Report

Environmental Management Programme Report
(Environmental Impact Assessment and Management)
in terms of the Mineral and Petroleum Resources Development Act, 2002 and the National Environmental Management Act, 1998 (and its subsidiary Acts)
Vaalbult Mining Company (Pty) Ltd – Vaalbult Colliery

DMR Reference: MP30/5/1/2/2/10067MR
DEDET Reference: 17/2/3GS-182

June 2013
Updated August 2013 and November 2013

(Reference: D011211)

(For submission to DMR and DEDET)

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Quality Assurance			
Project Name: *Vaalbult Mining right Application*			**Project Number:** D011211
Version	**Description**	**Responsible person**	**Date**
1	Document compilation	Leonie Berjak	June 2013
	Document review	Digby Gold	June 2013
	Copies to:	Vaalbult Mining Company (Pty) Ltd, Johannesburg (1 copy) Albert Luthuli LM (1 copy) Gert Sibande District Municipality (1 copy) Carolina Library (1 copy) Vaalbult Mining Area, Farm Vaalbult 3 IT portion 9 (1 copy) Department of Mineral Resources (6 copies) Inkomati Catchment Management Agency (1 copy)	
2 *(Updated primarily Sections 6, 8, 9 and Appendices B & K)*	Document update	Leonie Berjak	August 2013
	Copies to:	Vaalbult Mining Company (Pty) Ltd, Johannesburg (1 copy) Department of Mineral Resources (6 copies) Department of Economic Development, Environment & Tourism (2 copies)	
3 *(Amendment primarily Sections 7.2, 7.3, 8.2, 8.6, 9 and Appendices L & M)*	Document amendment	Leonie Berjak	November 2013
	Copies to:	Vaalbult Mining Company (Pty) Ltd, Johannesburg (1 copy) Department of Mineral Resources (2 copies) Department of Economic Development, Environment & Tourism (2 copies)	

This version of the EMPR is an amendment of the August 2013 report that incorporates information requested by the DMR in terms of the directive letter dated 30 October 2013.

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The observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge using information available at the time of compilation. Copperleaf Consulting reserve the right to modify aspects of the report including the recommendations if and when new information becomes available from research or consultation. This report must not be altered or added to without the prior written consent of the author.

Executive Summary

Vaalbult Mining Company (Pty) Ltd (Vaalbult Mining) has applied to the Department of Mineral Resources (DMR) to mine coal via opencast, trench and high wall mining on portions 1, 9 and 10 of the Farm Vaalbult 3 IT within the Albert Luthuli Local Municipality, Gert Sibande District, Mpumalanga. Acceptance of this Mining Right Application (MRA; reference **MP30/5/1/2/2/10067MR**) has been received dated the 1st March 2013. The proposed mining right area covers approximately 730 ha and is located about 13.5 km west of Carolina off the R38 to Hendrina.

One of the requirements in the application process is the undertaking of environmental investigations that include the drafting of an Environmental Management Programme Report (EMPR) that incorporates the Environmental Impact Assessment (EIA). The EMPR is compiled in terms of, and in compliance with, the Mineral and Petroleum Resources Development Act, 2002 as amended (MPRDA), the National Environmental Management Act, 1998 as amended (NEMA) and the National Water Act, 1998 as amended (NWA).

This EMPR has been compiled for public review prior to final submission to the DMR (Mpumalanga), as well as the Mpumalanga Department of Economic Development, Environment and Tourism (Ermelo); and describes the methodology applied to the environmental process, a description of the proposed project, project alternatives, a description of the current state of the environment, the consultation process, and the impact assessment with mitigation measures. The process, timeframes and document content will follow that laid out in the Mineral and Petroleum Resources Development Regulations, as well as the Environmental Impact Assessment Regulations, 2010.

The proposed mining methods include both opencast conventional strip mining (74 ha), as well as trenching (12.5 ha – 46.7 ha surface disturbance) to create high walls for high wall / auger mining (approximately 245 ha). It is proposed that mining take place in two sections / blocks, east and west, as divided by the surface water drainage line. Approximately 7.8 million tons of coal is available for mining and at a production rate of 60,000 run of mine tons per month the life of mine is expected to be approximately 11 years. All ROM will be sold to local markets and taken to Eastside Colliery, which is located on the R38 east approximately 6 km from Carolina, for processing.

The infrastructure for the operations will include:

- Main office complex (0.13 ha) with prefabricated / portable administration and management offices, stores, workshop, change house (ablutions), first aid room and training room (480 m2), diesel store (<80,000 litres / 80 m3) and water and electrical distribution installations (on surface). Chemical toilets will be used and the change house will be linked to a grey water filter system to recover some water for operations.
- Mining sections with overburden stockpiles for opencast and trench areas (29.45 ha), ROM stockpiles (2.85 ha / <100,000 tons capacity), screening area (to size coal) within ROM stockpile pad area, water and electrical temporary portable installations (on surface), on-site haul roads (approximately 3.7 km) and pollution and stormwater control measures (berms, trenches and pollution control dams).

Based on the type and placement of the mine infrastructure the listed activities requiring additional authorisation includes:

- Activities requiring a basic assessment (NEMA):
  - Construction of facilities for the transmission and distribution of electricity > 33 kV but <275 kV (Activity 10)
  - Road construction – road >8m wide (Activity 22)
- Activities requiring a scoping and EIA (NEMA):
  - Construction of facilities for the storage of effluent (Activity 5)
  - Transformation of undeveloped land >20 hectares (Activity 15)
- Activities requiring a scoping and EIA (NEMWA) – this may be covered by the NEMA submission:
  - Storage of dirty water (potential for high sulphur content – hazardous) from the mining area in pollution control dams for reuse (Activity 4(1))
  - Reuse of water from the pollution control dams for the operation and dust suppression (Activity 4(2))
  - Construction of the storage facility – pollution control dams (Activity 4(11))
- Activities requiring a water use (NWA):
  - Section 21a – taking water from a water resource – abstraction from a borehole (groundwater) for the mining operations (4,000 litres per hour by 12 hours by 30 days)
  - Section 21g – Disposing of waste in a manner which may detrimentally impact on the water resource including pollution control dam/s, use of pollution control dam water for dust suppression, and temporary ROM stockpiles
  - Section 21j – Removal of underground water for a safe mining environment
  - Sections 21c & i – mining within 500 m catchment of a wetland (pan / riparian wetland).

Based on scoping of the pre-mining environment, the potential impacts identified as requiring specialist investigation during the EIA / EMP phase include those on soils and land capability, surface and groundwater (hydrogeological and floodlines), air quality, biodiversity assessment (ecological), heritage impact assessment and vibration assessment. The following studies are therefore included within this EMPR:

- A ***soils and land capability assessment*** – the soil forms most affected by mining are Avalon (38 ha), Glencoe (24 ha), Dresden (19 ha) and Bainsvlei (18 ha) which are loamy sand soils. Approximately 49% of the area is arable and 29% is grazing land, with the eastern mining predominantly affecting arable land and the western mining affecting arable and grazing land evenly. Apart from the Dresden soils in the west and Westleigh soils in the east, most of the disturbed areas will have sufficient soils for rehabilitation.
- ***Floodline assessment*** – planned infrastructure development is outside of the demarcated 1:100 year flood levels and if areas assessed for wetland accumulation are avoided, then the remainder of the study area is unlikely to be affected by floods.
- A ***water balance assessment*** – the mine requires a total of about 240 m3 per day for operations (potable water 14 m3; high wall mining 48 m3 and dust suppression 178 m3). However, surfacing / treatment of the external and high traffic internal roads reduce the dust suppression requirement to 94m3 per day and the total water requirement to 156 m3 per day. The require capacities of the pollution control dams are, PCD1 5,200m3 (ROM west), PCD 2 19,800 m3 (overburden west), PCD3 28,800 m3 (overburden east) and PCD4 3,800m3 (ROM east).
- A ***hydrogeological assessment*** – the groundwater is mainly low flow seepage within the weathered zone, with the static water level regionally between 0.74 m and 16.1 m below ground level. Within the proposed mining right area a localised secondary aquifer with a calculated sustainable yield of 120,000 litres per day was identified on the western boundary. The cone of depression from abstraction of this aquifer at the sustainable rate for operations will not impact the water of adjacent landowners. Seepage into the pit during opencast mining is primarily from the

upper soils zone at an average rate of 80 m3 per day and 163 m3 per day (summer) and 8 m3 per day and 26 m3 per day (winter) in the west and in the east respectively. Surface and groundwater quality is good, apart from the northern pan and six boreholes (four of which are monitoring boreholes in the mining right area – VM01, 03, 05 and 06). Acid generation is only predicted in the high wall mining sections owing to sulphur in the coal pillars; however it is planned to grout the end-face of these pillar and seal each drive / mined section to reduce / minimise oxidation. Interaction water accumulation in the areas with the weathered zone is predicted to occur within 6.7 and 5.1 years in the west and east opencast areas respectively, and 46 years in the trenches.

- An ***air quality assessment*** - the pre-mining baseline indicates that the PM10 and PM2.5 levels are within the current national ambient air quality standards., however the dust fallout values are above the residential threshold limit (east / north) and above the action threshold limit (south / west / central) within the Vaalbult mining right area. These elevated dust levels are attributed to agricultural practices (exposed surfaces at the end of winter).
- A ***biodiversity assessment*** – one red data plant and five red data fauna were identified within the mining right area; however although areas of high ecological sensitivity have been identified most of the mining is within the transformed land (low ecological sensitivity areas) outside these natural vegetation areas and corridors and no mining is within the 400 m buffer zone for the red data plant species.
- A ***heritage impact assessment*** - four heritage sites were identified on site (3 graves and one homestead). All of these are outside the areas of surface disturbance and require management of these sites only.
- A ***vibration and noise assessment*** – owing to the existence of other mines in the area, a baseline assessment of the structures can only be established immediately prior to mining.

The environmental consequences of the proposed project, both positive and negative have been addressed in this EIA. The requirements to prevent or minimise the negative environmental impacts and degradation whilst promoting socio-economic upliftment are incorporated into the EMP. The process will be conducted in an open and transparent manner to ensure that all aspects and issues of concern are taken into account. All impacts and remedial measures were presented to the registered I&APs at a public consultation meeting on the 10th June 2013.

The significant impacts in terms of this report requiring careful management include:

- Changes in topography and slope during and after opencast / trench operations;
- Handling of soils and effective rehabilitation to ensure that areas of surface disturbance are returned to agriculture;
- Water resource availability during operations - groundwater volumes and elevation changes through abstraction;
- Water resource pollution potential;
- Long-term impacts of acid mine drainage post-closure;
- Ecologically sensitive areas during operation;
- Heritage sites during operations; and
- Habitat and atmospheric degradation due to high levels of particulates in the air.

Uitvoerende Opsomming

Vaalbult Mining Company (Pty) Ltd (Vaalbult Mining) aansoek gedoen het om die Departement van Minerale Hulpbronne (DMH) te myn steenkool via oopgroef, sloot en hoë muur mynbou op gedeeltes 1, 9 en 10 van die Plaas Vaalbult 3 IT binne die Albert Luthuli Plaaslike Munisipaliteit, Gert Sibande distrik, Mpumalanga. Aanvaarding van hierdie Aansoek om Mynregte (MRA; verwysing MP30/5/1/2/2/10067MR) ontvang is gedateer 1 Maart 2013. Die voorgestelde myn reg area beslaan ongeveer 730 ha en is geleë ongeveer 13,5 km wes van Carolina af die R38 na Hendrina.

Een van die vereistes in die aansoek proses is die onderneming van die omgewing ondersoeke wat insluit die opstel van 'n Omgewings Bestuur Program Report (EMPR) wat inkorporeer Omgewings Impak Bepaling (OIB) ingesluit. Die EMPR word saamgestel in terme van, en in ooreenstemming met die Minerale en Petroleum Hulpbronne Ontwikkeling Wet, 2002 soos gewysig (MPHOW), die Nasionale Omgewings Bestuurs Wet, 1998 soos gewysig (NOBW) en die Nasionale Water Wet, 1998 soos gewysig (NWW).

Die EMPR is saamgestel vir publieke hersiening voor die finale voorlegging aan die DMH (Mpumalanga), sowel as die Mpumalanga Departement van Ekonomiese Ontwikkeling, Omgewing en Toerisme (Ermelo), en beskryf die metode toegepas op die omgewing proses, 'n beskrywing van die voorgestelde projek, alternatiewe, 'n beskrywing van die huidige stand van die omgewing, die konsultasieproses, en die impak assessering met versagtende maatreëls. Die proses, tydraamwerke en dokument inhoud sal volg, soos uiteengesit in die Minerale en Petroleum Hulpbronne Ontwikkelings Regulasies, sowel as die Omgewings Impak Bepalings Regulasies, 2010.

Die voorgestelde mynbou-metodes sluit in beide oopgroef konvensionele strook mynbou (74 ha), sowel as vore (12,5 ha - 46,7 ha oppervlak versteuring) hoë mure te skep vir 'n hoë muur / awegaar mynbou (ongeveer 245 ha). Daar word voorgestel dat mynbou plaasvind in twee afdelings / blokke, oos en wes, as gedeel deur die oppervlak dreinering lyn. Ongeveer 7.8 miljoen ton steenkool is beskikbaar vir mynbou en by 'n produksie-koers van 60,000 loop van die myn ton per maand het die lewe van my sal na verwagting ongeveer 11 jaar. Alle ROM sal verkoop word aan plaaslike markte en na Eastside steenkoolmyn, wat op die R38-Ooste ongeveer 6 km vanaf Carolina, vir die verwerking geleë is.

Die infrastruktuur vir die bedryf sal die volgende insluit:

- Main kantoor kompleks (0.13 ha) met voorafvervaardigde / draagbare administrasie en bestuur kantore, winkels, werkswinkel, verandering huis, noodhulp kamer en opleiding kamer (480 m2), diesel winkel (<80,000 liter / 80 m3) en water en elektriese verspreiding installasies (op die oppervlak). Chemiese toilette gebruik sal word en die kleedkamers sal gekoppel word aan 'n grys water filter stelsel om water te verhaal vir operasies.
- Mining afdelings met bolaag voorrade vir oopgroef-en sloot gebiede (29.45 ha), ROM voorrade (2.85 ha / <100,000 ton kapasiteit), vertoning gebied (die grootte steenkool) binne ROM voorraad pad area, water en elektriese tydelike draagbare installasies (op die oppervlak), on-site afstand paaie (ongeveer 3,7 km) en besoedeling en stormwater beheermaatreëls (berms, slote en beheer van besoedeling damme).

Gebaseer op die tipe en plasing van die myn infrastruktuur om die lys aktiwiteite wat addisionele magtiging sluit in:

- Aktiwiteite wat 'n basiese assessering (NEMA):
- konstruksie van fasiliteite vir die transmissie en verspreiding van elektrisiteit> 33 kV maar <275 kV (Aktiwiteit 10)
- Road konstruksie - road> 8m wyd (Aktiwiteit 22)
- Aktiwiteite wat 'n bestekopname en OIE (NEMA):
- konstruksie van fasiliteite vir die berging van afval (Aktiwiteit 5)
- Transformasie van onontwikkelde grond> 20 hektaar (Aktiwiteit 15)
- Aktiwiteite wat 'n bestekopname en OIE (NEMWA) - dit kan gedek word deur die NEMA inhandiging:
- Storage van vuil water (potensiaal vir 'n hoë swaelinhoud - gevaarlik) van die mynbou-area in beheer van besoedeling damme vir hergebruik (Aktiwiteit 4 (1))
- hergebruik van water uit die beheer van besoedeling damme vir die bedryf en die vermindering van stof (Aktiwiteit 4 (2))
- Konstruksie van die stoor fasiliteit - besoedeling beheer damme (Aktiwiteit 4 (11))
- Aktiwiteite wat 'n watergebruik (NWW):
- Artikel 21A - die neem van water uit 'n waterhulpbron - onttrekking uit 'n boorgat (grondwater) vir die mynbou-bedrywighede (4000 liter per uur teen 12 uur deur die 30 dae)
- Artikel 21G - wegdoen van afval op 'n wyse wat nadelig kan beïnvloed op die water hulpbronne, insluitend besoedelingsbeheerdam / s, gebruik van besoedeling beheer dam water vir stof te onderdruk, en tydelike ROM voorrade
- Artikel 21j - Die opheffing van die ondergrondse water vir 'n veilige omgewing mynbou
- Artikel 21c & I – mynbou binne 500 m opvanggebied van 'n vleiland (pan / oewer vleiland).

Gebaseer op bestekopname van die pre-mynbou-omgewing, is die potensiële impakte wat geïdentifiseer is as wat vereis spesialis ondersoek tydens die OIB / EMP fase sluit in dié wat op grond en land vermoë, oppervlak-en grondwater (hidrogeologiese en floodines), kwaliteit van die lug, biodiversiteit assessering (ekologiese), Erfenisimpakbeoordeling en vibrasie assessering. Die volgende studies word dus ingesluit binne hierdie EMPR:

- 'n grond en land vermoë assessering - die grond vorm die meeste geraak word deur die mynbou is Avalon (38 ha), Glencoe (24 ha), Dresden (19 ha) en Bainsvlei (18 ha) wat leemsand gronde. Ongeveer 49% van die gebied is landbougrond en 29% is weiding land, met die Oos-myn oorwegend wat landbougrond en die Wes-myn wat landbougrond en weiding land eweredig. Afgesien van die Dresden gronde in die weste en Westleigh grond in die ooste, sal die meeste van die versteurde gebiede het genoeg gronde vir rehabilitasie.
- Vloedlyn assessering - beplande infrastruktuur-ontwikkeling buite die afgebakende 1:100-jaar vloed vlakke en as areas beoordeel vir vleiland opeenhoping vermy word, dan is die res van die studie area is onwaarskynlik te wees deur die vloede geraak.
- 'n water balans aanslag - die myn vereis dat 'n totaal van ongeveer 240 m3 per dag vir operasies (drinkbare water 14 m3; hoë muur mynbou 48 m3 en stof onderdrukking 178 m3). Maar oppervlak / behandeling van die eksterne en 'n hoë verkeer interne paaie te verminder die stof onderdrukking vereiste om 94m3 per dag en die totale waterbehoefte tot 156 m3 per dag. . Die benodig vermoëns van die beheer van besoedeling damme is, PCD1 5,200m^3 (ROM-Wes), PCD 2 19,800 m^3 (bolaag weste), PCD3 28,800 m^3 (bolaag oos) en PCD4 3,800m^3 (ROM-Oos).
- 'n hidrogeologiese aanslag - die grondwater is hoofsaaklik lae vloei syfering binne die verweerde sone, met die statiese water vlak streek tussen 0,74 m en 16.1 m onder die grondvlak. Binne die voorgestelde myn reg area 'n gelokaliseerde sekondêre waterdraer met 'n berekende volhoubare opbrengs van 120,000 liter per

dag is geïdentifiseer op die westelike grens. Die keël van depressie van onttrekking van die waterdraer by die volhoubare koers vir operasies het geen invloed op die water van die aangrensende grondeienaars. Sypeling in die put tydens oopgroef mynbou is hoofsaaklik uit die boonste grond sone teen 'n gemiddelde koers van 80 m3 per dag en 163 m3 per dag (somer) en 8 m3 per dag en 26 m3 per dag (winter) in die weste en in die ooste onderskeidelik. Oppervlak-en grondwater kwaliteit is goed, met die uitsondering van die noordelike pan en ses boorgate (waarvan vier monitering van boorgate in die mynbou-area reg - VM01, 03, 05 en 06). Suur generasie is net voorspel in die hoë muur mynbou-afdelings as gevolg van swael in die steenkool pilare, maar dit word beplan om die einde gesig van hierdie pilaar Grout en elke ry / gemyn artikel te verminder / beperk oksidasie seël. Interaksie water opgaar in die gebiede met die verweerde sone word voorspel om binne 6,7 en 5,1 jaar in die Wes-en Oos oopgroef areas onderskeidelik, en 46 jaar in die loopgrawe.

- 'n kwaliteit van die lug aanslag - die pre-myn basislyn dui daarop dat die PM10 en PM2.5 vlakke binne die huidige nasionale lug kwaliteit standaarde, maar die stofuitskot waardes bokant die residensiële drempelbeperking (oos / noord) en bo die. aksie drempelbeperking (suid / wes / sentraal) binne die Vaalbult myn reg area. Hierdie verhoogde stof vlakke word toegeskryf aan landbou-praktyke (blootgestel oppervlaktes aan die einde van die winter).
- 'n biodiversiteit assessering - 'n rooi data plant en vyf rooi data fauna is geïdentifiseer kan word binne die mynbou-area reg, maar hoewel die gebiede van hoë ekologiese sensitiwiteit is geïdentifiseer meeste van die mynbou is in die getransformeerde land (lae ekologiese sensitiwiteit gebiede) buite hierdie natuurlike plantegroei gebiede en gange en geen mynbou in die 400 m buffersone vir die rooi data plantspesies.
- 'n erfenisimpakbeoordeling - vier erfenisterreine is geïdentifiseer op die terrein (3 grafte en een opstal). Al hierdie is buite die gebiede van die oppervlak versteuring en vereis die bestuur van hierdie plekke net.
- 'n vibrasie en geraas assessering - as gevolg van die bestaan van ander myne in die gebied is, kan slegs 'n basislyn assessering van die strukture wat gevestig sal word onmiddellik voor mynbou.

Die gevolge vir die omgewing van die voorgestelde projek, beide positief en negatief is in hierdie OIE. Die vereistes te voorkom of te verminder die negatiewe uitwerking op die omgewing en die agteruitgang, terwyl die bevordering van sosio-ekonomiese opheffing is opgeneem in die EMPR. Die proses sal gedoen word in 'n oop en deursigtige wyse om te verseker dat alle aspekte en kwessies van kommer in ag geneem word. Alle impakte en remediërende maatreëls is aan die geregistreerde B & GP's op 'n openbare konsultasie vergadering op 10 Junie 2013.

Die beduidende impak in terme van hierdie verslag wat versigtig bestuur, sluit in:

- Wysigings in topografie en helling tydens en na oopgroef / sloot bedrywighede;
- Hantering van grond en doeltreffende rehabilitasie om te verseker dat die gebiede van die oppervlak versteuring teruggestuur word aan die landbou;
- Water beskikbaarheid van die hulpbron tydens operasies - grondwater volumes en opstand veranderinge deur middel van onttrekking;
- Water hulpbron besoedeling potensiaal;
- Lang-termyn impak van suur mynwater post-sluiting;
- ekologies sensitiewe gebiede tydens die operasie;
- erfenisterreine tydens operasies en
- Habitat en atmosferiese agteruitgang as gevolg van hoë vlakke van deeltjies in die lug.

Table of Contents

APPENDIX B: CONCEPTUAL DESIGN REPORT AND WATER BALANCE

APPENDIX C: SOILS AND LAND CAPABILITY ASSESSEMENT REPORT

APPENDIX D: FLOODLINE DETERMINATION REPORT

APPENDIX E: HYDROGEOLOGICAL ASSESSMENT

APPENDIX F: BASELINE AIR QUALITY ASSESSMENT

APPENDIX G: BIODIVERSITY ASSESSMENT REPORT

APPENDIX H: HERITAGE IMPACT ASSESSMENT

APPENDIX I: VIBRATION AND NOISE ASSESSMENT

APPENDIX J: PHOTOGRAPHS AND PLANS

APPENDIX K: CONSULTATION PROCESS

APPENDIX L: ENVIRONMENTAL PREPAREDNESS PLAN

APPENDIX M: REHABILITATION PLAN

List of Figures

List of Tables

List of Abbreviations

ABA	Acid Base Accounting
AMD	Acid mine drainage
CopperLeaf	CopperLeaf Consulting
DEA	Department of Environmental Affairs
DEDET	Department of Economic Development, Environment and Tourism
DEM	Digital elevation model
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
ECO	Environmental Compliance Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Programme
EMPR	Environmental Management Programme Report
ESR	Environmental Scoping Report
I&APs	Interested and Affected Parties
ICMA	Inkomati Catchment Management Agency
IWULA	Integrated water use licence application
LM	Local Municipality
MDALA	Mpumalanga Department of Agriculture and Land Administration
MPRDA	Mineral and Petroleum Resources Development Act, 2002 as amended
MRA	Mining Right Application
NAG	Net acid generation
NEMA	National Environmental Management Act, 1998 as amended
NEMWA	National Environmental Management: Waste Act, 2008
NWA	National Water Act, 1998 as amended
PCD	Pollution control dam
PPP	Public Participation Process
ROM	Run of mine
SAHRA	South African Heritage Resources Agency
SLP	Social and Labour Plan
Vaalbult Mining	Vaalbult Mining Company (Pty) Ltd

1. INTRODUCTION

Vaalbult Mining Company (Pty) Ltd (Vaalbult Mining) has applied to the Department of Mineral Resources (DMR) to mine coal via opencast, trench and high wall mining on portions 1, 9 and 10 of the Farm Vaalbult 3 IT within the Albert Luthuli Local Municipality (LM), Gert Sibande District, Mpumalanga. Acknowledgement / acceptance of this Mining Right Application (MRA) and requirements to proceed were received under reference MP30/5/1/2/2/10067MR from the DMR on the 8th March 2013 (dated 1st March 2013). The proposed mining right area covers approximately 730 ha of which approximately 74 ha is opencast, 12.5 ha is trenching (46.7 ha surface disturbance) and 245 ha is high wall / auger mining. The site is located about 13.5 km west of Carolina off the R38 to Hendrina (Figure 1.1). There will be no processing of coal on-site, and the run of mine coal will be sold to Eastside Colliery approximately 22.5 km east of the site along the R38 (Figure 1.1).

One of the requirements of a MRA is the undertaking of environmental investigations in terms of the Mineral and Petroleum Resources Development Act, 2002 as amended (MPRDA) and the National Environmental Management Act, 1998 as amended (NEMA; and its associated suite of legislation as appropriate[1]) that includes the drafting of an Environmental Scoping Report (ESR), the undertaking of site specific specialist studies with an Environmental Impact Assessment (EIA) and the subsequent drafting of the Environmental Management Programme (EMP). The EIA and EMP are reported on in a single Environmental Management Programme Report (EMPR). These environmental studies are also used in the compilation of an integrated water use licence in terms of and in compliance with the National Water Act, 1998 as amended (NWA). CopperLeaf Consulting (CopperLeaf), as an independent consultant, has been appointed by Vaalbult Mining to undertake and co-ordinate the environmental process.

In order to comply with the requirements of section 22(4) of the MPRDA, as well as provisions in NEMA, this document is presented as the assessment stage in the environmental investigation process. This EMPR has been compiled for public / interested and affected parties (I&APs) review purposes with subsequent submission to the Mpumalanga Regional Manager of the DMR (Witbank), as well as the Mpumalanga Department of Economic Development, Environment and Tourism (DEDET; Ermelo); and describes the methodology applied to the environmental process, a description of the proposed project, project alternatives, a brief description of the current state of the environment, the environmental impact assessment for the proposed mining, environmental management (impact mitigation), rehabilitation objectives and financial planning, and the consultation process.

[1] The National Environmental Management: Waste Act, 2008 (Act 59 of 2008; NEMWA) may be applicable – see Sections 3.4.1 and 3.4.5.

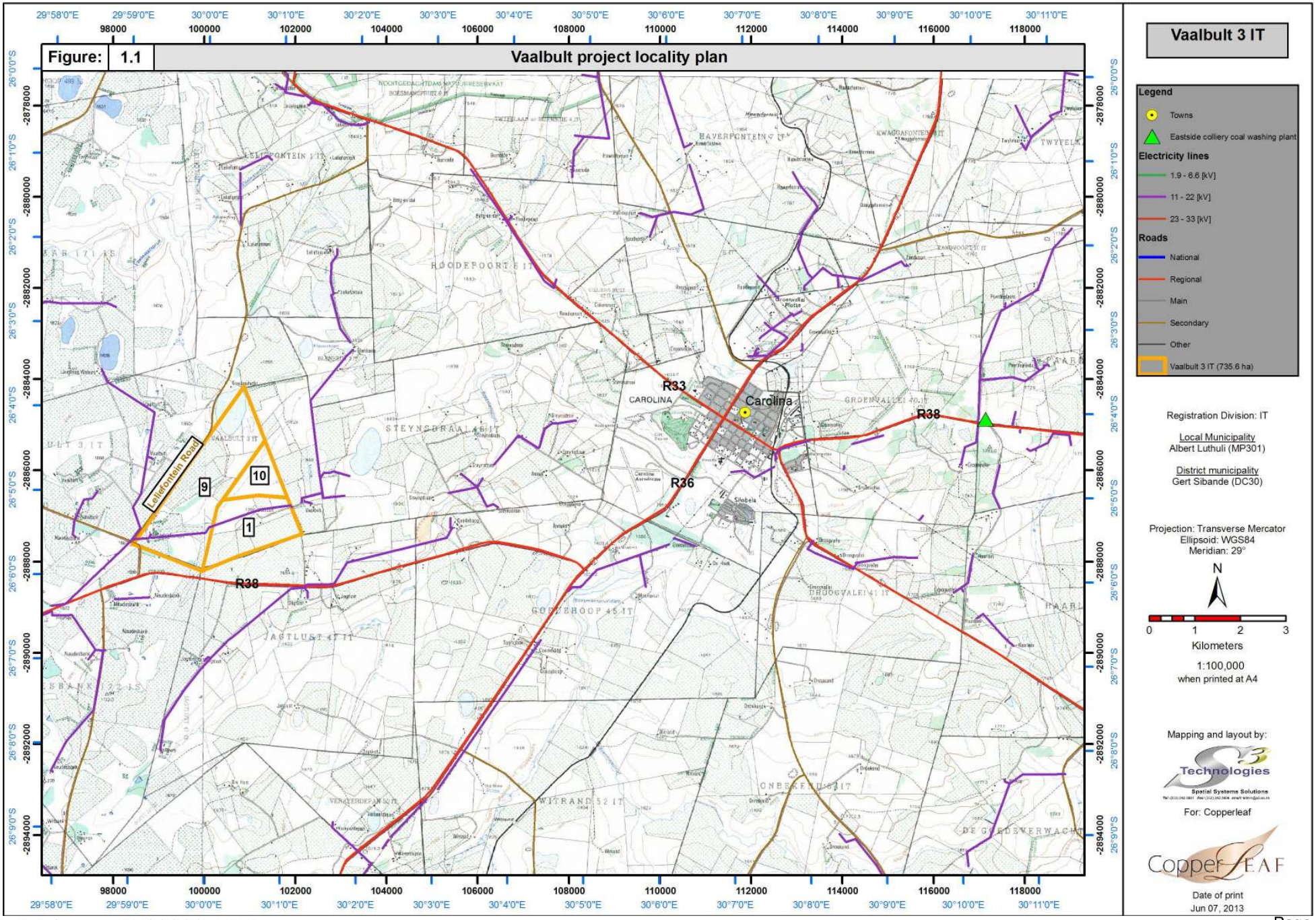


Figure: 1.1
Vaalbult project locality plan
Vaalbult 3 IT
Legend
Towns
Eastside colliery coal washing plant
Electricity lines
1.9 - 6.6 [kV]
11 - 22 [kV]
23 - 33 [kV]
Roads
National
Regional
Main
Secondary
Other
Vaalbult 3 IT (735.6 ha)
Carolina
CAROLINA
R33
R38
R36
Leliefontein Road
9
10
1
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
N
0 1 2 3
Kilometers
1:100,000
when printed at A4
Mapping and layout by:
S3 Technologies
Spatial Systems Solutions
For: Copperleaf
Copperleaf
Date of print
Jun 07, 2013

2. METHODOLOGY OF THE ENVIRONMENTAL PROCESS

In accordance with the MPRDA and NEMA, an EIA needs to be undertaken and an EMP compiled, and environmental authorisation issued before a mining right can be granted and mining can commence. CopperLeaf has been appointed as an independent consultant to undertake and co-ordinate the EIA process and any associated specialist environmental investigations, as well as the Water Use Licence application, for the proposed project. CopperLeaf is also part of the management team, along with Vaalbult Mining, to ensure and effect compliance with the relevant Public Participation Process (PPP). The process to be followed is based on that described in the MPRDA, which has been aligned with NEMA and NWA (Table 2.1). The timeframes and dates provided may change depending on the public and authority review processes. The purpose of the process is to ensure that environmental and social impacts and factors are taken into account at each stage of project development, and to ensure that all relevant parties are adequately consulted. In terms of the timeframes, this project is currently within the EMPR review stage.

Table 2.1: Timeframes for mining right application process

Time	Application		Public participation & scoping submission		Authorities review	Public participation & EIA submission			Decision / approval
Mining right application									
Aspect	Lodge application with fee	Acceptance of application letter	Submit ESR & landowner notification to DMR	I&AP registration & scoping report for public comment		EIA for public comment	Submit EMPR	Draft EMP for public comment	Authorities review & MR approved
Period	0 days	14 days	30 days	30 days	30 days	40 days	90 days	40 days	
Start date				05-Apr-13	01-Apr-13	10-Jun-13		06-Aug-13	05-Aug-13
End date	Feb-13	01-Mar-13	01-Apr-13	07-May-13	01-May-13	22-Jul-13	05-Aug-13	15-Sep-13	Mar-14
NEMA applications									
Aspect	Submit with notice to landowner	Acceptance of application letter	I&AP registration & scoping report for public comment	Submit ESR to DEA		EIA for public comment	Submit EIA & draft EMP	Draft EMP for public comment	Authorities review / acknowledge & accept
Period	0 days	14 days	30 days	5 days	40 days	40 days	Align with EMPR	40 days	60 days
Start date			05-Apr-13		12-May-13	10-Jun-13		06-Aug-13	05-Aug-13
End date	04-Apr-13	18-Apr-13	07-May-13	12-May-13	21-Jun-13	22-Jul-13	05-Aug-13	15-Sep-13	04-Oct-13
Water use licence application									
Aspect	Process followed in terms of specialist studies, impact assessments and public consultation as per the NEMA / MPRDA applicationas bove - liaise with DWA and ICMA during process					Prelinminary technical designs	Specialist design review	Submit WULA to DWA	Authorities review
End date						14-Jun-13	14-Jul-13	05-Aug-13	no timeline given

An EIA is a decision-making tool utilised in assessing the environment. It addresses the effect of development on the existing socio-economic and biophysical environmental conditions. The EIA process typically comprises two phases:

- ***Environmental Scoping Phase*** which involves investigation of the current status of the receiving environment by means of desktop studies and reconnaissance, reviews proposed project activities, highlights the environmental sensitivity of the proposed site, identifies preliminary

project issues and possible alternatives, and identifies information gaps that guide the nature and extent of the specialist investigations required for the EIA; and

- ***Environmental Impact Assessment Phase*** where detailed specialist investigations are undertaken to determine and assess the nature and extent of possible impacts of the proposed development. This information is used to highlight appropriate mitigation measures for each significant impact, and provide an implementation programme with environmental objectives and goals on how the identified impacts will be avoided, mitigated and/or managed (EMP). An approved EMP is a legally binding document and is a legal requirement of the MPRDA for all mines, existing or new, prior to initiating mining operations.

The process engages I&APs through advertisements and notification of the project and communicates key project issues identified by the proponent, consultants, authorities and the public. Public involvement, through notification and consultation with I&APs, is a key component in the environmental process and comments obtained from the authorities and I&APs are addressed in the final EMPR. An EMPR is a document which contains an EIA (which provides a description of the receiving environment, a description of the mining project and an assessment of the impacts of the mining project), and an EMP on how impacts will be avoided, mitigated and/or managed.

2.1 Legislative objectives

The environmental process and assessment of the proposed project will comply with, and take cognisance of, the following legislation:

- Constitution of the Republic of South Africa, 1996;
- Minerals and Petroleum Resources Development Act, 2002 as amended (Act 28 of 2002);
- National Environmental Management Act, 1998 as amended (Act 107 of 1998);
    - National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004);
    - National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004);
    - National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
- National Water Act, 1998 (Act 36 of 1998);
- National Heritage Resources Act, 1999 (Act 25 of 1999);
- Environment Conservation Act, 1989 (Act 73 of 1989);
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983);
- Mine Health and Safety Act, 1996 (Act 29 of 1996); and
- Hazardous Substances Act, 1973 (Act 15 of 1973).

2.2 Environmental Scoping Phase

The environmental scoping phase has been completed. The ESR was submitted to the DMR on the 28th March 2013 for dissemination to relevant government authorities for review, and was submitted to the DEDET on the 13th May 2013 after the period of public review[2]. The ESR was made available for public comment from the 5th April 2013 to the 7th May 2013. No additional comments specific to environmental issues were received on the ESR during this period, apart from comments relating to the need for correct sizing of the stormwater and pollution control structures from the Gert Sibande District Municipality which is accounted for in the water balance and civil designs studies (see Appendices B and K).

The submitted ESR highlighted the following specialist studies to be incorporated into the EIA:

- A ***soils and land capability assessment*** to determine the pre-mining potential of the proposed mining area, as well as the nature of the soil in terms of mining and rehabilitation.
- ***Floodline assessment*** – to determine the 1:50 and 1:100 year flood levels and associated flat areas over the mining right area.
- A ***water balance assessment*** to establish surface water runoff, groundwater input, and water use for the stormwater management systems design.
- A ***hydrogeological assessment*** to establish a pre-mining baseline and assist in predicting the surface-groundwater interaction, as well as the surface and groundwater quantity and quality impacts during and after mining.
- An ***air quality assessment*** of the pre-mining environment.
- A ***heritage impact assessment*** to locate, identify and record any possible sites of cultural heritage significance that could possibly be negatively impacted on by mining.
- A ***biodiversity assessment*** – summer and winter surveys of the flora and fauna in terms of biodiversity.
- A ***vibration and noise assessment*** – assessment of the structures in the area and the planned blasting and mining programme.

Any studies that are not available have been identified as information gaps in Section 10 of this report.

2.3 Environmental Impact Assessment, Management Plan and Reporting Phase

The specialist studies highlighted in Section 2.2 above have been incorporated into this EIA as follows:

- A ***soils and land capability assessment*** – detailed soil survey and wetland delineation report of disturbed areas is included.
- ***Floodline assessment*** – report included.

[2] An application has been made to the DEDET; however we are still waiting to hear from the Department of Environmental Affairs in terms of the need to make an application for a waste management license – see Sections 3.4.1 and 3.4.5 of this report

- A ***water balance assessment*** – report included.
- A ***hydrogeological assessment*** – draft preliminary report included with on-going field monitoring.
- An ***air quality assessment*** – report included with on-going field assessment.
- A ***heritage impact assessment*** – report included (AMAFA still to respond).
- A ***biodiversity assessment*** – report included.
- A ***vibration and noise assessment*** – preliminary data provided.

This EMPR includes the assessment of impacts of the project with potential mitigation measures and was available for public review prior to final submission to the DMR and DEDET. Information from this report will be used to draft the integrated water use licence application (IWULA) for submission to the Department of Water Affairs (DWA) and the Inkomati Catchment Management Agency (ICMA).

The structure of the report is as follows:

- Section 1 – Introduction that provides a brief background to the project
- Section 2 – Methodology followed in the environmental process to complete this report
- Section 3 – Project description that provides information on the proposed mining operation
- Section 4 – Project alternatives that include those alternatives considered for the land
- Section 5 – Description of pre-mining environment that incorporates available information from the specialist studies.
- Section 6 – Consultation process
- Section 7 – Environmental impact assessment for the proposed mining area that includes both individual activity / aspect impacts and cumulative impacts and incorporates information from the specialist studies. Each impact identified has been assessed in terms of nature, extent (spatial scale), duration (temporal scale), probability (likelihood of occurring), and intensity (severity). To enable a scientific approach to the determination of impact significance (importance), a numerical value is linked to each rating scale and the sum of the numerical values defines the significance.
- Section 8 – Environmental Management Plan (impact mitigation)
- Section 9 – Rehabilitation plan and financing
- Section 10 – Information gaps and conclusion
- Section 11 – Undertaking

Environmental authorisation must be obtained ***prior*** to the proposed activity being undertaken.

3. PROJECT DESCRIPTION

3.1 Applicant details

Name of prospecting right holder / applicant	Vaalbult Mining Company (Pty) Ltd
Postal address	PO Box 681 Northlands 2116
Physical address	34 Bath Avenue Rosebank 2193
Telephone	011 788 0083
Facsimile	086 571 2037 / 011 788 7499
Contact person	Ms Vanessa Jacklin- Levin

3.2 Land tenure

The proposed mining operation will take place on portions 1, 9 and 10 of the Farm Vaalbult 3 IT. A list of the land owners of these farms as well as the surrounding farms is provided in Table 3.1, and a visual representation of the affected farms / farm portions is provided in Figures 1.1 and 3.1.

Table 3.1: Landowners for the mining right area and adjacent farms

Farm	Farm name	Owner	Contact details
Mining Right Area	Vaalbult 3 IT portion 1 & 10	Jan Hendrik Combrink	PO Box 184 Carolina 1185 Tel: 0823359343
Mining Right Area	Jagtlust 47 IT portion 3		
Mining Right Area	Vaalbult 3 IT portion 9	Charles Benjamin de Villiers	PO Box 41 Carolina 1185 Tel: 0836301895
Adjacent	Vaalbult 3 IT portion 2 & rem	CMJ Papenfus Trust c/o Mr Kobus Papenfus	PO Box 71 Carolina 1185 Tel: 0828077577
Adjacent	Vaalbult 3 IT portion 3, 4, 5, 11 & 12	SJM Trust c/o Mr van der Merwe	PO Box 258 Carolina 1185 Tel: 0825683286
Adjacent	Steynsdraai 46 IT portions 4, 6, 7, 11 & rem	Christiaan Willem Adriaan Bierman	PO Box 233 Carolina 1185 Tel: 0823883531
Adjacent	Jagtlust 47 IT portion 2	Juanco Trust c/o Mr Gys Klein	PO Box 309 Carolina 1185 Tel: 0828068026
Adjacent	Naudesbank 172 IS portion 4	Moeder Natuur se Produkt (Pty) Ltd c/o Mr Nick Vos and Ms Martina Breet	PO Box 299 Carolina 1185 Tel: 0825577096
Adjacent	Naudesbank 172 IS portions 7 & 16	Gideon Albertus Gebhardt	PO Box 178 Carolina 1185 Tel: 0824941197

3.3 Resources and life expectancy of the mine

The coal ranges from where it is exposed at surface to approximately 40 m below surface within two coal seams (E and D seams) and both will be mined. The proposed mining methods include both opencast conventional strip mining (74 ha), as well as trenching (12.5 ha, with 46.7 ha surface area) to create high walls for high wall / auger mining (approximately 245 ha; Figure 3.2). It is proposed that mining take place in two sections / blocks, east and west, as divided by the surface water drainage line.

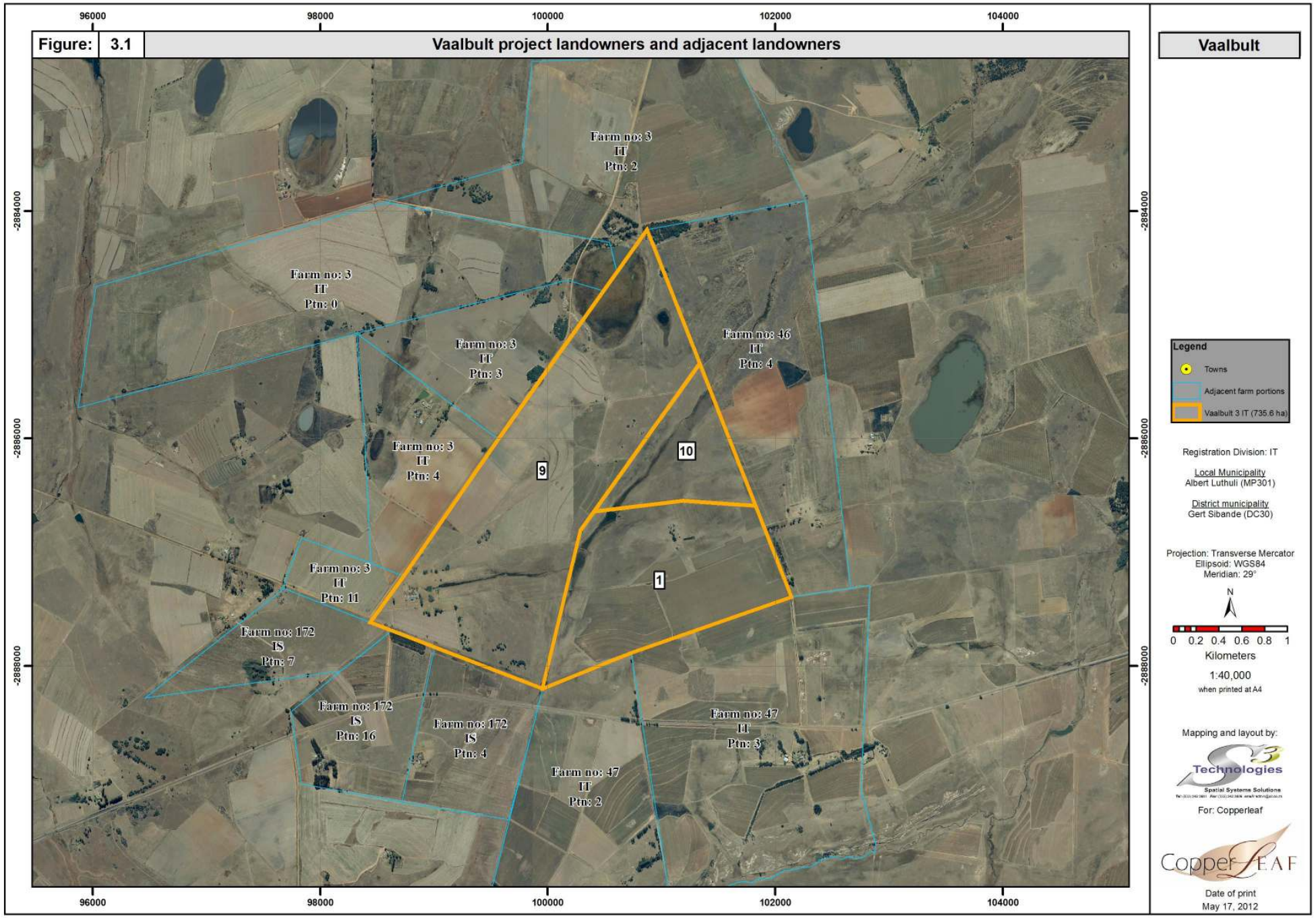
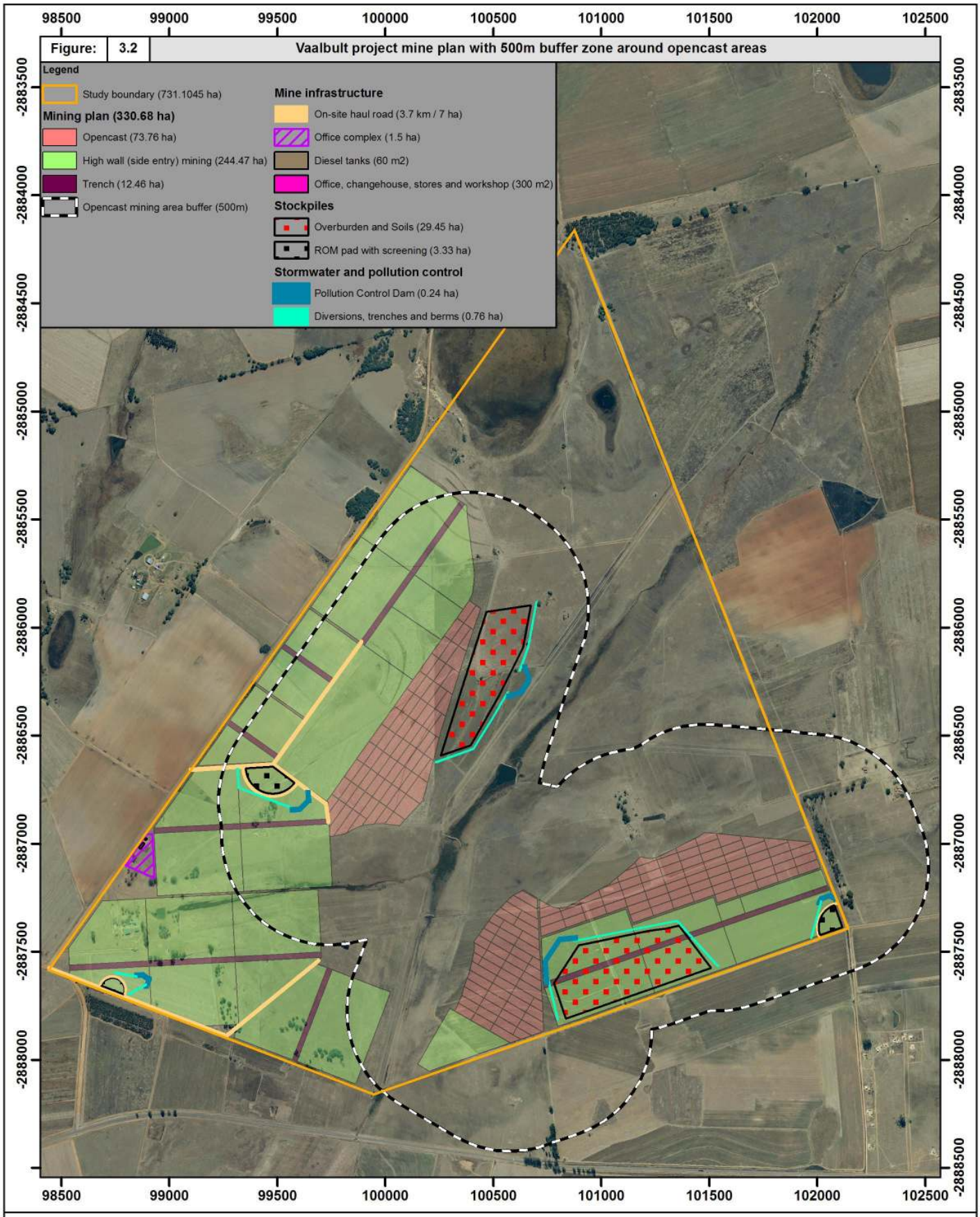


Figure: 3.1
Vaalbult project landowners and adjacent landowners
96000
98000
100000
102000
104000
-2884000
-2886000
-2888000
Farm no: 3
IT
Ptn: 2
Farm no: 3
IT
Ptn: 0
Farm no: 3
IT
Ptn: 3
Farm no: 46
IT
Ptn: 4
Farm no: 3
IT
Ptn: 4
9
10
1
Farm no: 3
IT
Ptn: 11
Farm no: 172
IS
Ptn: 7
Farm no: 172
IS
Ptn: 16
Farm no: 172
IS
Ptn: 4
Farm no: 47
IT
Ptn: 3
Farm no: 47
IT
Ptn: 2
Vaalbult
Legend
Towns
Adjacent farm portions
Vaalbult 3 IT (735.6 ha)
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
N
0 0.2 0.4 0.6 0.8 1
Kilometers
1:40,000
when printed at A4
Mapping and layout by:
Technologies
Spatial Systems Solutions
For: Copperleaf
Copper LEAF
Date of print
May 17, 2012



Mapping and layout by:

S3 Technologies
Spatial Systems Solutions
Tel: (033) 342 3981 Fax: (033) 342 3996 email: admin@s3.co.za

Date of print
07 June 2013

N

0 250 500 750 1,000
Meters

Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°

1:22,500
when printed at A4

VAALBULT

CopperLEAF

D011211

Approximately 7.8 million tons of coal is available for mining from an *in situ* reserve of about 12.6 million tons (an average extraction rate of 58% has been used). The life of mine is expected to be approximately 11 years based on the planned full production rate of 60,000 run of mine (ROM) tons per month (720,000 tons per annum). All ROM will be sold and taken to Eastside Colliery, which is located on the R38 east approximately 6 km from Carolina, for processing (Figure 1.1). Based on the timeframes provided in Section 2, should this application prove successful mining will not take place until 2014.

3.3.1 Mining method

The Vaalbult mine has been planned to operate with a single 12-hour shift seven days a week. A total of 64 persons are expected to be employed through the operation for the life of mine.

3.3.1.1 Opencast mining

The open pit design criteria and mining methodology is based on strip ratio limit and a process of conventional strip mining and roll-over method (sequential lateral roll-over) where possible is as follows:

- An initial box-cut is excavated:
  - The soft material is stripped off with an excavator and trucks and stockpiled separately according to topsoil, subsoil and weathered rock overburden. Stripping depths for the soil stockpiles has been determined through a soils study (see Section 5.3). This material will be used to close the final void of the operation and will require protection to minimise wind and water erosion and maintain topsoil viability.
  - The remaining hard rock overburden will be broken up through drill and blast to enable removal with an excavator and truck operation to expose the coal. Box cut material will be stockpiled adjacent to the opencast area. Some overburden will be cast beyond the coal edge and therefore will not need to be excavated; however blasting will be planned to minimise fly-rock. A 500 m zone around the proposed operations could be affected by blasting (see Figure 3.2 for a delineation of this zone). There are currently structures within this zone in the west and east. Blasting will be conducted by registered specialists, and the size, timing, and frequency will be regulated to reduce the potential for rock debris and fly-rock. Neighbouring landowners within the potential sphere of influence will be notified of blasting schedules.
- The coal is then mined. Exposed coal is drilled and blasted only when necessary and then loaded and hauled to the ROM stockpile pad where it may be screened prior to loading and transporting to local markets and the Eastside Colliery Coal Washing facility. It is expected that much of the coal may be excavated without blasting (free digging) and this will assist in limiting the fine coal fraction.
- Access to the open pit will be almost horizontal from the point of outcrop.
- After the initial box-cut the coal is mined in successive strips.

- The mining area as laid out will accommodate multiple 40 to 50 metre wide mining strips / blocks. Each successive cut will be used to backfill and top dress the previous cut. During steady-state operation the blasted overburden is hauled / shunted inside the mining area and dumped in the void of the previous strip (see Figure 3.3). Note that owing to topography the initial box-cut and first few cuts / strips will have a lower overburden volume than the final cut / strip. Therefore, several cuts may be open at any one time in order to accommodate the differences in volume from each successive cut to allow for the overburden and soils to be replaced in sequence.
- The backfilled void is compacted, and only when machinery will no longer require the area for access is the area finally contoured, the topsoil replaced, with the initial self-succession of vegetation encouraged (where applicable). The topography will be returned as close as possible to the pre-mining conditions. It is expected that the bulking factor and correct backfilling and contouring of the land surface will prevent any depressions from forming. This will be managed post-closure.

The equipment used during opencast operations includes front-end loaders, dozers, excavators, dump trucks, water carts and mine vehicles. This type of mining requires approximately 17 to 30 personnel per shift to mine, load and stockpile the coal.

3.3.1.2 High wall / auger mining

High wall mining accesses the coal through a high wall that is normally exposed as a final void from opencast mining (as would be the case in part of the western and eastern blocks) or from the creation of access trenches. The trench would be excavated using conventional opencast methods and machinery and the dimensions are dependent upon the make and model of the high wall miner. On average the trenches are approximately 20 to 30 m wide at the base (point where coal is exposed) with a surface width of approximately 90 m depending on an appropriate slope safety factor (see Figure 3.5). The overburden of successive trenches will be used to backfill the final void of the opencast block or previous trenches in sequence, with the subsoil and topsoil being placed on the upslope side of the trench to act as a clean water diversion berm.

High wall mining is the mining of underground strips of coal using a specialised machine and leaving strips of coal as a continuous pillar between each successive drive (Figure 3.4). A high wall miner, such as the CAT 320 HWM, is capable of cutting a 3.6 m wide entry for a length of up to 320 m (see Appendix A). The height of the cut depends on the coal seam thickness. The high wall miner cuts the coal at the face and transports it to the 'surface' via its linked / associated conveyor system. This requires approximately 2,500 kV.A of electricity. The coal is tipped from the conveyor into bins / containers that will be loaded onto the trucks. Mine planning for the Vaalbult project requires that each drive is sealed (brick, mortar and concrete) and that a pillar of approximately one metre of coal is left between drives. These pillars will be sealed (gunite/shotcrete) to prevent oxidation of sulphides in the coal face. Excess water (if available) may be pumped into the drives to above the coal seam to further reduce oxidation potential. High wall mining does not require persons underground and is operated remotely from surface. This type of mining requires a maximum of six personnel per shift to operate the miner.

Figure 3.3: Opencast method of mining

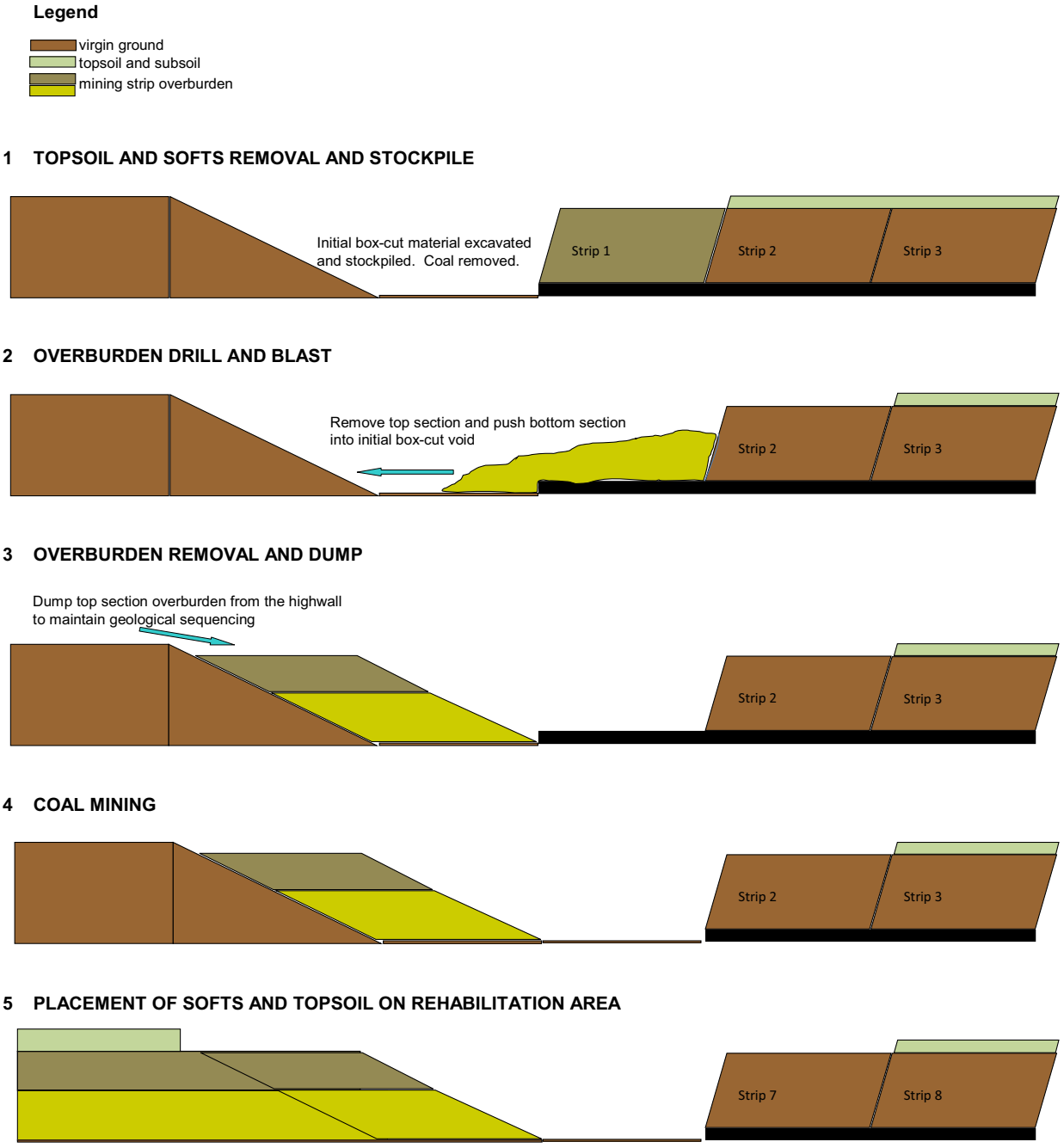
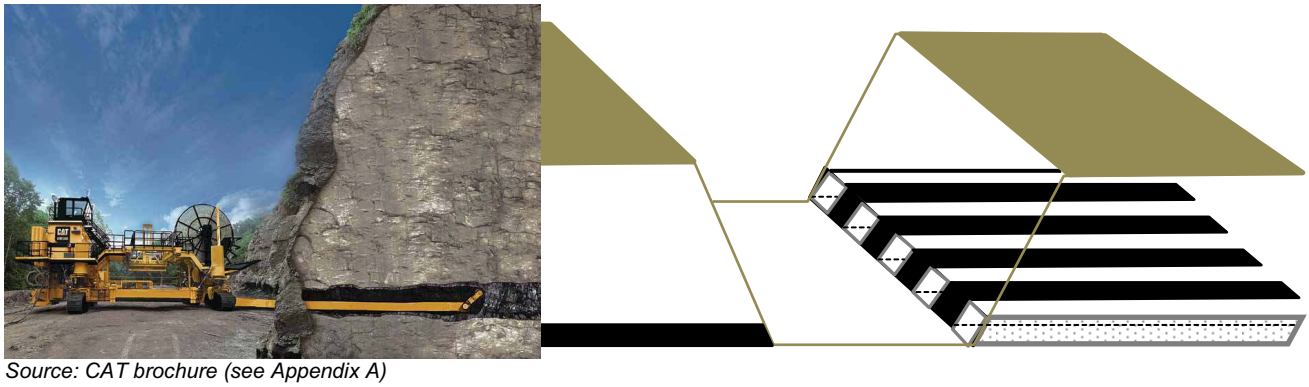
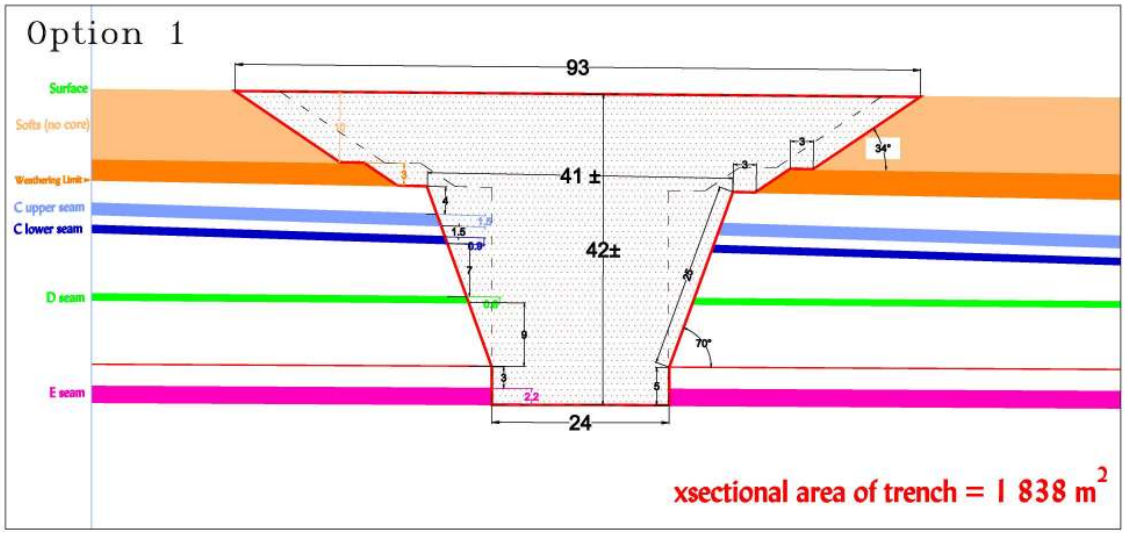


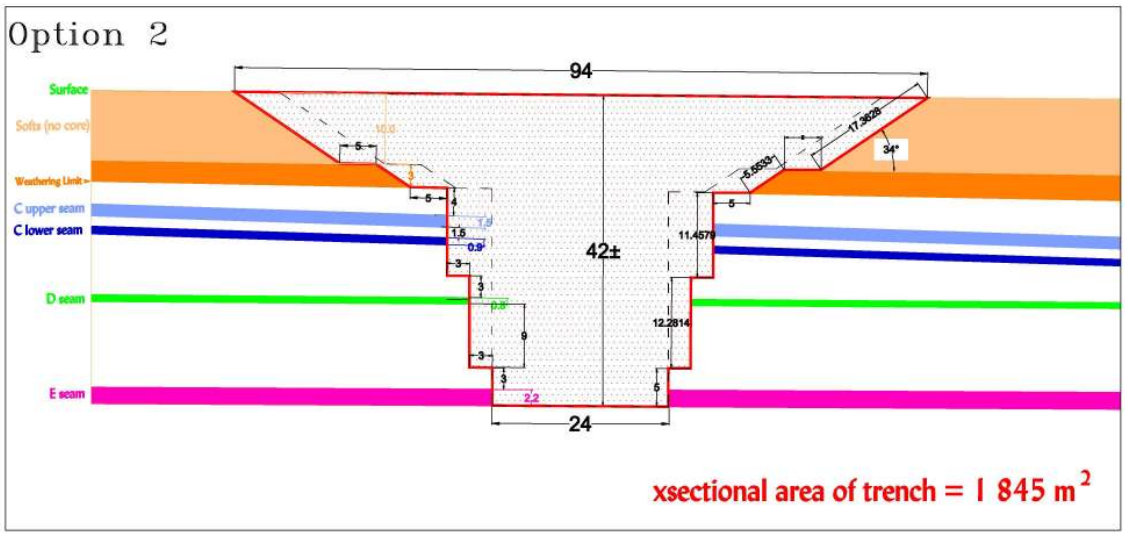
Figure 3.4: High wall method of mining

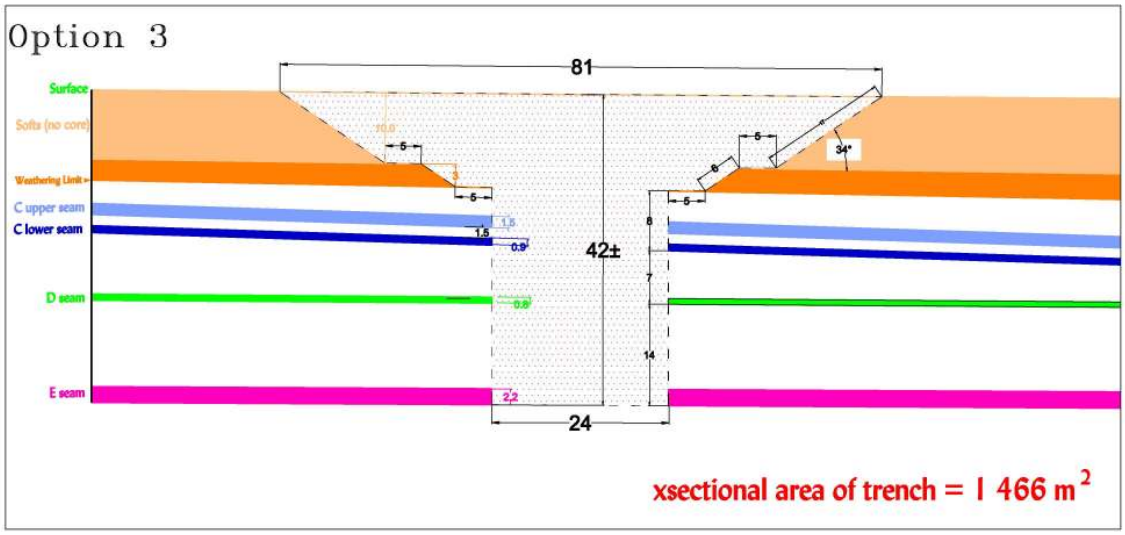


Source: CAT brochure (see Appendix A)

Figure 3.5: Potential trench design cross-sections for the high wall method of mining.







3.3.2 Mining phases

The mining sequence is broken down generically into the three stages, namely construction, operation and decommissioning / closure (see Section 3.5); however each operational area may be in a different phase of the sequence over the life of mine. Mining is planned in four phases as follows (see Figure 3.6):

- Phase 1 – opencast mining of the western block (12 months)
- Phase 2 – high wall mining of the western block (year 2 to year 9)
- Phase 3 – opencast mining of the eastern block (year 10 to year 11)
- Phase 4 – high wall mining of the eastern block (year 9 to year 11)

3.4 Infrastructure and services

3.4.1 Infrastructure

The mining operations will be controlled from a main office complex in the southwest of the mining right area on portion 9 of the Farm Vaalbult 3 IT. The infrastructure for the operations as indicated in Figure 3.3 will include:

- Main office complex (originally 1.5 ha which has been reduced to 0.13 ha – Figure 8.1)
    - Prefabricated / portable administration and management offices, stores, workshop, change house, first aid room and training room (480 m^2). Chemical toilets will be used and the change house will be linked to a grey water filter system to recover some water for operations.
    - Diesel store (<80,000 litres / 80 m^3).
    - Water and electrical distribution installations (on surface).
- Mining sections:
    - Overburden stockpiles for opencast and trench areas (29.45 ha).
    - ROM stockpiles (2.85 ha / <100,000 tons capacity).
    - Screening area (to size coal) within ROM stockpile pad area.
    - Water and electrical temporary portable installations (on surface).
    - On-site haul roads (approximately 3.7 km)
    - Pollution and stormwater control measures (berms, trenches and pollution control dams).

  Note that the western and eastern mining sections will be mined separately therefore the above areas will not all be disturbed at the same time.

The pollution control and stormwater management infrastructure will be designed to comply with GN704 in terms of the National Water Act, 1998 (NWA), namely:

- clean water diversion facilities for the 1:50 year storm event will be constructed upstream of the potential pollution source/s, and
- dirty water diversion facilities for the 1:50 year storm event will be constructed downstream of the potential pollution source/s.

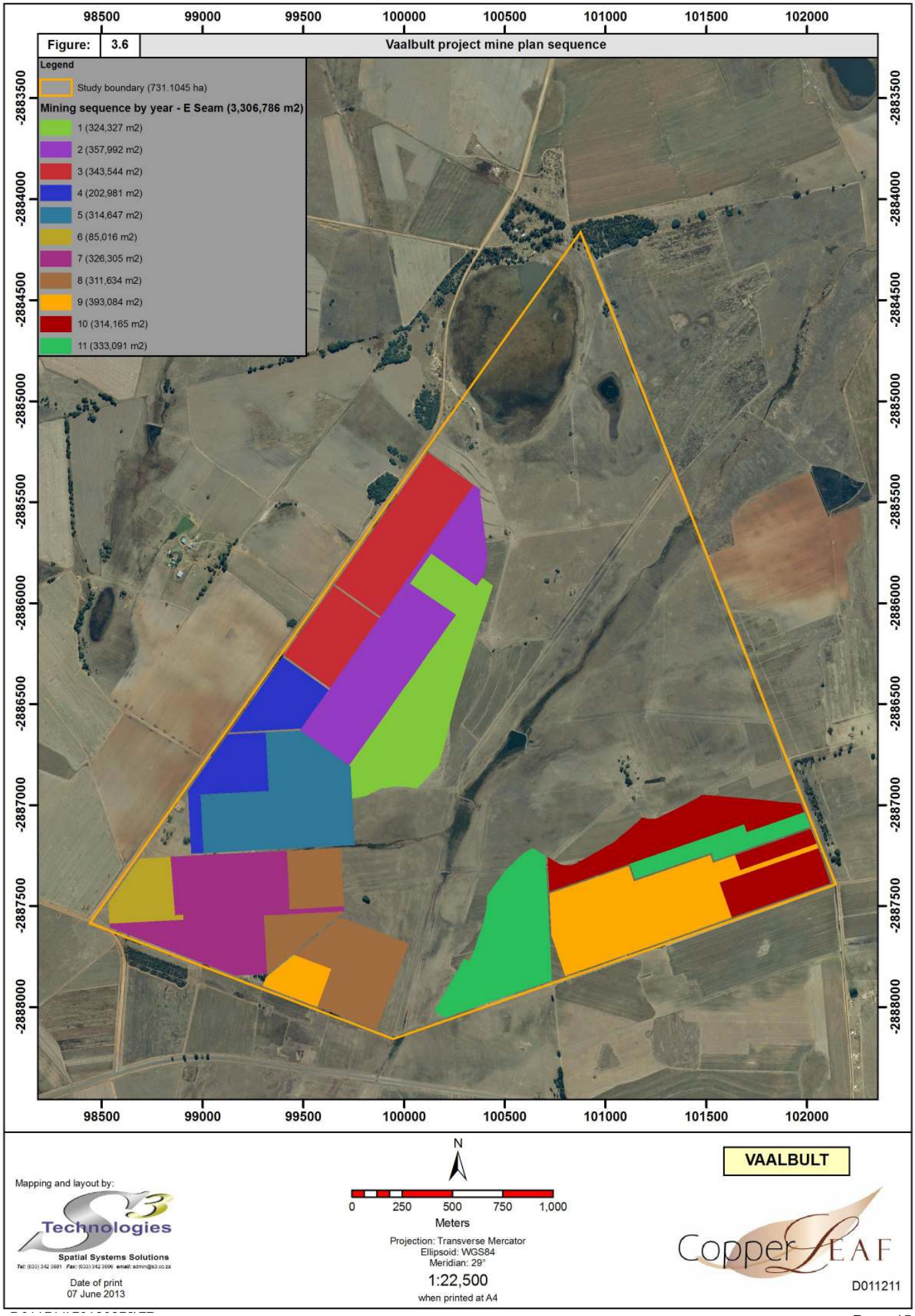


Figure: 3.6
Vaalbult project mine plan sequence
Legend
Study boundary (731.1045 ha)
Mining sequence by year - E Seam (3,306,786 m2)
1 (324,327 m2)
2 (357,992 m2)
3 (343,544 m2)
4 (202,981 m2)
5 (314,647 m2)
6 (85,016 m2)
7 (326,305 m2)
8 (311,634 m2)
9 (393,084 m2)
10 (314,165 m2)
11 (333,091 m2)
98500
99000
99500
100000
100500
101000
101500
102000
-2883500
-2884000
-2884500
-2885000
-2885500
-2886000
-2886500
-2887000
-2887500
-2888000
N
0
250
500
750
1,000
Meters
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
1:22,500
when printed at A4
VAALBULT
Mapping and layout by:
S3 Technologies
Spatial Systems Solutions
Date of print
07 June 2013
CopperLEAF
D011211

Diesel fuel will be regularly bulk delivered and stored in tanks placed on concrete foundations surrounded by spillage bunds (as per SANS 10131:2004 specifications).

Apart from the sizing / screening of the coal, there will be no beneficiation on site.

Based on the type and placement of the mine infrastructure the listed activities requiring environmental authorisation in terms of NEMA and its associated suite of legislation includes:

- Activities requiring a basic assessment in terms of the Environmental Impact Assessment Regulations Listing Notice 1 of 2010 (submitted to Regional DEDET):
    - Run of mine stockpiles (Activity 2) – this is not applicable to the current operation as although the stockpiles may cumulatively be in excess of 100,000 tons storage, they fall within a mine or works area as defined.[3]
    - Construction of facilities for the transmission and distribution of electricity > 33 kV but <275 kV (Activity 10) – this may be applicable depending on the existing available Eskom powerlines in the area.
    - Off stream storage of water >50,000 kl (Activity 12) – this is not applicable in terms of the cumulative storage of the planned pollution control dams collecting run off from the defined dirty water areas within the operations.
    - Diesel tanks 80 to 500 m^3 / kl (Activity 13) – this is not applicable as the cumulative storage of diesel for the operations is below the threshold for environmental authorisation.
    - Road construction – road >8m wide (Activity 22) – internal access / haul roads within the mining areas are required to be greater than 8 m to accommodate large vehicles and equipment whilst ensuring operational safety (road width likely to be 20 m).
- Activities requiring a full scoping and EIA in terms of the Environmental Impact Assessment Regulations Listing Notice 2 of 2010 (submitted to Regional DEDET):
    - Construction of facilities for the storage of effluent (Activity 5) – pollution control facilities.
    - Transformation of undeveloped land >20 hectares (Activity 15) – this includes the short and the long term (approximately 11 years) transformation of mining areas and the office complex.
- Activities requiring a full scoping and EIA in terms of the National Environmental Management: Waste Act, 2008 (submitted to the National DEA Waste Management) – after consultation with DEDET, this may not be applicable:
    - Storage of hazardous effluent (Activity 4(1)) – storage of dirty water (potential for high sulphur content) from the mining area in pollution control dams for reuse.
    - Reuse of wastewater (Activity 4(2)) – reuse of water from the pollution control for dust suppression and operations.
    - Construction of the storage facility (Activity 4(11)) – Construction of the pollution control dams.

An application in terms of the planning and development legislation may be required to be submitted to the Local Municipality for the areas disturbed through the mining operation.

[3] The storage and handling of ore or coal of >100,000 tons not on a mine or works as an activity requiring an air quality licence in terms of the National Environmental Management: Air Quality Act, 2008 also does not apply.

3.4.2 Power

Power is required for the office complex, screening plant and high wall miners. The power requirement during the first year of operation is approximately 200 kV.A and increases to a 2,500 kV.A during the second year when high wall mining commences. There are a number of 11 to 22 kV Eskom medium voltage supply lines across the area with an 11 to 22 kV line that crosses east-west in the south of portions 1 and 9 of the Farm Vaalbult 3 IT (see Figure 1.1). In addition, there is a 132 kV line that trends east-west approximately 14 km north of the project area. Eskom has been approached for the supply and they have indicated that there is available capacity within the area to meet the needs of the second year of operation.

Diesel will be used for the opencast mining vehicles and equipment, with storage of this fuel at the office complex as per the SANS 10131:2004 specifications (see Section 3.5.1).

3.4.3 Transport and mine access

Access to the area is via a gravel district road off the R38 approximately 13.5 km west of Carolina. The western block will be accessed via the existing Leliefontein gravel road (approximately 2 km) that has sufficient width to accommodate the haul trucks; however the eastern block will be accessed via the farm road (approximately 1.1 km). This eastern access is not currently wide enough to accommodate the haul trucks, therefore it will have to be widened / upgraded prior to operations in this area in years 9 to 11. Based on the existing road conditions, the upgrade is unlikely to increase the road width by more than six metres, nor to create a road wider than eight metres. Surfacing of the gravel access / haul roads in operation will take place to minimise / prevent dust generation (see Figure 3.7 for an example of the road surfacing).

Figure 3.7: Access and on-site haul road examples of surfacing to reduce dust (from a mine previously operated by the applicant in Mpumalanga).

All coal from the Vaalbult Mine will be sold and transported off site to local markets and the Eastside Colliery coal washing plant that is located approximately 22.5 km east along the R38 (east of Carolina). This will require the hauling of the coal along a R38 through Carolina. It is currently planned that the coal trucks taking coal from Eastside Colliery to Hendrina Power Station will collect coal from Vaalbult on their return journey (when empty). This will reduce the number of additional haul trucks required.

3.4.4 Water usage

Water usage for the project includes the following (see Appendix B for the water balance):

- Potable / domestic water for consumption – approximately 14 m^3 per day
- High wall mining water – approximately 48 m^3 per day
- Dust suppression water – approximately 178 m^3 per day without surfacing or 94 m^3 per day with surfacing

Potable water is suitable for drinking purposes and is required at the main office complex and will either be transported to the office complex by trucks (stored in tanks) or will be obtained from locally sourced boreholes. A reticulation system will need to be installed. The volume of potable water required is based on an average individual use and consumption of 200 litres per person per day for 64 workers and 6 visitors. With a low level storage of at least 2 days volume, a storage capacity of approximately 28 m^3 is required (a large prefabricated tank/s).

Opencast mining does not consume water; therefore no additional water requirements will be necessary for these sections.

The high wall / auger mining operations will require water for dust suppression and cooling the high wall miners. Approximately 4,000 litres per hour is required equating to an average of 1,440 m^3 per month (based on a 12-hour per day shift for 30 days). The potential source of this water is included in the hydrogeological study for the operational area (see Appendix E and Section 5.6). It is proposed that this water is sourced from a borehole (VGM02 has a sustainable yield / capacity of 120 m^3 per day) and supplemented with water from the trench collection sumps and pollution control dams. A temporary portable reticulation system will need to be installed to accommodate the different mining sections.

Water from the pollution control dam/s will be used for dust suppression around the operations and could also contribute to the volume required for high wall mining. The volume of water for dust suppression is based on 4 litres per square metre on the average on-site haul road and product haul road lengths over the life of mine (see Appendix B). The planned surfacing of the haul roads (see Section 3.4.3), as well as the surfacing of the on-site haul up to and including the Phase 1 ROM stockpile pad will reduce the required water for dust suppression from 178 to 94 m^3 per day.

Based on the type and placement of the mining and infrastructure, the following have been highlighted as potential water uses requiring a water use licence in terms of the NWA:

- Section 21a – taking water from a water resource – abstraction (Form DW760)
    - taking water from a borehole (groundwater) for the mining operations (10,000 litres per hour by 12 hours per day by 30 days)
- Section 21g – Disposing of waste in a manner which may detrimentally impact on the water resource (Form DW767)
    - pollution control (including return water and evaporation) dam/s
    - use of surface runoff and groundwater within pollution control dam for dust suppression
    - temporary ROM stockpiles
- Section 21j – Removal of underground water for a safe mining environment (Form DW805)
    - This volume is expected to be minimal – only from soils after the summer rains (see Appendix E).
- Sections 21c & i – impeding or diverting flow and characteristics of a water resources (Forms DW763 & DW768)
    - Mining within the 500 m buffer catchments areas of the pan and riparian wetlands and under the riparian wetlands in the southwest.

3.4.5 Waste management

The waste streams within the operational area include the following:

- General / domestic waste
- Industrial / hydrocarbon waste
- Sewerage (chemical toilets) – approximately 1.5 m^3 per day
- Grey water – approximately 10.5 m^3 per day

A system of waste minimisation, reuse and recycling will take place prior to ultimate disposal. Recycling components and waste generated will be temporarily stored on-site prior to off-site transportation to recycling facilities / collection points or licensed waste disposal sites by a registered contractor.

Very little domestic and industrial waste is expected to be produced. All domestic waste generated will be separated into recyclable components at source and temporarily stored in demarcated areas (total capacity <100m^3) such as paper, cardboard, glass, tins, plastic and polystyrene (packaging). Removal of the recycling will be a minimum of monthly by an appointed contractor. Any organic components will be placed in a composting facility; the product may be used to facilitate growth within rehabilitated areas. The remaining general waste will be collected on-site in clearly marked skip bins and transported off site by an appointed waste disposal company when full (minimum of monthly, but ideally weekly depending on volumes generated and sustainability of contract). Disposal will be to the Carolina municipal waste facility.

All industrial waste such as metal, tyres, conveyor belt / sheeting and batteries will be stored separately in clearly marked containers at the workshop area and will be removed by an appointed recycling

contractor. Hydrocarbon containing waste such as oil, diesel and grease, will be collected in 210 litre drums at designated collection points that have been underlain by impervious materials linked to an oil trap / sump to ensure that any spills are contained. These will be collected by a contractor when full for recycling / safe disposal.

All maintenance will take place on a slab linked to a sump that has been prepared to prevent infiltration of potential pollutants. Diesel fuel will be regularly bulk delivered and stored in tanks placed on concrete foundations surrounded by spillage bunds (as per SANS 10131:2004 specifications). Fuel and oil spills will be handled in accordance with approved procedures. Sufficient quantities of absorbent material for spills will be kept onsite.

At the office complex self-contained septic tanks / chemical toilet systems will be used; and within the mining sections chemical toilets will be established, these facilities will be maintained regularly. Commercial waste handlers will be appointed by mine management, once mining operations commence, to manage and maintain the facilities and dispose of all waste generated. Grey water from the change house will be recycled through a closed filtration system, and the resultant water will be used in the operations (mining and dust suppression).

All dirty water from the operational area will be collected in a pollution control structure. Although these structures are a mitigation measure and are regulated through the NWA, owing to the potentially hazardous nature (containing sulphur) of the water within the pollution and stormwater control structure / dams (storage) this may trigger the requirement for a waste management licence in terms of Schedule 1 in terms of Section 19 of NEMWA. See Section 3.4.1 for the waste activities. However, after discussions with DEDET an application for the construction of these facilities in terms of NEMA has been made only. Water from these facilities will be used for dust suppression within the dirty water areas only as well as for operations (see Section 3.4.4).

3.5 Phases and activities

Development of the operational areas is broken down into the three stages, namely construction, operation and decommissioning / closure as discussed in the following sections.

3.5.1 Construction

Generally the construction stage includes the preparation of the area for mining such as establishment of the main office and workshop area, on-site haul roads, initial box-cut for opencast operations and trenching for high wall mining operations, and the pollution and stormwater control structures, as well as preparation of stockpile areas with associated infrastructural developments that will include:

- Fencing of mining sections (where required for health and safety);
- Stripping of vegetation from construction areas; and
- Removal of topsoil from construction areas for replacement on rehabilitation / decommissioning.

It is anticipated that the initial site establishment and construction period will be undertaken over approximately 2 months.

The following activities will be undertaken to prepare the area for the mining operations:

- Construction of office complex[4]
    - Construction of the mining infrastructure will include the installation of prefabricated portable buildings for the offices, change house, workshop, stores, first aid room, training room and security control points; as well as prefabricated tanks for the potable water storage. Note that existing farm infrastructure will be used during the first few years of operation.
    - Construction of the diesel store at the office complex will be a <80 m^3 tank/s bunded according to SANS 10131:2004 specifications (concrete foundation and bunding - 110% capacity - with sump);
    - Construction of a concrete bases for the service / workshop area linked to an oil trap / sump.
- Construction of on-site haul roads and upgrade of access
    - The access roads where they are gravel will remain gravel, as such, but a dust suppressant surfacing will be applied to operational access roads (see Section 3.4.3) by the mine operator or transport contractor as per product instructions. On-site haul roads will be constructed of gravel with the road between the access road and the ROM stockpile pad being surfaced and the road between the mining areas and the ROM stockpile pad being established as an approximately 20 m wide gravel road to accommodate the larger mine vehicles.
- Initial box-cut for opencast mining, initially in the western block
    - During the construction phase a cut is excavated to enable access to the area for opencast mining. Removal and stockpiling of the subsoil and overburden from the box-cuts for replacement into the final voids at the end of the life of the mine;
    - The high wall mining operations will only come on line in year 2 and will initially be from the high wall of the western opencast block. Construction of trenches (as per Figure 3.2) will be required for the remaining high wall mining in the western block (as well as later in the eastern block) and this will be similar to the construction of the box-cuts for opencast mining.
- Creation of stockpile areas
    - The construction of the stockpile areas at each of the operations includes topsoil, sub-soil, overburden, and mined coal (ROM).

[4] Note that the water and electrical distribution installations will be on surface and therefore will not require excavation.

  - The soil and overburden stockpiles will be in place for the life of the respective mining section. During high wall mining operations, overburden from the trenches may be placed in the final void of the opencast areas or used to backfill the previous trench (as the case may be) prior to replacement of the soils. The subsoil and topsoil will be used to create clean water diversion berms on the upslope side of the trench.
  - The coal / ROM stockpiles will be for the temporary storage of mined coal prior to screening and transportation off site to the Eastside Colliery coal washing facility. These coal stockpile pads will be correctly engineered to reduce permeability, support the volumes of stockpiled coal, prevent ponding of water, and to drain surface water runoff into the pollution control structures; and
- Construction of stormwater and pollution control measures (see Appendix B for the conceptual report and water balance)
  - The stormwater and pollution control measures will include the development of berms and cut-off trenches to separate clean water within the environment surrounding the operating area from dirty water within the operating area and prevent contamination. This is achieved by diverting clean water away from the dirty water area, and diverting and containing dirty water into lined pollution control dam/s.
  - Lined pollution control dams / facilities will be established to capture the diverted dirty water from the operating area and water from pit dewatering (where required). During high wall mining an in pit sump will be used to collect the dirty water. This water will be re-used for dust suppression within the operating area (dirty water zone).

3.5.2 Operation

This is a medium-term coal deposit with an 11 year life of mine. Once mining commences there will be a short ramp up to full production (approximately 60,000 ROM tons per month). The opencast and high wall mining sections will be phased into the operation as required to achieve full production (Figure 3.6). The following activities will be undertaken during the mining process (see Section 3.3.1 for the mining methods):

- Opencast pit including mining, blasting and contribution to the various stockpiles;
- Trenching and high wall operations including mining, blasting (if required) and contribution to the various stockpiles;
- Coal screening / sizing (as required) within the Phase 1 ROM stockpile area;
- Roads and transport routes use and maintenance (where applicable);
- Storage of waste (wastewater – dirty water) temporarily at the mining sections for reuse for dust suppression within dirty water areas and high wall mining operations;
- Operation and maintenance of self-contained septic tanks / chemical toilet systems from the office complex, as well as an artificial wetland filter system for grey water from the change house. This filtered water can be reused for dust suppression and the high wall mining operations; and
- Storage of domestic and industrial waste temporarily at the office complex area.

Apart from the main infrastructure for the west and east blocks, there are also on-site haul roads in the west that will be established during year 6 or 7 for ease of access to this portion of the western mining area with a second ROM stockpile area with associated stormwater and pollution control structures (should these be required). However, as the trenching operations do not require a stockpile area (coal is loaded directly into bins / containers from the high wall miner), this area would only be required for screening of the coal if this proves necessary.

3.5.3 Decommissioning and closure

The decommissioning of mining sections will occur in phases over the life of mine i.e. as the opencast operations or each of the high wall trenching operations are completed they will be decommissioned and closed. Final decommissioning and closure of the mining sections will comprise the following activities:

- Closure of the opencast pits / voids – backfill, contouring and re-vegetation
    - This process will commence once all the extractable coal has been removed and includes filling of the final void with overburden material excavated from the first trench and covering it with previously stockpiled subsoil and topsoil in sequence from the box-cut and facilitating re-vegetation of the area. Note that part of the final void may lined and used as an evaporative facility for the mitigation of decant should this be required.
- Closure of trenches and high wall mining sections – sealing of high wall cuts, grouting of 'pillar' faces, and backfilling, contouring and re-vegetation of the trenches
    - This process will commence once all the extractable coal has been removed and includes the sealing of the high wall cuts / access points (bricks, mortar and concrete) as well as adjacent 'pillar' faces after each cut / drive (gunite / shotcrete), and the filling of the trench with overburden material from the next trench or the previously stockpiled material from the initial cut, contouring, covering it with the subsoil and topsoil in sequence, and facilitating re-vegetation of the area.
    - Removal of surface infrastructure – roads and stockpile areas
        - This process will commence once all the extractable coal has been removed and the infrastructure is no longer required for other activities and includes removal and rehabilitation of on-site haul roads and removal of the stockpile areas.
        - Removal of all remaining coal from the ROM pads.
        - Rehabilitation of the disturbed areas by removing the top layer of carbonaceous material, ripping the area to loosen the surface and reduce compaction, replacing the topsoil and re-vegating / seeding where necessary.
- Removal of stormwater control measures – berms and trenches
    - Once the site has been contoured and cleaned the stormwater control measures may be removed with the subsequent construction of cut-off berms and trenches to keep clean water away from potential decant points (if necessary) and reduce the volume of water entering the evaporation/pollution control dam; and
- Fencing off the mined areas where required.

Only once all the mining sections have been completed will closure of the operation include:

- Removal of surface infrastructure – office complex
    - This process will commence once all the extractable coal has been removed and the infrastructure is no longer required for other activities and includes removal of all portable infrastructure such as offices / security huts, diesel tanks, change house, etc. established for mining.
    - General cleaning of the mining area with the reestablishment of vegetation.
    - Establishment of post-closure monitoring programme.

3.6 Post closure and site closure

The mine will be required to apply for a Closure Certificate according to Section 43 of the MPRDA. Section 43 (1) of the MPRDA states clearly that "The holder of a ... mining right … remains responsible for any environmental liability, pollution or ecological degradation, and the management thereof, until the Minister has issued a closure certificate to the holder concerned." In addition, the mine will be required to comply with conditions provided in their integrated water use licence and any other environmental authorisations obtained. It is therefore anticipated that all environmental impacts will be successfully addressed and managed through implementing the management measures provided in the EMP that is approved with the mining right and any subsequent amendments.

The mine aims to carry out as much of the rehabilitation / aftercare programme while the mine is in operation. For the opencast sections this requires correct backfilling as the mining progresses, and for the high wall mining sections this requires the sealing and minimising of oxidation of the mined strips. The MPPRDA requires that the mine applies the following principles for closure:

- The process which must start at the commencement of the operation and continue throughout the life of the operations;
- Risks pertaining to the environmental impacts must be quantified and managed pro-actively, which includes the gathering of relevant information throughout the life of a mining operation;
- The safety and health requirements in terms of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) are complied with;
- Residual and possible latent environmental impacts are identified and quantified;
- The land is rehabilitated, as far as is possible, to its natural state, or to a predetermined and agreed standard or land use which conforms with the concept of sustainable development; and
- Mine operations are closed efficiently and cost effectively.

Rehabilitation of all mine related roads and infrastructure is planned as per the closure phase indicated in Section 3.5.3. No depressions are expected after backfilling within the opencast areas, nor subsidence from the high wall mined sections. Owing to the phased nature of the operations, post-closure monitoring of some of the opencast and trench areas (especially in the west) will take place during the life of mine. This will enable effective management of the rehabilitated sections with further mitigation measures implemented (if required). The current objective post-mining will be to rehabilitate the area for agricultural use.

4. PROJECT ALTERNATIVES

4.1 Alternative mining method

The mining method was assessed during geological and geotechnical assessment and reporting for the area. The initial intention was to use a combination of both opencast and conventional underground mining. However, the geological strata above the coal seams proved to be incompetent over large areas of the reserve thereby preventing safe conventional underground mining from taking place. Alternative mining methods were sought and the most feasible and environmentally acceptable processes solution was found in opencast mining areas with suitable strip ratios in combination with trenching and high wall mining (using a machine such as the CAT 320 HWM – see Appendix A) in the remaining areas as provided in Section 3.3.1 and Figure 3.2 above.

4.2 Land use options

This section briefly discusses the most relevant land use options. See Section 5.7 for a description of the current land use.

4.2.1 Grazing / cultivated land

The current land-use in the area is largely agricultural, primarily livestock (cattle and sheep) and dryland crops (maize and soya). Only 16% of the mining right area will be directly affected by opencast type mining with a total of about 22% of the area being disturbed. As the affected areas will not all be disturbed at the same time, the continuation of current farming activities concurrently with mining could take place. However, the ratio of dryland crop to livestock may vary from the current practice. This will require interaction and planning between the current landowners / occupiers and the mine. The intention is to return the land to agricultural use once rehabilitation is complete.

4.2.2 Tourism

The area is primarily rural / agricultural land and not a pristine landscape devoid of human intervention. However, wetland areas, fauna and avifauna within the region in general could encourage tourism. No existing tourism facilities are available in the immediate project area.

4.2.3 Residential

The nearest town to the proposed mining operation is Carolina approximately 13.5 km away. The land is currently zoned as agricultural and with the distance from Carolina it is unlikely to be rezoned for residential purposes.

4.3 Alternative transport routes, power and water supply

In terms of the Vaalbult project there are no sustainable alternatives for proposed power supply (Eskom and diesel), water supply (groundwater and municipal), and transportation to market (use of the existing black-top public road, R38).

4.4 Benefits of the project

The proposed project will result in the following benefits for the surrounding community:

- **Product status and market**: a mining operation with a sustainable life of mine of approximately eleven years will produce coal for the local market. The production and sale of coal will ensure a constant inflow of capital into the project region. Although Vaalbult is not undertaking beneficiation, the ROM coal will be washed at an independent facility that is also within the region.
- **Employment opportunities (labour force)**: The estimated labour force at full production will be 64 people (as per the Mining Work Programme submitted to the DMR) and it is the intention of the mine to give priority to the local community when recruiting (where possible) which could assist in reducing unemployment levels in the area (see Section 5.15). No houses will be erected on site.
- **Regional socio-economic benefit (multiplier effect)**: The average household size within the Albert Luthuli LM is 3.9 persons (see Section 5.15). Based on the proposed labour force to be employed, a total of 250 persons will be supported by the mine.
- **Economic inputs into the area**: expenditure on construction and operation of the mine will lead to positive economic impacts as they would constitute an injection of capital into the local and regional economy resulting in increased commercial activity for the life of mine.

4.5 The 'no project' option

If any environmental impacts are considered to be of such a nature that they cannot be mitigated and may be considered as fatal to the environment, the 'no project' option would be considered. The 'no-go' alternative in this instance would entail no mining in the proposed area. Based on the current land use practices this would entail crop production in areas, some of which are not suited to arable land in terms of soils (see Section 5.7), and grazing of natural areas in excess of the land carrying capacity (see Section 5.8).

5. DESCRIPTION OF ENVIRONMENTAL SETTING

This section presents the existing environmental setting of the proposed mining area by aspect / component. The description of the pre-mining environment, ideally involves a consultation process with interested and affected parties as discussed in Section 6. In addition, information provided from consultation with landowners during the undertaking of specialist studies is incorporated into the specialist reports. Within this section information on the environmental baseline was obtained through the involvement of the following specialists:

- Dr Bruce Randal, Ilanda Water Services – hydrology and water balance (Appendix B);
- Mr Warren Heathman (Pr.Sci.Nat), Geology and Soil Consultant – soils, wetland and land capability assessment (Appendix C);
- Mr Michael Berjak (Pr.Sci.Nat), S3 Technologies – floodline determination (Appendix D);
- Dr Digby Gold (Pr.Sci.Nat), CopperLeaf Consulting – hydrogeological assessment (Appendix E);
- Ms Linda MacGregor, WSP Environment and Energy – air quality assessment (Appendix F);
- Mr Willem De Frey (Pr.Sci.Nat.), EkoInfo and Mr Dewald Kamffer (Pr.Sci.Nat), Ecocheck – biodiversity assessment (Appendix G);
- Mr Anton Pelser, A Pelser Archaeological Consulting – heritage impact assessment (Appendix H).

5.1 Topography

The landscape of the region consists of gently sloping topography. The project area has been flown to produce aerial imagery and 0.5 m contour data set for environmental interpretation and planning purposes. Using this data the Digital Elevation Model (DEM) and slope analysis have been created (Figures 5.1 and 5.2).

The planned mining area is situated between about 1,650 m and 1,685 m above mean sea level on land that slopes towards the northeast-southwest trending drainage line that bisects the area, and an endoheric / depression pan in the north (Figure 5.1). The change in elevation over the entire mining right area results in about 70% of the land having slopes that are considered to be flat and fairly flat (gradient <1: 20), with relatively minor areas around the pans in the north and the drainage line that could be considered more hilly with gradients up to 1: 5 (Figure 5.2). This relatively flat topography will have an impact on the visual nature of the operations (see Section 5.13), and in combination with the geology, the available options for opencast mining and potential surface water drainage from the area (see Section 5.5). This level landscape will also promote the development of *in situ* soils as well as the infiltration of rainwater. In combination with the soils, the relatively flat landscape is likely to lead to seasonal and temporary wetlands adjacent to the riparian zone (see Section 5.12).

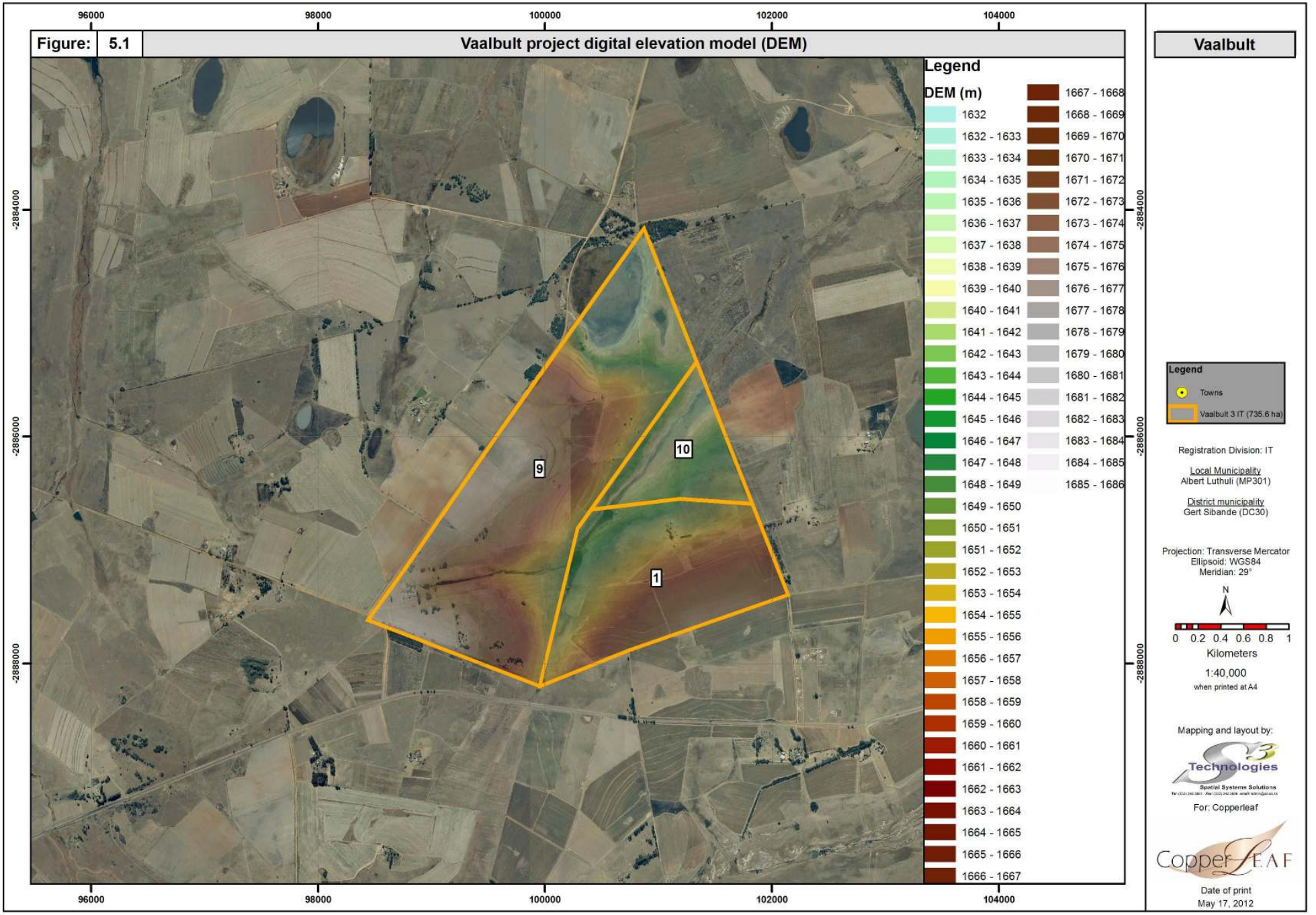


Figure: 5.1
Vaalbult project digital elevation model (DEM)
96000
98000
100000
102000
104000
-2884000
-2886000
-2888000
9
10
1
Legend
DEM (m)
1632
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1633 - 1634
1634 - 1635
1635 - 1636
1636 - 1637
1637 - 1638
1638 - 1639
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1640 - 1641
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1680 - 1681
1681 - 1682
1682 - 1683
1683 - 1684
1684 - 1685
1685 - 1686
Vaalbult
Legend
Towns
Vaalbult 3 IT (735.6 ha)
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
N
0 0.2 0.4 0.6 0.8 1
Kilometers
1:40,000
when printed at A4
Mapping and layout by:
S3 Technologies
Spatial Systems Solutions
For: Copperleaf
Copper Leaf
Date of print
May 17, 2012

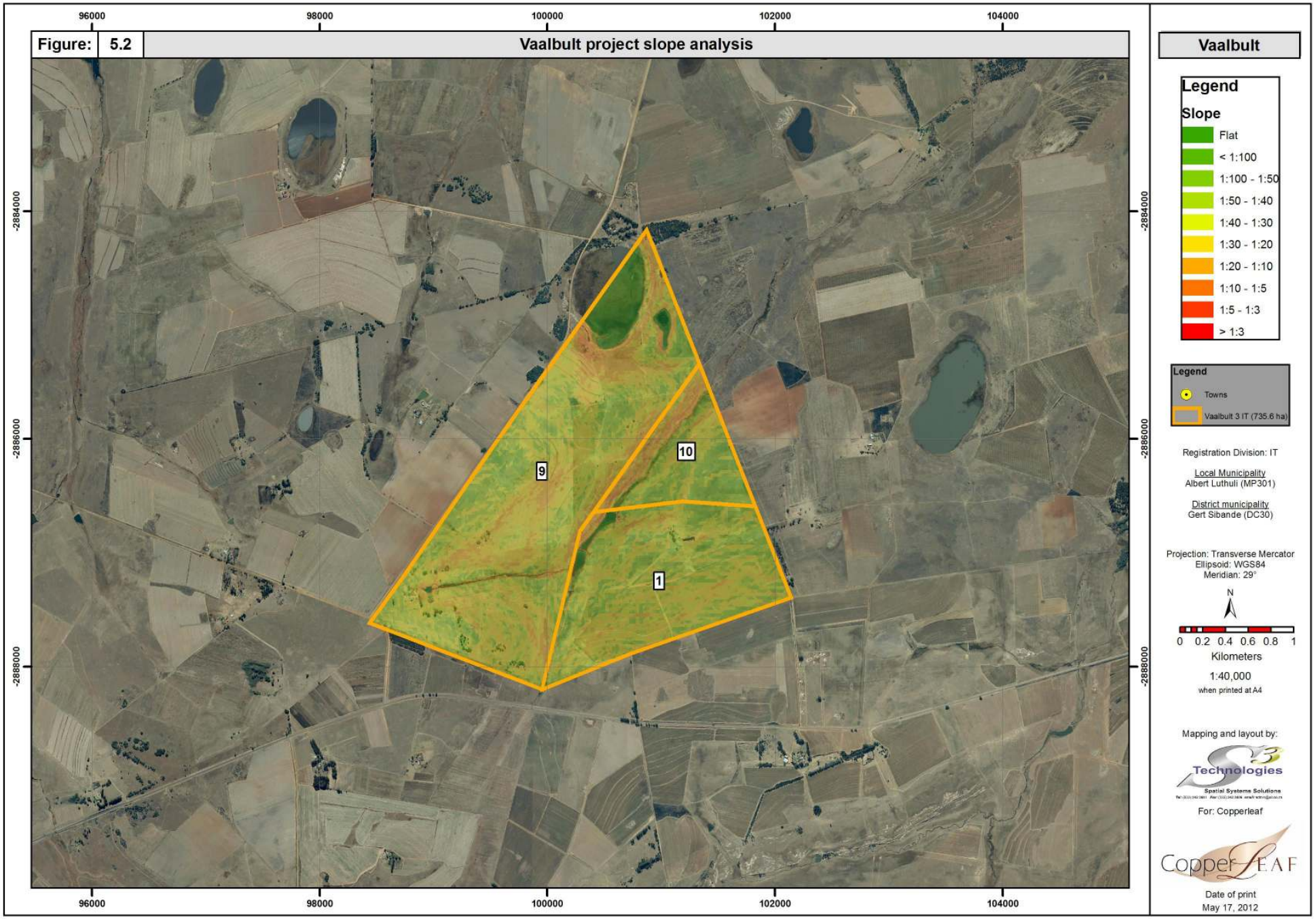


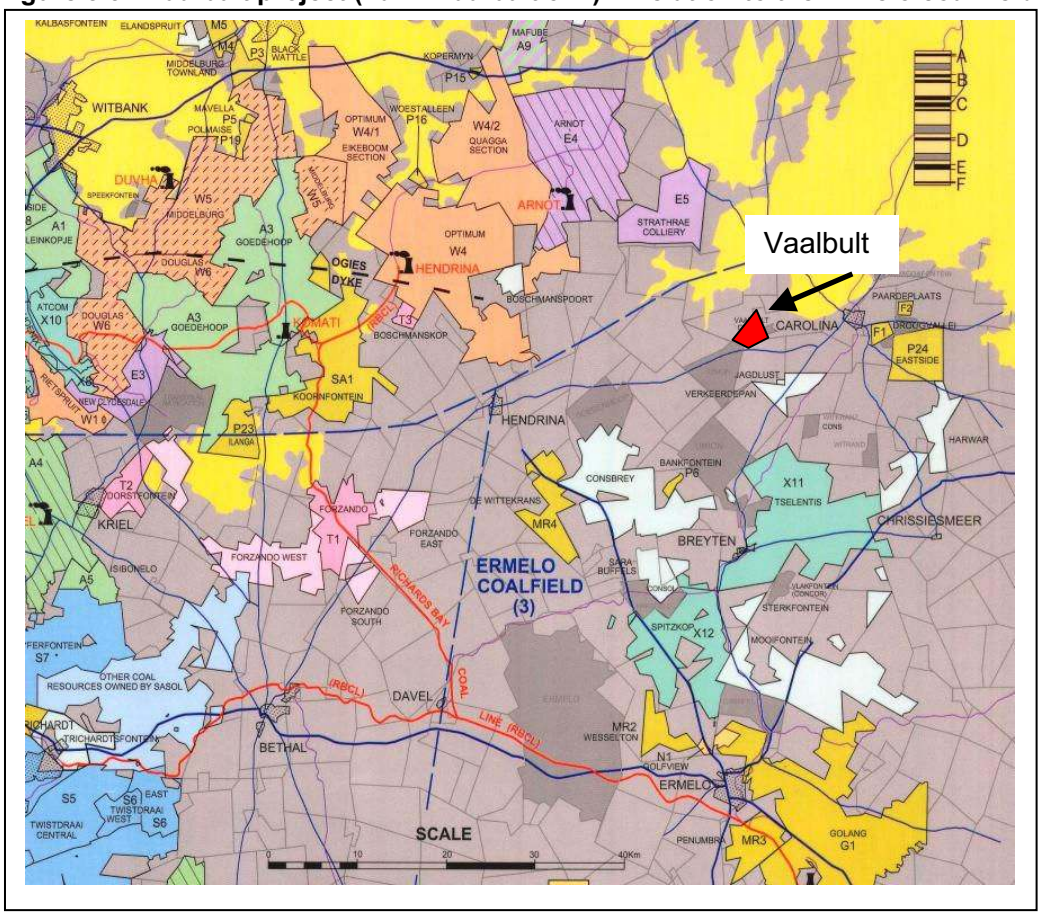
Figure: 5.2
Vaalbult project slope analysis
96000
98000
100000
102000
104000
-2884000
-2886000
-2888000
9
10
1
Vaalbult
Legend
Slope
Flat
< 1:100
1:100 - 1:50
1:50 - 1:40
1:40 - 1:30
1:30 - 1:20
1:20 - 1:10
1:10 - 1:5
1:5 - 1:3
> 1:3
Legend
Towns
Vaalbult 3 IT (735.6 ha)
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
N
0 0.2 0.4 0.6 0.8 1
Kilometers
1:40,000
when printed at A4
Mapping and layout by:
Technologies
Spatial Systems Solutions
For: Copperleaf
Copper LEAF
Date of print
May 17, 2012

5.2 Geology

5.2.1 General description

The project area falls within the Ermelo Coalfield (Figure 5.3) which lies in Mpumalanga. It is separated from the Highveld coal field to the west by a basement high. The coalfield was developed following the retreat of the Dwyka glaciers which deposited diamictites that filled the Karoo Basin with sediments ascribed to deposition in shallow marine and fluviodeltaic environmental settings. These sediments, which constitute the Vryheid Formation of the Ecca Group (Karoo Supergroup), contain several economically exploitable coal seams. A total of eight coal seams have been recorded from the Ermelo coal field. They are numbered from A at the top to F at the base. The E seam has the greatest economic potential and can attain thicknesses of up to three metres. The other seams are largely seen as being of limited economic potential although when the D seam is mined using opencast methods in conjunction with the E seam it can become economically viable.

Figure 5.3: Vaalbult project (Farm Vaalbult 3 IT) in relation to the Ermelo coal field.



The proposed mining at Vaalbult will exploit the E seam which attains a maximum thickness here of 2.66 m. The seam has been exposed by weathering and erosion on Vaalbult (Figure 5.4). This means

that Vaalbult is at the very edge of the Ermelo coal field and that in the valley on the property there is no coal. This also means that the coal is found either at the surface or very near to it. The deepest coal is in the southwestern corner where it is 41.23 m deep. The D seam in the southwestern part of the property attains a maximum thickness of 1.34 m and is found at a maximum depth of 29.14 m. The D seam has also been exposed by weathering and erosion in this area which means that the coal seam is also found at the surface.

5.2.2 Acid generation potential

The potential for a given rock to generate and / or neutralise acid is determined by its mineralogical composition. The potential for acid mine drainage (AMD), or poor quality leachate, in collieries is related to the generation of acid through the oxidation of sulphide minerals, which is caused through the exposure of these minerals (most commonly pyrite) to atmospheric oxygen. Therefore, the chemistry of the country rock (roof / overburden and floor of the coal seam) as well as the coal will assist in determining the acid generation potential as a result of mining and therefore the impact that mining may have on the water regime through AMD.

Sulphur speciation, acid base accounting (ABA) and net acid generation (NAG) testing has been performed on a six rock samples from the roof and floor of the targeted coal seam/s within the area. The results of the laboratory analysis indicate that although all samples have net acid generating potential, all but one sample have insufficient sulphide for oxidisation to sustain acid generation (see Appendix E). In addition, the neutralising potential of the country rock classifies it as having no potential for acid rock drainage. However, all coal samples tested contained sulphur with an average total sulphur percentage over the area of 1.26. Therefore, opencast operations with total coal extraction and limited exposure of the floor material will not result in acid generation; however high wall mining where coal strips are left will be acid generating. In these operations all loose coal should be removed (where possible) before each section is sealed as soon as possible to reduce oxygen exposure. Any decant from all mining operations must be treated as a potential pollutant (see Section 5.6).

5.3 Soils

The topography, altitude, climate and parent material source have influenced the types of soils evident across the study area. Owing to the geology (sandstone and alluvium) it is expected that loamy textured soils, with finer textured soils in the lower lying areas, will have developed. A detailed specialist soil survey on the areas of actual surface disturbance has been completed. This report is attached as Appendix C, and summarised in this section.

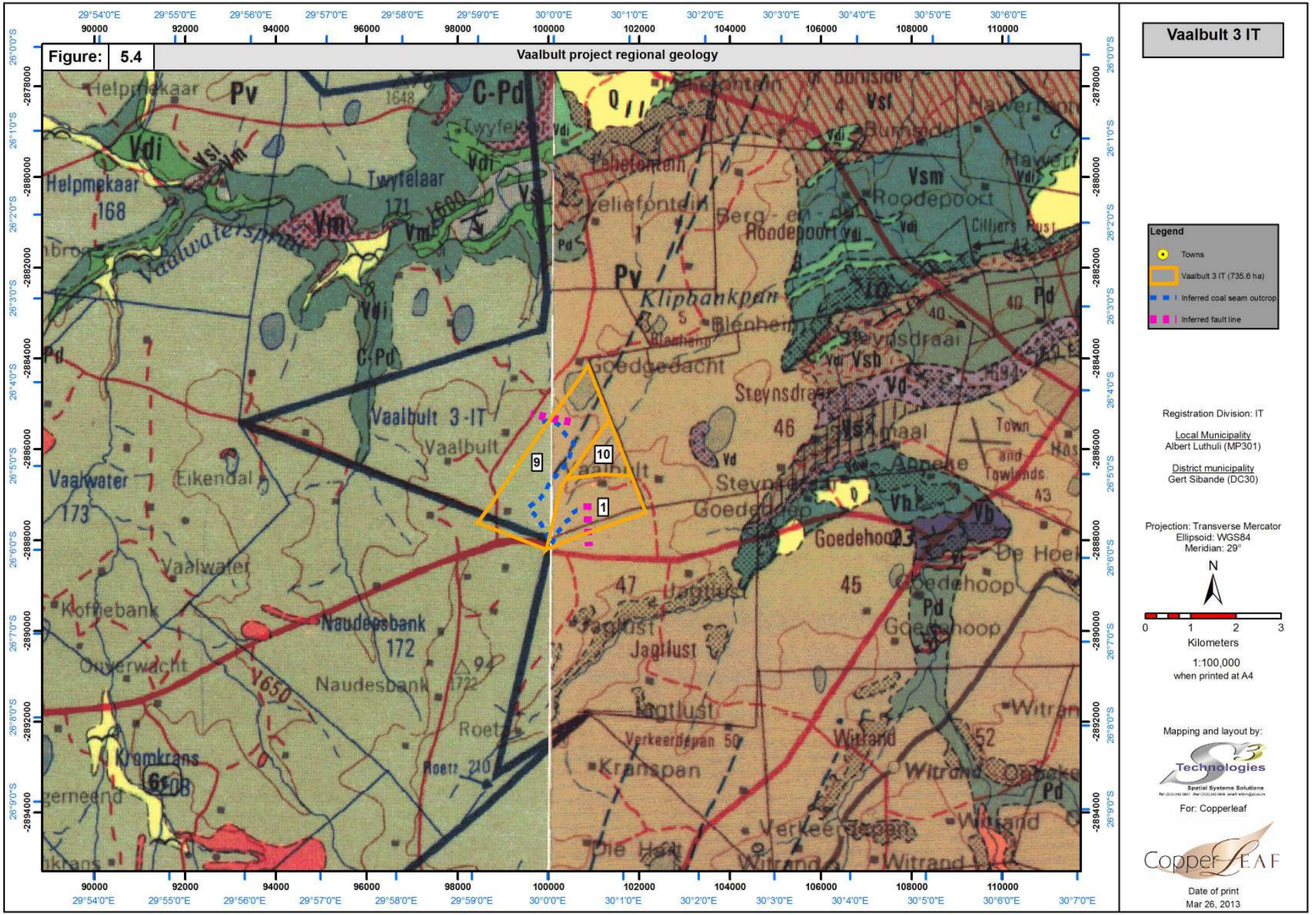


Figure: 5.4
Vaalbult project regional geology
Vaalbult 3 IT
Legend
Towns
Vaalbult 3 IT (735.6 ha)
Inferred coal seam outcrop
Inferred fault line
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
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Kilometers
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when printed at A4
Mapping and layout by:
Technologies
Spatial Systems Solutions
For: Copperleaf
Copper Leaf
Date of print
Mar 26, 2013
Vaalbult 3-IT
Vaalbult
Vaalwater
Eikendal
Naudesbank
Kramkrans
Kliphankpan
Steynsdraai
Goedehoop
Jagtlust
Witrand
Roodepoort
Helpmekaar
Twyfelaar
9
10
1

The main soil forms identified are Glencoe, Avalon, Dresden and Bainsvlei with ten soil associations having effective rooting depths / usable soil for rehabilitation as follows (Figures 5.5 and 5.6):

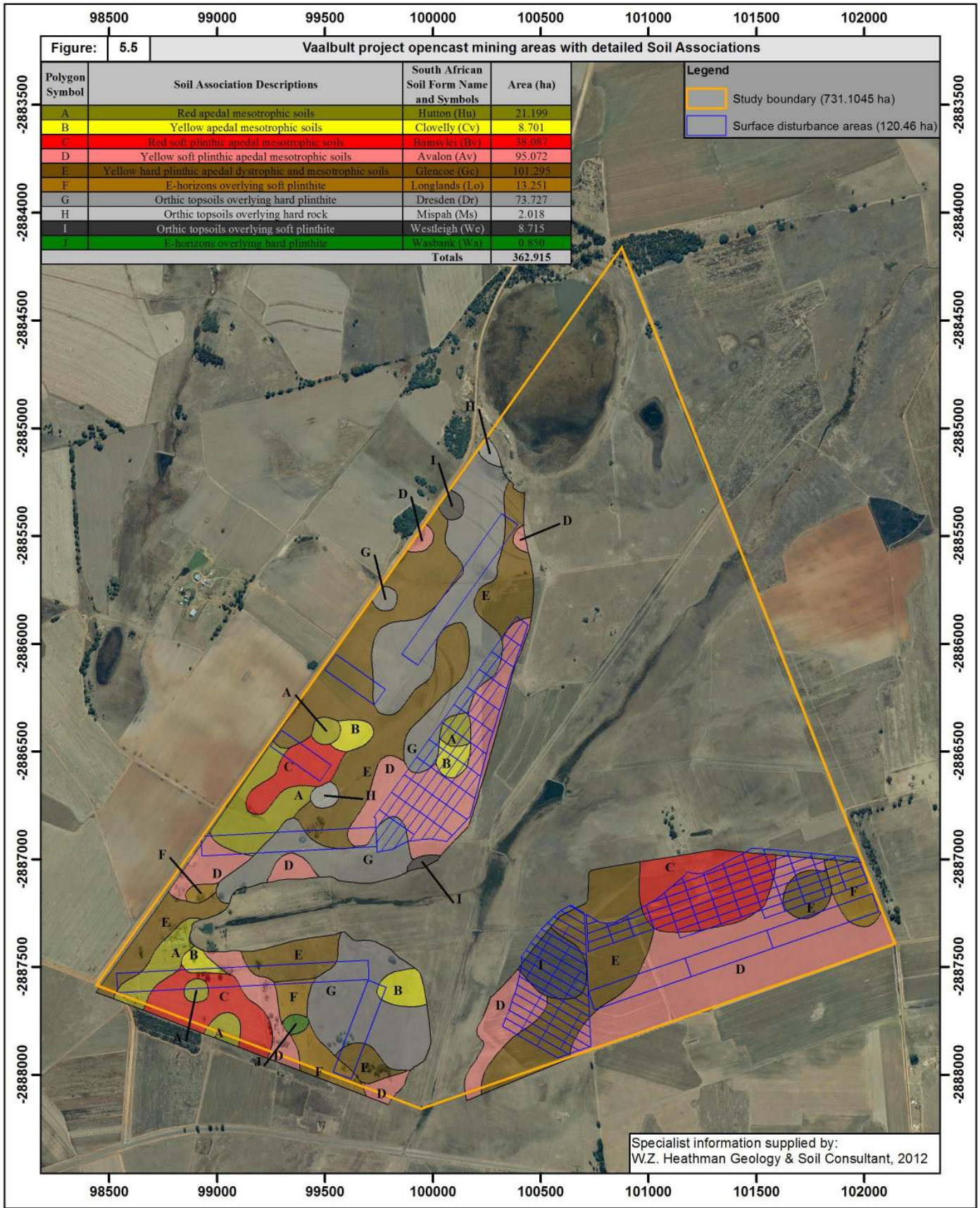
1. Yellow apedal dystrophic-mesotrophic hard plinthic soils (101 ha / 28%) – soil form of Glencoe, yellow brown sandy loam – usable depth 0 to 110 cm (hard plinthite)
2. Yellow apedal mesotrophic plinthic soils (95 ha / 26%) – soil form of Avalon, yellow brown mottled loamy sand – usable depth 60 to 140 cm (soft plinthite)
3. Orthic topsoils overlying hard plinthite (74 ha / 20%) – soil form of Dresden, grey sandy – usable soil depth 0 to 30 cm (hard plinthite)
4. Red apedal mesotrophic plinthic soils (38 ha / 10.5%) – soil form of Bainsvlei, red loamy sand - usable depth 90 to 120 cm (soft / hard plinthite)
5. Red apedal mesotrophic soils (21 ha / 5.8%) – soil form of Hutton, red iron rich loamy sand – usable depths 60 to 120 cm (hard rock)
6. E-horizons overlying soft plinthite (13 ha / 3.7%) – soil form of Longlands, grey mottled sandy loam - usable depth of 20 to 25 cm (E-horizon)
7. Yellow apedal mesotrophic soils (8.7 ha / 2.4%) – soil form of Clovelly, yellow brown loamy sand – usable depth 40 to 150 cm (hard rock)
8. Orthic topsoils overlying soft plinthite (8.7 ha / 2.4%) – soil form of Westleigh, grey mottled loamy sand – usable soil depth 0 to 30 cm (soft plinthite)
9. Orthic topsoils overlying hard rock (2 ha / 0.6%) – soil form of Mispah, grey loamy sand – usable soil depth 20 to 35 cm (hard rock)
10. E-horizons overlying hard plinthite (0.9 ha / 0.2%) – soil form of Wasbank, grey loamy sand - usable depth of 20 to 30 cm (E-horizon)

The soils are acidic, non-saline and well leached (mesotrophic / dystrophic), with higher calcium, potassium and magnesium values than sodium values. Phosphorus reserves in the soils are moderate and most of the topsoil is generally low in nitrogen (<1.8% organic carbon content). The effective rooting depth (i.e. depth to limiting layer – usable soil) varies across the area, averaging 60 to 90 cm. The loamy sandy soils are conducive to the infiltration of rainwater, rather than runoff. Soil permeability is rapid (>0.018 m^3/hr) in the sandstone derived soils and moderate (0.0036 to 0.018 m^3/hr) on the loam plinthic subsoils. The plinthic subsoils develop where the water table fluctuates within 1.5 m of the surface, and with their finer texture tend to retard vertical movement of water and increase the probability of lateral water movement in the soils. Erosion is a risk owing to the sandy nature of the soils; with an average erodability factor K for the topsoils of 0.5. These factors have been used to determine the land use capability of the proposed mining area (see Section 5.7).

In terms of disturbance of these soils, the opencast operations mainly affect the Avalon, Bainsvlei and Glencoe soil forms (72% of the area) and trenching mainly affects the Dresden, Avalon and Glencoe soil forms (77% of the area). Overall the soil forms most affected by mining are Avalon (38 ha), Glencoe (24 ha), Dresden (19 ha) and Bainsvlei (18 ha). Apart from the Dresden soils in the west and Westleigh soils in the east, most of the disturbed areas will have sufficient soils for rehabilitation.

Figure: 5.5 Vaalbult project opencast mining areas with detailed Soil Associations

Polygon Symbol	Soil Association Descriptions	South African Soil Form Name and Symbols	Area (ha)
A	Red apedal mesotrophic soils	Hutton (Hu)	21.199
B	Yellow apedal mesotrophic soils	Clovelly (Cv)	8.701
C	Red soft plinthic apedal mesotrophic soils	Bainsvlei (Bv)	38.087
D	Yellow soft plinthic apedal mesotrophic soils	Avalon (Av)	95.072
E	Yellow hard plinthic apedal dystrophic and mesotrophic soils	Glencoe (Gc)	101.295
F	E-horizons overlying soft plinthite	Longlands (Lo)	13.251
G	Orthic topsoils overlying hard plinthite	Dresden (Dr)	73.727
H	Orthic topsoils overlying hard rock	Mispah (Ms)	2.018
I	Orthic topsoils overlying soft plinthite	Westleigh (We)	8.715
J	E-horizons overlying hard plinthite	Wasbank (Wa)	0.850
		Totals	362.915



Mapping and layout by:
S3 Technologies
Spatial Systems Solutions
Tel: (033) 342 3681 Fax: (033) 342 3696 email: admin@s3.co.za

Date of print
07 June 2013

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Ellipsoid: WGS84
Meridian: 29°

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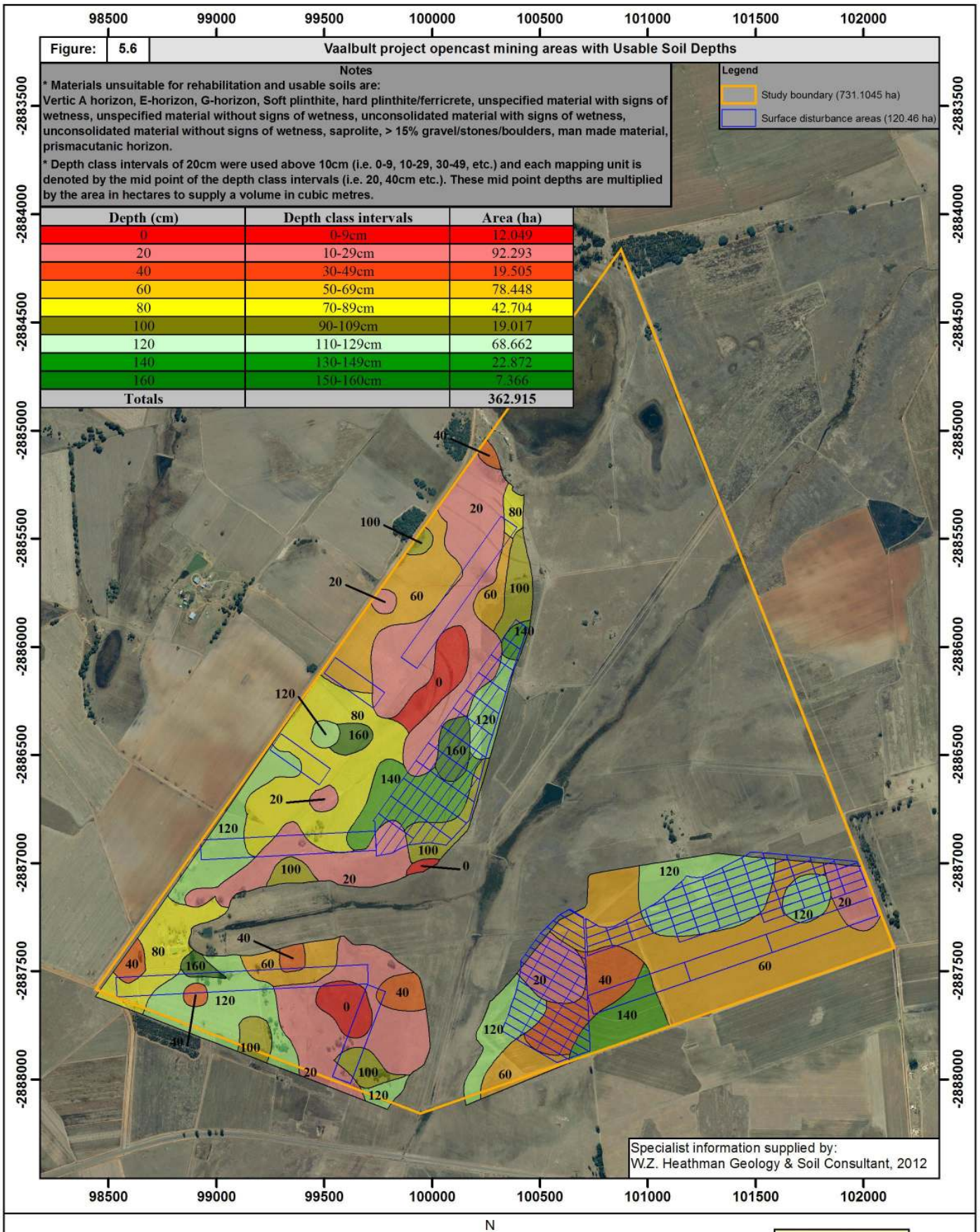
98500
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99500
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101500
102000
-2883500
-2884000
-2884500
-2885000
-2885500
-2886000
-2886500
-2887000
-2887500
-2888000
Figure: 5.6
Vaalbult project opencast mining areas with Usable Soil Depths
Notes
* Materials unsuitable for rehabilitation and usable soils are:
Vertic A horizon, E-horizon, G-horizon, Soft plinthite, hard plinthite/ferricrete, unspecified material with signs of wetness, unspecified material without signs of wetness, unconsolidated material with signs of wetness, unconsolidated material without signs of wetness, saprolite, > 15% gravel/stones/boulders, man made material, prismacutanic horizon.
* Depth class intervals of 20cm were used above 10cm (i.e. 0-9, 10-29, 30-49, etc.) and each mapping unit is denoted by the mid point of the depth class intervals (i.e. 20, 40cm etc.). These mid point depths are multiplied by the area in hectares to supply a volume in cubic metres.
Depth (cm) | Depth class intervals | Area (ha)
0 | 0-9cm | 12.049
20 | 10-29cm | 92.293
40 | 30-49cm | 19.505
60 | 50-69cm | 78.448
80 | 70-89cm | 42.704
100 | 90-109cm | 19.017
120 | 110-129cm | 68.662
140 | 130-149cm | 22.872
160 | 150-160cm | 7.366
Totals | | 362.915
Legend
Study boundary (731.1045 ha)
Surface disturbance areas (120.46 ha)
Specialist information supplied by:
W.Z. Heathman Geology & Soil Consultant, 2012
N
0 250 500 750 1,000
Meters
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
1:22,500
when printed at A4
Mapping and layout by:
S3 Technologies
Spatial Systems Solutions
Date of print
07 June 2013
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5.4 Climate

The regional climate is characterised by relatively warm wet summers and cold dry winters. Although the information used in this section is from number of sources (*Surgeo data*), a small-scale weather station has been erected in the proposed mining area at the farm house located in the southwest corner of portion 9 of the Farm Vaalbult 3 IT to determine local conditions. Information from this station will include temperature, rainfall, humidity and wind direction and speed. This data will be interpreted and used to plan, manage and mitigate impacts of the operations more effectively, especially relating to aspects of wind conditions and air quality (see Sections 5.4.3 and 5.9).

5.4.1 Rainfall

The area has a mean annual rainfall of 589 mm with a mean annual precipitation of 672 mm. Rainfall occurs mostly in the form of thunderstorms (80 days of thunder per year) during summer months (October to March). The average rainfall during summer is 555 mm with the highest average rainfall occurring during November (121mm). This high variance in rainfall during the year, results in excess surface runoff water duration summer rainfall events while there is little to no available water during the winter months. This has the potential for water erosion of exposed surfaces in summer (such as in the case of opencast mining), with wind erosion of dry exposed / disturbed surfaces during winter.

5.4.2 Temperature

The average monthly minimum and maximum temperatures for the region range from 1°C to 25°C with a 16°C temperature variation in winter and 12°C variation in summer. Temperature affects the formation, action and interaction of pollutants by impacting the rate of chemical reactions (often in combination with relative humidity). In addition, surface temperature inversions which are strongest during the winter months impact air quality.

5.4.3 Wind

The closest official weather station to the Vaalbult area with wind data is Ermelo approximately 20 km south. The prevailing winds in this region are variable with a dominant east-west trend. Although some northerly winds do occur wind never comes from the south. Based on the short duration of data from the on-site small scale weather station, locally wind direction is predominantly gentle breezes from the east-northeast and east-southeast (average 2.14 m/s) with short duration, higher wind speeds from the west and northwest (max 10.7 m/s – see Appendix F). The importance of determining wind direction and

speed is to assist in assessing the potential for dust generation (entrainment) and air quality impact (dispersion) from mining activities (see Section 5.9).

5.4.4 Evaporation

The mean annual evaporation for the region is estimated at 1,402 mm (S-pan), with the maximum evaporation occurring during the summer months (October to March). The highest evaporation (158 mm) occurs in January with the lowest average evaporation during June (72 mm). A comparison of the mean monthly rainfall with the mean monthly evaporation indicates in a net monthly deficit throughout the year, apart from November (see Appendix B). This is important in terms of the overall water balance for the mining operation where pollution control facilities will be constructed primarily for the reuse of the water within the mining operation and for dust suppression.

5.4.5 Extreme weather conditions

The region is exposed to cold winters when nightly temperatures can drop below freezing. Mist is prevalent during the colder months, while high frequency, high intensity and short duration thunderstorms occur in the summer months (on average 80 days per year thunder is heard).

5.5 Surface water

The proposed mining area is situated within the X11B quaternary which forms the upper headwaters of the Inkomati Water Management Area (Komati West River Catchments). Transfers do occur out of these upper catchments from the Nooigedacht and Vygeboom Dams for Eskom. Although there may be water available in these upper catchments for development, the water management area as a whole does not have surplus allocation (DWA, 2003), especially as it forms part an international river system with international capacity obligations and requirements (Mozambique and Swaziland). A non-perennial stream drains through the area towards the northeast (Figure 5.7). This stream has been dammed along its course within portion 1 of the Farm Vaalbult 3 IT, creating a habitat for a variety of avifaunal and faunal species. In addition, there is a depression wetland (pan) system in the north as well as wetland areas associated with the riparian zone. Wetland delineation within the planned mining area has been undertaken (see Appendix C and Figure 5.14), the discussion of which is included in Section 5.12.

5.5.1 Flood peaks and volumes

Flood peaks and volumes for the 1:20, 1:50 and 1:100 year recurrence intervals as well as the 1:100 year flood levels for the proposed mining area have been undertaken (see Appendix D). Based on this study, the X11B catchments would receive 125 mm over a 24 hour period every 100 years. The 1:100 year flood levels are illustrated in Figure 5.7. Flood depths will be 1.5 m at the deepest points of the river channels with an average of about 1 m.

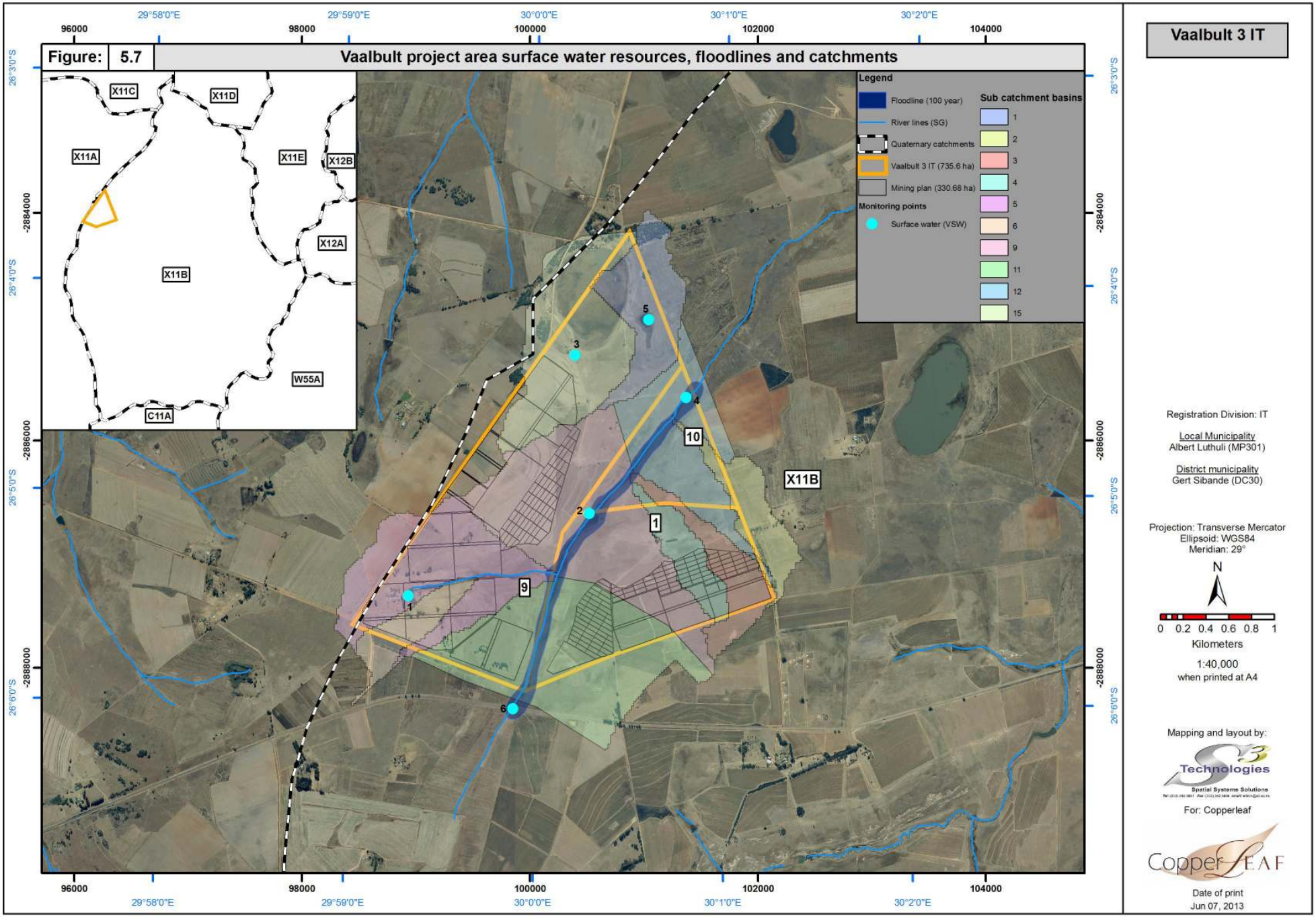
Figure: 5.7
Vaalbult project area surface water resources, floodlines and catchments
Vaalbult 3 IT
Legend
Floodline (100 year)
River lines (SG)
Quaternary catchments
Vaalbult 3 IT (735.6 ha)
Mining plan (330.68 ha)
Monitoring points
Surface water (VSW)
Sub catchment basins
1
2
3
4
5
6
9
11
12
15
X11A
X11B
X11C
X11D
X11E
X12A
X12B
W55A
C11A
29°58'0"E
29°59'0"E
30°0'0"E
30°1'0"E
30°2'0"E
96000
98000
100000
102000
104000
26°3'0"S
26°4'0"S
26°5'0"S
26°6'0"S
-2884000
-2886000
-2888000
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
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Kilometers
1:40,000
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Mapping and layout by:
S3 Technologies
Spatial Systems Solutions
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Copper Leaf
Date of print
Jun 07, 2013

It is evident that there is one significant stream within the designated study area where only minor flooding will occur, as the fairly steep banks surrounding the flowlines will contain the flood during all events up to and including 100 year. As highlighted in Section 5.1, the area is relatively flat and in some of these areas accumulations of residual rainwater will remain under normal storm conditions as well as during major flood events. Planned infrastructure development is outside the demarcated floodlines, and if areas assessed for wetland accumulation are avoided, then the remainder of the study area is unlikely to be affected by floods.

5.5.2 River diversion

There are no river diversions required for the proposed mine plan; however a water balance is provided in Appendix B that determines typical surface water yield across the impacted area for clean water diversion and dirty water capture and storage.

5.5.3 Surface water quality

Surface water sampling and the laboratory analysis of the water quality at a number of sites across the proposed mining area has been undertaken. The locality of these sites is provided in Figure 5.7 (see Appendix E). Water qualities are largely good and in most cases the water would be considered "allowable" for human consumption (chemical analysis only). Two chemical trends are evident, namely poor quality water in the northern pan and a north-south gradation in concentrations possibly as a result of agricultural practices in association with filtration and / or storage in wetlands and dams.

5.6 Groundwater

Groundwater in the area is generally associated with three aquifer types, namely primary aquifers where water is in the interstitial spaces and pores of the rocks (such as sandstones), weathered rock aquifers in upper weathered zones, and secondary fractured rock aquifers (e.g. adjacent to dolerite intrusions and in fault zones). All these aquifers may contribute to basal flow of surface water bodies. The hydrogeologically significant units are generally identified as the upper weathered Ecca aquifer, the fractured aquifer within and below the unweathered Ecca sediments.

The interrelation between surface and groundwater within the area is important in terms of potential water resource contamination. A detailed hydrogeological assessment of the pre-mining conditions and the potential impact (as well as cumulative impacts) that mining may have on the water regime (surface

and groundwater resources) has been undertaken (see Appendix E). This report includes a hydrocensus, the drilling and monitoring of on-site groundwater boreholes, and groundwater modelling.

Groundwater utilisation in this water management area is considered to be small owing to the general low volumes available. Groundwater is abstracted, almost exclusively, for domestic and livestock use. A total of 27 boreholes within a 2.5 km radius of the Vaalbult Colliery area were identified during the hydrocensus. About half of these are used for domestic consumption and a quarter for agriculture. Seven monitoring boreholes were drilled on the Vaalbult site to depths of 22 to 48 m. Two separate aquifers were intersected, namely the weathered zone (seepage) and a secondary aquifer (18,000 litres per hour blow yield) in one of the monitoring boreholes (VGM02).

The weathered rock aquifer generally occurs within a zone limited to a depth of between 9 and 12 m below ground level. This aquifer is recharged by rainfall and the percentage recharge is estimated to be between 1% and 4% of the annual rainfall. The relatively low permeability of the competent rock below the weathered zone will retard vertical migration of the recharging rainwater and result in the development of the upper aquifer. Groundwater then flows down gradient within the weathered zone towards the lower lying areas and surface water bodies. The groundwater level and the sustainable yield of this aquifer are markedly influenced by seasonal changes in rainfall and evaporation. In general this aquifer is low yielding (0.02 to 0.5 l/s), and in the Vaalbult mining area only minor seepage was intersected with most of the moisture being within the upper level soils.

A contour map of the static water level elevations is provided in Figure 5.8 with the groundwater flow in the weathered zone aquifer presented in Figure 5.9. The groundwater elevation model shows that the 'saturated' groundwater zone approximates the surface topographic contours very closely – i.e. the groundwater elevation is at its lowest in the valley and at its highest where the topography is highest. The depth to the 'saturated' zone varies between 0.74m (borehole IN-004-0 found to the south of the proposed mine area) and 16.10m (in VGM08 on the western boundary of the proposed mine area. It is expected that groundwater flow directions are perpendicular to the elevation contours (assuming no impediments to flow such as dolerite dykes, faults and other impervious man-made structures). During mining seepage into the opencast pit will be primarily from the upper soil zone at an average rate of 80 m^3 per day and 163 m^3 per day (summer) and 8 m^3 per day and 26 m^3 per day (winter) in the west and in the east respectively. Owing to the location of the trenches in the upper catchments area this volume will be far less during high wall mining. The in pit / trench seepage can be used in the operations.

A portion (approximately 10 %) of the groundwater associated with the weathered material aquifer will migrate into the underlying fractured rock and recharge the fractured rock and primary aquifer which may be developed below this zone.

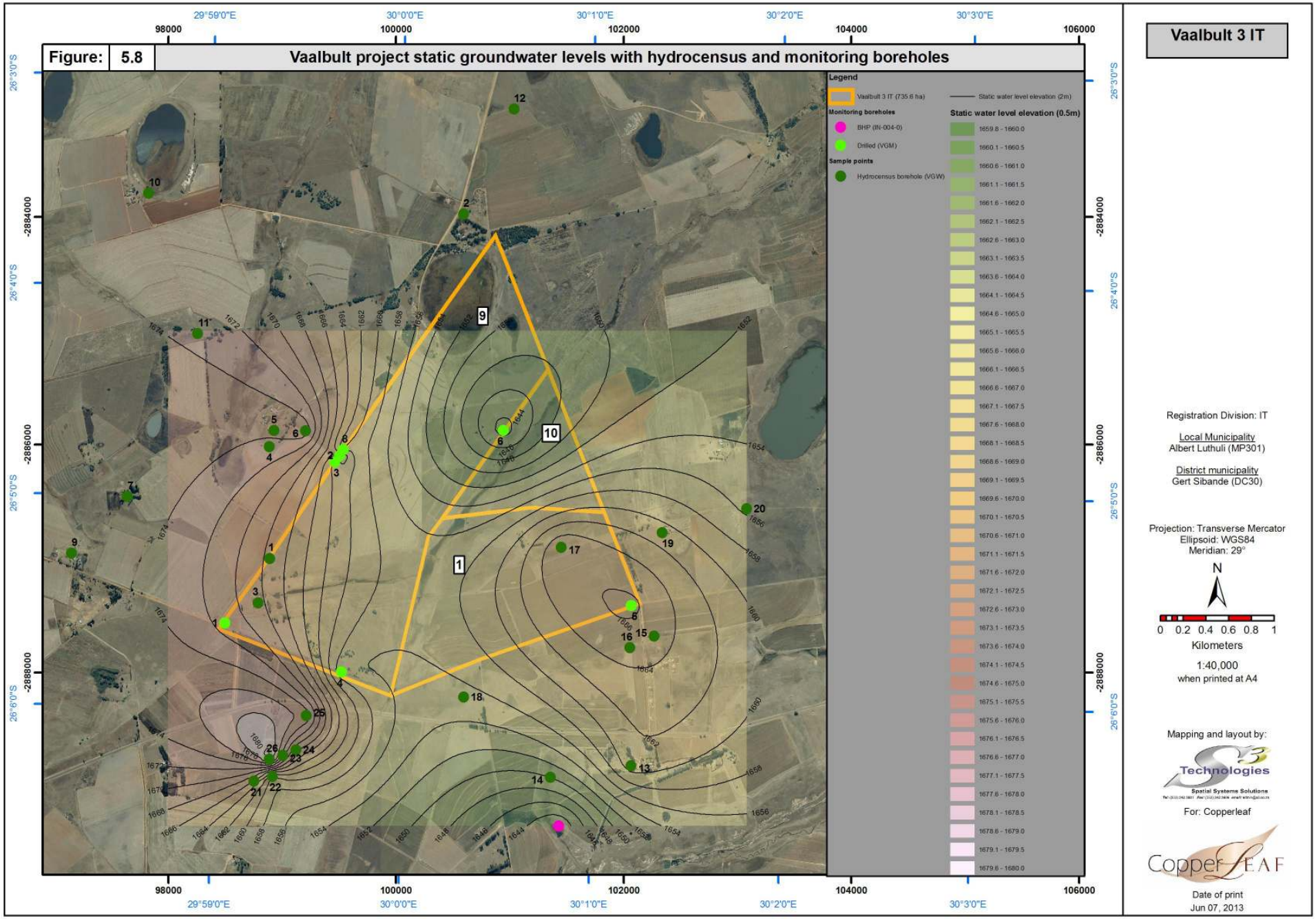
Figure: 5.8
Vaalbult project static groundwater levels with hydrocensus and monitoring boreholes
Vaalbult 3 IT
Legend
Vaalbult 3 IT (735.6 ha)
Static water level elevation (2m)
Monitoring boreholes
BHP (IN-004-0)
Drilled (VGM)
Sample points
Hydrocensus borehole (VGW)
Static water level elevation (0.5m)
29°59'0"E
30°0'0"E
30°1'0"E
30°2'0"E
30°3'0"E
26°3'0"S
26°4'0"S
26°5'0"S
26°6'0"S
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
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Projection: Transverse Mercator
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Jun 07, 2013

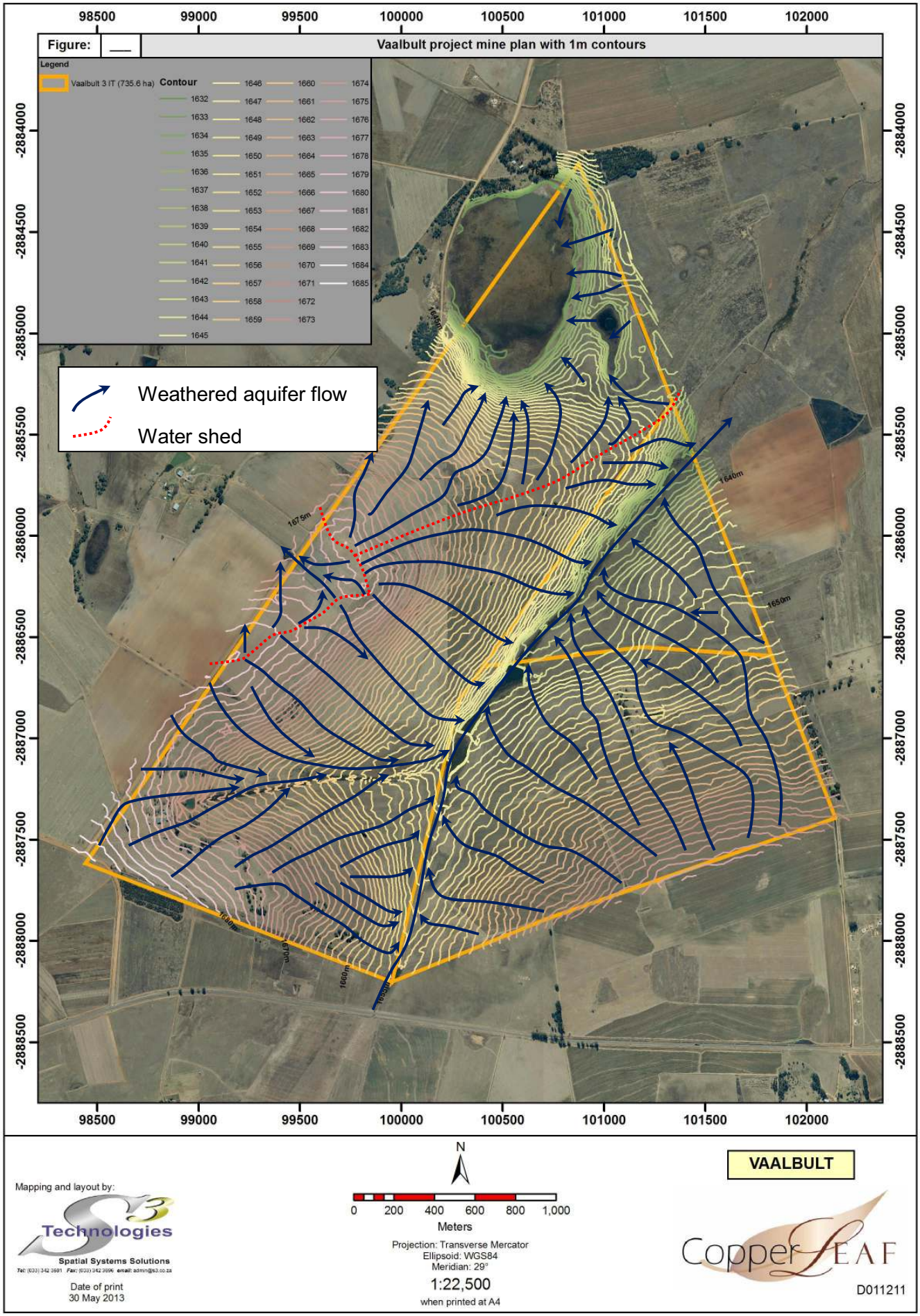


Figure 5.9: Vaalbult project groundwater flow within the weathered zone aquifer.

The fractured rock aquifer develops within competent rock where the permeability would ordinarily be zero. Fracturing of this rock may occur through a number of geological mechanisms, but within this region it is primarily as a result of igneous intrusions (dolerite) and faulting to a lesser degree. Groundwater flow in this aquifer is along the secondary structures and interstices such as fractures and joints. Recharge of this aquifer is generally from the weathered zone; however sustainable yield of this aquifer is indirectly linked with seasonal changes in rainfall and evaporation. The fractured rock aquifer is considered the main water supplier for local groundwater users. The secondary aquifer intersected at VGM02 is a localised feature with a sustainable yield calculated at 10,000 litres per hour over 12 hours per day. Water from this zone will be used for operational requirements (see Section 3.4.4). During abstraction the cone of depression will not impact on the adjacent landowners (see Appendix E).

Water quality samples were taken from boreholes that were either equipped with pumps that are operational or from boreholes that enabled bailers to be lowered to collect water samples (see Figure 5.8 for sample points). Of the 21 boreholes sampled the water in three is not fit for human consumption (monitoring boreholes IN-004-0, VGM01 and VGM05 in the south) and three are "allowable" for human consumption (VGM03, VGM06 and VGW11). The rest of the boreholes sampled have good quality water (Appendix E).

Post-mining it will take approximately 6.7 and 5.1 years for the backfilled water to interact with the weathered zone in the western and eastern opencast sections respectively and 46 years on average in the trenches, and owing to topography for decant to commence. However, water within the backfilled areas is not expected to be acidic. The results of the ABA and NAG indicate that the roof and floor of the coal seam are generally non-acid generating (see Section 5.2.2 and Appendix E) and within the trench areas the mine plan is to seal the high wall sections (brick, mortar and concrete) and the adjacent end-face of the 'pillar' (gunite / shotcrete) immediately after coal extraction to reduce oxidation and acid generation potential from the coal. Monitoring of groundwater quality and elevations, as well as surface water quality, pre-, during and post-mining must be carried out with post-mining modelling of groundwater recovery and quality for the high wall mining and opencast sections.

5.7 Land use and land capability

Various human influences are present in the landscape surrounding the Vaalbult project, including agriculture (cultivation and livestock), mining (approximately three kilometres south), forestry and built-up areas. However in spite of these human influences the general area is still relatively untransformed. The pre-mining land use in the area is primarily agriculture (Figure 5.10). Agricultural activity within the area is based primarily on livestock (cattle, sheep and some poultry) and dryland crops (maize and soya). Within the mining right area livestock grazing dominates and accounts for 50 to 66% of the land use. In terms of the mining plan and schedule, it is envisaged that the current land use can occur in

combination with mining. There are dwellings / buildings within the mining right area; however these are outside the planned opencast sections. Labour residing on the farm will be relocated to Carolina (consultation with affected parties in this regard has taken place). The impact of blasting within the vicinity of the buildings (and livestock such as chickens) is a concern therefore an assessment of the structures prior to the commencement of mining at Vaalbult will takes place. Any impacts that can be attributed to the Vaalbult operations will be rectified / addressed by the Vaalbult Mining Company (Pty) Ltd within an appropriate timeframe.

Land capability is a function of slope, soil type and depth and climatic conditions and determines the best use for the land. In terms of the detailed soils assessment over the planned mining area (see Appendix C), approximately 49% of the area is arable and 29% of the area is grazing land. In the eastern block, opencast operations and two and half of the trenches fall within land classified as having arable capacity (Figure 5.10). The remaining three and a half trenches fall within wilderness (no economic value) and grazing land, although in terms of land use practices some of this land has been cultivated. In the western block, the opencast area falls evenly between arable and grazing land (with minor pockets of wilderness), with the trench falling primarily within land classified as having grazing capacity. However, in terms of land use practices most of this land has been cultivated.

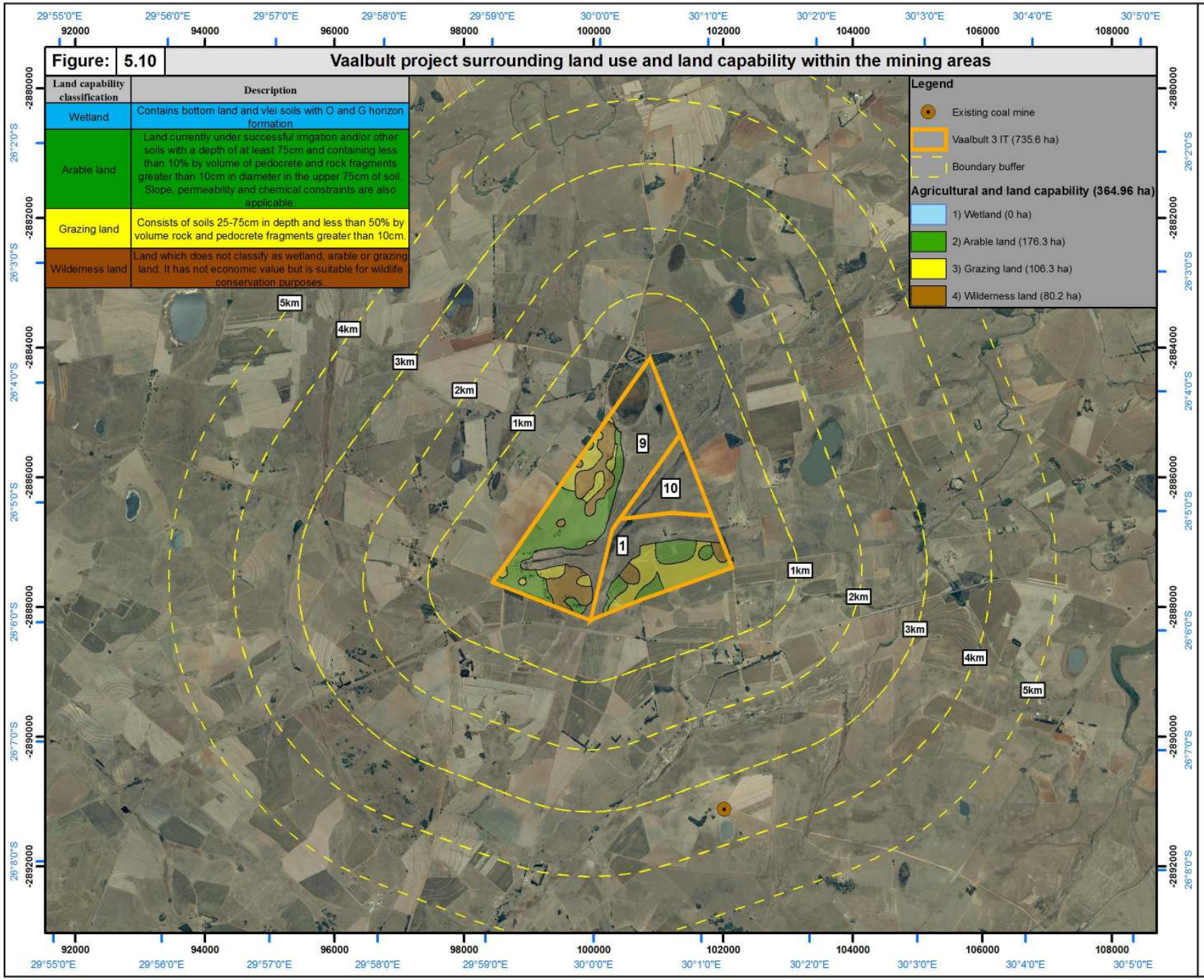
5.8 Biodiversity – flora and fauna

As it is not the listing of individual plant and animals species that is environmentally important but the interaction of these species in terms of biodiversity, the normal categories of vegetation (flora) and animal life (fauna) have been combined to determine overall ecological state of the proposed mining area. This will ensure management of the biological environment as a whole to minimise any impact on biodiversity of the site. A detailed biodiversity assessment has been undertaken that includes surveys during September (winter) and February (summer). The specialist report is provided in Appendix G and summarised in this section.

The proposed mining area is situated within the Grassland Biome of South Africa. The Grassland Biome is considered to have a high biodiversity, and although very few grasses are rare or endangered, rare plants often occur, especially in escarpment areas. The area is located within the Eastern Highveld Grassland (covering the entire proposed opencast mining area) with a minor area of Eastern Temperate Freshwater Wetland in the northwest (pan wetland area; Figure 5.11). This grassland is considered endangered, but almost none of the area is protected even though the conservation target is 24% and 44% of the natural distribution area has already been transformed (urbanisation, agriculture, dam construction and mines), with cultivation having had a more extensive impact. According to the Biodiversity Report, only 19% of quaternary catchment X11B in which the study area is located has been transformed through cultivation, human settlements and mining.

Figure: 5.10 **Vaalbult project surrounding land use and land capability within the mining areas**

Land capability classification	Description
Wetland	Contains bottom land and vlei soils with O and G horizon formation
Arable land	Land currently under successful irrigation and/or other soils with a depth of at least 75cm and containing less than 10% by volume of pedocrete and rock fragments greater than 10cm in diameter in the upper 75cm of soil. Slope, permeability and chemical constraints are also applicable.
Grazing land	Consists of soils 25-75cm in depth and less than 50% by volume rock and pedocrete fragments greater than 10cm.
Wilderness land	Land which does not classify as wetland, arable or grazing land. It has not economic value but is suitable for wildlife conservation purposes.



Vaalbult 3 IT

Registration Division: IT

Local Municipality
Albert Luthuli (MP301)

District municipality
Gert Sibande (DC30)

Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°

N

0 0.5 1 1.5 2 2.5
Kilometers

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when printed at A4

Mapping and layout by:

S3 Technologies
Spatial Systems Solutions

For: Copperleaf

Date of print
August, 2013

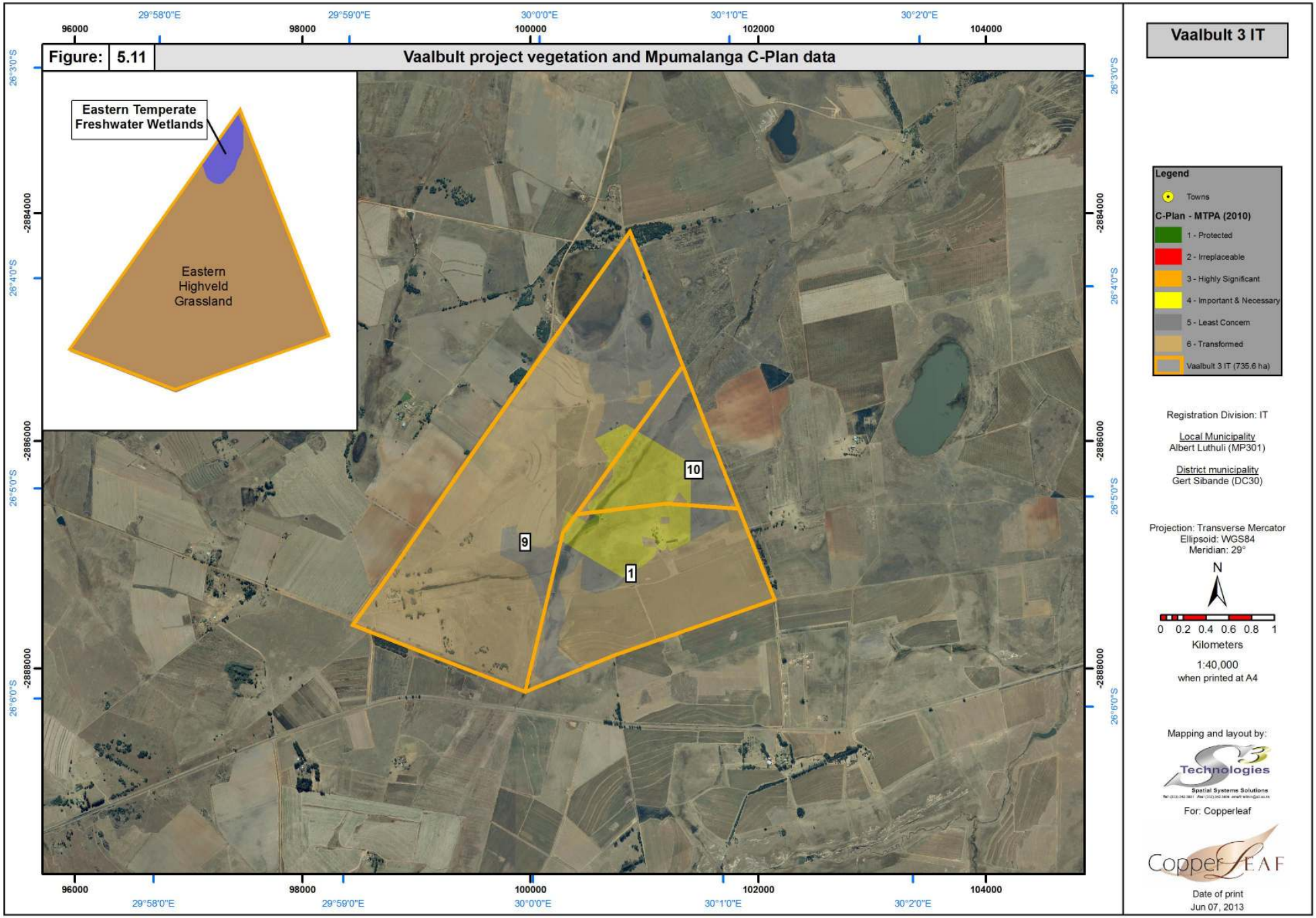
Figure: 5.11
Vaalbult project vegetation and Mpumalanga C-Plan data
Eastern Temperate Freshwater Wetlands
Eastern Highveld Grassland
10
9
1
Vaalbult 3 IT
Legend
Towns
C-Plan - MTPA (2010)
1 - Protected
2 - Irreplaceable
3 - Highly Significant
4 - Important & Necessary
5 - Least Concern
6 - Transformed
Vaalbult 3 IT (735.6 ha)
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
N
0 0.2 0.4 0.6 0.8 1
Kilometers
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when printed at A4
Mapping and layout by:
Technologies
Spatial Systems Solutions
For: Copperleaf
Date of print
Jun 07, 2013
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102000
104000
29°58'0"E
29°59'0"E
30°0'0"E
30°1'0"E
30°2'0"E
26°3'0"S
26°4'0"S
26°5'0"S
26°6'0"S
-2884000
-2886000
-2888000

During the biodiversity assessment 158 flora species, represented by 98 forbs, 57 grasses and 2 woody species (44 plant families, 119 genera) were recorded[5] (see Appendix G). Although six threatened Red Data plant species can potentially occur in the area; only the vulnerable *Khadia carolinensis* was recorded (this was within Community 3 in the east)[6]. Six provincially protected plants were recorded[7]: *Brunsvigia radulosa*, *Crinum graminicola*, *Disa versicolor, Gladiolus crassifolius, Gladiolus papilio*, *Satyrium cristatum* var. *cristatum;* and five plants with medicinal properties were recorded[8].

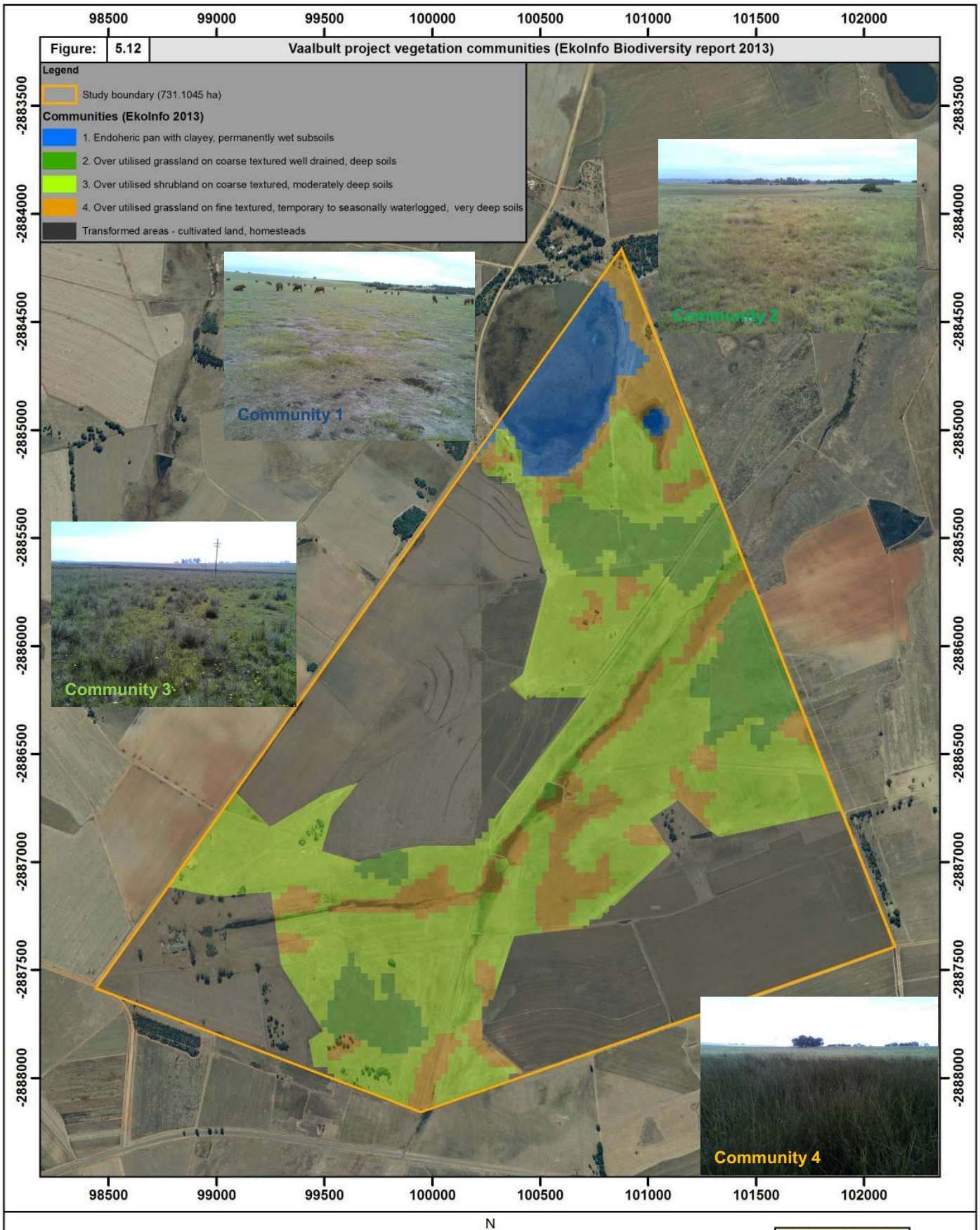
In terms of the Mpumalanga Conservation Plan (C-plan data; Figure 5.11) most of the proposed mining area has been transformed (no natural habitat remaining) or are within areas of least concern; however there is a portion of the mining right area just outside the planned mining in the east (primarily on portions 1 and 10 of the farm Vaalbult 3 IT) that is considered important and necessary. This area was confirmed during the biodiversity assessment to be part of the remaining natural vegetation (over utilised shrub and grassland).

The biodiversity assessment identified four vegetation communities within the study area based on 37 plots surveyed during February 2013, using the Braun-Blanquet approach[9] (Figure 5.12). The vegetation mainly reflects the influence of altitude, soil texture, soil depth, and soil moisture. Only one of the four communities is associated with well drained terrestrial soils, the other three are associated with a pan, temporary wet and seasonally wet areas. Poorly drained grassland or wetlands present 344 ha or 85% of the remaining natural vegetation within the mining right area (located mainly along the drainage line and to the east).

These plant communities (flora) are considered to be the main faunal habitats for impact assessment purposes. The following habitat sensitivities were estimated for the faunal habitats found in the study area:

- cultivated land and homesteads - low faunal sensitivity,
- over utilised grassland on well drained, deep soils - **high faunal sensitivity (Community 2)**,
- over utilised shrubland on moderately deep soils -**high faunal sensitivity (Community 3)**,
- over utilised grassland on fine soils, seasonally waterlogged soils - **high faunal sensitivity (Community 4),** and
- endoheric pan with permanently wet subsoils - **very high faunal sensitivity (Community 1)**.

[5] 70% of the species are within the following families: Poaceae, Asteraceae, Cyperaceae, Fabaceae, Rubiaceae, Hypoxidaceae, Scrophulariaceae, Caryophyllaceae, Iridaceae, Polygonaceae; and 35% of the species are within the following genera*: Eragrostis, Helichrysum, Senecio, Aristida, Cyperus, Hypoxis, Andropogon, Panicum, Bidens, Commelina, Gladiolus, Haplocarpha, Hermannia, Juncus, Oxalis, Solanum, Tristachya*.
[6] A 400 m buffer for this species was recommended by SANBI.
[7] Mainly in vegetation communities 2 and 3
[8] Mainly in the well-drained and the temporary wet vegetation communities
[9] Plots were placed *pro rata* randomly on a georeferenced Google Earth image taking into consideration slope, aspect and a wetness index derived from 1 m contours.



Mapping and layout by:

S3 Technologies
Spatial Systems Solutions

Date of print
07 June 2013

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0 250 500 750 1,000
Meters

Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°

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when printed at A4

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There are 113 faunal species confirmed for the study area which include 21 invertebrates, 4 frogs, 1 reptile, 70 birds and 17 mammals (see Appendix G). Of these five are Red Data species (Figure 5.13) and two have protected status within Mpumalanga: **Blue Korhaan**, *Eupodotis caerulescens* (NT)[10], **Blue Crane**, *Anthropoides paradiseus* (VU), **Black-winged Pratincole**, *Glareola nordmanni* (NT), **Honey Badger**, *Mellivora capensis* (NT), **Serval**, *Leptailurus serval* (NT, protected) and Southern Reedbuck, *Redunca arundinum* (protected). In addition landowners and occupiers within the area indicated that, crowned crane, springbok, steenbok and duiker have been observed in the south and east.

Community 2 has the highest species richness (number of species) owing to its terrestrial nature (variation in slope, aspect and soils). Communities 2 and 3 have high conservation significance as they provide habitat to numerous species and are under pressure from agriculture. However, the seasonally inundated area of the pan and the drainage area make it less suitable for a variety of plants and as such these have low conservation significance.

The total ecological sensitivity for the study area is the result of combining the flora and fauna sensitivity (Figure 5.14). This resulted in the pan having a rating of moderate and the remaining vegetation having high conservation significance because:

- It represents habitat for confirmed Red Data plants and animal;
- Is located along a drainage line which provide a corridor for organisms to move;
- It also connects the pan with the remaining landscape; and
- It represents a mosaic of well drained and poorly drained / wetland soils, of which the latter presents more than 80% of the study area.

The majority of the proposed mining infrastructure will avoid the remaining natural vegetation, therefore the direct impact of the proposed mine is considered to be low (Figure 5.14). However, the regional or indirect impacts include:

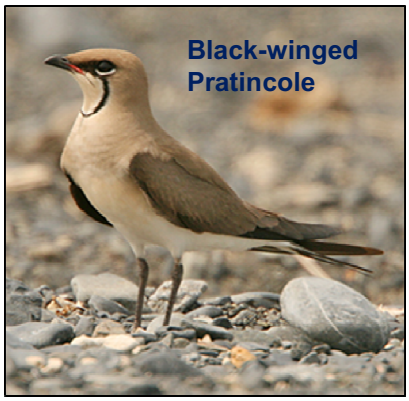
1. Natural vegetation being transformed to replace the lost cultivated land.
2. Additional grazing pressure on remaining vegetation resulting in overgrazing with subsequent changes in flora species composition and productivity (carrying capacity).
3. Displacement of animals sensitive to human activities (noise, movement) with intra and / or inter species confrontations and increased road kill incidents.

Two alien invasive flora species were recorded within the plots surveyed during the biodiversity assessment, *Solanum elaeagnifolium* (Community 2) and *Cirsium vulgare* (Community 4); both species are category 1 plants and require eradication / removal in terms of the Conservation of Agricultural Resource Act, 1983 and the National Environmental Management: Biodiversity Act, 2004. Outside the surveyed plots (in the vicinity of the homesteads and pan), stands of alien invasive trees such as Bluegum (*Eucalyptus* species), Wattle (*Acacia mearnsii*) and Popular (*Populus* species) were present. These are either category 2 or 3 plant species and are required to be controlled when they occur outside their demarcated areas. Also included in the study area are two alien and invasive fauna species: Spotted Maize Beetle, *Astylus atromaculatus* and Common Myna, *Acridotheres tristis*.

[10] This species is considered to be near-endemic to the Highveld Grassland ecoregion (Harrison *et.al*, 1997).

Figure 5.13: Vaalbult project Red Data Flora and Fauna.

Overview of the appearance and habitat of the vulnerable *Khadia carolinensis (taken from EkoInfo Biodiversity Assessment)*



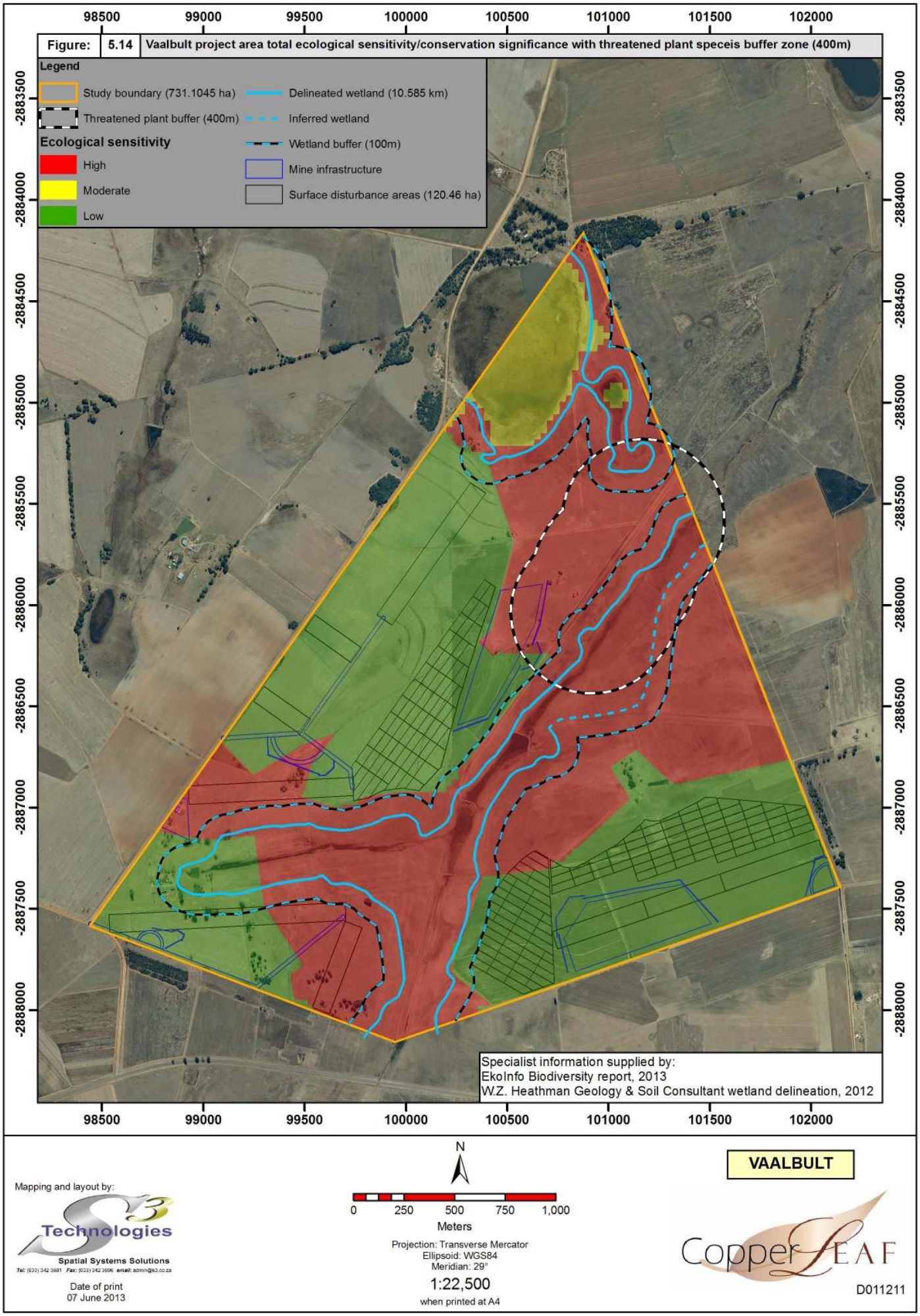


Figure: 5.14 Vaalbult project area total ecological sensitivity/conservation significance with threatened plant speceis buffer zone (400m)
Legend
Study boundary (731.1045 ha)
Threatened plant buffer (400m)
Ecological sensitivity
High
Moderate
Low
Delineated wetland (10.585 km)
Inferred wetland
Wetland buffer (100m)
Mine infrastructure
Surface disturbance areas (120.46 ha)
98500
99000
99500
100000
100500
101000
101500
102000
-2883500
-2884000
-2884500
-2885000
-2885500
-2886000
-2886500
-2887000
-2887500
-2888000
Specialist information supplied by:
EkoInfo Biodiversity report, 2013
W.Z. Heathman Geology & Soil Consultant wetland delineation, 2012
N
0 250 500 750 1,000
Meters
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
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Mapping and layout by:
S3 Technologies
Spatial Systems Solutions
Date of print
07 June 2013
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5.9 Air quality

The baseline air quality study has been undertaken by WSP Environment and Energy, monitoring is on-going to establish a seasonal baseline (see Appendix F). The existing potential sources of air pollution (including particulate matter and odour) within the region of the proposed mine include:

- Vehicle tailpipe emissions (on surrounding roads such as the R38 and the gravel roads - hydrocarbons such as benzene, CO, $NO_{2,}$, $S0_2$ and particulates);
- Domestic fuel burning (rural residential settlements - CO, $NO_{2,}$, $S0_2$, particulates and polycyclic aromatic hydrocarbons);
- Agricultural activities and biomass burning (surrounding farmlands and gravel roads – CH_4, CO, $NO_{2,}$ and fugitive dust); and
- Fugitive dust from other mining activities and entrainment of dust from gravel roads within the area.

Particulate matter is classified as a criteria pollutant, with a National ambient air quality standard having being established for PM10 and PM2.5 (particulate matter with an aerodynamic diameter less than 10 µm and 2.5 µm respectively). Particulates may have potential health effects, impact vegetation or simply be a nuisance issue. The preliminary baseline air quality assessment (see Appendix F) determined point source PM10 and PM2.5 at 6 sites across the proposed mining area (Figure 5.15). The baseline levels indicate that particulate levels are below the 24-hour threshold limits of the latest NEMA (air quality) standards. The PM10 concentrations ranged between 37.4 µg/m^3 (VB03 - north) and 83.4 µg/m^3 (VB04 – west adjacent to the Leliefontein Road); the national ambient air quality standard is 120 µg/m^3 over a 24-hour period or an annual average of 50 µg/m^3. The PM2.5 concentrations ranged between 5.6 µg/m^3 (VB02 - east) and 15.2 µg/m^3 (VB04); the national ambient air quality standard is 65 µg/m^3 over a 24-hour period or an annual average of 25 µg/m^3. These standards will change and become stricter in January 2015 (PM10) and 2016 (PM2.5).

Results of the dust fall out concentrations indicate that three of the sites (VB02 to VB04) along the east, north and northwest boundaries are above the residential threshold limit (>600 mg/m^2/day) and the remaining three sites (VB01, VB05 and VB06) along the south, southwest boundaries and centrally within the study area were above the action threshold limit (>1200 mg/m^2/day). The high values have been attributed to wind erosion from ploughed fields; however this highlights the potential problem of dust fallout from exposed / disturbed surfaces at the end of the winter season. Owing to the nature and seasonal change of wind, dust generation from increased vehicle use during mining operations, exposed surfaces and stockpiles and possible odour generation from sulphur derivatives from the coal stockpiles, is likely to migrate westwards (west northwest and west southwest) during winter and early spring. On-going ambient air quality analysis through dust fallout to provide a seasonal baseline for long-term monitoring purposes is being undertaken.

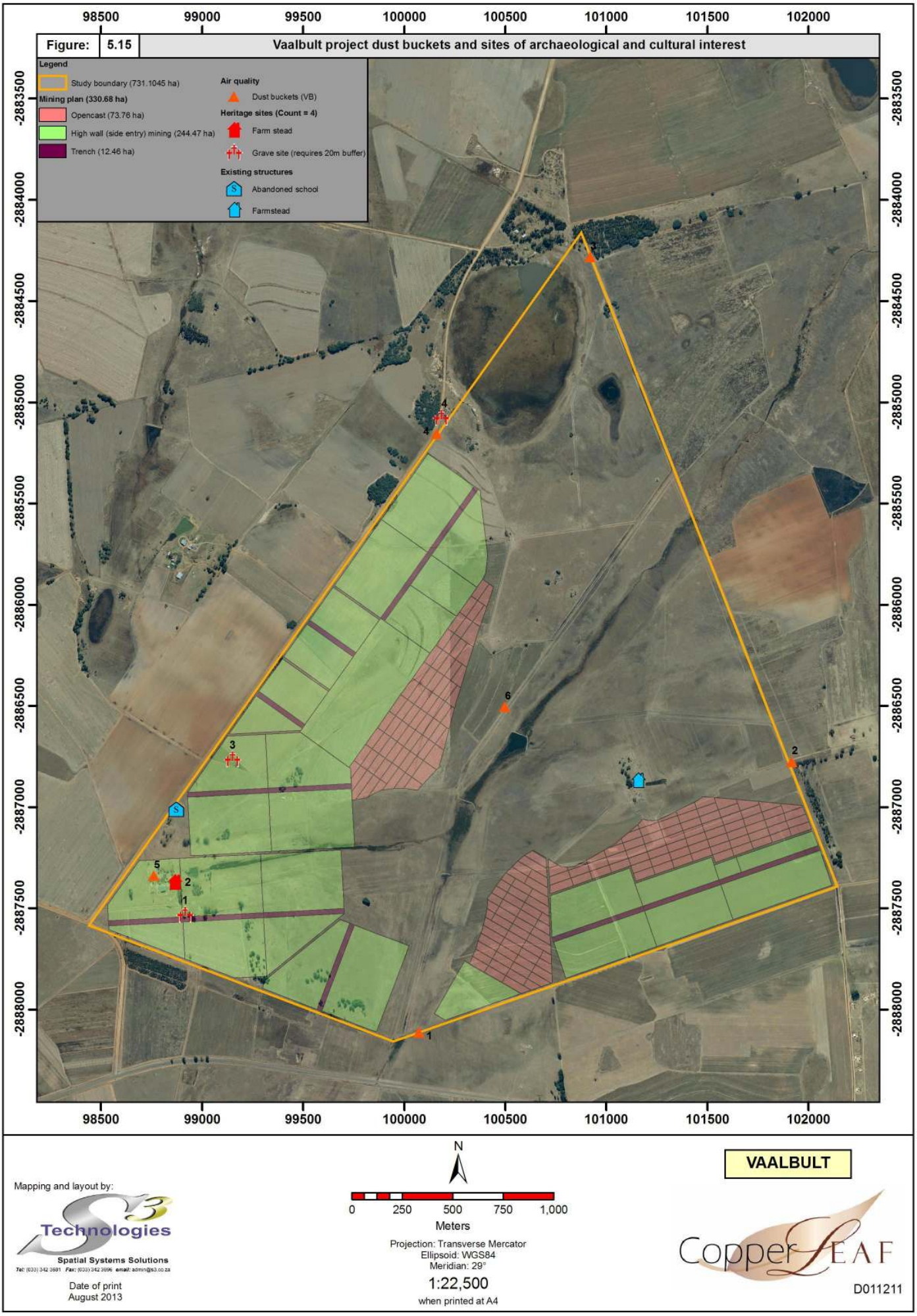
Figure: 5.15
Vaalbult project dust buckets and sites of archaeological and cultural interest
Legend
Study boundary (731.1045 ha)
Mining plan (330.68 ha)
Opencast (73.76 ha)
High wall (side entry) mining (244.47 ha)
Trench (12.46 ha)
Air quality
Dust buckets (VB)
Heritage sites (Count = 4)
Farm stead
Grave site (requires 20m buffer)
Existing structures
Abandoned school
Farmstead
98500
99000
99500
100000
100500
101000
101500
102000
-2883500
-2884000
-2884500
-2885000
-2885500
-2886000
-2886500
-2887000
-2887500
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Mapping and layout by:
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Spatial Systems Solutions
Date of print
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Ellipsoid: WGS84
Meridian: 29°
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VAALBULT
CopperLEAF
D011211

Dust buckets have been erected around the mining right area to determine baseline dust fallout. Within the proposed mining area the dust sources primarily relate to movement of vehicles on gravel roads and rural agricultural activities, with seasonal variation related to climate and wind conditions. The mine plan includes the surfacing of gravel haul roads and some high use on-site roads, with wet suppression of the remaining areas, to minimise dust from this source. Based on rainfall data for the region (see Section 5.4.1) the removal of pollutants in the atmosphere through wet deposition occurs mainly in summer. Relative humidity is also highest in the summer months and any chemical transformations which require water vapour (for example the conversion of SO^2 to sulphate aerosols) will be performed most efficiently in the summer months.

5.10 Noise

The proposed mining area is situated primarily within rural commercial agricultural land. Noise attenuation occurs exponentially with distance; therefore although activities such as opencast and high wall mining and coal haulage / transportation have the potential to contribute to the ambient noise levels of the region, none of these sources are likely to produce noise levels in excess of the maximum allowable health limit outside the proposed mining area (acceptable levels for rural daytime setting is 45dBA). Workers / operators in the immediate vicinity of the noise source (vehicles, mining equipment and blasting) will be provided with appropriate personal protective equipment (PPE, such as earplugs) to reduce the impact. In general, existing noise sources in the vicinity of the proposed mining area include traffic on the R38, farming activities, and vehicles accessing the area. Figure 5.16 highlights that the noise and visual impacts are more likely to be evident to the northeast based on topography; however the main wind directions are from the east therefore the sphere of influence from the operations will be low. Most of the noise will be background, apart from blasting which also has the associated impact of air and ground vibrations. Blasting will only take place to remove hard rock overburden during opencast operations and trenching, approximately every few weeks. Planning of the blast will be undertaken by a specialist taking account of conditions at the time of blasting to minimise the impacts. A vibration assessment of the buildings within and immediately adjacent to the mining area will be undertaken prior to operations commencing and incorporated as Appendix I. There are other mines within the area; therefore a baseline can only be established immediately prior to mining. Any impact on the structures directly attributed to mining operations at Vaalbult Colliery will be addressed by Vaalbult Mining.

5.11 Sites of archaeological or cultural interest

No known sites of archaeological interest have been officially recorded during the consultation process. A number of structures exist within the project area, namely a farmhouse and abandoned school on portion 9 (west) and a farmstead on portion 1 (east). An heritage impact assessment and site visit by a South African Heritage Resources Agency (SAHRA) registered archaeological consultant has been undertaken, and only four heritage sites were found within the mining right area (Figure 5.15 and Appendix H). All heritage sites are in the west and consist of three grave sites and a farmstead. All these sites fall outside the area of surface disturbance, therefore only management of the sites is required (see Appendix H). A buffer of 20 m with fencing around the grave sites has been recommended.

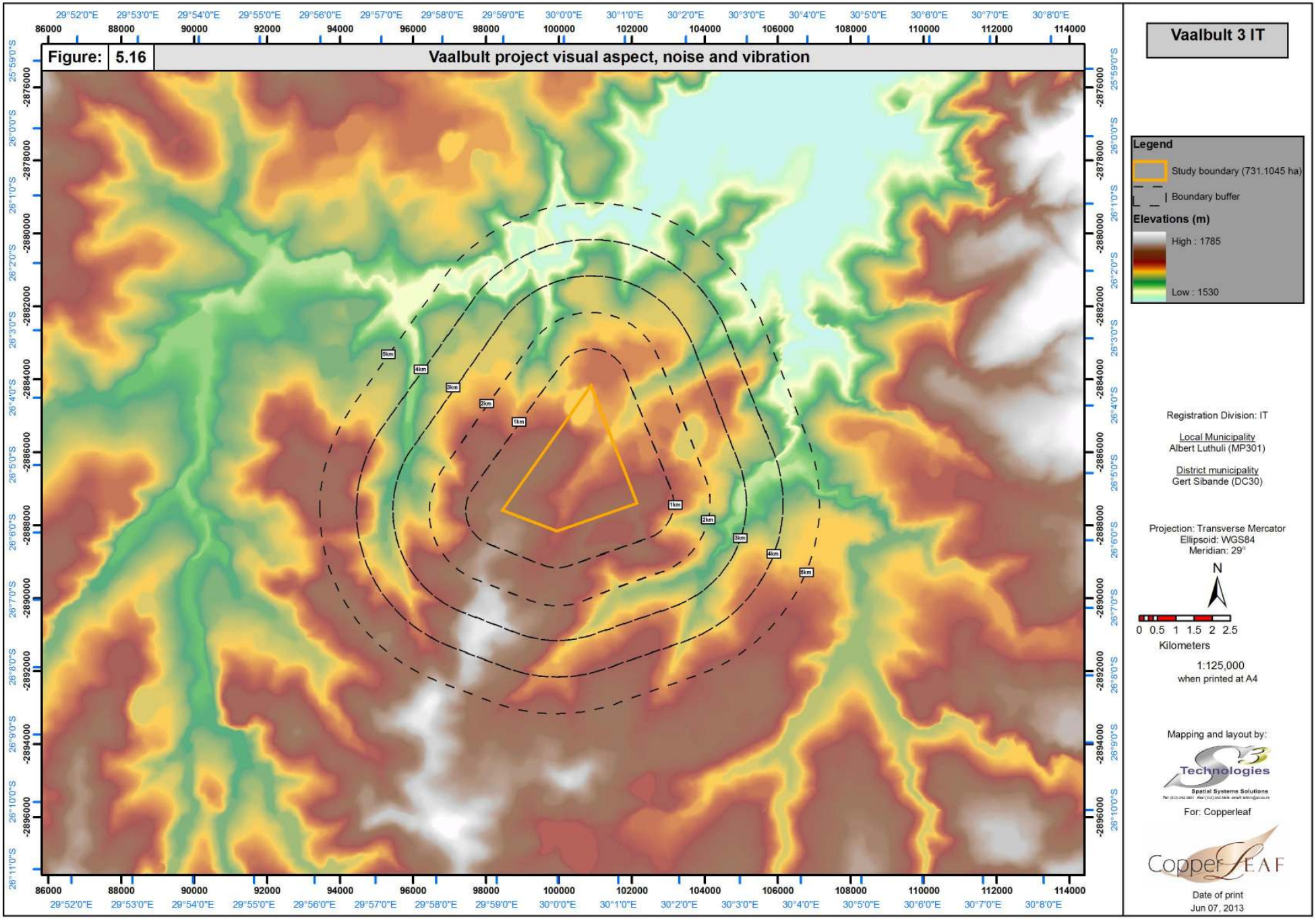
Figure: 5.16
Vaalbult project visual aspect, noise and vibration
Vaalbult 3 IT
Legend
Study boundary (731.1045 ha)
Boundary buffer
Elevations (m)
High : 1785
Low : 1530
Registration Division: IT
Local Municipality
Albert Luthuli (MP301)
District municipality
Gert Sibande (DC30)
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
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Kilometers
1:125,000
when printed at A4
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Spatial Systems Solutions
For: Copperleaf
Copper Leaf
Date of print
Jun 07, 2013

5.12 Sensitive landscapes

There are no sensitive landscapes under statutory protection within the mining right area; however water resources exist in the form of non-perennial streams and wetlands (riparian and pans). There are many definitions of a wetland, but most are defined by vegetation type, soil type, soil wetness, slope/terrain position and surface and ground water hydrology. Gleyed soils (indicating anaerobic soil conditions and a permanent all year water saturation of the soil profile) and mottles (indicating a fluctuating water table and seasonal/temporary anaerobic conditions lasting for a few weeks to a few months, but mostly during the summer rainfall period) are signs of wetness which, when present in the top 50 cm of the soil profile indicate that the soil profile can be classified as being within the boundary of a wetland. The wetlands should have a buffer strip from the edge of the temporary wetland zone boundary in the mining right area. The wetland delineation is provided in Figure 5.14 with a 100 m buffer (see Appendix C). Surface mining operations and disturbance fall outside the wetland buffer.

According to the biodiversity assessment report, soils with signs of wetness occur far more widely within the study area than what the detailed wetland delineation shows, as small pockets of wet areas (about 10m by 10m based on vegetation and the wetness index) are evident within the landscape. This is primarily evident in the natural vegetation in the northeast. It should be noted that the detailed wetland delineation is based on site specific soils and terrain / slope criteria (as per DWA; see Appendix C). In addition, the area with most probability (variance) is within portion 10 of Vaalbult 3 IT (east) which was not included in the wetland delineation or detailed soils assessment as no mining or disturbance will take place in this area.

5.13 Visual aspects

The landscape is currently gently undulating commercially cultivated farmland and areas that are used for the grazing of livestock. The proposed mining area will be visible from the various roads that cross-cut the area, although the undulating nature of the topography may create visual screens from some aspects. Figure 5.16 highlights that the visual impacts are more likely to be evident to the northeast based on topography. The site office will be visible from the Leliefontein district road.

5.14 Transport, traffic and safety

In terms of the mining operation, increased traffic on the surrounding road network will occur during construction, operation and closure. In addition, although the mining activity itself (operation) will be

contained on-site, coal will be trucked from the mine to the washing facility at Eastside Colliery by road. This facility is located on the R38 east of Carolina. The planned ROM is 60,000 tons per month which is approximately 2,000 tons per day or 60 trucks. This will significantly increase heavy vehicle traffic on the R38 through Carolina (see Figure 1.1). However, the plan is to use empty trucks returning to Eastside Colliery from delivery to Hendrina Power Station to reduce the number of additional trucks required (see Section 3.4.3).

Access roads to the site include a gravel district road (Leliefontein Road) in the west and a gravel farm access road in the east. The Leliefontein Road links the R38 and the R33. There are no communities on the access road (approximately 2 km); however there is an intersection at the southwest boundary point before reaching the R38. Information signage and speed reduction will be required. The eastern access road (approximately 1.1 km) is not a through road and is used to access farmlands only. This road passes three community / labour dwellings immediately east of the road close to the R38 intersection. This eastern access will be required in years 9 to 11 only and upgrade in consultation with the local community and affected landowners will take place closer to the time. However, safety features such as fencing, signage and speed restriction will be required. Surfacing with a binding agent will reduce dust, and improve visibility and safety.

5.15 Socio-economic[11]

The proposed area of operation is located within the Albert Luthuli LM. The LM covers approximately 5,559 km², with a population of 186,010 (47,705 households). The mining right area extends over approximately 0.13% of the LM area. The region is predominantly rural residential and agriculture, with the closest first order centre being Carolina approximately 13.5 km to the east.

The main economic sectors within the LM are agriculture, mining, business services and manufacturing. The economically active population accounts for 58%, with a dependency ratio of 72% and unemployment at approximately 35%. Almost 20% of the adult population has no schooling.

There is a need for job creation in the area. The proposed mining operation requires approximately 64 personnel, with technical skills including: bulldozer operators, back-actor operators, front-end loader operators, off-road and on-road truck drivers, water cart operators, electricians, mechanics, fitters and security personnel.

[11] Information sourced from Statistics SA, National census 2011 – www.statssa.gov.za.

6. CONSULTATION PROCESS

Public participation is an important tool in the decision-making process. Consulting the interested or affected public is the only meaningful way through which account of locally relevant conditions can be taken, rather than imposing a socially and environmentally insensitive design onto an environment. This section documents the process followed with respect to consultation with I&APs and Regulatory Authorities (see Sections 2 and 3 for the environmental process and objectives).

6.1 Interested and affected parties

6.1.1 Regulatory Authorities

The following Regulatory Authorities have been identified as affected by the project:

- Department of Mineral Resources (DMR)
- Mpumalanga Department of Economic Development, Environmental and Tourism (DEDET)
- Department of Water Affairs (DWA)
- Inkomati Catchment Management Agency (ICMA)
- Mpumalanga Department of Agriculture and Land Administration (MDALA)
- Gert Sibande District Municipality: planning and development
- Albert Luthuli LM: planning and development

Correspondence with these authorities in terms of the mining right application, environmental authorisation and water use licensing has commenced. Consultation has been and will be through one-on-one engagement, letters, email and telephone. Consultation with regulatory authorities is on-going and will continue during the course of the application process and operations.

6.1.2 Landowners & other interested and affected parties

An initial list of potential I&APs was created from a desktop study of the immediate surrounding landowners (see Section 3.2). Initial contact with most of these I&APs took place during March 2013 and took the form of an information and notification phase through individual one-on-one consultation with the landowners (and lawful occupiers) within the mining right area as well as adjacent farms (see Appendix K). Other I&APs were engaged with during the information phases.

6.2 Information phases

6.2.1 Advertising

Legal notices informing the public of the proposed project, inviting them to register as I&APs, and informing them of the ESR and EIA availability for public comment (and public meeting) was placed on the 5th April 2013 and 29th/31st May 2013 respectively in the following newspapers (see Appendix K):

- Kontrei Gazette (Local) – English and Afrikaans
- Beeld (Provincial / National) – Afrikaans
- Daily Sun (Provincial / National) – English

It was decided not to advertise the ESR prior to the 5th April owing to the numerous public holidays at the end of March.

The ESR and EIA have also been placed on an ftp site for download and all identified I&APs were emailed to inform them of the availability of the documents. The files can be downloaded from http://www.clcon.co.za/D01Vaalbult_Report_links_June13.htm).

In addition, site notices were placed along the boundary of the proposed mining area. These site notices incorporated the part of the legal notices as placed in the newspapers, a mine plan of the area, as well as the executive summary from the ESR in English and Afrikaans (see Appendix K).

6.2.2 Availability of the ESR

The ESR was available at the Albert Luthuli LM, Carolina Library, and at the proposed mine area (on portion 9 of the Farm Vaalbult 3 IT) for comments by the public from 5th April 2013 to 7th May 2013. No specific comments in writing on the ESR have been received to date; apart from feedback for mining from the Gert Sibande District Municipality (see Appendix K).

6.2.3 Availability of the EIA / EMP

The EIA was available for comments by the public from 10th June 2013 to 22nd July 2013 at the venues listed in Section 6.2.2. No additional comments were received in writing during this phase (see Appendix K).

6.2.4 Meetings

Apart from meetings arranged with I&AP / authority groups or individuals, a public meeting was held with the landowners and I&APs on the 10th June 2013. The meeting was presented in English and translated (for the majority of the attendees) into Zulu. The presentation highlighted the project details, environmental setting, and specialist studies outcomes in terms of impacts and mitigation (see Appendix K). The main concerns addressed in the meeting related to dust, water and agricultural viability, and these factors were discussed and responded to during the meeting.

7. ENVIRONMENTAL IMPACT ASSESSMENT

This section follows the requirements of the MPRDA and identifies the main mining activities and assesses the potential impacts of each of these activities as well as the cumulative impacts based on the environmental setting provided in Section 5. Of these identified mining activities, those that relate to the NEMA environmental authorisation application include:

- On-site haul roads (Table 7.4);
- Construction of pollution control dams (PCDs; Table 7.9); and
- Transformation of undeveloped land for mining (Tables 7.5 and 7.6), office complex (Table 7.3) and stockpile areas (Tables 7.7 and 7.8).

The assessment of environmental impacts of mining on the environment, as well as the environment on mining, ideally involves a consultation process with interested and affected parties as discussed in Section 6. Information used in this section is based on the specialist studies undertaken as highlighted in Section 5 with input / feedback from the consultation process.

7.1 Mining phases and activities

When assessing environmental impacts, the proposed project needs to be viewed holistically, incorporating all phases of development from establishment to eventual closure. Therefore, to mitigate potential negative impacts and identify any potential fatal flaws that may render the project environmentally unacceptable, the environmental assessment addresses all phases related to the establishment of the proposed mine as discussed in Section 3, namely:

- Construction;
- Operation;
- Decommissioning and closure; as well as
- Post-closure (residual impacts).

Note that although each of the phases is discussed below, mining is planned to start with the opencast operations in the western block (year 1), moving to high wall mining in the west (years 2 to 9), and then onto opencast and high wall mining in the east (years 9 to 11; see Section 3).

7.1.1 Construction

It is anticipated that the initial site establishment and construction will be undertaken over approximately two months. The following activities will be undertaken to prepare the area for the mining operations (see Section 3.5.1 for details):

- Site preparation that includes fencing of mining sections (where required for health and safety), stripping of vegetation from construction areas, and removal of topsoil from construction areas for replacement on rehabilitation / decommissioning.
- Construction of the office complex which includes preparation of concrete bases for the service / workshop area linked to an oil trap / sump; concrete bunded diesel storage area with sump; installation of prefabricated portable buildings for the offices, change houses, workshop, stores, and security control points; and installation of domestic water tanks, chemical toilets and grey water filter system.
- Construction of gravel on-site haul roads with the road between / within the mining areas and the ROM stockpile pad being approximately 20 m, and the upgrade of the site access to include surfacing of gravel product haul road to ROM stockpile pad with a binding agent (dust suppressant).
- Initial box-cut for opencast mining, initially in the western block with the removal and stockpiling of the subsoil and overburden from the box-cuts for replacement into the final voids at the end of the life of the mine;
- Creation of overburden stockpile areas and preparation of the mined coal stockpile pad (ROM). Note that most of the topsoil and subsoil from the site preparation will be used to create clean water diversion berms or visual berms.
- Construction of stormwater and pollution control measures including clean water diversion berms, dirty water trenches and pollution control dams at the ROM and overburden stockpile areas (see Appendix B).

7.1.2 Operation

This is a medium-term coal deposit with an 11 year life of mine (see Section 3.3). The following activities will be undertaken during the mining process (see Section 3.5.2 for details and Section 3.3.1 for the mining methods):

- Opencast pit including mining, blasting and contribution to the various stockpiles
    - The method of mining is discussed under Section 3.3.1.1.
- Trenching and high wall operations including mining, blasting (if required) and contribution to the various stockpiles
    - The method of mining is discussed under Section 3.3.1.2.
- Coal screening / sizing (as required) within the Phase 1 ROM stockpile area
- Roads and transport routes use and maintenance (where applicable)
    - The roads and transport routes are discussed under Section 5.14;
- Storage of waste (wastewater – dirty water) temporarily at the mining sections for reuse for dust suppression within dirty water areas and high wall mining operations;
- Operation and maintenance of self-contained septic tank / chemical toilet systems from the office complex, as well as a ‘closed’ artificial wetland filter system for grey water from the change house. This filtered water can be reused for dust suppression and the high wall mining operations; and
- Storage of domestic and industrial waste temporarily at the office complex area.
    - Waste management is discussed under Section 3.4.5.

7.1.3 Closure

The decommissioning of mining sections will occur in phases over the life of mine i.e. as the opencast operations or each of the high wall trenching operations are completed they will be decommissioned and closed. Final decommissioning and closure of the mining sections will comprise the following activities (see Section 3.5.3 for details):

- Closure of the opencast pits / voids – backfill, contouring and re-vegetation
- Closure of trenches and high wall mining sections – sealing of high wall cuts (brick, mortar and concrete) and 'pillar' faces (gunite / shotcrete), and backfilling, contouring and re-vegetation of the trenches
- Removal of surface infrastructure – roads and stockpile areas, removing the top layer of carbonaceous material, ripping the area to loosen the surface and reduce compaction, replacing the topsoil and re-vegetation / seeding
- Removal of stormwater control measures – berms and trenches
- Removal of surface infrastructure – office complex only once all the mining sections have been completed.
- Fencing off the mined areas where required.

7.1.4 Post Closure Phase

It has been indicated that it is the purpose of the surface rehabilitation to re-establish surface drainage to the pre-mining conditions as far as is practical. Therefore rehabilitation will:

- Restore normal infiltration rates to areas where recharge was reduced due to surface compaction such as the access roads, and
- The mine will consult with DMR and DWA with regards to the best rehabilitation option of the area in terms of surface runoff and the evaporation dam/s.

The mine aims to carry out as much of the rehabilitation / aftercare programme while the mine is in operation. For the opencast sections this requires correct backfilling and contouring as mining progresses, and for the high wall sections this requires that the high wall mined sections are systematically sealed, the adjacent pillar end-faces are sealed (gunite / shotcrete), and the trench is backfilled and contoured on completion. See Section 9.1.1 for the rehabilitation objectives.

7.1.5 Overall mining activities

The main mining activities and the potential environmental impacts associated with the proposed activities and the biophysical environment are provided in Table 7.1. These impacts are assessed in this section as per the process highlighted in Section 7.2 using the information available from the studies as a base.

Table 7.1: Main mining activities and the potential impacts for the operations

Activity	Environmental aspect – potential impact	Phase of mining
Office complex	• Soil contamination and loss of viability (land capability) through: o incorrect stripping and storage prior to construction of the offices, workshop, change house and storage areas o incorrect construction of the workshop and diesel storage areas o spillage of oils, grease and diesel during operations o incorrect storage of domestic or industrial waste o concentrated run-off as a result of demolition activities	Construction Construction Construction, operation & closure Operation Closure
	• Surface and groundwater contamination and quantity through: o incorrect construction of the workshop and diesel storage areas o spillage of oils, grease and diesel during operations o incorrect storage of domestic or industrial waste o abstraction of water for the operations o incorrect establishment and maintenance of the grey water system o concentrated run-off as a result of demolition activities	Construction Construction, operation & closure Operation Operation Operation Closure
	• Dust generation (particulate emissions) through: o wind erosion of exposed surfaces o vehicle entrainment within construction area surfaces o tailpipe emissions from vehicles	Construction and closure Construction Construction and closure
	• Noise generation through: o movement of heavy vehicles	Construction & closure
Access & on-site roads	• Soil contamination and loss of viability through: o incorrect stripping during road construction o spillage of oils and grease	Construction and operation Construction, operation & closure
	• Surface and groundwater contamination through: o spillage of oils and grease o wet suppression of exposed surfaces could leading to soil erosion in mining areas	Construction, operation & closure
	• Dust generation (particulate emissions) through: o wind erosion of exposed surfaces o vehicle entrainment on the roads within mining areas o tailpipe emissions from vehicles	Construction, operation & closure
	• Noise generation through: o movement of heavy vehicles	Construction, operation & closure
	• Traffic and safety through: o Upgrading of access roads - widening in the east and surfacing east / west	Construction, operation & closure
Overburden, subsoil and topsoil stockpiles	• Soil contamination and loss of viability (land capability) through: o incorrect stripping during construction of the stockpile area o incorrect placement (not separating) of soil during stockpiling o spillage of oils and grease by vehicles during operations	Construction
	• Potential loss of biodiversity through: o Placement of western overburden stockpile within / close to area of high ecological sensitivity / buffer zone	Construction & closure

Activity	Environmental aspect – potential impact	Phase of mining
	• Surface and groundwater contamination through: o spillage of oils and grease	Construction and closure
	• Dust generation (particulate emissions) through: o wind erosion of exposed surfaces o materials handling o tailpipe emissions from vehicles	Construction, operation & closure
	• Noise generation through: o movement of heavy vehicles	Construction and closure
Pits – strip mining (initial box-cut and subsequent roll-over cuts) and trenches	• Soil contamination and loss of viability (land capability) through: o incorrect stripping during construction of the initial box-cut o incorrect placement of soil sequencing during roll-over mining method and rehabilitation phase, or trench backfill o spillage of oils and grease by vehicles during operations	Construction Operation and closure Construction and operation
	• Potential loss of biodiversity through: o Removal of vegetation and faunal movement from the trench area in the southwest o Disturbance of cultivated / grazing land creating grazing pressure or resulting in transformation of other areas	Construction and operation Operation
	• Altering of aquifer state (quantity) through: o Dewatering of pit to create safe working environment o Recovery of groundwater level once dewatering has ceased	Operation Closure
	• Surface and groundwater contamination through: o Incorrect contouring of backfilled area o Acid generation within backfilled areas	Operation and closure Operation, closure & post-closure
	• Dust generation (particulate emissions) through: o wind erosion of exposed surfaces o drilling and blasting o vehicle entrainment within opencast pit and trenches o tailpipe emissions from vehicles	Construction, operation & closure
	• Noise / vibration generation through: o drilling and blasting o movement of heavy vehicles	Construction, operation & closure
High wall mining (miner with conveyors into bins)	• Altering of aquifer state through: o Abstraction of water for operations o Dewatering workings to create safe working environment o Recovery of groundwater level once dewatering has ceased	Operation Operation and Closure
	• Surface and groundwater contamination through: o Acid generation within the high wall sections	Operation, closure & post-closure
	• Air quality / subsidence through: o Spontaneous combustion of coal 'pillars'	Operation, closure & post-closure
	• Noise generation through: o High wall miner operations o movement of heavy vehicles	Construction, operation & closure

Activity	Environmental aspect – potential impact	Phase of mining
ROM Stockpiles (with possible coal sizing / screening)	• Soil contamination and loss of viability (land capability) through: o incorrect stripping during construction of the stockpile area o incorrect placement (not separating) of ROM from soil during stockpiling o spillage of oils and grease by vehicles during operations	Construction and operation
	• Surface and groundwater contamination through: o spillage of oils and grease by vehicles during operations o surface wash of stockpiled coal	Construction, operation & closure
	• Dust generation (particulate emissions) through: o wind erosion of exposed surfaces o materials handling (including screening) o tailpipe emissions from vehicles	Construction, operation & closure
	• Noise generation through: o movement of heavy vehicles o screening / sizing of the coal	Construction, operation & closure Operation
Stormwater and pollution control measures (trenches, berms and pollution control dams)	• Soil contamination and loss of viability (land capability) through: o incorrect stripping during construction of the trenches, berms and pollution control dams o mixing of topsoil and subsoil during the construction of the berms o spillage of oils and grease by vehicles during operations	Construction
	• Surface and groundwater contamination through: o alteration of surface water run-off o incorrect design, placement and construction of the pollution control facilities o spillage of oils and grease by vehicles during operations	Construction Construction and operation Construction
	• Dust generation (particulate emissions) through: o wind erosion of exposed surfaces o materials handling o tailpipe emissions from vehicles	Construction, operation &closure Construction Construction
	• Noise generation through: o movement of heavy vehicles	Construction

7.2 Environmental impact assessment process

To ensure comparable results, the assessment of potential impacts is addressed in a standard manner using a clearly defined numerical rating scale to determine the significance of the potential impacts as a result of the proposed project (Table 7.2). Each impact identified is assessed in terms of probability (likelihood of occurring), extent (spatial scale), intensity (severity), and duration (temporal scale); the sum of the numerical values defines the significance. Assessment is based on the specific environmental setting in relation to the mine plan (layout and process) provided in Section 3. Although impacts may be positive or negative, only the negative impacts that require mitigation measures area addressed in this section.

The EIA per mining activity presented in Tables 7.3 to 7.9, rates the impact for each relevant environmental aspect per mining activity as required by the DMR. The activities (and sub-activities) are assessed according to the different phase of the mining process. For all tables under this section the following abbreviations are used for the various categories:

- P - probability
- E - extent
- D - duration
- I - intensity
- S - significance

Table 7.2: Numerical rating scale to determine environmental impact significance

Category	Category	Rating	Description
Probability	Improbable	0	Less than 40% sure of a particular fact or the likelihood of that impact occurring.
	Possible	1	40% to 70% sure of a particular fact or the likelihood of that impact occurring.
	Probable	2	70% to 90% sure of a particular fact or the likelihood of that impact occurring.
	Definite	3	More than 90% sure of a particular fact or the likelihood of that impact occurring.
Extent	Site	1	Immediate project site
	Local	2	Up to 5km form the project site
	Regional	3	20km radius from the project site (beyond the borders of the immediate area)
	Provincial	4	Provincial
	National	5	South Africa
	International	6	Neighbouring countries/overseas
Duration	Very short-term	1	Less than 1 year
	Short-term	2	1 to 5 years
	Medium-term	3	5 to 10 years
	Long-term	4	10 to 15 years
	Very long-term	5	Greater than 15 years
	Permanent	6	Permanent
Intensity	Very low	0	Where the impact affects the environment in such a way that natural, cultural and social functions are not affected
	Low	1	Where the impact affects the environment in such a way that natural, cultural and social functions are only marginally affected
	Medium	2	Where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way
	High	3	Where natural, cultural and social functions or processes are altered to the extent that it will temporarily cease
	Very high	4	Where natural, cultural and social functions or processes are altered to the extent that it will permanently cease
Significance		2 to 4	Low
		5 to 7	Low to moderate
		8 to 10	Moderate
		11 to 13	Moderate to High
		14 to 16	High
		17 to 19	Very high

Assessment of the environmental impacts is provided in Tables 7.3 to 7.9 per activity as follows:

- Table 7.3: Environmental impact of the office complex – offices, change house / ablutions, workshop, diesel store and security
- Table 7.4: Environmental impact of the access and on-site haul roads
- Table 7.5: Environmental impact of the opencast mining and trenches – initial box-cut, strip mining and trenching
- Table 7.6: Environmental impact of the high wall operations – mining
- Table 7.7: Environmental impact of the stockpile areas – topsoil, subsoil and overburden
- Table 7.8: Environmental impact of the stockpile pad – ROM with screening / sizing as required
- Table 7.9: Environmental impact of the stormwater and pollution control measures (trenches, berms and pollution control dams).

Table 7.3: Impact assessment of the office complex – offices, change house / ablutions, workshop area, diesel store and security							
Potential impact	**Activity description**	**P**	**E**	**D**	**I**	**S**	**Management measure**
Soil contamination and loss of viability	Construction of the site office complex will require that the topsoil is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly such as allowing mixing of the soils, it could lead to contamination and therefore loss of soil viability.	3	1	1	2	7	A log and plan of soil stripping and placement must be kept up to date on-site and must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report • Topsoil, subsoil and overburden must be stockpiled separately – topsoil from this area may be used as a visibility berm
	Incorrect construction of the workshop and diesel storage area	1	1	4	2	8	• Diesel tanks must be bunded according to SANS 10131:2004 specifications. • Maintenance to be carried out in designated workshop area only. Workshop area must be on a concrete base linked to an oil trap / sump
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources and the subsequent loss of soil viability.	1	1	5	2	9	A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas. • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage. An incident reporting and remediation log must be kept on site. All vehicles and equipment must be serviced regularly and the logs kept on-site.
	Temporary storage of domestic or industrial waste	3	1	5	1	10	A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas (maintenance area). • Domestic waste collection in marked bins in a designated area (maintenance / office area). • Collection of waste by a recognised contractor for disposal at a registered facility off-site
	Concentrated runoff as a result of the demolition activities during closure could lead to erosion, which will reduce the fertility of the soils and the subsequent establishment of flora.	0	1	1	2	4	• All clean and dirty water infrastructures will be maintained up until completion of demolition and rehabilitation activities.
Surface and groundwater contamination	Spillage of oils, grease, diesel, etc. could lead to the contamination of the water resources.	0	1	5	2	8	• Maintenance to be carried out in designated workshop area only. • A waste management plan must be put in place (see above).
	Temporary storage of domestic and industrial waste	3	1	5	0	9	A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas (maintenance area). • Domestic waste collection in marked bins in a designated area (maintenance / office area). • Collection of waste by a recognised contractor for disposal at a registered facility off-site
	Abstraction of water for the operations may reduce the quantity of groundwater	1	2	4	2	9	• Abstraction rate as per hydrological report to be used (VGM02). • Monitoring of abstraction and surrounding boreholes within 1km radius of VGM02.
	Concentrated runoff as a result of the demolition activities during closure could lead to erosion, which may result in contamination of the water resources.	0	1	1	2	4	• All clean and dirty water infrastructures will be maintained up until completion of demolition and rehabilitation activities.
	Incorrect establishment and maintenance of the grey water system	1	1	4	1	7	• System must be contained. • Weekly checks and maintenance as required
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, wind erosion exposed surfaces, vehicle entrainment on the construction site, and tailpipe emissions from vehicles.	2	1	5	2	10	Fugitive dust suppression techniques to reduce emissions include: • Minimise areas stripped areas or areas of exposure • Areas around offices to be vegetated or paved • Daily surface treatment such as wet suppression (70%) during construction and decommissioning Establish a dust fallout monitoring programme with at least five dust fallout buckets around the proposed mining operations.
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	3	1	5	1	10	• Regular vehicle maintenance – logs kept on-site. • Limit vehicle movements to what is necessary by demarcating and fencing off zones.

Table 7.4: Impact assessment of the access and on-site haul roads (MRA and NEMA)							
Potential impact	**Activity description**	**P**	**E**	**D**	**I**	**S**	**Management measure**
Soil contamination and loss of viability	Construction of the roads will require that the topsoil is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly such as allowing mixing of the soils, it could lead to contamination and therefore loss of soil viability.	3	1	2	2	8	A log and plan of soil stripping and placement must be kept up to date on-site and must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report • Topsoil, subsoil and overburden must be stockpiled separately
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources and the subsequent loss of soil viability.	0	1	4	2	7	A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas. • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage. An incident reporting and remediation log must be kept on site. All vehicles and equipment must be serviced regularly and the logs kept on-site.
Surface and groundwater contamination	Spillage of coal, oils, grease, diesel, etc. could lead to the contamination of the water resources.	1	2	3	2	8	• All haul trucks must be covered (tarpaulin) and kept as clean as possible. • A waste management plan must be put in place that takes account of the aspects highlighted above. • An incident reporting and remediation log must be kept on site. All vehicles and equipment must be serviced regularly and the logs kept on-site.
	During construction and operation, the increase in the exposed area combined with wet suppression for dust control increases the potential for soil erosion and subsequent water resource contamination.	1	1	3	1	6	• Surface water runoff within the operational area must be contained by the trenches and pollution dam – daily checks by the designated responsible party must be logged.
Dust generation affecting air quality	Potential sources of particulate emissions include wind erosion of exposed surfaces, vehicle entrainment on the roads, and tailpipe emissions from construction and haul vehicles.	3	2	5	1	11	Fugitive dust suppression techniques to reduce emissions include: • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Surface treatment of haul roads as per mine plan • Daily surface treatment such as wet suppression in mining area (70%) Establish a dust fallout monitoring programme with dust fallout buckets around the proposed mining operations.
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	3	2	5	1	11	Regular vehicle maintenance – logs kept on-site. Limit vehicle movements to what is necessary by demarcating and fencing off zones.
Traffic and safety	Upgrading of farm access road and increased traffic in the east will result in a safety risk for labour in dwellings adjacent to the road	3	1	2	2	8	• Ensure area is fenced securely • Signage and vehicle speed restrictions - enforcement; • Road surface treatment to reduce dust and increase visibility
	Additional trucks on the R38 impacting farmer and farm activity safety e.g. cattle movement between lands	3	1	4	2	10	• Signage, speed restrictions and reduction mechanisms – especially at intersections with the R38; • Liaise directly with affected landowners for the movement of cattle across the R38 – minimise trucks from Vaalbult Colliery during key times

Table 7.5: Impact assessment of the opencast mining and trenches - initial box-cut, strip mining and trenching							
Potential impact	**Activity description**	**P**	**E**	**D**	**I**	**S**	**Management measure**
Soil contamination and loss of viability	The construction of the box-cut will require that the soil is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly such as allowing mixing of the soils, it could lead to contamination and therefore loss of soil viability.	1	1	3	2	7	A log and plan of soil stripping and placement must be kept up to date on-site and must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report • Topsoil, subsoil and overburden must be stockpiled separately
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources and the subsequent loss thereof.	0	1	3	1	5	A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas. • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage. • An incident reporting and remediation log must be kept on site. • All vehicles and equipment must be serviced regularly and the logs kept on-site.
	With the roll-over mining method the overburden and soils are removed and replaced in sequence - as close to the original sequence as is practically possible; however there will be a permanent change in structure, compaction and possibly permeability.	3	1	6	2	12	An updated plan and log of the backfilled areas (opencast and trenches) indicating the volumes of overburden, subsoil and topsoil in the correct sequence and using correct and recognised procedures must be kept on-site.
Loss of biodiversity	The removal of vegetation from the trench area in the southwest may result in loss of species habitat and therefore biodiversity	3	1	2	3	9	Weekly monitoring and reporting on the overall environmental status by the ECO, including any mitigation measures / actions required. This includes aspects on: • Surface restoration and sloping of backfilled trench; • Self-succession of vegetation and alien plant control • A six monthly biodiversity assessment of the site by a competent person.
	Generally removal of land from agriculture places additional grazing pressure on, or the transformation of, other areas. If the natural areas are fragmented then there will be displacement of fauna.	3	2	4	3	12	Establish an ecological management plan that includes: • Monitoring of grazing pressure • A grassland burning programme • Maintenance of corridors and free faunal movement • Maintenance and monitoring of recommended buffer zones (Biodiversity report – Appendix G)
Altering of aquifer state (groundwater)	Dewatering of the pit / trench will be required resulting in flow direction towards the excavation. This will lower the groundwater level locally and any possible pollution will be contained within the working area. The water levels should recover once dewatering has ceased.	3	2	3	2	10	Quarterly monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes.
Surface and groundwater contamination	Contamination of the aquifers surrounding the mining areas during active mining when the mining area is being dewatered as the groundwater flow gradients will be directed towards the mining area and thus any contamination will be confined to the direct vicinity of the mining area.	1	1	3	1	6	Quarterly monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes and surface water (quality) monitoring points.
	The backfilling and contouring of the mined areas will return the topography to as close as possible to the original status. If incorrectly undertaken this may change the natural drainage and may result in surface and groundwater contamination.	3	1	6	0	10	Regular survey of the backfilled areas to check contouring elevations and ensure that free flow of surface water occurs (with no ponding). An up to date plan of the rehabilitation must be kept on-site.
	Acid generation within backfilled areas may result in contamination through drainage into the surrounding groundwater resources	1	1	5	2	9	Quarterly monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes. Modelling of the results of the monitoring programme to predict migration of the possible pollution plume and determine any mitigation measures.
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, drilling and blasting, wind erosion of exposed surfaces, vehicle entrainment within pit surfaces, and tailpipe emissions from vehicles.	3	1	3	2	9	Fugitive dust suppression techniques to reduce emissions include: • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Daily surface treatment such as wet suppression (70%) Establish a dust fallout monitoring programme with dust fallout buckets around the proposed mining operations.
	Fly rock from blasting of overburden during opencast mining and trenching can impact agricultural activities	2	1	1	1	5	• After blasting 500 m radius around the blast area must be swept for fly rock to prevent this material from damaging agricultural equipment.
Air quality / safety	Spontaneous combustion of the coal from fracturing and oxidation (limited sulphides)	0	1	1	2	4	• Limit use of explosives and heavy machinery to reduce fracturing of the coal – generation of fines and oxidation • Keep fire prevention equipment onsite with appropriate emergency procedures
Noise generation / vibrations	Noise and vibrations will be generated from drilling and blasting, as well as noise from the movement of heavy earth moving machinery during operations.	3	2	3	1	9	• Monitoring of blasting vibrations on surrounding infrastructure – pre- and post-blasting assessment in consultation with landowners • The blasting schedule (times and frequency) must be published on-site and distributed to surrounding land users. A log of any correspondence must be kept on-site. • A suitably competent person must be assigned as responsible party to ensure that the correct design procedures are followed. The air blast and vibration must be monitored (logged) and controlled to ensure that health and safety of employees and people around the area are not affected (Regulations under the Mines Health and Safety Act). • Regular vehicle maintenance – logs kept on-site. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Scheduling of equipment within the pit (taking account of noise emissions from the equipment used in order to spread them out over the interface area).

Table 7.6: Impact assessment of the high wall mining operations – mining							
Potential impact	**Activity description**	**P**	**E**	**D**	**I**	**S**	**Management measure**
Altering of aquifer state (groundwater)	Dewatering of the high wall sections may be required resulting in flow direction towards the excavation (this water will be used in the operations of the high wall miner). This will lower the groundwater level locally and any possible pollution will be contained within the pollution control facility. The water levels should recover once dewatering has ceased.	3	1	2	2	8	• Construction of an in trench sump at the lowest point to collect water for reuse in the operations. • Quarterly monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes.
Surface and groundwater contamination	Acid generation within the sealed and rehabilitated areas may result in contamination through drainage into the surrounding groundwater resources	1	2	5	2	11	• Sealing of high wall mining sections as per the mine plan to reduce oxidation. Materials used for sealing must be stable and able to withstand long-term break down in subsurface environments. • Excess water from the operations may be pumped into the drives before sealing to further reduce oxidation. • Quarterly monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes. Modelling of the results of the monitoring programme to predict migration of the possible pollution plume and determine any mitigation measures.
Air quality / safety and subsidence	Spontaneous combustion of the remaining coal pillars from oxidation (limited sulphides)	0	1	2	2	5	• High wall miner limits fracturing of the coal pillar – fines and oxidation • Removal of loose coal from mined sections • Sealing of high wall mining drives and exposed high wall ends of strip pillars daily as per the mine plan to reduce oxidation and limit oxygen within the mined area (required for combustion). Materials used for sealing must be stable and able to withstand long-term break down in subsurface environments • Excess water from the operations may be pumped into the drives before sealing to further reduce oxidation • Keep fire prevention equipment onsite with appropriate emergency procedures
Noise generation	Noise will be generated from the high wall miner as well as by the movement of heavy vehicles during operations.	3	1	3	1	8	• Regular equipment / vehicle maintenance – logs kept on-site. • Mufflers / noise reducers to be installed where possible.

Table 7.7: Impact assessment of the stockpile areas – topsoil, subsoil and overburden							
Potential impact	**Activity description**	**P**	**E**	**D**	**I**	**S**	**Management measure**
Soil contamination and loss of viability	The placement and separation of the topsoil, subsoil and overburden within the stockpile area. If separation of the material types does not take place, or is done incorrectly such as allowing mixing of the soils, it could lead to contamination and therefore loss of soil viability.	2	1	1	2	6	A log and plan of soil placement must be kept up to date. This must take account that: • Stripping and stockpiling according to the soil survey report • Topsoil must not be more than 1.5 m high • Overburden stockpiles must not exceed a height of 15m with associated safe gradient.
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources and the subsequent loss of soil viability.	0	1	1	2	4	Maintenance may only be carried out within specifically constructed designated area - impervious layer • A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas. • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage. • An incident reporting and remediation log must be kept on site. • All vehicles and equipment must be serviced regularly and the logs kept on-site.
Loss of biodiversity	The removal of vegetation from the area for the western overburden stockpile may result in loss of species habitat and therefore biodiversity	3	1	3	2	9	Minimal materials handling once stockpile is established, until it is required for backfilling of trenches • Restrict access to stockpile area • Self-succession of vegetation and alien plant control • A six monthly biodiversity assessment of the site by a competent person must be undertaken.
Surface and groundwater contamination	Spillage of oils, grease, diesel, etc. could lead to the contamination of the water resources.	0	1	1	2	4	• Maintenance may only be carried out within specifically constructed designated area - impervious layer • A waste management plan must be put in place (as above)
	Altering natural surface drainage paths and water volumes through the establishment of the overburden stockpile and PCD	3	1	3	2	9	No mitigation / management measure possible
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, levelling area, materials handling operations, wind erosion exposed surfaces, vehicle entrainment on site, and tailpipe emissions from vehicles.	2	1	1	2	6	Fugitive dust suppression techniques to reduce emissions include: • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Daily surface treatment such as wet suppression (70%) • Self-vegetation of long-term stockpiles and if this has not happened after the first wet season then seeding may be required. Establish a dust fallout monitoring programme at the operations.
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	3	1	1	1	6	• Regular vehicle maintenance – logs kept on-site. • Limit vehicle movements to what is necessary by demarcating and fencing off zones.

Table 7.8: Impact assessment of the stockpile pads – ROM with screening / sizing as required							
Potential impact	**Activity description**	**P**	**E**	**D**	**I**	**S**	**Management measure**
Soil contamination and loss of viability	The construction of the stockpile area will require that the topsoil is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly, it could lead to contamination of the soil and therefore loss of soil viability.	3	1	1	2	7	A log and plan of soil stripping and placement must be kept up to date. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report
	The placement and separation of the ROM from the topsoil; subsoil and overburden. If separation does not take place, or is done incorrectly such as allowing mixing of the soils and coal, it could lead to contamination and therefore loss of soil viability.	1	1	5	2	9	A log and plan of the ROM coal stockpiled and removed must be kept up to date. This must take account that: • ROM must be stockpiled separately from the overburden and soils • Stockpiles must not exceed a height of 25m with associated safe gradient.
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources and the subsequent loss of soil viability.	1	1	5	2	9	Maintenance may only take place in designated workshop area A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas. • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage. • An incident reporting and remediation log must be kept on site. • All vehicles and equipment must be serviced regularly and the logs kept on-site.
Surface and groundwater contamination	Spillage of oils, grease, diesel, etc. could lead to the contamination of the water resources.	0	1	5	1	7	
	The placement and separation of the ROM from the topsoil; subsoil and overburden. If separation does not take place, or is done incorrectly such as allowing mixing of the soils and coal, it could lead to water contamination through increased acid mine generation when the stockpiled material is replaced during rehabilitation.	1	1	4	2	8	A log and plan of the ROM coal stockpiled and removed must be kept up to date. This must take account that: • ROM must be stockpiled separately from the overburden and soils • Stockpiles must not exceed a height of 15m with associated safe gradient. • Correct clean and dirty water separation must take place (construction) Quarterly monitoring and internal reporting on the surface and groundwater (quality and elevation) for the monitoring boreholes.
	Incorrect design and preparation of the stockpile area could lead to contamination of surface and groundwater resources.	2	1	3	2	8	Correct compaction and design linked to stormwater management system.
	Concentrated runoff / surface wash from stockpiled coal as a result of surface exposure, which may result in contamination of the water resources.	3	1	5	2	11	Surface water runoff within the operational area must be contained by the trenches and pollution dam – daily checks by the designated responsible party must be logged.
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, levelling area, materials handling operations (including screening / sizing of coal), wind erosion exposed surfaces, and tailpipe emissions from vehicles.	2	2	5	2	11	Fugitive dust suppression techniques to reduce emissions include: • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Daily surface treatment such as wet suppression (70%) Establish a dust fallout monitoring programme with dust fallout buckets around the proposed mining operations. A log and plan of the ROM coal stockpiled and removed must be kept up to date. This will assist in monitoring the ROM coal storage periods – ideally this should be of short duration.
Air quality / safety	Spontaneous combustion of the coal from oxidation (limited sulphides)	1	1	1	1	4	• Limit materials handling both in stockpiling and when screening the coal – generation of fines and oxidation • Free air flow around stockpile – reduce heat generation • Dust suppression of the area – limit fine fraction oxidation and reduce heat • Limit storage time of stockpiled material prior to transport to the washing facility • Keep fire prevention equipment onsite with appropriate emergency procedures
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	3	1	5	1	10	• Regular vehicle maintenance – logs kept on-site. • Limit vehicle movements to what is necessary by demarcating and fencing off zones.
	Noise will be generated through the implementation of the screening / coal sizing processes	3	1	3	1	8	• Regular maintenance of screening equipment plants to ensure good working order – logs kept on-site. • Noise reducers on machinery to be used where possible.

Table 7.9: Impact assessment of the stormwater and pollution control measures (trenches, berms and pollution control dams) (MRA and NEMA)

Stormwater management requires the effective separation of clean and dirty water. The extent of the dirty water area must be minimised as far as possible and clean water must be allowed to flow naturally within the catchment. The planned system is 'closed' as far as possible. This involves the collection of dirty water within the pollution control / return-water dams for reuse as dust suppression within dirty water areas and high wall mining operations. The planned stormwater and pollution control measures are provided in Figure 8.1 with the details of design provided in Appendix B.

Potential impact	Activity description	P	E	D	I	S	Management measure
Soil contamination and loss of viability	The construction of the trenches, berms and the pollution control dams will require that the topsoil is removed and either stockpiled (or used to create clean water division berms) for rehabilitation on closure or used to top-dress the berms. Incorrect stripping could lead to soil contamination.	2	1	1	2	6	A log and plan of soil stripping and placement must be kept up to date. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report
	Mixing of topsoil and subsoil during construction of the berms	1	1	1	2	5	Environmental Compliance Officer (ECO) must be present during construction to aid with soil identification and must sign off the process followed. A log of the excavation and construction must be kept.
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources and the subsequent loss of soil viability.	0	1	1	2	4	Maintenance of vehicles and equipment may only take place in designated areas. A waste management plan must be put in place that takes account of the following: • Oils, grease, diesel and other chemicals will be stored in the prescribed manned and within bounded areas. • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage. • An incident reporting and remediation log must be kept on site. • All vehicles and equipment must be serviced regularly and the logs kept on-site.
Surface and groundwater contamination	Surface run-off will be altered through the creation of various clean water diversion berms, dirty water cut-off trenches, and pollution control dams which will be established as part of the water management system around the mining area. Incorrect construction or ineffective maintenance could lead to pollution from the mixing of dirty and clean water.	1	2	5	2	10	ECO / civil engineer must be present during construction to ensure compliance with the design, that takes account of: • The 1:50 year runoff volumes from the dirty water area. • Slope stability, aided by self-succession of vegetation without being obstructive. • A signed-off log of the phases of construction (in compliance with the approved design) and maintenance of the pollution control dam must be kept on-site – daily checks by the designated responsible party must be logged.
	Spillage of oils, grease, diesel, etc. could lead to the contamination of the water resources.	0	1	1	2	4	• Maintenance of vehicles and equipment may only take place in designated areas. • A waste management plan must be put in place (as above)
Dust generation affecting air quality	Potential sources of particulate emissions include wind erosion of exposed surfaces, materials handling, and tailpipe emissions from vehicles.	2	1	5	2	10	Fugitive dust suppression techniques to reduce emissions include: • Surface treatment such as wet suppression (70%) • Natural succession of vegetation or seeding on berms • Vehicle weight - prevent overloading by daily spot checks Establish a dust fallout monitoring programme with dust fallout buckets around the proposed mining operations.
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	3	1	1	1	6	• Regular vehicle maintenance – logs kept on-site. • Limit vehicle movements to what is necessary by demarcating and fencing off zones.

7.3 Cumulative impacts

Some of the impacts assessed per mining activity in Section 7.2 are potentially cumulative (i.e. each impact cannot be viewed in isolation, but rather as a composite where each incident adds to the impact of the previous one with potentially long-term or permanent affects). The impact significance of the cumulative impacts, if not mitigated is likely to be moderate to high. The impacts that have been identified as potentially cumulative within the proposed mining area are (Table 7.10):

- Traffic and safety through increased trucks on the R38 moving through Carolina (during operation)
- Acid mine drainage and associated water resource pollution (contamination – post closure)

Table 7.10: Cumulative impact assessment of the mining operations

Activity description	P	E	D	I	S	Management measure
Increased truck traffic on the R38 moving through Carolina resulting in safety and road maintenance issues	3	3	4	1	11	Although Vaalbult Colliery plans to use existing trucks on their return trip from Hendrina Power Station to Eastside Colliery, there will be an increase in trucks on the R38 between Vaalbult and Eastside. This not only has safety issues with regard to the number of trucks, but also may result in a cumulative impact on road integrity and maintenance. • Liaise with the local municipality in terms of planning with regular meetings (quarterly) to address any issues. • Actively participate in any planning forums established by the municipality. • Signage, speed restrictions and reduction mechanisms – especially at intersections with the R38 and through Carolina. • Monitor truck drivers – speed, overloading and safety awareness (annual review). • Minimise trucks from Vaalbult Colliery during key / peak times.
Cumulative impact of acid generation from within the Vaalbult sealed and rehabilitated areas and surrounding mines impacting surface water quality	1	2	5	2	10	Although Vaalbult Colliery is not likely to be acid generating if the mine plan is followed and mitigation / management measures to reduce oxidation of the high wall mining sections are put in place, the existence of other coal mines in the vicinity may result in minimal acid generation having a cumulative effect. • Actively participate in ICMA forums for the area – water users. • Ensure barrier pillars between mined sections are maintained. • Sealing of high wall mining sections as per the mine plan to reduce oxidation. • Long-term monitoring on the final void pits and groundwater (quality and elevation) for the monitoring boreholes and adjacent farms. • Modelling of the results of the monitoring programme to predict migration of the possible pollution plume and determine any passive treatment mitigation measures required.

7.4 Summary of assessment

The main impacts from the proposed mining operation relate to soil, water, biodiversity, and air quality – more specifically lack of suitable soil for rehabilitation, water resource availability during operation, biodiversity (and red data species) protection, dust generation from the operations, and long-term impacts of acid mine drainage post-closure, and. The mitigation of these impacts, where possible, is incorporated in the EMP (Section 8).

8. ENVIRONMENTAL MANAGEMENT PLAN (IMPACT MITIGATION)

An EMP is aimed at providing management measures to reduce or mitigate the environmental impacts highlighted in the EIA. Management strategies are based on the BATNEEC principle (Best Available Technology Not Exceeding Excessive Cost). Wherever possible, management strategies will be incorporated into the mine systems to avoid, or appropriately manage, impacts from the outset.

The environmental management measures provided in this section are as follows:

- Management measures for activities during construction, operation and closure.
- The environmental monitoring programme
- The waste management plan
- The environmental awareness programme (including health and safety and reporting)
- Maintenance and emergency procedures

Implementation of the management measures and plans will be undertaken by the relevant party/ies (primarily the appointed mine manager), with monitoring of compliance by the appointed Environmental Compliance Officer. A check list to identify the responsible parties for the various mitigation / management measures, as well as monitoring frequency will be used for audit purposes.

8.1 Objective and goals

The overall objectives are to minimise operational impacts and rehabilitate the disturbed areas back to agricultural use, ensure that the site is made safe, and to control erosion and pollution emanating from the proposed mining activities (Table 8.1).

8.2 Management measures

8.2.1 Design changes

To reduce the area of disturbance and as a result of the specialist studies the infrastructural layout of the mine plan has been amended from that originally provided in the mining work programme. This amendment has affected the following changes as represented in Figure 8.1:

- The office complex area has been refined and reduced to a total area of 0.13 ha. In addition, this area has been moved southwards along the boundary outside the high ecological sensitivity zone to an area that is classified as low ecological sensitivity. Existing farm infrastructure will be used for the first few years of operation.
- Removal of the additional ROM stockpile in the southwest for Phase 2 of the western mining section. This area has been replaced by a 0.11 ha concrete lined screening area linked to a sump located in the southwest corner of the mining right area (see Figure 8.1).

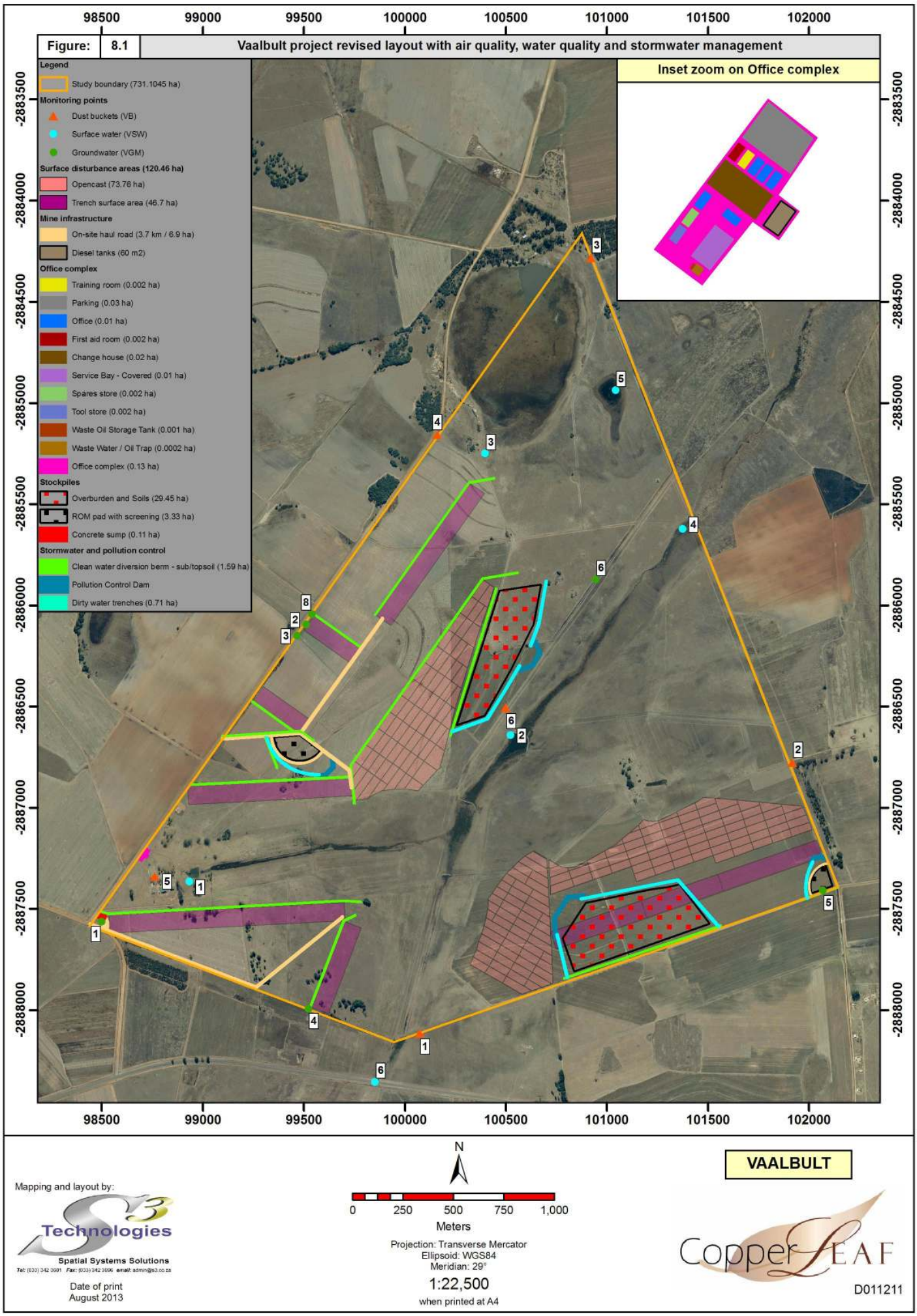
Figure: 8.1
Vaalbult project revised layout with air quality, water quality and stormwater management
Inset zoom on Office complex
Legend
Study boundary (731.1045 ha)
Monitoring points
Dust buckets (VB)
Surface water (VSW)
Groundwater (VGM)
Surface disturbance areas (120.46 ha)
Opencast (73.76 ha)
Trench surface area (46.7 ha)
Mine infrastructure
On-site haul road (3.7 km / 6.9 ha)
Diesel tanks (60 m2)
Office complex
Training room (0.002 ha)
Parking (0.03 ha)
Office (0.01 ha)
First aid room (0.002 ha)
Change house (0.02 ha)
Service Bay - Covered (0.01 ha)
Spares store (0.002 ha)
Tool store (0.002 ha)
Waste Oil Storage Tank (0.001 ha)
Waste Water / Oil Trap (0.0002 ha)
Office complex (0.13 ha)
Stockpiles
Overburden and Soils (29.45 ha)
ROM pad with screening (3.33 ha)
Concrete sump (0.11 ha)
Stormwater and pollution control
Clean water diversion berm - sub/topsoil (1.59 ha)
Pollution Control Dam
Dirty water trenches (0.71 ha)
98500
99000
99500
100000
100500
101000
101500
102000
-2883500
-2884000
-2884500
-2885000
-2885500
-2886000
-2886500
-2887000
-2887500
-2888000
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0
250
500
750
1,000
Meters
Projection: Transverse Mercator
Ellipsoid: WGS84
Meridian: 29°
1:22,500
when printed at A4
VAALBULT
Mapping and layout by:
Technologies
Spatial Systems Solutions
Date of print
August 2013
CopperLEAF
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Table 8:1: Environmental objectives related to aspect

Aspect	Objectives
Topography	• To mitigate topographic impacts created during the operational phase and restore the topography to as close to its original form as possible • To minimise spontaneous combustion of coal strip pillars from high all mining with subsequent subsidence and continuance of coal combustion
Geology	• To limit the impact on the mining area by limiting the size of the area disturbed by mining and ensuring proper stockpiling of the overburden and soils for use during rehabilitation
Soils	• To mitigate long-term soil contamination impacts • To maintain the viability of the soils for future rehabilitation purposes • To ameliorate altered physical and chemical properties of soils caused by stripping, handling and stockpiling • To install and maintain long-term erosion control structures using natural vegetation and stand-alone methods • To ensure proper and effective dust monitoring measures are put in place • To prevent the possible contamination of soils along the roads, and around the mining operational area
Land capability & use	• To reduce the area that is to be disturbed, and contain the impacts on the natural habitat caused by mechanised equipment • To restore the affected surface area to agricultural use based on the current pre-mining land use activities
Biodiversity	• To reduce the impact on the natural biodiversity in the area by limiting mining activities to the designated areas and maintaining buffers as defined • To control weed/alien plant invasion • Encourage vegetation to control erosion • To ensure proper rehabilitation and natural succession occurs so that the natural habitats can be restored
Hydrogeology	• To ensure the most effective water management of the mining site
Noise / vibration	• To ensure blasting events are guided by the Mines Health and Safety Act • To ensure that the blasting events are controlled and monitored • To reduce the impact of mining noise on the overall environment, and within the mining areas in particular
Visual	• To limit the visual impact of the mining activities to the road-users and local residence of the area
Socio-economic	• To limit the socio-economic impacts as a result of cessation of the mining activities as highlighted in the mine's social and labour plan
Maintenance	• To monitor and manage post-closure impacts until closure is obtained
Infrastructure	• To ensure that the components are properly removed and disposed of within the rehabilitation plan
Waste	• To minimise waste production • To collect, reuse or recycle waste where possible • To collect and dispose of all remaining waste at a permitted / licenced disposal site

Additional amendments to the mine plan layout will be required for the trench located near the secondary aquifer located at monitoring borehole VGM02. This trench is planned to be mined in year 3. Additional hydrogeological studies prior to the commencement of trenching in year 2 will refine the layout.

This section provides the mitigation and management measures of the impacts highlighted in the EIA (Section 7) during construction, operation, decommissioning and closure phases of the proposed mining operation. As indicated in Sections 3.5.1 and 7.1.1 the pre-construction land preparation includes:

- Fencing of the area for health and safety;
- Stripping of vegetation from construction areas; and
- Removal and stockpiling of topsoil (according to the soils assessment) from construction areas for replacement on rehabilitation / decommissioning.

8.2.2 Construction

Construction of the following is included as per the design / layout plan for Phase 1 and 2 of the operations – western section years 1 to 9 (see Figure 8.1 and Appendix B). Similar mitigation measures will be required for the eastern section:

- Access and onsite haul roads
    - Surfacing of access from the Leliefontein Road with a binding agent.
    - Access and security office from the Leliefontein Road.
    - Onsite haul roads.
    - Coal truck tarpaulin installation area.
- ROM and overburden stockpile areas
- Pollution control dams (PCD1 and 2) and stormwater control structures.
- Office complex
    - Offices, stores, first aid and training rooms, change house / ablutions, and parking area (with visibility berm).
    - Workshop / service bay (with bunded waste water / oils traps and storage).
    - Diesel storage (with bunding and sump).
    - Water, sewage and electricity distribution installation.
- Initial box-cut for opencast mining (year 1) and trenching (year 2 onwards)

The construction activities therefore include:

- Stripping of vegetation from the areas to be disturbed (where required).
- Removal and stockpiling of topsoil (minimum 300 mm depth) from the areas to be disturbed and placing the topsoil per soil type in stockpiles of no more than 1.5 m in height in the demarcated area – most of the topsoil and subsoil will be used as visibility or clean water diversion berms upslope of the operating area (see Table 8.2 for management measures).
- Construction of onsite access roads with tarpaulin installation area (adjacent to ROM stockpile area) as per the mine plan, and surfacing of the gravel access road from the R38 to the ROM stockpile pad. See Table 8.3 for management measures.
- Preparation of the ROM stockpile pad with removal of subsoil and rock (where required) from the base areas to ensure correctly engineered fill and compaction of material to reduce permeability and support the cumulative loads of 60,000 tonnes per month as well as vehicular traffic. See Table 8.4 for management measures.
- Preparation of the overburden stockpile area (see Table 8.5 for management measures).
- Construction of the stormwater and pollution control measures this includes (see Table 8.6 for management measures):
    - Excavation and construction of dirty water trenches and clean water diversion berms (as per the civil designs - see Appendix B). The excavated material from the trenches will be used to construct the clean water diversion berms.
    - Excavation and construction of the PCDs, as per the civil designs (see Appendix B). The excavated material (excluding topsoil) will be used for berms and the topsoil will be stockpiled either within the designated area, or used to vegetate the clean water side of the PCD (where applicable).

- Construction of the office complex that includes the following (See Table 8.7 for management measures):
    - Removal of subsoil and rock (where required) from the base areas of the workshop / service bay area with the placement of correctly engineered backfill and concrete to ensure sufficient foundation for the service area loads. The material removed from this area will be used to establish a visual berm west of the office complex area.
    - The construction of the bunded diesel storage. This includes removal of subsoil, correct compaction, and concrete foundations / bunding linked to a sump.
    - The establishment of prefabricated offices, stores, change houses (ablutions), training and first aid rooms within the demarcated area.
    - Installation of water storage tanks, chemical toilets and grey water filter system.
    - Installation of water and electricity distribution system.
- Construction of the initial box cut for opencast mining (and subsequent trenching and high wall mining) that includes the following (See Table 8.8 for management measures):
    - The stripping and stockpiling of soft material with an excavator and trucks (see Section 3.3.1).
    - The drilling and blasting of the remaining hard rock overburden to enable removal and stockpiling with an excavator and truck operation to expose the coal (see Section 3.3.1).

Construction will be undertaken by an appointed contractor. A 'Contractor's Pack' will be signed by all contractors in terms of Mine Health and Safety prior to commencement on site. The emergency preparedness plan and mine health and safety for these contractors will form part of the contractor's pack (see Appendix L).

Table 8.2: Construction of topsoil stockpiles - management measure					
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Responsible party**
Soil contamination and loss of viability	The construction of the stockpile area will require that the topsoil is removed and stockpiled for rehabilitation. If this stripping does not take place the weight and disturbance by the various infrastructure could lead to loss of soil viability.	6	A log and plan of soil stripping and placement must be kept up to date on-site. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report – soil type – average 60 to 90 cm (use of the interactive database must be made) • Stripping and stockpiling of a minimum of 300 mm seed stock layer in grassland areas (if required). • Most of the topsoil will be used to create visibility or clean water diversion berms – these should not allow mixing of topsoil / soil types • Topsoil stockpiles / berms must not exceed a height of 1.5 m (1.2 m where pre-stripping does not take place) • Topsoil, subsoil and overburden must be stockpiled separately	Daily log with monthly plan updates throughout construction	Civils contractor
	The placement and separation of the topsoil, subsoil and overburden within the stockpile area. If separation of the material types does not take place, or is done incorrectly such as allowing mixing of the soils, it could lead to contamination and therefore loss of soil viability.	6			
Surface and groundwater contamination	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	4	All vehicles and equipment must be serviced regularly within designated area only and the logs kept on-site. An incident reporting and remediation log must be kept on site and include. • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Civils contractor
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, levelling area, materials handling operations, wind erosion exposed surfaces, vehicle entrainment on site, and tailpipe emissions from vehicles.	6	Fugitive dust suppression techniques to reduce entrainment and emissions include: • Stripping should ideally not take place at the end of winter (dry conditions and high winds) – timing of materials handling should take account of actual local conditions being experienced. • Cleared areas to be kept to a minimum. • Daily surface treatment of stockpile area with clean water (wet suppression, 70%) where required. • Self-vegetation of long-term stockpiles and if this has not happened after the first wet season then seeding with the correct mix may be required. Topsoil from natural vegetation areas contains the seed stock for rehabilitation.	Daily wet suppression with clean water as required.	Civils contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	6	• Regular vehicle maintenance – logs kept on-site. • Operations during daylight hours only. • Limit vehicle movements to what is necessary by demarcating and fencing off zones.	Ad hoc spot checks by ECO	Civils contractor

Table 8.3: Construction of access and on-site haul roads and tarpaulin installation area - management measures (MRA and NEMA)					
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Responsible party**
Soil contamination and loss of viability	Construction of the roads and tarpaulin installation area will require that the topsoil is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly such as allowing mixing of the soils, it could lead to contamination and therefore loss of soil viability.	8	A log and plan of soil stripping must be kept up to date on-site. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report – soil type - average 60 to 90 cm (use of the interactive database must be made) • Topsoil, subsoil and overburden must be stockpiled separately (use of the topsoil and subsoil for visual and clean water diversion berms may take place)	Daily log	Civils contractor
Surface and groundwater contamination	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	7 8	All vehicles and equipment must be serviced regularly and the logs kept on-site. Maintenance and compliance testing of vehicles to take place in designated service areas only. An incident reporting and remediation log must be kept on site and include: • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Civils contractor
	Construction of the tarpaulin installation area needs to ensure correct compaction and design according to engineering specifications	6	• Minimise water ponding and infiltration • Compaction to minimise material available to water erosion. • Correct slopes and gradients to direct water flow off area. • Link area to stormwater management and pollution control structures.	Daily site check with logging of findings	Civils contractor
	During construction and operation, the increase in the exposed area combined with wet suppression for dust control increases the potential for soil erosion and subsequent water resource contamination.	6	• Surface water runoff within the area must be contained by temporary stormwater cut-off drains during construction.	Weekly site check or within 24 hrs of rainfall event	Civils contractor
Dust generation affecting air quality	Potential sources of particulate emissions include wind erosion of exposed surfaces, vehicle entrainment on the roads, and tailpipe emissions from construction vehicles.	11	Fugitive dust suppression techniques to reduce emissions and air quality impact include: • Limiting exposed surfaces and vehicular traffic to established planned / demarcated onsite roads. • Surface treatment of gravel access roads and onsite haul roads in high traffic areas (access road to ROM stockpile area) as per manufacturer's instructions • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Wet suppression (70%) where required – suppression with dirty water may only be within the dirty water area.	Daily wet suppression	Civils contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	11	• Regular vehicle maintenance – logs kept on-site. • Use mufflers / noise reducers on equipment where appropriate • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Only operate during daylight hours	Ad hoc spot checks by responsible party	Civils contractor
Traffic and safety	Upgrading of farm access road and increased traffic in the east will result in a safety risk for labour in dwellings adjacent to the road	8	Safety measures to be put in place: • Ensure areas where there are dwellings adjacent to the access road are adequately fenced. • Installation of signage, speed restrictions and reduction mechanisms – especially at intersections with the R38 and where dwellings are adjacent to the road. • Road surface treatment with binding agent as per manufacturer's instructions to reduce dust and increase visibility	Ad hoc spot checks by responsible party	Civils contractor

Table 8.4: Construction of the ROM stockpile areas with portable screening / sizing plant - management measures					
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Responsible party**
Soil contamination and loss of viability	The construction of the stockpile area will require that the topsoil, subsoil (and possibly some weathered rock) is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly, it could lead to contamination of the soil and therefore loss of soil viability.	7	A log and plan of soil stripping must be kept up to date on-site. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report – soil type - average 60 to 90 cm (use of the interactive database must be made) • Topsoil, subsoil and overburden must be stockpiled separately (use of the topsoil and subsoil for visual and clean water diversion berms may take place)	Daily log with monthly plan updates	Civils contractor
Surface and groundwater contamination (and wetland areas)	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	9 7	All vehicles and equipment must be serviced regularly within designated area only and the logs kept on-site. An incident reporting and remediation log must be kept on site and include: • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Civils contractor
	Incorrect design and preparation of the stockpile areas could lead to contamination of surface and groundwater resources in the long-term	11	• Reduced permeability through backfill with suitable material (where required) and compaction of the ground after stripping of the topsoil and some subsoil) • Compaction to minimise material available to water erosion – measure compaction and permeability values. • Minimise water ponding and infiltration • Correct slopes and gradients to direct water flow off area. • Link areas to stormwater management and pollution control structures as designed.	Daily site check and logging	Civils contractor
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, levelling area, materials handling operations, wind erosion exposed surfaces, and tailpipe emissions from vehicles.	11	Fugitive dust minimisation / suppression techniques to reduce emissions include: • Regular vehicle maintenance to minimise emissions – logs kept on-site • Limit materials handling to what is necessary • Compaction of the exposed surface immediately after placement of base material during construction • Creation of berms and containment structures to minimise dust migration over the long-term (mine layout plan) • Reduce exposed surfaces by minimising areas of disturbance and vegetating areas adjacent to the ROM stockpile pad. Vegetating of this area should be with a variety of low growing grasses and succulents that will not create a fire risk. • Wet suppression (70%) of exposed surfaces where required.	Daily wet suppression during materials handling	Civils contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	10	• Regular vehicle maintenance – logs kept on-site. • Use mufflers / noise reducers on equipment where appropriate. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Only operate during daylight hours	Ad hoc spot checks by responsible party	Civils contractor

Table 8.5: Preparation of the overburden stockpile area - management measures					
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Responsible party**
Soil contamination and loss of viability	The preparation and placement of the topsoil, subsoil, and hard overburden within the stockpile area (as applicable) will require that the topsoil, subsoil (and possibly some weathered rock) is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly, it could lead to contamination of the soil and therefore loss of soil viability.	6	A log and plan of soil stripping must be kept up to date on-site. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report – soil type - average 60 to 90 cm (use of the interactive database must be made) • Topsoil, subsoil and overburden must be stockpiled separately (use of the topsoil and subsoil for visual and clean water diversion berms may take place)	As required	Civils contractor
Surface and groundwater contamination	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	4	All vehicles and equipment must be serviced regularly at the designated areas only and the logs kept on-site. An incident reporting and remediation log must be kept on site and include: • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Civils contractor
	Incorrect design and preparation of the facility could lead to contamination of surface and groundwater resources	8	Correct design and construction of the facility linked to a dirty water drainage system by a certified engineer.	Daily checks / As required	Civils contractor in consultation with design engineer Alan Robinson
Loss of biodiversity	The removal of vegetation from the area for the western overburden stockpile may result in loss of species habitat and therefore biodiversity	9	• Minimal materials handling once stockpile is established, until it is required for backfilling of trenches • Restrict access to stockpile area • Self-succession of vegetation and alien plant control	Daily checks / As required	Civils contractor in consultation with ECO
Dust generation affecting air quality	Potential sources of particulate emissions include clearing vegetation, levelling area, materials handling, wind erosion of exposed surfaces, vehicle entrainment on site, and tailpipe emissions from construction vehicles.	6	Fugitive dust suppression techniques to reduce emissions include: • Undertake base preparation in stages to limit exposed surfaces • Limit materials handling to what is necessary • Surface treatment such as wet suppression (70%) where possible • Vehicle speed and load restrictions to minimise dust entrainment - signage and enforcement; • Regular vehicle maintenance within designated areas only – logs kept on-site.	Daily site checks	Civils contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	6	• Regular vehicle maintenance within designated areas only – logs kept on-site. • Use mufflers / noise reducers on equipment where appropriate. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Only operate during daylight hours.	Ad hoc spot checks by responsible party	Civils contractor

Table 8.6: Construction of the stormwater (clean water) and pollution control measures (dirty water) – trenches, berms and pollution control dams - management measures (MRA and NEMA)

Stormwater management requires the effective separation of clean and dirty water. The extent of the dirty water area must be minimised as far as possible and clean water must be allowed to flow naturally within the catchment. Within the Vaalbult Colliery area the planned system is a closed system as far as possible to reduce the volume of water required from abstraction. This involves the collection of dirty water from the ROM and overburden stockpiles within pollution control dams for reuse in the mining operations and dust suppression within the dirty water areas. The planned stormwater and pollution control measures are provided in Figure 8.1 with the details of design provided in Appendix B. No coal may be extracted without this system having been constructed and signed off as operational by the design engineer.

Potential impact	Activity description	S	Management measure	Frequency	Responsible party
Soil contamination and loss of viability	The construction of the trenches, berms, and pollution control dams will require that the topsoil is removed and either stockpiled (or used to create clean water diversion berms) for rehabilitation on closure or used to top-dress berms in clean water areas. If this stripping does not take place, or is done incorrectly, it could lead to contamination and therefore loss of soil viability	6	A log and plan of soil stripping and placement must be kept up to date. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report – soil type • Stormwater berms may only make use of topsoil if on the clean water side of a dirty water trench	Daily log with monthly plan updates	Civils contractor
	Mixing of topsoil and subsoil during construction of the berms	5	ECO must be present during construction to aid with soil identification and must sign off the process followed. A log of the excavation and construction must be kept.	Ad hoc during construction	Civils contractor in consultation with ECO
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	4	All vehicles and equipment must be serviced regularly at the designated areas only and the logs kept on-site. An incident reporting and remediation log must be kept on site and include: • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Civils contractor
Surface and groundwater contamination	Surface run-off will be altered through the creation of various clean water diversion berms, dirty water cut-off trenches and pollution control dams, which will be established as part of the water management system around the area. Incorrect construction could lead to pollution from the mixing of dirty and clean water.	10	• Remove water from within existing excavations where necessary and utilise for dust suppression • Correct design and construction of the facility drainage system by a certified engineer. • Lining of the dams to be installed correctly. • Lining of the trenches (as per the design). • A signed-off log of the phases of the construction (in compliance with the approved design) must be kept on-site. • Slope stability of the berms, aided by self-succession of vegetation without being obstructive. • ECO / civil engineer must be present during construction to ensure compliance with design	Daily site checks and logging / As required	Civils contractor in consultation with Alan Robinson
Dust generation affecting air quality	Potential sources of particulate emissions include wind erosion of exposed surfaces, materials handling, and tailpipe emissions from vehicles.	10	Fugitive dust suppression techniques to reduce emissions include: • Limit materials handling and take account of local wind conditions • Avoid construction at the end of winter, where possible • Surface treatment such as wet suppression (70%) where possible • Natural succession of vegetation or seeding on berms	Daily wet suppression	Civils contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery during construction and decommissioning.	6	• Regular vehicle maintenance at designated area only – logs kept on-site. • Use mufflers / noise reducers on equipment where appropriate. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Only operate during daylight hours.	Ad hoc spot checks by responsible party	Civils contractor

Table 8.7: Installation of the office complex – offices, change house / ablutions, workshop area, diesel store and security – management measures

Note: The establishment of prefabricated offices, stores, change houses (ablutions), training and first aid rooms within the demarcated area does not require additional management.

Potential impact	Activity description	S	Management measure	Frequency	Responsible party
Soil contamination and loss of viability	Site preparation for the construction of the workshop / service bay area, and grey water filtration system; as well as for the erection of offices, stores, parking area, training room, first aid room, and change house / ablution facilities and installation of water distribution system will require that the topsoil is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly, it could lead to contamination and therefore loss of soil viability.	7	A log and plan of soil stripping must be kept up to date on-site and must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping according to the soil survey report - soil type –average 60 to 90 cm, especially for the workshop and grey water system areas • Topsoil (and subsoil where applicable) to be use of for a visual berm – soil types must be kept separate.	Daily log with monthly plan updates throughout construction	Civils contractor
	The mixing of concrete for the base of the workshop / service bay and diesel storage areas could lead to the contamination of soil resources and the subsequent loss of soil viability	8	• Concrete must be mixed close to / within area of use and contained within a designated impervious surface area. • Pre-mix concrete should be used for large areas. • Any spills must be removed and disposed of off-site.	As required	Civils contractor
	Maintenance of vehicles and equipment on exposed surfaces could lead to the contamination of soil resources and the subsequent loss of soil viability.	9	• All vehicles and equipment must be serviced regularly and the logs kept on-site. • No maintenance may take place outside the designated area which has been prepared with an impermeable layer linked to a sump and the dirty water system.	As required	Civils contractor
	Incorrect storage of oils, grease, diesel, etc. could lead to the contamination of soil resources and the subsequent loss of soil viability.	9	• Oils, grease, and other chemicals will be stored in the prescribed manned on impervious (concrete bases) with an oil trap (bunded area) and within sealed containers. • Diesel tanks must be constructed according to SANS 10131:2004 specifications (bunded concrete structure with sump). • The materials and prescribed procedure for minor spillage and rehabilitation must be accessible – posters on-site and marked materials. • The prescribed procedure and contact for major spillage must be accessible – posters on-site. • An incident reporting and remediation log must be kept on site.	Daily site check and updating of incident reporting log plan updates	Civils contractor
	Temporary storage of domestic or industrial waste	10	Contractors are responsible for the collection and removal of their own generated waste. The following waste management plan must be followed: • Collection of waste must be at a designated point – preferably a covered area • Waste must be contained in appropriate receptacles / bins to prevent littering and contamination – larger bulky waste (e.g. metals) must be stored neatly in a covered area. • Oils, grease, diesel and other chemicals must be stored in the prescribed manner within a bunded area • Collection of waste by a recognised contractor at the end of the construction period must take place for recycling or disposal at a registered facility off-site – weekly removal of domestic waste should take place.	Daily site check	Civils contractor
Surface and groundwater contamination	Incorrect preparation of the base / foundation for the service bay or diesel storage areas could lead to contamination of surface and groundwater resources	8	• Cast concrete slabs with correct drainage to oil traps / sumps (where required) according to engineering design – engineer to sign off construction • Link areas to stormwater management and pollution control structures as designed.	Daily checks by site engineer – must be lodged	Civils contractor
	Incorrect installation / establishment of the grey water filter system could lead to waterlogging and water resource contamination	7	• System must be contained – closed. • Only grey water from the change house must be diverted to the filter system - all sewage from the toilets must be directed to the chemical toilet system / enclosed portable septic tank type toilets • All water pipelines must be colour coded for safety – potable water and dirty water	Daily checks by site engineer – must be lodged	Civils contractor
	Spillage of oils, grease, diesel, etc. could lead to the contamination of the water resources.	8	A waste management plan must be put in place (see above) • Any spillage must be removed using the prescribed procedure for either minor spills and rehabilitation, or major spillage and emergency contacts as appropriate. • Incident reporting on the spillage of oils, grease, diesel and other chemicals.	Daily site check and updating of incident reporting log plan updates	Civils contractor
	Temporary storage of domestic and industrial waste	9			
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, wind erosion exposed surfaces, vehicle entrainment on the construction site, and tailpipe emissions from vehicles.	10	Fugitive dust suppression techniques to reduce emissions include: • Minimise areas stripped areas or areas of exposure – keep surrounding vegetation and grasslands • Bare surfaces around office / workshop areas must be paved or grassed (vegetated) on completion of construction • Vehicle speed and weight restrictions - signage and enforcement; • Regular vehicle maintenance in designated area – logs kept on-site • Daily surface treatment such as wet suppression (70%)	Daily wet suppression as required	Civils contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery, as well as the erection prefabricated structures.	10	• Regular vehicle maintenance at designated area only – logs kept on-site. • Use mufflers / noise reducers on equipment where appropriate. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Use machinery during daylight hours only	Ad hoc spot checks by responsible party	Civils contractor

Table 8.8: Construction of the opencast mining initial box-cut - management measures					
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Responsible party**
Soil contamination and loss of viability	The construction of the box-cut will require that the soil is removed and stockpiled for rehabilitation on closure. If this stripping does not take place, or is done incorrectly such as allowing mixing of the soils, it could lead to contamination and therefore loss of soil viability.	7	A log and plan of soil stripping must be kept up to date on-site. This must take account that: • Structural integrity is maintained if stripping occurs during early winter • Stripping and stockpiling according to the soil survey report – soil type - average 60 to 90 cm (use of the interactive database must be made) • Topsoil, subsoil and overburden must be stockpiled separately (use of the topsoil and subsoil for visual and clean water diversion berms may take place)	As required	Civils contractor
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	5	All vehicles and equipment must be serviced regularly at the designated areas only and the logs kept on-site. An incident reporting and remediation log must be kept on site and include: • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Civils contractor
Dust generation affecting air quality	Potential sources of particulate emissions include clearing vegetation, drilling and blasting, materials handling, wind erosion of exposed surfaces, vehicle entrainment on site, and tailpipe emissions from construction vehicles.	6	Fugitive dust suppression techniques to reduce emissions include: • Limit materials handling to what is necessary • Surface treatment such as wet suppression (70%) where possible • Vehicle speed and load restrictions to minimise dust entrainment - signage and enforcement; • Regular vehicle maintenance within designated areas only – logs kept on-site.	Daily site checks	Civils contractor
	Fly rock from blasting of overburden during opencast mining and trenching can impact agricultural activities	5	• After blasting 500 m radius around the blast area must be swept for fly rock to prevent this material from damaging agricultural equipment.	After blasting	Mining contractor
Noise generation / Vibrations	Noise and vibrations will be generated from drilling and blasting, as well as noise from the movement of heavy earth moving machinery during operations.	9	• Regular vehicle maintenance in demarcated area only – logs kept on-site. • Use mufflers / noise reducers on equipment where appropriate. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Use machinery during daylight hours only. • Scheduling of equipment within the pit (taking account of noise emissions from the equipment used in order to spread them out over the interface area). • Monitoring of blasting vibrations on surrounding infrastructure – pre- and post-blasting assessment in consultation with landowners • The blasting schedule (times and frequency) must be published on-site and distributed to surrounding land users. A log of any correspondence must be kept on-site. • A suitably competent person must be assigned as responsible party to ensure that the correct design procedures are followed. The air blast and vibration must be monitored (logged) and controlled to ensure that health and safety of employees and people around the area are not affected (Regulations under the Mines Health and Safety Act).	Ad hoc spot checks by responsible party	Mining contractor

8.2.3 Operation

The following activities will be undertaken during the mining process (see Section 3.3.1 for the mining methods):

- Opencast pit including mining, blasting and contribution to the various stockpiles (see Table 8.11 for management measures).
- Trenching and high wall operations including mining, blasting (if required) and contribution to the various stockpiles (see Table 8.12 for management measures).
- Stockpile of coal in the ROM areas with screening / sizing (as required) within the Phase 1 ROM stockpile area (see Table 8.13 for management measures).
- Roads and transport routes use and maintenance (where applicable) - transport of the ROM coal to the washing plant at Eastside Colliery (see Table 8.14 for management measures).
- Maintenance on-site vehicles and equipment (see Table 8.15 for management measures).
- Operation and maintenance of self-contained septic tanks / chemical toilet systems from the office complex, as well as an artificial wetland filter system for grey water from the change house. This filtered water can be reused for dust suppression and the high wall mining operations (see Table 8.15 for management measures); and
- Storage of domestic and industrial waste temporarily at the office complex area (see Table 8.15 for management measures).

The topsoil stockpiles and pollution control structures will be static during operations, but will require management - see Tables 8.9 and 8.10 respectively.

Operations will be undertaken by Vaalbult Mining (admin, health and safety, and environmental compliance) with mining being undertaken by a contractor for the opencast and Vaalbult Mining for the high wall operations. A ‘Contractor’s Pack’ will be signed by all contractors in terms of Mine Health and Safety. Once the mining contractor has been appointed, the emergency preparedness plan will be put together in consultation with the relevant contractor/s (Section 8.6 provides basic information that will form part of the emergency preparedness plan).

Table 8.9: Topsoil stockpiles - management measures during operation						
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Annual management cost**	**Responsible party**
Loss of soil viability and dust generation	Exposed stockpiles could degrade through erosion (wind / water)	6	• Ensure that the area is fenced and that no vehicles traverse the stockpile area or berms. • Ensure self-succession of vegetation, and where this does not take place after the first rains seeding of the stockpiles must take place.	Weekly monitoring	R120,000	Vaalbult Mining ECO
Loss of biodiversity	Vegetation of the newly created stockpile areas may result in alien vegetation establishment and therefore the loss of biodiversity	7	• Alien vegetation control – manual removal of alien vegetation (roots and foliage) within / adjacent to areas of disturbance as soon after germination as possible and before flowering and seed production. If manual removal is not possible then an herbicide may be used after germination. Vegetation removed must be dried and can then be placed within the composting facility, unless there are flower / seeds or a herbicide has been used when the material must be disposed of - see photographs below • Biodiversity assessment of the site by a competent person to audit vegetation cover.	Weekly internal status monitoring with mitigation measures and actions Six-monthly	No additional costs R50,000	Vaalbult Mining ECO

Alien plant control:

The following category 1 plants need to be controlled and removed from site should they establish, as well as black jacks and cosmos (only where it is in dense groups that prevent the pioneer grasses from establishing):

Daturastramonim

Daturaferox

Argenomeochroleuca sups ochroleuca) (= A. subfusiformis

Solanum elaegnifolium

Cirsium vulgare

Table 4.10: Trenches, berms and pollution control dams – management measures during operation						
Stormwater management requires the effective separation of clean and dirty water. The extent of the dirty water area must be minimised as far as possible and clean water must be allowed to flow naturally within the catchment. Within the Vaalbult Colliery area the planned system is a closed system as far as possible to reduce the volume of water required from groundwater abstraction. This involves the collection of dirty water from the ROM and overburden stockpiles within pollution control dams for reuse in the mining operations and dust suppression within the dirty water areas. The planned stormwater and pollution control measures are provided in Figure 8.1 with the details of design provided in Appendix B. ***No coal may be extracted without this system having been constructed and signed off as operational by the design engineer.***						
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Annual management cost**	**Responsible party**
Soil contamination and loss of viability	Silt / salts trapped within the pollution control dams could result in contamination of soil and water if left long -term	7	• Silt / salts from the pollution control dams to be disposed of correctly at a registered waste facility.	As required	No further cost See Table 8.15	Vaalbult Mine Manager
Surface and groundwater contamination	Surface run-off will be altered through the creation of various clean water diversion berms, dirty water cut-off trenches and pollution control / dirty water storage dams, which will be established as part of the water management system around the area. Ineffective maintenance could lead to pollution from the mixing of dirty and clean water.	10	• Dams and trenches to be monitored. • Maintenance of trenches and dams on a weekly basis – especially during the wet season ○ Free flow of water in trenches – removal of any silt or vegetation. ○ Slope stability of the berms to be monitored - vegetation without being obstructive. • Establish a surface and groundwater monitoring programme (see Section 8.3)	Daily site check and weekly maintenance – as required Checks of all stormwater systems within 24 hrs after major storm events	Included in salaries, No further cost	Vaalbult Mine Manager in consultation with Vaalbult Mining ECO
	Spillage of oils, grease, diesel, etc. during maintenance could lead to the contamination of the water resources.	4	• All vehicles and equipment must be serviced regularly at the designated areas only and the logs kept on-site. • An incident reporting and remediation log must be kept on site. • The prescribed procedure for major or minor spillage and rehabilitation as applicable must be followed.	As required	Included in operator costs No further cost	Vaalbult Mine Manager

Table 8.11: Opencast mining - management measures during operations

Potential impact	Activity description	S	Management measure	Frequency	Annual management cost	Responsible party
Soil contamination and loss of viability	With the roll-over mining method the overburden and soils are removed and replaced in sequence - as close to the original sequence as is practically possible; however there will be a permanent change in structure, compaction and possibly permeability.	12	• An updated plan and log of the backfilled areas (opencast and trenches) indicating the volumes of overburden, subsoil and topsoil in the correct sequence and using correct and recognised procedures must be kept on-site.	As required	R500,000 (incorporated into salaries)	Mine surveyor
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	5	All vehicles and equipment must be serviced regularly at the designated areas only and the logs kept on-site. An incident reporting and remediation log must be kept on site and include: • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Included in operator costs No further cost	Mining contractor
Loss of biodiversity	Generally removal of land from agriculture places additional grazing pressure on, or the transformation of, other areas. If the natural areas are fragmented then there will be displacement of fauna.	12	Establish an ecological management plan that includes: • Monitoring of grazing pressure • A grassland burning programme • Maintenance of corridors and free faunal movement • Maintenance and monitoring of recommended buffer zones (Biodiversity report – Appendix G)	Update as required	No annual cost See Table 8.9	Vaalbult Mining ECO
Altering of aquifer state (groundwater)	Dewatering of the pit / trench will be required resulting in flow direction towards the excavation. This will lower the groundwater level locally and any possible pollution will be contained within the working area. The water levels should recover once dewatering has ceased.	10	• Monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes.	Weekly portable probe (pH, EC, TDS, Sal) Quarterly / six monthly laboratory analysis – or as required	R25,000	Vaalbult Mining ECO
Surface and groundwater contamination	Contamination of the aquifers surrounding the mining areas during active mining when the mining area is being dewatered as the groundwater flow gradients will be directed towards the mining area and thus any contamination will be confined to the direct vicinity of the mining area.	6	• Monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes and surface water (quality) monitoring points.	Weekly potable probe Quarterly / six monthly laboratory analysis – or as required	No further cost See above	Vaalbult Mining ECO
	The backfilling and contouring of the mined areas will return the topography to as close as possible to the original status. If incorrectly undertaken this may change the natural drainage and may result in surface and groundwater contamination.	10	• Regular survey of the backfilled areas to check contouring elevations and ensure that free flow of surface water occurs (with no ponding). An up to date plan of the rehabilitation must be kept on-site.	As required	No further cost See above	Mine surveyor
	Acid generation within backfilled areas may result in contamination through drainage into the surrounding groundwater resources	9	• Sampling of country rock (roof / floor) during opencast and trench mining operations – ABA, S-speciation, NAG • Drilling of additional boreholes into backfilled areas during operations (closure of section) • Monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes. • Modelling of the results of the monitoring programme to predict migration of the possible pollution plume and determine any mitigation measures.	As required Weekly portable probe As required	R25,000 R50,000 No further cost R200,000 (included in salaries)	Vaalbult Mining ECO
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation, drilling and blasting, wind erosion of exposed surfaces, vehicle entrainment within pit surfaces, and tailpipe emissions from vehicles.	9	Fugitive dust suppression techniques to reduce emissions include: • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Daily surface treatment such as wet suppression (70%) • Establish a dust fallout monitoring programme with dust fallout buckets around the proposed mining operations.	Monthly	R5,000	Mining contractor Vaalbult Mining ECO
	Fly rock from blasting of overburden during opencast mining and trenching can impact agricultural activities	5	• After blasting 500 m radius around the blast area must be swept for fly rock to prevent this material from damaging agricultural equipment.	After each blast	Included in Salaries No additional cost	Mining contractor
Air quality / safety	Spontaneous combustion of the coal from fracturing and oxidation (limited sulphides)	4	• Limit use of explosives and heavy machinery to reduce fracturing of the coal – oxidation • Keep fire prevention equipment onsite with appropriate emergency procedures	As required	No additional cost	Mining contractor
Noise generation / Vibrations	Noise and vibrations will be generated from drilling and blasting, as well as noise from the movement of heavy earth moving machinery during operations.	9	• Monitoring of blasting vibrations on surrounding infrastructure – pre- and post-blasting assessment in consultation with landowners • The blasting schedule (times and frequency) must be published on-site and distributed to surrounding land users. A log of any correspondence must be kept on-site. • A suitably competent person must be assigned as responsible party to ensure that the correct design procedures are followed. The air blast and vibration must be monitored (logged) and controlled to ensure that health and safety of employees and people around the area are not affected (Regulations under the Mines Health and Safety Act). • Regular vehicle maintenance – logs kept on-site. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Scheduling of equipment within the pit (taking account of noise emissions from the equipment used in order to spread them out over the interface area).	As required	Included in operator costs No further cost	Mining contractor

Table 8.12: Trenching and high wall mining - management measures during operations

Potential impact	Activity description	S	Management measure	Frequency	Annual management cost	Responsible party
Soil contamination and loss of viability	With trenching overburden and soils are removed and replaced in sequence - as close to the original sequence as is practically possible; however there will be a permanent change in structure, compaction and possibly permeability.	12	• An updated plan and log of the backfilled areas (opencast and trenches) indicating the volumes of overburden, subsoil and topsoil in the correct sequence and using correct and recognised procedures must be kept on-site.	As required	No further cost See Table 8.11	Mine surveyor
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil and water resources and the subsequent loss of soil viability.	5	All vehicles and equipment must be serviced regularly at the designated areas only and the logs kept on-site. An incident reporting and remediation log must be kept on site and include: • The prescribed procedure for minor spillage and rehabilitation. • The prescribed procedure and contact for major spillage.	Daily site check and updating of incident reporting log plan updates	Included in operator costs No further cost	Mining contractor
Loss of biodiversity	The removal of vegetation from the trench area in the southwest may result in loss of species habitat and therefore biodiversity	9	Monitoring and reporting on the overall environmental status by the ECO, including any mitigation measures / actions required. This includes aspects on: • Surface restoration and sloping of backfilled trench; • Self-succession of vegetation and alien plant control • A six monthly biodiversity assessment of the site by a competent person.	Weekly Six monthly	No further cost See Table 8.9	Vaalbult Mining ECO
	Generally removal of land from agriculture places additional grazing pressure on, or the transformation of, other areas. If the natural areas are fragmented then there will be displacement of fauna.	12	Establish an ecological management plan that includes: • Monitoring of grazing pressure • A grassland burning programme • Maintenance of corridors and free faunal movement • Maintenance and monitoring of recommended buffer zones (Biodiversity report – Appendix G)	Update as required	No further annual cost See Table 8.9	Vaalbult Mining ECO
Altering of aquifer state (groundwater)	Dewatering of the high wall sections may be required resulting in flow direction towards the excavation (this water will be used in the operations of the high wall miner). This will lower the groundwater level locally and any possible pollution will be contained within the pollution control facility. The water levels should recover once dewatering has ceased.	8	• Construction of an in trench sump at the lowest point to collect water for reuse in the operations. • Monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes.	Weekly portable probe (pH, EC, TDS, Sal) Quarterly / six monthly laboratory analysis – or as required	No further cost See Table 8.11	Vaalbult Mining ECO
Surface and groundwater contamination	Acid generation within the sealed and rehabilitated areas may result in contamination through drainage into the surrounding groundwater resources	11	• Sealing of high wall mining sections (brick, mortar and concrete / shotcrete) as per the mine plan to reduce oxidation. Materials used for sealing and grouting must be stable and able to withstand long-term break down in subsurface environments. • Excess water from the operations may be pumped into the drives before sealing to further reduce oxidation. • Monitoring and internal reporting on the groundwater (quality and elevation) for the monitoring boreholes. Modelling of the results of the monitoring programme to predict migration of the possible pollution plume and determine any mitigation measures.	Daily / As required Weekly portable probe	R63,000 No further cost See Table 8.11	Vaalbult Mine Manager Vaalbult Mining ECO
Dust generation affecting air quality	Potential sources of particulate emissions include clearing of vegetation for trenches, drilling and blasting, wind erosion of exposed surfaces, vehicle entrainment within the trench, and tailpipe emissions from vehicles.	9	Fugitive dust suppression techniques to reduce emissions include: • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Daily surface treatment such as wet suppression (70%) • Establish a monthly dust fallout monitoring programme with dust fallout buckets around the operations to monitor the effectiveness of the dust suppression techniques. PM10 and PM2.5 monitoring to be undertaken six monthly (summer / winter). See Section 8.3.	Daily wet suppression Monthly dust fall out Six monthly PM monitoring	Included in operator costs No further cost See Table 8.11 R20,000	Vaalbult Mine Manager Vaalbult Mining ECO
	Fly rock from blasting of overburden during opencast mining and trenching can impact agricultural activities	5	• After blasting 500 m radius around the blast area must be swept for fly rock to prevent this material from damaging agricultural equipment.	After each blast	No additional cost See Table 8.11	Mining contractor
Air quality / safety and subsidence	Spontaneous combustion of the remaining coal pillars from oxidation (limited sulphides)	5	• High wall miner limits fracturing of the coal pillar – fines and oxidation • Removal of loose coal from mined sections • Sealing of high wall mining drives and exposed high wall ends of strip pillars daily as per the mine plan to reduce oxidation and limit oxygen within the mined area (required for combustion). Materials used for sealing must be stable and able to withstand long-term break down in subsurface environments • Excess water from the operations may be pumped into the drives before sealing to further reduce oxidation • Keep fire prevention equipment onsite with appropriate emergency procedures	Daily / As required	Included in cost of planned mining operations No further cost	Vaalbult Mine Manager Vaalbult Mining ECO
Noise generation	Noise will be generated from the high wall miner as well as by the movement of heavy vehicles during operations.	8	• Regular equipment / vehicle maintenance – logs kept on-site. • Mufflers / noise reducers to be installed where possible.	As required during trenching	Included in operator costs No further cost	Vaalbult Mine Manager
Heritage sites	Trenching in the southwest is close to a grave site	3	• All grave sites must have a 20 m buffer (as per the Heritage Assessment Report) • Fencing of the buffer area, especially for the grave site south of the farm house is required.	As required	No additional cost	Vaalbult Mine Manager Vaalbult Mining ECO

Table 8.13: ROM stockpile areas with screening / sizing as required - management measures during operation						
Potential impact	**Activity description**	**S**	**Management measure**	**Frequency**	**Annual management cost**	**Responsible party**
Soil contamination and loss of viability	The placement and separation of the ROM from the topsoil / subsoil. If separation does not take place, or is done incorrectly such as allowing mixing of the soils and coal, it could lead to contamination and therefore loss of soil viability.	7	• ROM coal may only be stockpiled within designated correctly prepared areas • A log of the ROM coal stockpiled and removed must be kept up to date. • Pad areas must be demarcated and are bounded by the haul road to prevent encroachment on the surrounding grassland • Stockpiles should not exceed a height of 15m with associated safe gradient.	Daily log with pad integrity monitoring	No further cost	Mining contractor
Surface and groundwater contamination (and wetland areas)	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources with the subsequent loss of soil viability and the contamination of the water resources.	9	• Oils, grease, diesel and other chemicals may not be stored within the stockpile pad areas. • The prescribed procedure for minor spillage and rehabilitation or major spillage (contact) must be followed. • All vehicles and equipment must be serviced regularly and the logs kept on-site. • An incident reporting and remediation log must be kept on site.	Daily site check and updating of incident report	No further cost	Mining contractor
	The placement and separation of the ROM from the topsoil; subsoil and overburden. If separation does not take place, or is done incorrectly such as allowing mixing of the soils and coal, it could lead to water contamination through increased acid mine generation when the stockpiled material is replaced during rehabilitation.	8	A log and plan of the ROM coal stockpiled and removed must be kept up to date. This must take account that: • ROM must be stockpiled separately from the overburden and soils • Stockpiles should not exceed a height of 15m with associated safe gradient. • Correct clean and dirty water separation must take place (construction) Monitoring and internal reporting on the surface and groundwater (quality and elevation) for the monitoring boreholes.	Daily / Weekly Weekly portable probe	No further cost See Table 8.11	Vaalbult Mining ECO
	The creation of ROM stockpiles could result in surface water and groundwater contamination over the long-term	11	• Minimise water ponding and infiltration – repair (fill and compact depressions) • Ensure that stormwater management and pollution control structures as designed are in place.	Weekly monitoring with checks within 24 hrs after major storm events	NA	Mining contractor
	Concentrated runoff / surface wash from stockpiled coal as a result of surface exposure, which may result in contamination of the water resources.	11	• Stockpile areas are designated as dirty water areas and surface water runoff tom these areas must be directed and contained by the trenches and pollution control dams (as per the mine plan) • Monitoring and internal reporting on the surface and groundwater (quality and elevation) for the monitoring boreholes – see Section 8.3	Daily checks and logs	No further cost See Table 8.11	Vaalbult Mining ECO
Dust generation affecting air quality	Potential sources of particulate emissions include materials handling operations (including screening / sizing of the coal), wind erosion from exposed surfaces, and tailpipe emissions from vehicles.	11	• Fugitive dust minimisation / suppression techniques to reduce emissions include: • Vehicle weight to minimise dust entrainment - prevent overloading by daily spot checks • Regular vehicle maintenance to minimise emissions – logs kept on-site • Limit materials handling to what is necessary (especially when screening / sizing) o Do not operate screening plant on very windy days o Minimise or schedule use outside of the winter months where possible • Monitor berms and containment structures for minimisation of dust migration • Wet suppression (70%) of dust • Establish a monthly dust fallout monitoring programme (see above)	Daily wet suppression	No further cost See Table 8.11	Mining contractor
Air quality / safety	Spontaneous combustion of the coal from oxidation (limited sulphides)	4	• Limit materials handling both in stockpiling and when screening the coal – generation of fines and oxidation • Free air flow around stockpile – reduce heat generation • Dust suppression of the area – limit fine fraction oxidation and reduce heat • Limit storage time of stockpiled material prior to transport to the washing facility • Keep fire prevention equipment onsite with appropriate emergency procedures	Daily wet suppression	Included in operator costs No further cost	Mining contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery and through the implementation of the screening / coal sizing processes.	10	• Regular vehicle and screening equipment maintenance to ensure good working order – logs kept on-site. • Use mufflers / noise reducers on equipment / machinery where appropriate • Limit vehicle movements to what is necessary by demarcating and fencing off zones.	Ad hoc spot checks	NA	Vaalbult Mining ECO

Table 8.14: Access and on-site haul roads - management measures during operation (MRA and NEMA)

Potential impact	Activity description	S	Management measure	Frequency	Annual management cost	Responsible party
Soil contamination and loss of viability	Spillage of oils, grease, diesel, etc. within mining area could lead to the contamination of soil resources and the subsequent loss of soil viability.	7	• All vehicles and equipment must be serviced regularly and the logs kept on-site. • Maintenance and compliance testing of vehicles to take place in designated service areas only. • An incident reporting and remediation log must be kept on site.	Daily site check and updating of incident reporting	No further cost	Mining contractor
Surface and groundwater contamination	Spillage of coal, diesel, and oil on the haul roads could lead to the contamination of the water resources.	8	• All haul trucks must be covered (tarpaulin) and kept as clean as possible. • An incident report and remediation log must be kept on site. • All vehicles and equipment must be serviced regularly and the logs kept on-site.	Daily site check and updating of incident reporting log plan updates	NA	Logistics contractor
	During operation the increase in the exposed area combined with wet suppression for dust control increases the potential for soil erosion and subsequent water resource contamination.	6	• Surface water runoff within the operational area must be contained stormwater and pollution control (trenches, berms and pollution dam during operation – see Figure 8.1). • Minimise water ponding and infiltration – fill and repair where required. • Within clean water areas drainage to dissipate flow across adjacent grasslands rather than confine to channels – reinforcement of roadsides where required with stoloniferous sp. such as Cynodondactylon to protect and anchor soil in the drain.	Daily site check and logging, and updating of incident reporting	NA	Vaalbult Mining ECO
Dust generation affecting air quality	Potential sources of particulate emissions include wind erosion of exposed surfaces, vehicle entrainment on the roads, and tailpipe emissions from haul vehicles.	11	Fugitive dust suppression techniques to reduce emissions and air quality impact on onsite gravel roads include: • Limiting exposed surfaces and vehicular traffic to established planned / demarcated onsite roads. • Vehicle speed restrictions - signage and enforcement; • Vehicle weight - prevent overloading by daily spot checks • Regular vehicle maintenance – logs kept on-site • Wet suppression (70%) within mining area – suppression with dirty water may only be within the dirty water area.	Daily wet suppression throughout operation	No further cost	Mining contractor
Traffic and safety	Additional trucks on the R38 impacting farmer and farm activity safety e.g. cattle movement between lands	10	Safety measures to be put in place include: • Signage, speed restrictions and reduction mechanisms – especially at intersections with the R38; • Vehicle numbers – keep the number of transport vehicles to a minimum • Vehicle weight - prevent overloading by daily spot checks • Liaise directly with affected landowners for the movement of cattle across the R38 – minimise trucks from Vaalbult Colliery during key times	Daily checks on vehicles and signage	NA No further cost for cumulative impacts	Vaalbult Mine Manager

Table 8.15: Office complex – offices, change house / ablutions, workshop area, diesel store and security – management measures during operation

Note: The management measures below include the operation and maintenance of chemical toilets, grey water system, on-site vehicles and equipment at designated areas; and temporary storage of domestic and industrial waste.

Potential impact	Activity description	S	Management measure	Frequency	Annual management cost	Responsible party
Soil contamination and loss of viability	Incorrect storage of oils, grease, diesel, etc. could lead to the contamination of soil resources with the subsequent loss of soil viability.	10	• Oils, grease, and other chemicals will only be stored in the prescribed manned within designated workshop / service bay area. • Diesel will only be stored in designated areas – see Figure 8.1. • The materials and prescribed procedure for minor spillage and rehabilitation must be accessible – posters on-site and marked materials. • The prescribed procedure and contact for major spillage must be accessible – posters on-site. • An incident reporting and remediation log must be kept on site.	Daily site check and updating of incident reporting log	R10,000	Vaalbult Mine Manager Vaalbult Mining ECO
	Maintenance of vehicles and equipment on exposed surfaces could lead to the contamination of soil resources and the subsequent loss of soil viability.	9	• No maintenance may take place outside the designated area which has been prepared with an impermeable layer linked to a sump.	Monitoring as required	NA	Vaalbult Mining ECO
	Temporary storage of domestic and industrial waste	10	A waste management plan as highlighted in Section 8.4 must be put in place: • Reduction and recycling of waste – containment , collection and separation at source • Temporary storage in marked bins in a covered designated area (maintenance / office area) - larger bulky waste (e.g. metals) must be stored neatly in a covered area • Oils, grease, diesel and other chemicals will be stored in the prescribed manned within bunded areas (service bay area). • Collection of waste by a recognised contractor/s for recycling or disposal at a registered facility off-site – one set of contractors to be appointed for all waste	Daily site check	R60,000	Vaalbult Mine Manager Vaalbult Mining ECO
Surface and groundwater contamination	Operation and maintenance of chemical toilet systems		• Operation and maintenance to be undertaken by an appointed contractor • Collection of waste by a recognised contractor/s for disposal at a registered facility off-site.	Monthly or as required	No further cost	Vaalbult Mine Manager
	Operation and maintenance of the grey water filter system	7	• System must be contained - 'closed' – to prevent leaks to the surrounding environment, additional water ingress and water logging (stagnation) • Through flow filtered water to be used for dust suppression and mining operations – surface piping to relevant area	Weekly monitoring	No further cost	Vaalbult Mining ECO
	Abstraction of water for the operations may reduce the quantity of groundwater	9	• Abstraction rate as per hydrological report to be used (VGM02). • Monitoring of abstraction and surrounding boreholes within 1km radius of VGM02.	Quarterly	No further cost	Vaalbult Mining ECO
Loss of biodiversity	Establishment of alien vegetation within disturbed areas leading to the loss of biodiversity	7	• Alien vegetation control – manual removal of alien vegetation (roots and foliage) within / adjacent to areas of disturbance before as soon after germination as possible and before flowering and seed production. If manual removal is not possible then an herbicide may be used after germination. Vegetation removed must be dried and can then be placed within the composting facility, unless there are flower / seeds or an herbicide has been used when the material must be disposed of.	Weekly internal status monitoring	No additional cost	Vaalbult Mining ECO

8.2.4 Decommissioning and closure

The decommissioning of mining sections will occur in phases over the life of mine i.e. as the opencast operations or each of the high wall trenching operations are completed they will be decommissioned and closed. Final decommissioning and closure of the mining sections will comprise the following activities:

- Closure of the opencast pits / voids and trenches – backfill, contouring and re-vegetation of final void (R1,706,229 final rehabilitation cost life of mine – see Section 9 and Appendix M)
    - Backfill final void in sequence with suitable compaction prior to the placement of the soils
    - Part of the final void may be used as an evaporative facility for monitoring of water quality and groundwater elevation and possible mitigation of decant should this be required.
    - Contouring and re-vegetation of the backfilled area to ensure free flow of surface water away from backfill with no ponding
- Closure of high wall mining sections (R63,008 final rehabilitation cost – see Section 9 and Appendix M)
    - Sealing of high wall cuts and 'pillar' faces (during operations)
    - Backfilling, contouring and re-vegetation of the trenches (as above)
- Fencing off the mined areas where required (R114,218 final rehabilitation cost life of mine)

Only once all the mining sections have been completed closure of the operation includes:

- Removal of surface infrastructure – office complex, roads, stockpile areas and stormwater control measures (R8,829,293 final rehabilitation cost life of mine – see Section 9 and Appendix M)
    - Removal of all remaining coal from and rehabilitation of the ROM pads.
    - Removal of all prefabricated buildings (mobile offices / security huts, toilets)
    - Removal of the service bay and other concrete areas.
    - Removal of diesel tanks and bunding.
    - Rehabilitation of office and service bay areas
    - Removal and rehabilitation of onsite haul roads
    - Removal of stormwater control measures – berms and trenches once the site has been contoured and cleaned
    - General cleaning of the mining area with the reestablishment of vegetation.
    - Establishment of post-closure monitoring programme

Waste management, treatment of spillages and dust suppression will continue as per the operational phase. Specific management or rehabilitation measures during decommissioning are provided in Table 8.16.

During and post closure monitoring and maintenance of the area will include:

- Soils assessment
- Water management and modelling
- Rehabilitation and biodiversity monitoring

Table 8.16: Management measures during closure (and post-closure)

Activity	Activity description	S	Management / rehabilitation measure	Frequency	Final rehabilitation cost	Responsible party
Soil contamination and loss of viability	Rehabilitation of opencast and trenching areas to agricultural use	12	• Soil cover must be in accordance with the Soil Survey (active GIS database) – average depths 60 to 90 cm • Where the disturbed areas was arable land, a competent soil chemist must be consulted to report on rehabilitation structure, chemistry and initial cropping to re-establish nutrients and complexity • Where natural grassland has been disturbed a suitably competent person must be consulted to audit the vegetation cover and provide the optimal livestock carrying capacity for the area • Rehabilitated areas will remain fenced (using existing fencing) until the competent person/s deems this unnecessary to ensure effective re-establishment of vegetation / grassland.	As required	R500,000 No further cost See Table 8.11	Civils contractor in consultation with Vaalbult Mining ECO
	Rehabilitation of ROM and overburden stockpiles	6	• Removal of all coal from ROM areas and placement of overburden in final void • Removal of any carbonaceous material from the surface and disposal at a registered discard facility • Ripping of the surface to reduce compaction • Removal of subsurface compacted layers where required and the placement of subsoils as per the soils log and plan • Contouring of surface to re-establish correct surface drainage • Replacing topsoil area as per the topsoil log and placement plan	Daily check and log verification	R1,903,102	Civils contractor in consultation with Vaalbult Mining ECO
	Rehabilitation of the office complex area (including service bay) may result in contamination and loss of soil viability if incorrect removal placement takes place.	7	• Removal of prefabricated buildings • Breaking up and removal of any concrete surfaces to a registered discard facility • Ripping of the disturbed surface to reduce compaction • Removal of subsurface compacted layers where required and the placement of subsoils as per the soils log and plan • Contouring of surface to re-establish correct surface drainage • Replacing topsoil as per the topsoil log and placement plan • Vegetating / seeding the area (where required)	Daily check and log verification	R194,920	Civils contractor in consultation with Vaalbult Mining ECO
	Rehabilitation of access and on-site haul roads	6	• Removal of any carbonaceous material from the surface and disposal at a registered discard facility • Ripping of the surface to reduce compaction • Contouring of surface to re-establish correct surface drainage • Replacing topsoil as per the topsoil log and placement plan	Daily check and log verification	R1,291,220	Civils contractor in consultation with Vaalbult Mining ECO
	Spillage of oils, grease, diesel, etc. could lead to the contamination of soil resources with the subsequent loss of soil viability and the contamination of the water resources.	4	• All vehicles and equipment must be serviced regularly at the designated area only and the logs kept on-site – removal of workshop area should be one of the last areas to be cleaned. • An incident reporting and remediation log must be kept on site. • The prescribed procedure for major or minor spillage and rehabilitation as applicable must be followed.	Daily site check and updating of incident report	No further cost	Civils contractor
Surface and groundwater contamination	Concentrated runoff as a result of the demolition activities during closure could lead to erosion, which will reduce the fertility of the soils and the subsequent establishment of flora.	4	• All clean and dirty water infrastructures will be maintained up until completion of demolition and rehabilitation activities.	NA	NA	Civils contractor
	Removal and rehabilitation of pollution control dams and stormwater control measures	10	• Once these are no longer required removal of the lining of the dams and trenches must take place. • Backfill the dams and trenches with subsoil from the stockpile / berms as per the log and placement plan • Lightly compact area to ensure cohesion • Contouring of surface to re-establish correct surface drainage • Replacing topsoil as per the topsoil log and placement plan • Ensure vegetation is re-established • Monitor surface and groundwater as per monitoring programme (see Section 8.3) and water use licence	As required	R696,355	Civils contractor in consultation with Vaalbult Mining ECO
	Decanting of water from operational areas – potentially acidic	9	• Drill monitoring boreholes into backfilled areas to the base of the coal seam only • Monitor final void pits and monitoring boreholes (water elevation and chemistry) to determine water quality (if there is acid generation) and re-establishment of the groundwater levels for decant • Continue to monitor surface and groundwater as per monitoring programme (see Section 8.3) and water use licence • Regularly update the groundwater recovery and quality models to predict decant (weathered zone aquifer / surface water and long-term quality) • Assess surface rehabilitation to ensure free-drainage (no ponding) of surface water	Weekly elevation and portable probe chemical analysis (sample to the laboratory for full analysis as required / six monthly)	R4,301,724 No further cost for cumulative impacts post closure	Vaalbult Mining ECO
Biodiversity	Establishment of alien vegetation within disturbed and rehabilitated areas leading to the loss of biodiversity	7	• General surface cleaning and clearing • Alien vegetation control – manual removal of alien vegetation (roots and foliage) within / adjacent to areas of disturbance before as soon after germination as possible and before flowering and seed production. If manual removal is not possible then an herbicide may be used after germination. Vegetation removed must be dried and can then be placed within the composting facility, unless there are flower / seeds or a herbicide has been used then the material must be disposed of	Weekly internal status monitoring & biodiversity assessment on closure	R4,743,697	Vaalbult Mining ECO
Dust generation affecting air quality	Potential sources of particulate emissions include materials handling, wind erosion from exposed surfaces, vehicle entrainment on site, and tailpipe emissions from vehicles.	6	Fugitive dust suppression techniques to reduce emissions include: • Wet suppression (70%) where required – only clean water to be used during rehabilitation • Vegetation of exposed surfaces as soon as possible after placement of topsoil	Daily	No further cost	Civils contractor
Noise generation	Noise will be generated by the movement of heavy earth moving machinery.	6	• Regular maintenance of vehicles to ensure good working order – logs kept on-site. • Use mufflers / noise reducers on equipment where appropriate. • Limit vehicle movements to what is necessary by demarcating and fencing off zones. • Limit rehabilitation activities to daylight hours only.	Ad hoc spot checks by responsible party	NA	Civils contractor

8.3 Environmental monitoring programme

On-going monitoring of the bio-physical and socio-economic environments will continue throughout the life of mine as per the monitoring programmes. The mine's Environmental Management System (EMS) will monitor and assess the performance of the EMP on an on-going basis.

8.3.1 Hydrogeology

Groundwater quality and elevations must be monitored at the seven monitoring boreholes VGM01 to VGM07 (Figure 8.1). Additional monitoring of the hydrocensus boreholes immediately surrounding the mining area will be undertaken in consultation with the relevant landowners. The criteria to be monitored include pH, EC, TDS, and sulphate (SO_4). This can be sampled weekly using an *in-situ* /portable water quality meter / probe (pH, EC, TDS and Salinity), and by taking water samples and sending them to a laboratory for a more comprehensive analysis quarterly / six monthly (or as the weekly monitoring determines). Should the chemical results indicate any anomalies then a more comprehensive analysis will be undertaken. When sampling a bailer is used to purge the boreholes and take a fresh sample. The amount of water purged is dependent on the borehole depths and rest water levels. After purging, a sample is collected for analysis.

Surface water will be monitored weekly at the pollution control dam/s, pans, and stream (VWS01 to VWS06; Figure 8.1) using an *in-situ* /portable probe (as for the groundwater samples), and quarterly / six monthly by taking water samples and submitting them to a laboratory for an abbreviated standard analysis. Should the chemical results from the in-situ probe indicate any anomalies then a more comprehensive analysis will be undertaken.

The information obtained from this monitoring programme will be kept in a spatially referenced database. A quarterly monitoring report must be compiled and submitted to mine management and once a year a trend report is compiled and submitted to mine management, DWA and ICMA.

8.3.2 Air Quality

Dust will continue to be measured and reported on throughout the life of mine. The six dust buckets will be monitored monthly for dust fallout (Figure 8.1) and particulate matter will be monitored six monthly at strategic locations. Information from this monitoring programme will be maintained in a spatially referenced database. A quarterly monitoring report must be compiled and submitted to mine management.

8.3.3 Biodiversity

The only surface area where rehabilitation will be taking place during the operational phase is the opencast pits that have been mined through the roll-over mine method and trenches. The final box cut areas will be rehabilitated during the decommissioning phase for each pit or trench area (apart from the three small - final voids left at the lowest coal elevation points for water quality monitoring purposes). A six monthly biodiversity assessment will be conducted and reported on to the mine by competent and suitably qualified practitioner. This assessment will be conducted during life of mine and post closure. Actions that result from this assessment will be included in the environmental management programme.

8.3.4 Noise Survey

Noise monitoring from the box cuts and high wall mining (trenching) will be conducted annually, using a sound level meter, to ascertain the area of impact of the noise generation and to ascertain if noise abating measures need to be implemented.

8.3.5 Vibration Survey

Monitoring of the vibrations will be done as and when required. A report will be compiled using the data collected by the vibration sensors and submitted to management to ascertain compliance with any relevant standards. Together with the vibration surveys, a visual census may also take place. Photos of structures in and around the mining area will be taken and retaken after blasting has occurred and a few weeks thereafter where required. Such a survey will illustrate the possible damages caused by mining activities and blasting.

8.3.6 Performance Assessment

The MRPDA requires that the holder of a mining right undertake an assessment of performance against the requirements of its EMP and submit such report to the DMR. Performance assessments will be undertaken in accordance with Regulation 55 of the Mineral and Petroleum Resources Development Regulations and will include:

- Continuous monitoring of performance against the EMP provisions;
- Updating of all procedures (emergency, environmental awareness, rehabilitation strategies etc.) where necessary;
- Updating the financial provision (method and quantum) annually as part of the internal performance assessment audit;
- Submitting a performance assessment report to the DMR every two years; and
- Effective management all environmental information required by the various government departments such that this readily available for submission when required.

Review and monitoring of the commitments made in the EMP will continue throughout the life of mine. Mine management will conduct daily review of compliance which will be checked and reviewed on-site weekly by the environmental compliance officer. (In addition, a six monthly surrounding landowner's forum with mine operations site visit will be undertaken.) Any non-compliance will be noted and mitigation measures actioned, reported on, and addressed. A monthly report of environmental compliance will be reviewed by company management and an annual on-site internal audit will be conducted. The audit report will cover all aspects investigated, and provide suggestions and recommendations as to how the rehabilitation programme is progressing, advise on any mitigation measures which need to be implemented, and any amendments to the existing programme that will improve the levels of commitment. Should more specialist inputs be required then these will be assessed and implemented as the need arises.

8.4 Waste management plan

The waste streams within the mining area include general / domestic waste, industrial / hydrocarbon waste, sewerage (chemical toilets) and grey water treatment. A system of waste minimisation, reuse and recycling will take place prior to ultimate disposal. Recycling components and waste generated will be temporarily stored on-site prior to off-site transportation to recycling facilities / collection points or licensed waste disposal sites by a registered contractor. Table 8.17 provides a summary of the waste management plan (also see Section 3.4.5)

Table 8.17: Waste management

Waste stream	Description	Waste classification	Reuse / recycle / disposal	Transportation / treatment	Destination
General waste	Paper, cardboard, glass, tins, plastic, polystryrene	Inert	Reduce & recycle	Waste contractor	Recycling facility
	Organic	Inert	Recycle	Onsite composting	Nursery beds
	Food craps, non-recyclable containers etc.	Inert solids	Disposal	Waste contractor	Suitably licenced facility - Carolina
Industrial / workshop	Metal, tyres, conveyor belt / sheeting, bricks & timber	Inert solids	Reduce, reuse & recycle	Waste contractor	Recycling facility
	Batteries, oil, grease	Hazardous	Recycle and disposal	Licensed waste contractor	Suitably licenced facility
Sanitation system	Chemcial toilets	Hazardous	Disposal	Waste contractor	Suitably licenced facility
	Greywater filtration	Inert	Recycle (filter) through artifical wetland system	Onsite treatment	Operations water
Dirty water area (PCDs / return water dams)	Dirty water runoff or return water from the operational area	Potentially hazardous	Reuse	None	Dust suppression in dirty water areas

All recycling components will be separated at source. The main storage areas will be at the office complex (that includes the service area). The designated collection / storage areas must be:

- enclosed and covered to prevent exposure to the elements;
- be underlain by impervious materials to ensure that any spills are contained;
- have appropriate storage containers such as bins for general waste, 210 litre drums and skips for industrial waste;
- kept clean and tidy to prevent infestations of pests;
- recycling items that may have contained food, such as tins / cans / polystyrene, must be rinsed before storage to ensure that pests are not encouraged.

Waste will be removed from site by an appointed contractor/s as required, dependent upon the waste stream. However, general waste will be removed at least monthly, if not more regularly depending on the volumes generated. Ideally non-recyclable general waste will be removed from site weekly; however should this not prove sustainable then this waste will be placed in sealed containers pending collection to reduce the likelihood of pest infestations. The best storage time / collection volume ratio will be negotiated with the contractor/s. No general or industrial waste (as per Table 8.16) will be storage for more than 90 days. The contractor will be appointed during the construction phase once all environmental licencing has been concluded and the waste systems are established. At no time will the waste stored amount to more than 100 m^3 (general) or 35 m^3 (industrial hazardous).

8.5 Environmental awareness programme

The successful implementation of the Environmental Management Programme is dependent on training and awareness of all mining personnel.

8.5.1 Induction

All full time staff and contractors are required to attend an induction session. Employees are inducted when they start at the mine and when they return from leave. Any contractor, who works on the mine for a period of 24 hours or more, is required to undergo induction. Environmental issues and aspects relating to the operation, including environmental impacts and mitigation measures, will be discussed, explained and communicated in these sessions. Induction sessions will be modified according to the skill and education level of attendees, so that a suitable understanding of environmental issues and pollution is obtained.

The basic content of the induction programme for full time employees will include the following aspects:

- Topsoil management;
- Water (Surface and Groundwater) Control;
- Dust Control;
- Waste Management;
- Pollution Control;
- Poaching;
- Trespassing, and
- Hygiene.

8.5.2 Environmental seminars

Environmental seminars in the form of an open discussion can be held with management, and selected groups, such as supervisors, foremen or employee representatives. These seminars will aid in environmental awareness being generated at all levels, as well as assist the relevant department in defining all, and identifying new environmental issues, concerns and pollution sources.

8.5.3 In-house and on the job training

In-house training sessions, for each department, will be held with relevant employees to allow for participation in determining environmental issues and concerns that relating to their specific occupation. Education with regard to environmental incident reporting will be detailed at these sessions.

On the job training is an essential tool in environmental awareness as employees will be given details of the expected environmental issues and concerns specifically related to their occupation. Employees will be trained on how to respond if an environmental problem or source of environmental pollution arises. The training will be on-going, and all new employees will be provided with the same standard of training as existing employees.

8.5.4 Environmental communication strategy and incident reporting

Management shall establish and maintain procedures for the internal communication between the various levels and functions of the organisation, as well as receiving, documenting and responding to relevant communication from external interested and affected parties.

The following communication channels and media may be used to communicate environmental issues within the project area:

- The Mine Manager communicates information to senior management on environmental issues and the information is noted;
- Daily pre-shift environmental and safety meetings.
- 'Environmental issues' should be a recurring agenda item on the weekly planning meetings;
- Establishment of an internal incident reporting structure (Table 8.18) - employees are required to report any and all environmentally related problems, incidents and pollution, so that the appropriate mitigation action can be implemented timeously;
- Leaflets and posters may be produced by the relevant department or other designated persons;

The following communication channels and media may be used to communicate environmental issues with individuals from outside the project area:

- A site register must be kept of all concerns and comments of external parties, with associated actions referenced;
- Establishment of an incident reporting structure;
- Establishment of an environmental committee or forum to keep interested and affected parties informed of the significant environmental aspects and where interested and affected parties can raise environmental concerns. A six monthly surrounding landowner / farmer's forum will be established to ensure concerns are addressed.

Table 8.18: Environmental incident reporting procedure

Environmental incident reporting structure	Action required
Person causing or observing the incident	• Shall report the incident to an immediate supervisor in the area/section where the environmental incidents observed.
Line Management in relevant area of responsibility where the incident occurred	• Shall investigate the incident and record the following information: o How the incident happened; o The reasons why the incident happened; o How rehabilitation or clean up needs to take place; o The nature of the impact that occurred; o The type of work, process or equipment involved; and o Recommendations to avoid future such incidents and/or occurrences. • Shall inform the Environmental Compliance Officer and the Mine Manager on a daily basis of all incidents that were reported in the area/section. • Shall consult with the relevant department / person for recommendations on actions to be taken or implemented where appropriate (e.g. clean-ups). • Shall assist the Environmental Compliance Officer and/or Mine Manager with applicable data in order to accurately capture the incident into the reporting database.
Area / Line Managers Shall forward a copy of the incident form to other line managers.	• Shall forward a copy of the incident form to the Environmental Compliance Officer and the Mine Manager. • Shall inform the relevant department / person on a weekly basis of the incident by e-mail or by submitting a copy of the incident report. Once a High Risk Incident (any incident which results from a significant aspect and has the potential to cause a significant impact on the environment) occurred it must be reported immediately to the Environmental Compliance Officer and the Mine Manager by telephone or email to ensure immediate response / action. • Shall forward a copy of the completed Incident Reporting Form (and where applicable a copy of the incident investigation) to the relevant department / person.
Environmental Compliance Officer / Mine Manager shall complete an incident assessment form to assess what level of incident occurred	• Shall make recommendations for clean-up and / or appropriate alternate actions. • Shall enter actions necessary to remediate environmental impacts into the database in conjunction with the responsible line manager. • Shall enter the incident onto the database in order to monitor the root causes of incidents. • Shall include the reported incidents in an appropriate monthly / quarterly report. • Shall highlight all incidents for discussion at management meetings.

8.6 Maintenance and emergency procedures

An effective, comprehensive, well-considered and tested environmental emergency preparedness and response plan has the potential to save lives, prevent unnecessary damage to the company and other property and to manage environmental risk in the event of a large chemical spill, oil spill, fuel spill, explosives spill, or fire. The Mineral and Petroleum Resources Regulations requires the mine to implement procedures for environmentally related emergencies and remediation.

Environmental emergencies occur over the short-term and require immediate response. A mine, as part of its management tools, should have an Emergency Preparedness / Response Plan that is available on-site and disseminated to all employees and contractors. The draft emergency preparedness plans for the contractors during construction are provided in Appendix L. Vaalbult Mining will finalise the operational emergency preparedness plan during the construction phase. The plan should contain a list of procedures, evacuation routes and emergency contact numbers. In the event of an emergency, this plan should be consulted. It is advisable that the mine tests the emergency response plan in order to identify any areas for improvement. If the emergency has the potential to affect surrounding communities, they should be alerted via alarm signals or contacted in person. This is the responsibility of the appointed Health and Safety Officer.

A first aid room is provided in the office complex. Compliance with the Vaalbult Mining health and safety policies, as well as ensuring that adequate appropriately trained first aid officers, will be monitored by the appointed Mine Health and Safety Officer.

Communication is vital in an emergency, therefore communication devices such as mobile phones, two-way radios, pagers or telephones, must be placed around the mine. A checklist of emergency response units must be consulted and the relevant units notified. The checklist includes:

- Fire department;
- Police;
- Emergency health services such as ambulances, paramedic teams, poisons centres;
- Hospitals, both local and further afield, for specialist care;
- Public health authorities;
- Environmental agencies, especially those responsible for air, water and waste issues;
- Other industrial facilities in the vicinity with emergency response facilities;
- Public works and highways departments, port and airport authorities; and
- Public information authorities and media organisations.

A summary of a proposed mine emergency procedure plan to be carried out in the event of any accident or incident is provided in Table 8.19. The draft Emergency Preparedness Plan is provided in Appendix L. The detailed plan will be established once the contractors have been appointed.

Table 8:19: Emergency procedures

Accident handling procedure for duty officials	Emergency procedure for duty officials
1. Take down details from reportee including: (a) Telephone number of reportee; (b) Nature of injuries to accident victim/s; (c) If assistance is required from the paramedic; (d) Where the accident victim is located; and (e) If transport is required to evacuate a patient. 2. If the injuries are serious contact ER24 who will notify the paramedics. 3. Await paramedics and instruct them to proceed to the accident site. 4. Notify security and inform them of ambulance arrangements and where the said vehicle must go to. 5. Inform the paramedic called-out on the following: (a) Telephone number of reportee; (b) Nature of injuries to accident victim/s; (c) Location of injury - part of body (arm, leg, head, etc.); (d) Where the accident victim is presently; (e) The condition of victim (breathing, stable, etc.); and (f) If an ambulance is required to evacuate a victim from the accident site to hospital. 6. If necessary provide a guide, at security gate, to escort the ambulance or paramedics to the required location. 7. Inform manager of the accident. *NOTE:* *The procedure does not change because there is more than one accident victim. One victim or 20 victims must be handled in the same manner.*	**First Phase:** 1. Take down the following details of the incident from the reportee: (a) Name of person reporting the incident. (b) The phone number of the reportee; (c) Nature of the incident, explosion, fire etc.; (d) Location of the incident, explosion, fire etc.; (e) If there are casualties and the nature and extent of their injuries; and (f) Ask if the reportee requires assistance (rescue team, doctor, paramedic, transport etc.). 2. Based on the above-mentioned information, the official on duty will take a decision whether to evacuate any or all other work areas of the mine, making use of the current escape plan for the section or area. 3. Report the incident to the mine manager. 4. If the mine manager is unobtainable then report the incident to the next lowest level of official (engineer, mine overseer, etc.). 5. Contact and call out the following personnel: • The paramedics; • The mine overseer for the incident area; • The mine engineer; and • The safety manager. 6. Begin a logbook or record of events putting in detail of times and who said what, where and when, going back to the original reportee. *NOTE:* *(i) The official will assume the position of the incident controller until relieved of that position by the newly appointed incident controller, i.e. (mine manager, engineer, etc.).* *(ii) It is important to ensure that all phone messages are kept to a minimum duration throughout the incident period.* **Second Phase:** 1. If necessary send for ER24, fire brigade, police, etc. 2. Give feedback to newly appointed incident coordinator once he is present on the mine and hand over role to new incident coordinator. 3. Follow instructions of Mine Manager. 4. Refer all media enquiries to head office legal department. 5. Remain in position at control room until relieved. 6. Brief official on current situation. *NOTE:* *Remember to maintain the logbook at all times throughout the duration of the incident.*

9. Rehabilitation plan and financial provision

Once rehabilitation has been completed, post-closure activities will include:

- Water monitoring programme – quarterly assessment of groundwater quality and elevation; and
- Biodiversity assessment – six monthly assessment of the impact of rehabilitation measures taken.

This maintenance or aftercare must continue for a minimum of three years post-closure.

9.1.1 Rehabilitation objective

Once mining is complete the rehabilitation objective is to return the area as near as possible to the pre-mining land use of agriculture (see Appendix M). The aim is to return the arable / cultivated lands that were disturbed by mining back to maize / soya. This will be achieved through correct mining methods, soil stockpiling and replacement, as well as the use of a soil chemist to assist in final soil preparation for crop production. Crop yields from the relevant rehabilitated sections will be assessed against unmined areas. In addition, a suitable grazing capacity for long-term agricultural sustainability of the classified grazing areas, with correct plant speciation / composition and density (based on specialist report and six monthly biodiversity and rehabilitation monitoring programme), will be established. It has been recommended by the biodiversity specialist that should cultivation or grazing of the rehabilitated are not become sustainable long-term then other forms of productive land use are established to reduce the need to transform natural vegetation elsewhere in the landscape. Examples of such alternative agricultural use include (see Appendix G):

- Industries
    - Food processing plants/ factories
    - Manufacturing plants/ factories
    - Storage facilities
- Intensive agriculture
    - Protein production
        - Feedlots
        - Chicken farms
        - Piggeries
    - Starch/ vegetables
        - Hydroponics/ tunnels
        - Irrigation of rehabilitated areas specifically prepared for the purpose of cultivation
        - Orchards
    - Forestry related to energy production (wood chips, charcoal) and furniture

Taking account of the MPRDA principles for closure (see Section 3.6) the main closure objective is to mine in such a way as to limit impacts on the topography, biodiversity, hydrogeology and aesthetics of the area by:

- Restricting the sphere of influence through the creation of suitable buffers and limiting the disturbed area to that which is necessary only;
- Controlling erosion through the correct management of soils and the implementation of suitable erosion and storm water control measures;
- Controlling nuisances, such as fugitive dust and noise, at the source through the surfacing of haul roads, wet dust suppression in mining areas and operating primarily in daylight hours (12 hour days);
- Managing soils appropriately during stripping, handling and stockpiling to protect against erosion, compaction and contamination;
- Concurrent on-going rehabilitation during the mining phase (proper backfilling and shaping of the land profile) to minimise topography and visual impacts of the opencast / trench sections and ensure that the area will return to near pre-mining conditions as soon as possible after closure.
- Effective implementation of the Environmental Awareness Programme.

The main activities during the decommissioning and closure phases will include (taking account of all areas of disturbance):

- Removal of surface infrastructure such as the office complex, ROM coal stockpile areas, and any on-site operational roads.
- Removal of stormwater and pollution control measures that are no longer required.
- General surface rehabilitation of the area disturbed during the operations.

Therefore once the closure phase is complete it is expected that positive re-establishment of the following aspects post-mining will have occurred:

- Topography: the topography will be returned as close as possible to pre-mining conditions and contouring to ensure that the natural pre-mining drainage is maintained where opencast mining / trenching has taken place. This in combination with correct high wall mine planning and engineering should ensure that there is no effect on the land stability regarding the rehabilitated land once mining operations have ceased.
- Land use and capability: rehabilitation will return the disturbed land as close as possible to pre-mining conditions based on contouring and soils with the input of appropriately qualified professionals.
- Biodiversity and sensitive areas: re-establish agricultural practices on disturbed areas to prevent / reduce the need to transform natural vegetation elsewhere in the landscape.
- Visual: demolition and removal of mining related infrastructure with the associated rehabilitation (soils replacement, contouring, and vegetation) will return the topography as close as is feasible to pre-mining conditions and improve the overall visual impact of the project area.

There will however be residual environmental impacts on:

- Regional socio-economic structure: the proposed operation will provide employment for the life of the mine only; therefore some residual effects on the local economy will be felt for some time after the mine has closed. However, with the combination of the use of mining contractors for the short duration opencast sections and effective local economic development and re-skilling projects in the Social and Labour Plan this impact should not continue into the long-term.
- Hydrogeology: although the natural surface drainage and groundwater levels should return post-mining, there may be residual impacts in terms of quality. This will be monitored through the water monitoring programme to ensure that any negative post-closure impacts are identified and mitigated where necessary.

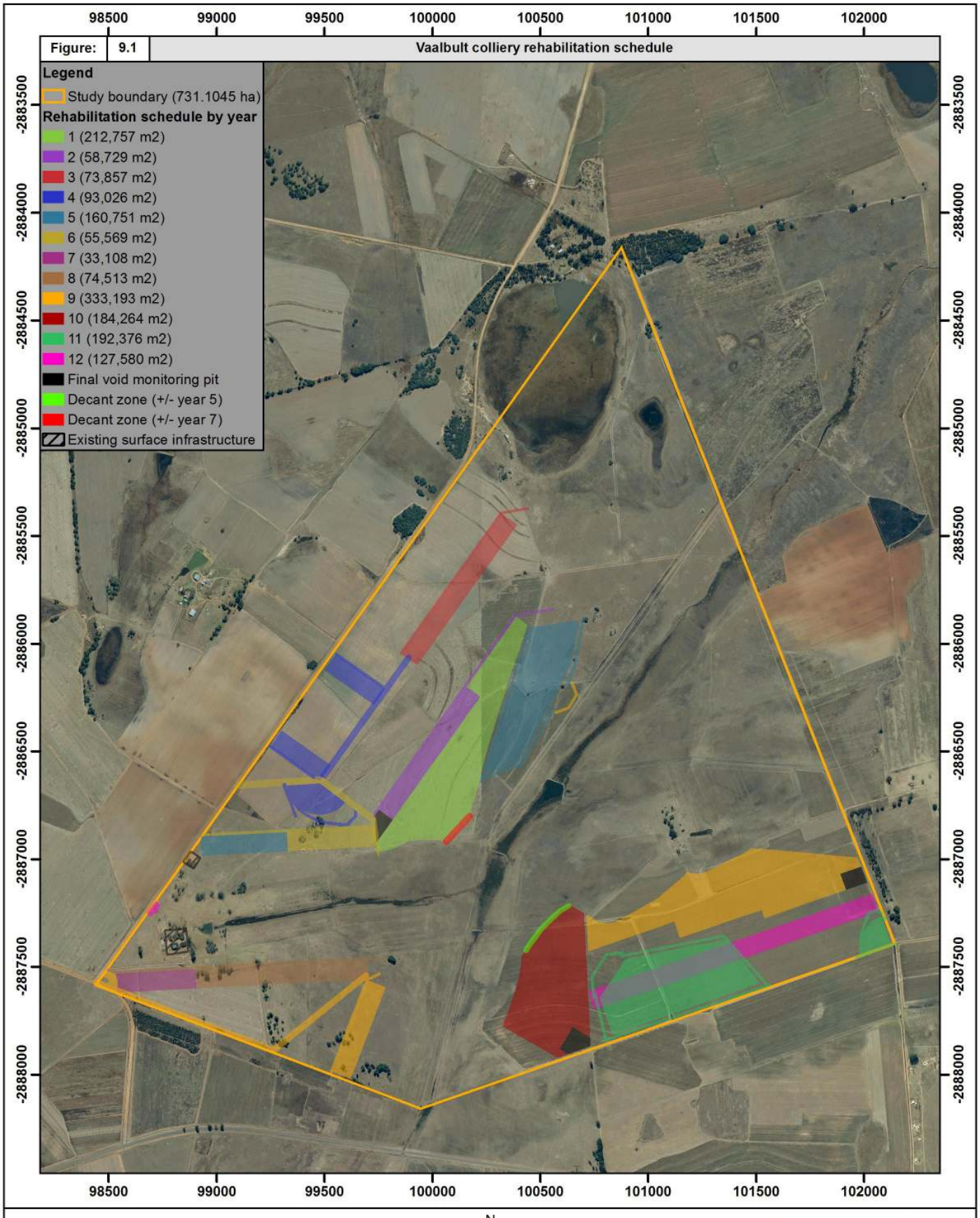
At the end of the closure phase the area should be rehabilitated to the stated objective. Post closure, however the rehabilitated area will be monitored for water quality, pollution and decant on a quarterly basis, and biodiversity on a six-monthly basis for a minimum of three years. This will ensure that stated objective has been achieved, as well as mitigate any post closure impacts.

9.1.2 Financial provision

The financial provision for the environmental rehabilitation and closure of any mine and its associated mining operations forms an integral part of the MPRDA (Sections 41(1), 41(2), 41(3) and 45). The DME guidelines require a 'clean closure' cost assessment, meaning that the mine infrastructure has no salvage value.

Based on the sequencing and phases of mining outlined in Section 3.5 it is evident that the quantum of the financial provision to ensure rehabilitation (as close as possible to the existing environment topographically and agriculturally) of the area disturbed will vary throughout the life mine. Figure 9.1 indicates the schedule of rehabilitation during the mining operations. The 'clean closure' cost estimates for the first year of operation and total life of mine (as provided in the mining work programme are presented in Tables 9.1 and 9.2 (in accordance with DMR guidelines) and include the following:

- Master rates as supplied by the 2013 guideline;
- Multiplication factor related to a Class A mine (coal) in an area of low sensitivity (largely disturbed rural area);
- Weighting factor 1 related to flat terrain (1)
- Weighting factor 2 related to peri-urban proximity (urban area <150 km; 1.05)
- Preliminary and General (P&G) at 12% of calculated total quantum (subtotal 1 <R100 million);
- Contingency at 10% of calculated total quantum (subtotal 1); and
- VAT at 14% of calculated total quantum including P&G and contingency (subtotal 2)



Mapping and layout by:

S3 Technologies
Spatial Systems Solutions

Date of print
13 November 2013

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The quantum for rehabilitation required per year based on the rehabilitation schedule is provided in Appendix M. The quantum provided is subject to an annual review and revision. The mine is required to ensure full financial cover for the current liability at any point in the life of the mine. Pecuniary provision must be made for the shortfall between any existing fund balance and the premature closure or current environmental rehabilitation liability. Updates and further information on the quantum for rehabilitation will be provided in Appendix M.

Table 9.1: Vaalbult rehabilitation financial provision for the first year of the mining process

CALCULATION OF THE QUANTUM

Mine:	**Vaalbult Colliery Project**
Period:	**Yr 1**
Operations:	**Opencast coal mining**
Risk Class	A
Area Sensitivity	Medium

No.	Description	Unit		B	C	D	E=A*B*C*D
				Master rate 2013	Multiplication factor	Weighting factor 1	Amount (rands)
1	Dismantling of **processing plant and related structures** (including overland conveyors and powerlines)	m3	N/A	11.23	1.00	1.00	
2(A)	Demolition of **steel buildings and structures**	m2	N/A	156.48	1.00	1.00	
2(B)	Demolition of **reinforced concrete buildings and structures**	m2	N/A	230.61	1.00	1.00	
3	Rehabilitation of **access roads**	m2	22,343	28.00	1.00	1.00	625,604
4(A)	Demolition and rehabilitation of **electrified railway lines**	m	N/A	271.79	1.00	1.00	
4(B)	Demolition and rehabilitation of **non-electrified railway lines**	m	N/A	148.25	1.00	1.00	
5	Demolition of **housing and/or administration facilities**	m2	N/A	312.97	1.00	1.00	
6	Opencast rehabilitation including final voids and ramps **(and trenches)**	ha	6	164,061	0.52	1.00	511,869
7	Sealing of **shafts, adits and inclines (high wall drives)**	m3	N/A	84.01	1.00	1.00	
8(A)	Rehabilitation of **overburden and spoils**	ha	12	109,374	1.00	1.00	1,323,422
8(B)	Rehabilitation of processing waste **deposits and evaporation ponds (basic salt-producing waste)**	ha	N/A	136,223	1.00	1.00	
8(C)	Rehabilitation of processing waste **deposits and evaporation ponds (acidic, metal-rich waste)**	ha	2	395,656	0.80	1.00	633,050
9	Rehabilitation of **subsided areas**	ha	N/A	91,584	1.00	1.00	
10	**General surface rehabilitation**	ha	25	86,642	1.00	1.00	2,140,067
11	**River diversions**	ha	N/A	86,642	1.00	1.00	
12	**Fencing** (use existing fencing)	m	0	98.83	1.00	1.00	0
13	**Water management**	ha	28	32,944	0.67	1.00	606,991
14	2 to 3 years of **maintenance and aftercare**	ha	44	11,530	1.00	1.00	511,948
15A	Specialist study (water)	Sum	1	500,000	1.00	1.00	500,000
15B	Specialist studies (soil remediation)	ha	1	500,000	1.00	1.00	500,000
					SubTotal 1		**7,352,950**
				(Sum of items 1 to 15 above)			
	Preliminary and General	**6.0%** if Subtotal 1 > 100 000 000			Weighting factor 2		
		12.0% if Subtotal 1 < 100 000 000				1.05	926,472
	Contingency	10.0% of Subtotal 1					735,295
						SubTotal 2	**9,014,717**
					(Subtotal 1 plus sum of management and contingency)		
						Add Vat (14%)	1,262,060
						GRAND TOTAL	**10,276,777**
						(Subtotal 2 plus VAT)	

Table 9.2: Vaalbult rehabilitation financial provision for the life of the mining operation

CALCULATION OF THE QUANTUM

Mine: **Vaalbult Colliery Project**

Period: **Life of Mine**

Operations: **Opencast, trenching and high wall mining**

Risk Class A

Area Sensitivity Medium

No.	Description	Unit		B	C	D	E=A*B*C*D
				Master rate 2013	Multiplication factor	Weighting factor 1	Amount (rands)
1	Dismantling of **processing plant and related structures** (including overland conveyors and powerlines)	m3	N/A	11.23	1.00	1.00	
2(A)	Demolition of **steel buildings and structures**	m2	N/A	156	1.00	1.00	
2(B)	Demolition of **reinforced concrete buildings and structures**	m2	N/A	231	1.00	1.00	
3	Rehabilitation of **access roads**	m2	46,115	28	1.00	1.00	1,291,220
4(A)	Demolition and rehabilitation of **electrified railway lines**	m	N/A	272	1.00	1.00	
4(B)	Demolition and rehabilitation of **non-electrified railway lines**	m	N/A	148	1.00	1.00	
5	Demolition of **housing and/or administration facilities**	m2	N/A	313	1.00	1.00	
6	Opencast rehabilitation including final voids and ramps **(and trenches)**	ha	20	164,061	0.52	1.00	1,706,229
7	Sealing of **shafts, adits and inclines (high wall drives)**	m3	750	84	1.00	1.00	63,008
8(A)	Rehabilitation of **overburden and spoils**	ha	17	109,374	1.00	1.00	1,903,102
8(B)	Rehabilitation of processing waste **deposits and evaporation ponds (basic salt-producing waste)**	ha	N/A	136,223	1.00	1.00	
8(C)	Rehabilitation of processing waste **deposits and evaporation ponds (acidic, metal-rich waste)**	ha	2	395,656	0.80	1.00	696,355
9	Rehabilitation of **subsided areas**	ha	0	91,584	1.00	1.00	0
10	**General surface rehabilitation**	ha	57.0	86,642	1.00	1.00	4,938,617
11	**River diversions**	ha	N/A	86,642	1.00	1.00	
12	**Fencing** (use existing fencing)	m	1,156	99	1.00	1.00	114,218
13	**Water management**	ha	120	32,944	0.67	1.00	2,648,688
14	2 to 3 years of **maintenance and aftercare**	ha	100	11,530	1.00	1.00	1,153,036
15A	Specialist study (water)	Sum	1	500,000	1.00	1.00	500,000
15B	Specialist studies (soil remediation)	ha	1	500,000	1.00	1.00	500,000
						SubTotal 1	**15,514,472**
				(Sum of items 1 to 15 above)			
	Preliminary and General	**6.0%** if Subtotal 1 > 100 000 000			Weighting factor 2		
		12.0% if Subtotal 1 < 100 000 000				1.05	1,954,823
	Contingency	10.0% of Subtotal 1					1,551,447
						SubTotal 2	**19,020,743**
						(Subtotal 1 plus sum of management and contingency)	
						Add Vat (14%)	2,662,904
						GRAND TOTAL	**21,683,647**
						(Subtotal 2 plus VAT)	

10. GAP ANALYSIS AND CONCLUSION

Vaalbult Mining Company (Pty) Ltd (Vaalbult Mining) has applied to the Department of Mineral Resources (DMR) to mine coal via opencast, trench and high wall mining on portions 1, 9 and 10 of the Farm Vaalbult 3 IT within the Albert Luthuli Local Municipality, Gert Sibande District, Mpumalanga. The proposed mining right area covers approximately 730 ha and is located about 13.5 km west of Carolina off the R38 to Hendrina.

Based on the type and placement of the mine infrastructure in addition to the mining right application process, the listed activities requiring authorisation include:

- Activities requiring a basic assessment (NEMA):
    - Construction of facilities for the transmission and distribution of electricity > 33 kV but <275 kV (Activity 10)
    - Road construction – road >8m wide (Activity 22)
- Activities requiring a scoping and EIA (NEMA):
    - Construction of facilities for the storage of effluent (Activity 5)
    - Transformation of undeveloped land >20 hectares (Activity 15)
- Activities requiring a water use (NWA):
    - Section 21a – taking water from a water resource – abstraction from a borehole (groundwater) for the mining operations (4,000 litres per hour by 12 hours by 30 days)
    - Section 21g – Disposing of waste in a manner which may detrimentally impact on the water resource including pollution control dam/s, use of pollution control dam water for dust suppression and temporary ROM stockpiles
    - Section 21j – Removal of underground water for a safe mining environment
    - Section 21c & i – mining within 500 m catchment of a wetland (pan / riparian wetland)

This EIA aims to identify the environmental impacts that may result from the proposed mining operations (including construction, operation, and decommissioning and closure phases). The significant impacts in terms of this report requiring careful management include:

- Changes in topography and slope during and after opencast / trench operations;
- Handling of soils and effective rehabilitation to ensure that areas of surface disturbance are returned to agriculture;
- Water resource availability during operations - groundwater volumes and elevation changes through abstraction;
- Water resource pollution potential;
- Long-term impacts of acid mine drainage post-closure;
- Ecologically sensitive areas during operation;
- Heritage sites during operations; and
- Habitat and atmospheric degradation due to high levels of particulates in the air.

The assessment has been based on information available, and the gaps in this information include:

- Vibration assessment – baseline stills needs to be undertaken prior to commencement of mining
- Hydrogeology – on-going monitoring and modelling of data for seasonal fluctuations groundwater-surface water interaction, and additional boreholes need to be drilled to gain a better understanding of the secondary aquifer at VGM02 and amend mine plan accordingly.

11. UNDERTAKING

An undertaking of agreement to the management strategies as proposed in the EMP as well as an undertaking of approval of the EMP is provided below:

I, _____ the undersigned and duly authorised thereto by **Vaalbult Mining Company (Pty) Ltd**, have studied and understand the contents of this Environmental Management Programme (EMP) and duly undertake to adhere to the conditions as set out therein, unless specifically or otherwise agreed to.

Signed at _____ on this day _____of 2013

_____

Signature of authorised representative

I, _____ the undersigned and duly authorised thereto by **Department of Mineral Resources** have studied and approved the contents of this Environmental Management Programme (EMP).

Signed at _____ on this day _____of 2013

_____

Signature of Director: Mineral Development

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APPENDIX A:
HIGH WALL MINING SYSTEM BROCHURE

(as per June 2013 submission)

APPENDIX B:
CONCEPTUAL DESIGN REPORT AND WATER BALANCE

(updated for the August 2013 submission as attached)

(See Annexure D of the IWULA Report)

Vaalbult Colliery Provisional Water Balance

Climate information			
Mean Annual Precipitation (mm)	672		
Wet Season Rainfall (mm)	604		
Mean annual Evaporation (mm)	1600		
Wet Season Evaporation (mm)			
Start of wet season 01-Sept			
Start of dry season 01-May			
Wet Season Loss ratio to Evaporation 85% of losses			
Dry Season Loss ratio to Evaporation 100% of losses			
Water usage: potable and sewage			
Potable			
Individual consumption (litres / person / day)	200		
Employees	64		
Visitors	6		
Total consumption (m3 / day)	14		
Low volume storage (2 days)	28		
Sewerage factor (%)	75		
Sewerage (m3 / day)	10.5		
Water usage: high wall mining			
Consumption (litres / hour)	4000		
Shift hours per day	12		
Operational days per month	30		
Total consumption (m3 / day)	48		
Total consumption (m3 / month)	1440		
Water usage: dust suppression		**With mitigation - road surfacing**	
On-site haul road length total (m)	3700		2025
On-site haul road length at any one time (m)	1500		1170
On-site haul road width (m)	20		20
Product haul road length: Year 1 to 5 (m)	2000		0
Product haul road length: Year 6 to 8 (m)	880		0
Product haul road length: Year 9 to 11 (m)	1120		0
Product haul road width (m)	10		0
Rate of application (litres/m2)	1		1
Application frequency (per day)	4		4
Total consumption: Year 1 to 5 (m3 / day)	200		94
Total consumption: Year 1 to 5 (m3 / month)	6000		2808
Total consumption: Year 6 to 8 (m3 / day)	155		94
Total consumption: Year 6 to 8 (m3 / month)	4656		2808
Total consumption: Year 9 to 11 (m3 / day)	165		94
Total consumption: Year 9 to 11 (m3 / month)	4944		2808
Average consumption (m3 / day)	178		94
Average consumption (m3 / month)	5345		2808
Water in (m3/day)		Water out (m3/day)	
Borehole (such as VGM02)	120	Potable-sewage	14
Grey water reclaim	8	High wall mining	48
Make up water (PCDs)	**28**	Dust suppression	94
	156		156

The full water balance and conceptual design report for the pollution control dams are provided in the following pages.

APPENDIX C:
SOILS AND LAND CAPABILITY ASSESSEMENT REPORT

(as per June 2013 submission)

(See Annexure E of the IWULA Report)

APPENDIX D:
FLOODLINE DETERMINATION REPORT

(as per June 2013 submission)

(See Annexure F of the IWULA Report)

APPENDIX E:
HYDROGEOLOGICAL ASSESSMENT

(as per June 2013 submission)

(See Annexure G of the IWULA Report)

APPENDIX F:
BASELINE AIR QUALITY ASSESSMENT

(as per June 2013 submission)

APPENDIX G:
BIODIVERSITY ASSESSMENT REPORT

(as per June 2013 submission)

(See Annexure H of the IWULA Report)

APPENDIX H:
HERITAGE IMPACT ASSESSMENT

(as per June 2013 submission)

APPENDIX I:
VIBRATION AND NOISE ASSESSMENT

(as per June 2013 submission)

APPENDIX J:
PHOTOGRAPHS AND PLANS

APPENDIX K:
CONSULTATION PROCESS

(updated for the August 2013 submission as attached)

APPENDIX L:
ENVIRONMENTAL PREPAREDNESS PLAN

APPENDIX M:
REHABILITATION PLAN