding and downstream land owners			
Magnitude	*Extent*	Regional -4		
	Intensity	High – 5		
	Duration	Long-term -4		
	Probability	Likely – 3		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (4+5+4+3) x 5 = 80 High		H
	With mitigation	*WOM x ME = WM* 80 x 0.6 =48 Medium		M

Mitigation measures:

- Refer to mitigation measures listed in Section F-3.1.1.

Significance of the impact:

The significance of this impact is regarded as high without mitigation, however, if the above mitigation measures are implemented successfully, the significance will be reduced to ***medium.***

F-4.1.2 Impacts on wetlands

Source and nature of the impact:

Potential impacts on wetlands, related to the operation of the mine, include the following:

- Degradation and/or loss of wetlands: Removal of hydric soils, hydrophytic vegetation and changes to the topography and hydrological functioning of the catchment.
- Sedimentation of wetland and increased erosion. Runoff from construction activities associated with clearing of natural vegetation.
- Surface and groundwater pollution: Mobilisation of sediments, excavations, removal and disturbances to vegetation, mobilisation of sulphur, hydrocarbon and pyrite compounds.
- Altered hydrology of the catchment: Destruction of hydric soils, hydrophytic vegetation and changes to catchment including drawdown water.
- Decrease of downstream water quality: Seepage of water, discharge of water and lack of clean and dirty water separation.

Table 26: Potential impacts on wetlands

Impact source(s)	• Degradation of wetlands; • Sedimentation of wetland and increased erosion; • Surface and groundwater pollution; • Altered hydrology of the catchment; and • Decrease of downstream water quality.		Status	-
Nature of impact	Potential impacts on surface wetlands during the operation of the mine which may lead to loss of wetland function and decreased downstream water quality.			
Reversibility of impact	The impact is reversible through the implementation of appropriate mitigation measures			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Surrounding and downstream land owners			
Magnitude	*Extent*	National -4		
	Intensity	High – 5		
	Duration	Long - Term - 4		
	Probability	Likely – 3		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (4+5+4+3) x 5 = 80 Medium - High		H
	With mitigation	*WOM x ME = WM* 80 x 0.4 =32 Low - Medium		L - M

Mitigation measures:

- Refer to mitigation measures listed in Section F-3.1.2.

Significance of the impact:

The significance of this impact is regarded as high without mitigation, however, if the above mitigation measures are implemented successfully, the significance will be reduced to ***low - medium.***

F-4.1.3 Potential impacts on groundwater as a result of underground mining

Source and nature of the impact:

Impacts on groundwater quality and/or quantity may occur as a result of the following mining operations:

Underground mining: Mining and associated dewatering activities will result in some inflow of groundwater into the mine which could reduce the groundwater available. The extent of dewatering of the upper aquifer, where landusers are currently getting their water from, is limited. The impact on groundwater quality during the operational phase will be limited. Due to the cone of the depression around the Adit system, contaminants will rather flow back to the adit.
Box cut and Adit: The extent of dewatering of the upper aquifer system is expected to be low because of the low permeability of the rock material and because of the grouting of the Adit along fractures. The cone of depression will be fairly small during the operations and towards closure. Impact on baseflow can be significant.
Workshops, wash bays and WWTPP: Seepage from the workshops, wash bays and sewage management facility may occur if not managed correctly.
RoM Stockpiles: Poor quality seepage may occur from the RoM facility due to rainfall infiltration and subsequent seepage into the underlying strata.
Discard and Slurry: Poor quality seepage may occur from the discard and slurry storage facility due to rainfall infiltration and subsequent seepage into the underlying strata. Acid rock drainage may also occur.
Processing Plant: Poor quality seepage may occur from the processing facility due to rainfall infiltration and subsequent seepage into the underlying strata.
Pollution control dams: Leakage of dams can result in seepage which could lead to elevated groundwater levels and groundwater pollution (if the seepage is of poor quality) which could affect downstream users negatively.

Table 27: Potential impacts on groundwater

Impact source(s)	• Underground mining; • Box cut and Adit; • Workshops, wash bays and WWTPP • RoM Stockpiles; • Discard and Slurry; • Processing Plant; and • Pollution control dams	Status	-
Nature of impact	Potential impacts on surface wetlands during the operation of the mine which may lead to loss of quality and/or quantity of groundwater.		
Reversibility of impact	The impact is reversible through the implementation of appropriate mitigation measures		
Degree of irreplaceable loss of resource	High		
Affected stakeholders	Surrounding and downstream land owners		
Magnitude	*Extent*	Regional -3	
	Intensity	High – 5	
	Duration	Long - Term - 4	
	Probability	Likely – 3	
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (5+5+4+3) x 5 = 85 Medium - High	H

	With mitigation	*WOM x ME = WM* 85 x 0.4 =34 Low - Medium	**L - M**

Mitigation measures:

- Eliminate the development of subsidence to surface through sound underground mine planning and leaving sufficient pillars and barrier zone along shallow sub-outcrop zones underground. It is unlikely that surface subsidence will occur but this needs to be confirmed by the Xstrata Rock Mechanical engineer. Subsidence increase groundwater recharge and may result in decant after closure.
- Re-use groundwater seepage collected in the Adit to adequately sized pollution control facilities in the mining process.
- Keep dirty areas like the pollution control dam and coal stockpiles, workshops and oil and diesel storage areas as small as possible; and
- Contain poor quality runoff from dirty areas and divert this water to pollution control dam for re-use.
- Have oil/diesel spill kits on site.
- Confirm groundwater and surface water monitoring protocol and plans. Recommended that groundwater monitoring be conducted on a quarterly basis.

Significance of the impact:

The significance of this impact is regarded as high without mitigation, however, if the above mitigation measures are implemented successfully, the significance will be reduced to ***low - medium.***

F-4.2 Socio-Economic Impacts

F-4.2.1 Impacts on ambient air quality

Source and nature of the impact:

Dust is a widespread impact associated with any form of mining and can occur as a result of vehicle entrainment on unpaved roads, during blasting and crushing and other fugitive dust sources.

Table 28: Impacts on ambient air quality

Impact source(s)	Unpaved roads, blasting and crushing		Status	-
Nature of impact	Increased levels of ambient dust			
Reversibility of impact	The impact is irreversible but can be mitigated to a large extent			
Degree of irreplaceable loss of resource	Low			
Affected stakeholders	Surrounding land owners			
Magnitude	*Extent*	Regional -3		
	Intensity	Medium – 3		
	Duration	Long Term – 4		
	Probability	Highly likely – 4		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+3+4+4) x 4 = 56 Medium		**M**
	With mitigation	*WOM x ME = WM* 56 x 0.6 =33,6 Low to Medium		**L - M**

Mitigation Measures:

- A monitoring system is recommended to be put in place at Xstrata Amersfoort mine. It is proposed that the dust fallout monitoring network be established before the start of any mining activities in view of the uncertainty regarding predicted dust-fall impacts. This will aid in the management of potential impacts.
- It is recommended that a dust fallout network comprising of single dust fallout buckets be established on the mining area boundaries and in adjacent residential areas to conservatively determine impact on adjacent properties. The proposed locations of these dust buckets should be determined taking areas that are most likely to be affected by the mine's operation.
- Dust deposition measurement should be carried out by method ASTM 1739- 98 recommended in SANS 1137-2012. This involves exposure of a standard bucket for a month, with weighing (and chemical analysis, if necessary) of the dust collected. The changing of the bucket can be done by on-site personnel while the weighing can be carried out at a suitable off-site or on-site laboratory.
- The single bucket dust monitors are deployed following the American Society for Testing and Materials standard method for collection and analysis of dust-fall (ASTM D1739). This method employs a simple device consisting of a cylindrical exposed for one calendar month (30 ±3 days).

Significance of the impact:

The significance of this impact, without mitigation, is regarded to be medium. Implementation of the mitigation measures will decrease the significance of the impact to low - medium.

F-4.2.2 Increase in ambient noise levels

Source and nature of the impact:

Operational activities and movement of vehicles will increase the ambient noise levels within the area during the operational phase. This may impact on adjacent landowners as well as sensitive faunal species within the study area.

Table 29: Increase in ambient noise levels

Impact source(s)	Continuous operational phase activities (incl. MAMS, ventilation shafts, transfer house, screen and crusher; stacking at the RoM stockpile, the Eskom stockpile and the export stockpile, CHPP, rail load stations and conveyors)		Status	-
Nature of impact	Increased level of ambient noise			
Reversibility of impact	The impact is reversible			
Degree of irreplaceable loss of resource	Low			
Affected stakeholders	Surrounding land owners and faunal species			
Magnitude	*Extent*	Site - 2		
	Intensity	Medium – 3		
	Duration	Long term – 4		
	Probability	Likely – 3		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (2+3+4+3) x 4 = 48 Medium		M
	With mitigation	*WOM x ME = WM* 48 x 0.6 = 28 Low - Medium		L-M

Mitigation measures:

- Refer to section F-3.2.2 for appropriate mitigation measures.

Significance of the impact:

Due to the limited number of noise receptors (adjacent landowners) the impact associated with increased ambient noise levels during the construction phase is predicted to be of medium significance, however the implementation of mitigation measures will reduce the significance of the impact to ***low - medium***.

F-4.2.3 Permanent change in the visual character of the area

Source and nature of the impact:

The newly constructed development and supporting infrastructure will permanently change the visual character of the site and surrounding area.

Table 30: Permanent change of visual character of the area

Impact source(s)	The newly constructed development		Status	-
Nature of impact	Visual character of the area will be altered permanently by new buildings and associated infrastructure			
Reversibility of impact	The impact is irreversible			
Degree of irreplaceable loss of resource	High			
Affected stakeholders	Surrounding land owners			
Magnitude	*Extent*	Regional -3		
	Intensity	High – 5		
	Duration	Permanent – 5		
	Probability	Definite – 5		
Significance	*Without mitigation*	*(Extent + Intensity + Duration + Probability) x WF* (3+5+5+5) x 4 = 72 Medium - High		M - H
	With mitigation	*WOM x ME = WM* *72* x 0.6 =43.2 Medium		M

Mitigation measures:

- Buildings should be painted a colour with a tone similar to that of the prevailing landscape.
- Steel component should be painted with a matt finish to avoid reflection.
- The development must at all times be kept neat and tide; all litter must be removed regularly.
- All lighting to be installed must be down light luminaries.

Significance of the impact:

The significance of the impact is regarded to be a medium to high due to the change in land-use. The proposed mitigation measures will marginally reduce the significance of the impact to medium.

F-4.2.4 Job creation during the operational phase

Permanent jobs will be created during the operational phase of the proposed mine. This will positively impact on the surrounding community and local economy due to possible skills development and income generation. This impact is predicted to have a **high positive significance.**

F-4.3 Cumulative Impacts:

Cumulative impacts are those impacts that are created as a result of the combination of the impacts of the proposed project, with impacts of other projects or operations, to cause related impacts. These impacts occur when the incremental impact of the project, combined with the effects of other past, present and reasonably

foreseeable future projects, are cumulatively considerable. The assessment of cumulative impacts on a site-specific basis is however complex – especially if many of the impacts occur on a much wider scale than the site being assessed and evaluated.

F-4.4 Increased loss of viable agricultural/ grazing land

Based on the Soil and Land Capability Assessment conducted for the site, the agricultural potential for intensive irrigated crop production is deemed to be very low. This is due to the high erosion susceptibility, shallow rooting depth of the soil. The best land use for the site is grazing of stock animals, such as sheep, and cattle. Therefore this impact is considered to have a **low – medium** significance rating as the impact of the proposed mine on the stocking capacity of individual farms will not be that significant.

F-4.5 Loss of visual resources in Mpumalaga (agricultural and vacant rural land)

The main element that provides the visual resource with a unique landscape character and strong sense of place is the rural feeling of remoteness. The proposed mine will change this landscape character through the high Visual Contrast that the surface infrastructure will have with the surrounding landscape, as well as through introducing higher volumes of traffic and people into the area. This is already happening in other areas across the Mpumalanga Coalfields. The significance of the cumulative impact that coal mines has on the rural landscape character of Mpumalaga is considered to be **medium – high**.

SECTION G: CONCLUSION AND RECOMMENDATIONS

In accordance with GN No. 543, the Environmental Impact Phase is aimed at identifying and assessing potential impacts caused by the proposed development. The ability to mitigate any of the identified impacts are also addressed and summarised into a working / dynamic Environmental Management Programme (EMP) for consideration by I&APs and ultimately by the MDEDET.

Comments and/or concerns identified by Interested and Affected Parties (I&APs) during the review period of the Draft Environmental Impact Report will be incorporated into the Final Environmental Impact Report which will then be submitted to the MDEDET for consideration.

Having assessed all the potential environmental impacts associated with the proposed development it is the opinion of the EAP that the proposed Xstrata Amersfoort Underground Coal Mine is issued with a positive Environmental Authorisation from MDEDET for the following reasons:

- The proposed mine will promote economic growth and mineral and petroleum resources in the Republic which is in line with Section 2(e) of the MPRDA;
- The proposed development will also contribute to local economic development and provide various employment opportunities to the people residing in the area; and
- Although a number of potential negative biophysical and social impacts where identified, with appropriate and recommended mitigation, there are no fatal flaws that should prevent the development from proceeding.

Refer to Table 31 for a summary of the impact significance ratings – without and with mitigation

Table 31: Impact significance ratings before and after mitigation

Impact	Significance without mitigation	Significance with mitigation
Construction and/or Decommissioning Phase Impacts:		
Potential impacts on soil and surface water resources that occur in close proximity to the proposed surface infrastructure.	Medium - High	Low - Medium
Impacts on Wetlands	Medium - High	Low - Medium
Potential impacts on groundwater as a result of shaft construction activities (construction only)	Medium	Low - Medium
Destruction of flora within the proposed area, stemming from activities such as vegetation clearance and topsoil stripping. (construction only)	Medium	Low
Faunal displacement and/or destruction	Medium - High	Medium
Impacts on ambient air quality	Medium	Low - Medium
Increased noise generation as a result of construction activities	Low - Medium	Low
Change in the visual character of the area	Medium - High	Medium
Potential impacts on existing cultural and heritage resources (construction only)	Medium	Low
Job creation	-	Medium (Positive)
Operational Phase Impacts:		
Potential impacts on soil and surface water resources that occur in close proximity to the proposed surface infrastructure.	High	Medium
Impacts on Wetlands	High	Low - Medium
Potential impacts on groundwater as a result of underground mining activities.	High	Low - Medium
Impacts on ambient air quality	Medium	Low - Medium
Increased noise generation as a result of the mining activities	Medium	Low - Medium
Change in the visual character of the area	Medium - High	Medium
Job creation	-	High (Positive)
Cumulative Impacts:		
Increased loss of viable agricultural/ grazing land	Low	Medium
Loss of visual resources in Mpumalaga (agricultural and vacant rural land)	High	Medium to High

SECTION H: REFERENCES

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http://www.southafrica.info/about/geography/mpumalanga (Date Accessed: 29 November 2011)

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http://www.xstratacoal.com (Date Accessed: 10 October 2012)

SECTION I: APPENDICES

Appendix 1: Locality Map

Appendix 2: Photograph plate

Appendix 3: Layout Plans

Appendix 4: Authority Correspondence

Appendix 5: Public Participation

Appendix 6: Specialist Studies

Appendix 7: Amersfoort Social and Labour Plan

Appendix 8: Environmental Management Programme