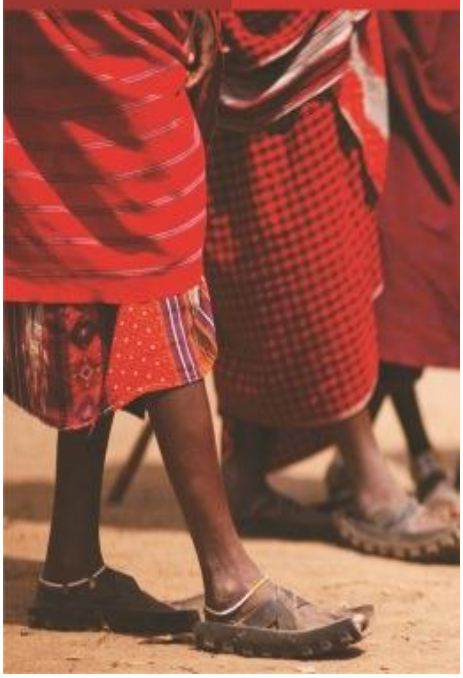

DIGBY WELLS
ENVIRONMENTAL

Exxaro Coal Pty (Ltd) Grootegeluk Short-Term Stockpiles Amendment Project

Soils, Land Capability and Land Use Assessment

Project Number:

EXX3666

Prepared for:

Exxaro Coal (Pty) Ltd

26 April 2016

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Soils, Land Capability and Land Use Report**
Project Name:	**Exxaro Coal Pty (Ltd) Grootegeluk Short-Term Stockpiles Amendment Project**
Project Code:	**EXX3666**

Name	Responsibility	Signature	Date
Siphamandla Madikizela	Report Compiler		26 April 2016
Brett Coutts	Report Reviewer		28 April 2016

EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) was appointed by Exxaro (Pty) Ltd (Exxaro), Grootegeluk Coal Mine (hereafter Grootegeluk) to amend the environmental authorisations for the Grootegeluk Infrastructure Expansion Project in 2014. The permitting documents were submitted to Limpopo Department of Economic Development, Environment and Tourism (LEDET) and Department of Mineral Resources (DMR).Exxaro were granted an Environmental Authorisation in October 2014 and August 2015.

This report gives a soils, land capability and land use assessment of the proposed extension of the GG10B Stockyard footprint within the internal area of the discontinued rail loop and the proposed stockpile areas (laydown area, GG10B, and multiproduct stockyard footprints) at the Grootegeluk Mine.

Grootegeluk is located approximately 20 kilometres (km) from Lephalale in Limpopo Province. Grootegeluk is in a relatively dry area within the boundaries of quaternary catchments A42J, in the Limpopo Water Management Area (WMA01). The surrounding surface water resources are the Sandloop Stream, the Mokolo River and the Limpopo River; however there are no streams flowing in the vicinity.

The land type data gathered suggested land type Ah85 with dominant soil types like Clovelly, Hutton and Mispah. The land capability is dominated by Class V (moderate grazing) and Hutton and Clovelly have deep depths and are easy to manage from an agricultural perspective when compared to Mispah. The land uses dominated in this project area are mines and mine buildings.

The impact assessment is provided in this report, as well as the necessary mitigation measures to prevent and/or minimise the identified potential impacts. The major impacts associated with the expansion of coal stockyard and stockpiles are the disturbance of soil profiles. The impact on soil is high because natural soil layers will be stripped and stockpiled for later use in rehabilitation. Soil fertility will be impacted on because stripped soil layers, thus fertilisation and monitoring of these is required to minimise erosion.

The following is recommended:

- All soils are only to be stripped during the dry season, if possible;
- The top soil stockpiles cleared from the stockpile footprints should be well managed and vegetated to prevent erosion; and
- The soils must be stripped according to the soil stripping guideline.

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1 Introduction

Digby Wells Environmental (Digby Wells) completed the soil assessments in in 2014 for the original infrastructure expansion project for Exxaro Coal (Pty) Ltd. (Exxaro) Grootegeluk Coal Mine. Subsequently, the off-take of coal by Medupi Power Station has slowed due to delays in construction and Exxaro requires additional stockpiling space to accommodate the excess coal on site. Exxaro was granted an Environmental Authorisation by Limpopo Department of Economic Development, Environment and Tourism (LEDET), according to the National Environmental Management Act (No. 107 of 1998), in October 2014.

Digby Wells was appointed by Exxaro (Pty) Ltd (Exxaro), Grootegeluk Coal Mine (hereafter Grootegeluk) to amend the environmental authorisations for the Grootegeluk Infrastructure Expansion Project in 2014. The permitting documents were submitted to Limpopo Department of Economic Development, Environment and Tourism (LEDET) and Department of Mineral Resources (DMR).Exxaro were granted an Environmental Authorisation in October 2014 and August 2015.

The approved uses of the stockpile areas will need to be changed to also utilise the laydown Area, GG10B, and multiproduct stockyard footprints to stock excess Eskom-grade coal only (in the form of a compacted coal stockpile), for an approximate period of five years, until Medupi station is fully operational. These changes will also include the extension of the GG10B Stockyard footprint by approximately 12.8 hectares (ha) by including the current D8 rail loop area, which will be decommissioned with the construction of the new loadout area, also referred to as the extension area.

The proposed changes will require authorisation in terms of Regulation 31 of the NEMA and, a Section 21(g) Authorisation in terms of the National Water Act, 1998 (Act No 36 of 1998).

The Grootegeluk operations consist of open pit mining, several plants supplied by extensive stockpiles and tailing storage facilities and discard dump. The site is operational and most of the proposed infrastructure will be in current mining / disturbed areas.

This report provides sufficient information associated with the soils aspects associated with the project and summarises some of the key findings based on the previous assessments undertaken.

1.1 Reviewed information

The soils report (Environmental Impact Assessment for Grootegeluk Rail Loop, 2014) has all the information required, soil types, land capability, land uses and soil fertility. Potential Impacts on soil for the expansions were identified for each phase. The Land Type for the existing area and proposed expansion is the same. The regional and specific site land capability is moderate grazing and land use is mining related and wilderness.

2 Project Description

Exxaro has an operational mine, namely Grootegeluk Coal Mine. Exxaro owns multiple mining operations, including Grootegeluk Coal Mine (hereafter Grootegeluk), which has been in operation since 1982 in the Limpopo Province. Grootegeluk is located approximately 18 km outside of Lephalale and was contracted to supply coal to Eskom's Matimba power station and later the Medupi power station. Off-take of Eskom coal has slowed and Exxaro requires additional stockpiling space to accommodate the excess coal on site.

Exxaro applied to expand certain infrastructure within the mine boundary area, referred to as the Grootegeluk Coal Mine Infrastructure Expansion Project. Exxaro submitted Applications in terms of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) and Minerals and Petroleum Resources Development Act (MPRDA), 2002 (Act No. 28 of 2002) to include the following activities / expansions within the mine boundary:

- Expansion of the rail loop, load out stations and associated infrastructure;
- Expansion of the existing coal stockyard and stockpiles;
- Expansion of the fuel storage depot;
- Expansion of beneficiation plants and associated infrastructure;
- New road and conveyors to fines recovery area;
- New gate and hard park area; and
- Expansion of ancillary infrastructure and new 33 kV power line.

The aforementioned 2014 amendment was also associated with the expansion of the existing coal product stockpiles. The following stockpiles and stockyards were included in the applications and approved:

- GG 6/2 stockyard;
- GG 10 stockyards;
  - Conical Stock pile;
  - Stockyard A and
  - Stockyard B;
- Multi-product overflow stockyard

The Grootegeluk Coal Mine Infrastructure Expansion Project was authorised in terms of the NEMA and the Environmental Impact Assessment Regulations of 2010[1], (which have been repealed). The Limpopo Department of Economic Development, Environment and Tourism (LEDET), and the Record of Decision are dated 27 October 2014, with reference number

[1] Dated 18 June 2010

12/1/9/1-W89 (refer to Figure 2-1). The Department of Mineral Resources (DMR) Environmental Management Programme (EMP) Amendment approval was granted on the 28 August 2015.

Exxaro proposed a phased authorisation approach for the amendments that are being requested for. Exxaro proposes to amend the existing Authorisation relevant to the Grootegeluk Mine Infrastructure Expansion Project (which included the expansion of the GG10 Stockyards and several other stockpile areas).

The purpose of these amendments is to allow Exxaro to legally stockpile Eskom-grade coal currently being mined from the upper coal benches at the Grootegeluk Mine. In summary the two phases included the following:

- Phase 1: Amendment of the GG10A stockyard for temporary use - The amendment of the GG10A stockyard area with the capacity of 400,000m^3 to include the alternative of a temporary 2 Mt compacted Power Station Coal Stockpile in the same footprint area.
- Phase 2: Amend the GG10B stockyard area - The amendment of the GG10B stockyard to include the additional area inside the loop not originally included. To also amend the use of the multi-product overflow stockpiles to stacking and loading areas. The additional 1.1mil stockpiles area in the footprint of the original Coke and Co-gen area will need to be included as an additional area.

Further to what has been noted above regarding the requested amendment, Exxaro received approval from Department of Water Affairs (DWS) and DMR for Phase 1 of the project on the 5th May 2016 and 7th July 2016 respectively. This part of the project and associated specialist studies conducted is in support of the Phase 2 amendment that is being requested for in terms Section 31 of the 2014 NEMA Regulations applies as this is an amendment to an existing Environmental Authorisation. Thus the information contained within this specialist report is specific to the Phase 2 amendment process, however does make reference to Phase 1 with respect to the areas assessed.

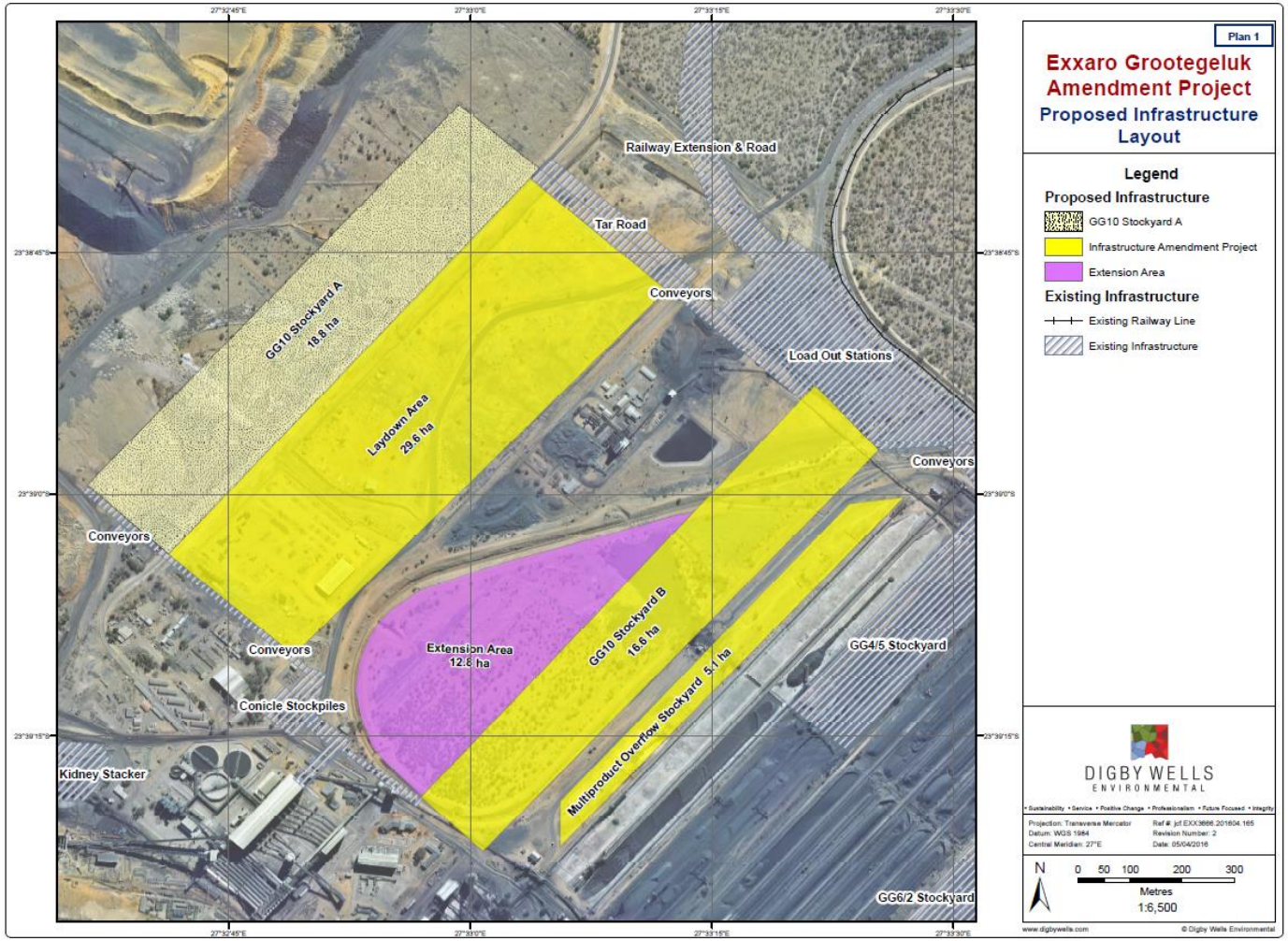


Figure 2-1 Site layout

The purpose of this Project is to utilise the laydown area, GG10B, and Multiproduct Stockyard footprints to stock excess Eskom-grade coal for an approximate period of five years, until Medupi power station is fully operational. This project also includes the extension of the GG10B Stockyard footprint by approximately 12.8 ha by including the current D8 rail loop area, which will be decommissioned with the construction of the new loadout area, also referred to as the extension area (approximate extent shown in purple). The assumed grade of coal to be placed on this proposed consolidated stockpile area has been classified as Type 3 waste, requiring a Class C liner or equivalent liner system. It is assumed the amount of coal to be stockpiled in this area will total six megatons. It must be noted that the liner requirements for Phase 1 and Phase 2 will differ and is based on the waste classification that was undertaken.

The proposed changes will require authorisation in terms of Regulation 31 of the NEMA, as well as a Section 21(g) Authorisation in terms of the National Water Act, 1998 (Act No 36 of 1998).

3 Methodology

3.1 Soil

For the existing soil information reviewed and previous site fieldwork conducted in 2014, a hand soil auger was used to determine the soil type and depth. The soil was augered to the first restricting layer or to a 1.5m depth. The soil types found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification work group, 1991). The topsoil and subsoil of dominant soil groups were sampled. The samples were analysed at a certified laboratory for soil acidity and fertility indicators.

3.2 Soil and Land Capability

Land Capability is determined by a combination of soil, terrain and climatic features. Land Capability classification indicates sustainable long term use of land under rain-fed conditions while soil properties implicating limitations associated with the various land use classes are taken into consideration. Land capability will be categorized by into the classes listed in Table 3-1.

Table 3-1: Land Capability Class and Intensity of use

Land Capability Class	Increased Intensity of Use									Land Capability Groups
I	W	F	LG	MG	IG	LC	MC	IC	VI C	**Arable Land**
II	W	F	LG	MG	IG	LC	MC	IC		
III	W	F	LG	MG	IG	LC	MC			

Land Capability Class	Increased Intensity of Use									Land Capability Groups
IV	W	F	LG	MG	IG	LC				
V	W		LG	MG						**Grazing Land**
VI	W	F	LG	MG						
VII	W	F	LG							
VIII	W									**Wildlife**

W – Wildlife **MG – Moderate Grazing** **MC – Moderate Cultivation**
F- Forestry **IG – Intensive Grazing** **IC – Intensive Cultivation**
LG – Light Grazing **LC – Light Cultivation** **VIC – Very Intensive Cultivation**

3.3 Land Use

Present Land Use was determined using aerial imagery.

3.4 Environmental Impact Assessment

The surface water impacts are assessed based on the impact's magnitude, as well as the receiver's sensitivity, culminating in an impact significance which identifies the most important impacts that require management.

Based on international guidelines and South African legislation, the following criteria are taken into account when examining potentially significant impacts:

- Nature of impacts (direct/indirect, positive/ negative);
- Duration (short/medium/long-term, permanent(irreversible) / temporary (reversible), frequent/seldom);
- Extent (geographical area, size of affected population/habitat/species);
- Intensity (minimal, severe, replaceable/irreplaceable);
- Probability (high/medium/low probability); and
- Possibility to mitigate, avoid or offset significant adverse impacts.

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

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

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

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

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 3-2. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this Report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 3-3, which is extracted from Table 3-2. The description of the significance ratings is discussed in Table 3-4.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 3-2: Impact Assessment Parameter Ratings

RATING	INTENSITY/ REPLACEABILITY		EXTENT	DURATION/REVERSIBILITY	PROBABILITY
	Negative impacts	Positive impacts			
7	Irreplaceable damage to highly valued items of great natural or social significance or complete breakdown of natural and / or social order.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable damage to highly valued items of natural or social significance or breakdown of natural and / or social order.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.
5	Very serious widespread natural and / or social baseline changes. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.

RATING	INTENSITY/ REPLACEABILITY		EXTENT	DURATION/REVERSIBILITY	PROBABILITY
	Negative impacts	Positive impacts			
4	On-going serious natural and / or social issues. Significant changes to structures / items of natural or social significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.
3	On-going natural and / or social issues. Discernible changes to natural or social baseline.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor natural and / or social impacts which are mostly replaceable. Very little change to the baseline.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.
1	Minimal natural and / or social impacts, low-level replaceable damage with no change to the baseline.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 3-3: Probability/Consequence Matrix

Significance

Probability \ Consequence	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3

Probability \ Consequence	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
7	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Table 3-4: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Substantial (positive)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Major (positive)
36 to 72	An positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Major (negative)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Substantial (negative)

4 Baseline Environment

This section aims to provide an accurate baseline of the soil resources of the study area through provision of the following data:

- The Land Type describing the expected soil types of the extended project area;

- The Land Capability which was based on the Land Type information;
- The Land Use described at a desktop level;
- The potential impacts associated with the project; and
- Management and mitigation for the project.

4.1 Soil-Regional

According to the Land Type Data, the study site is classified as Land Type Ah85 (Plan 1). The dominant soil forms expected within this Land Type are Hutton, Clovelly and Mispah. These soils are described in more detail below Table 4-1.

Table 4-1: Summary of dominant soil types within Ah85

Soil Type	Description	Land Capability
Clovelly	Yellow-brown, sandy, deep and well drained	V
Hutton	Red, sandy, deep and well drained	V
Mispah	Shallow and rocky	VI

4.1.1 Clovelly

The Clovelly soil form consists of an Orthic A overlying a yellow-brown apedal B-horizon, underlain by unspecified material. These soils are freely draining and as a result can be slightly acidic due to the low Cation Exchange Capacity (CEC).

4.1.2 Hutton

The Hutton soil from consists of an Orthic A overlying red apedal B horizon, underlain by unspecified material. The Hu soil form is well drained and often a deep soil. Have low cation exchange capacity (CEC) due to the low clay content. These soils are generally occupying upper mid-slopes and often found associated with the Griffin and Clovelly soil forms. They are suitable for arable crop production.

4.1.3 Mispah

The Mispah soil form consists of an Orthic A overlying impermeable rock. These soils are generally shallow with depths ranging from 100 to 400 mm and have a high erodibility potential. Despite their shallow nature, Mispah soils can accommodate a wide variety of short shrub vegetation.

4.2 Land Capability-Regional

The Land Capability from the Land Type database shows that the dominant land capability for the extension of the stockyard footprint is Class V (Moderate grazing – Refer to Plan 2). Land in Class V has little or no erosion hazard but have other limitations impractical to

remove that limit its use largely to pasture, range, woodland or wildlife food and cover. These limitations restrict the kind of plants that can be grown and prevent normal tillage of cultivated crops. Pastures can be improved and benefits from proper management can be expected.

4.3 Land Use-Regional

The dominant Land Use based on the Land Type data for the extension of the stockyard footprint, are mines and mine buildings (Refer to Plan 3).

4.4 Soil-Site Specific

The soil present in the Grootegeluk Coal Mine project area, are represented by land type namely Ah85. The dominant soils within land type Ah85 (Plan 1) are similar with the ones from the regional area. The dominant soils were Hutton, Clovelly and Mispah.

4.5 Baseline Soil Quality

Representative soil samples were collected within the project from the previous assessment that was undertaken and the information presented below provides a summary of the findings. These samples were collected from dominant Hutton, Clovelly and Shortlands soil types. Both top and subsoil samples were collected using a handheld soil auger. The soil samples were analysed for pH, P, K, Na, Ca and Mg. The results are in the Table 4-2 below.

Table 4-2: Soil fertility indicators of the major groups

Sample Number	Description	pH (KCl)	P mg kg^{-1}	K mg kg^{-1}	Na mg kg^{-1}	Ca mg kg^{-1}	Mg mg kg^{-1}
1	Clovelly Topsoil	4,62	0	24	7	49	17
2	Subsoil	4,55	0	27	8	40	15
3	Clovelly Topsoil	5,01	0	31	7	70	18
4	Subsoil	4,42	0	20	8	33	11
5	Shortlands Topsoil	5,84	1	111	16	777	237
6	Subsoil	6,32	0	77	13	529	188
7	Hutton Topsoil	6,00	1	61	11	438	131
8	Subsoil	5,82	0	25	8	181	47
9	Hutton Topsoil	5,98	1	41	9	242	41
10	Subsoil	6,16	0	26	10	263	36

4.5.1 Phosphorus

The P levels encountered in the samples from the site were all very low.

4.5.2 Soil pH

The pH is determined in the supernatant liquid of an aqueous suspension of soil after having allowed the sand fraction to settle out of suspension. The pH values determined in the samples varied mostly according to soil form. The pH levels were below 7 and thus these soils are acidic.

4.5.3 Exchangeable Cations (Ca, Mg, K and Na)

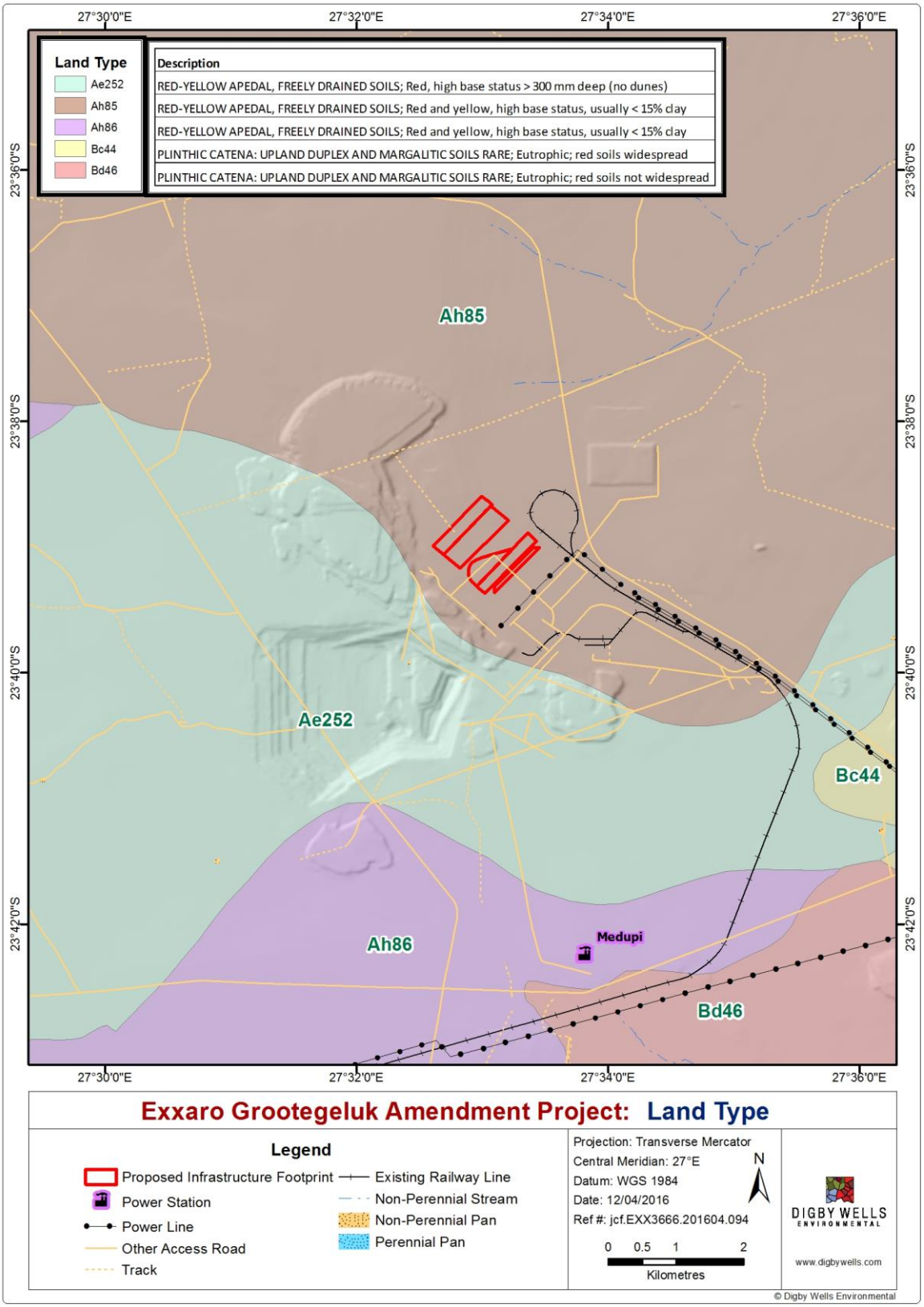
Almost all of the soil samples collected on the site exhibit the profile of Ca>Mg>K>Na concentrations (Table 4-2). These soils had low fertility content and this is due to poor soil parent materials.

4.6 Land Capability-Site Specific

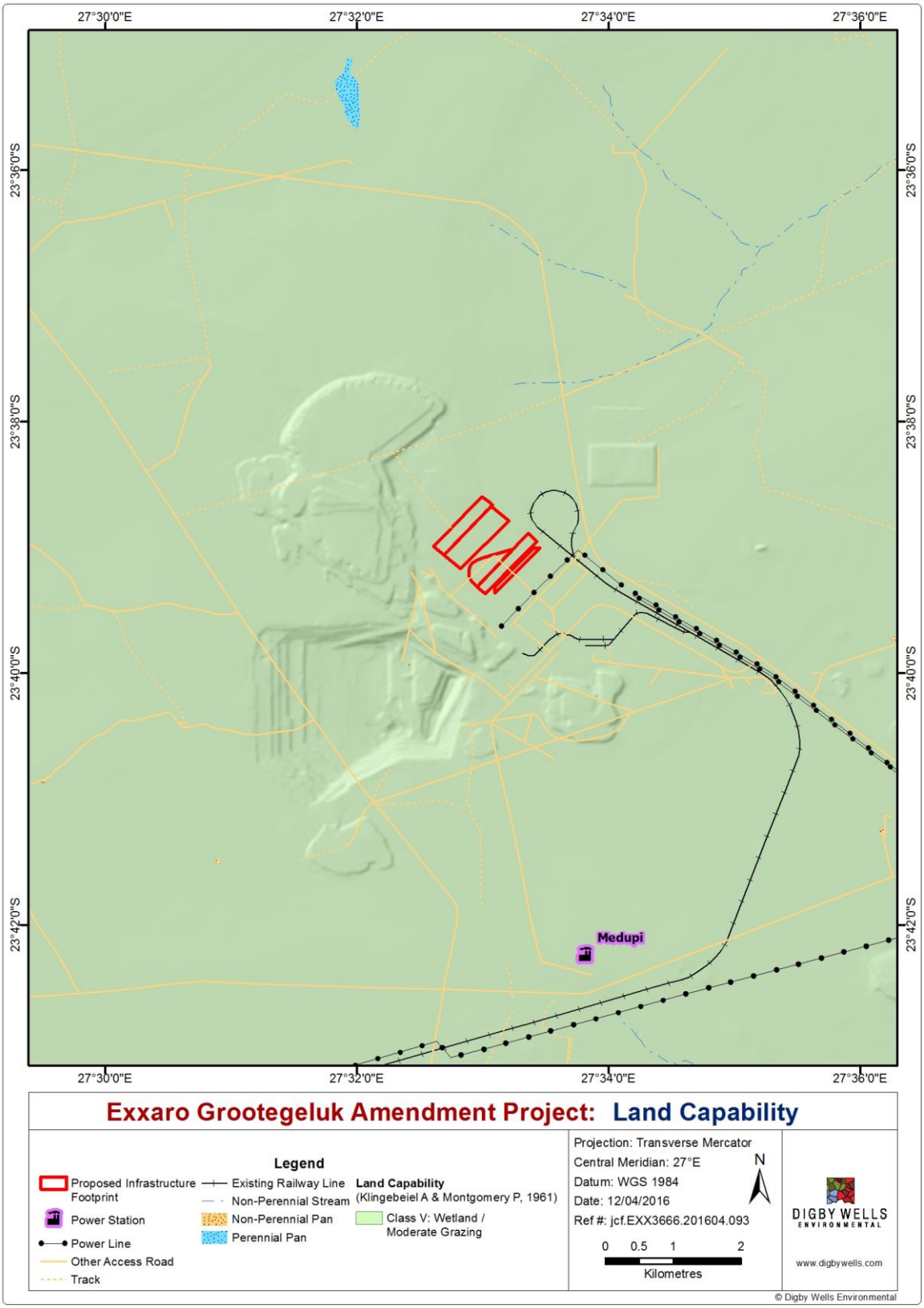
The land capability of the surveyed sites is agriculture, limited to grazing animals as the prevailing rainfall limits arable crop production.

4.7 Current Land Use-Site Specific

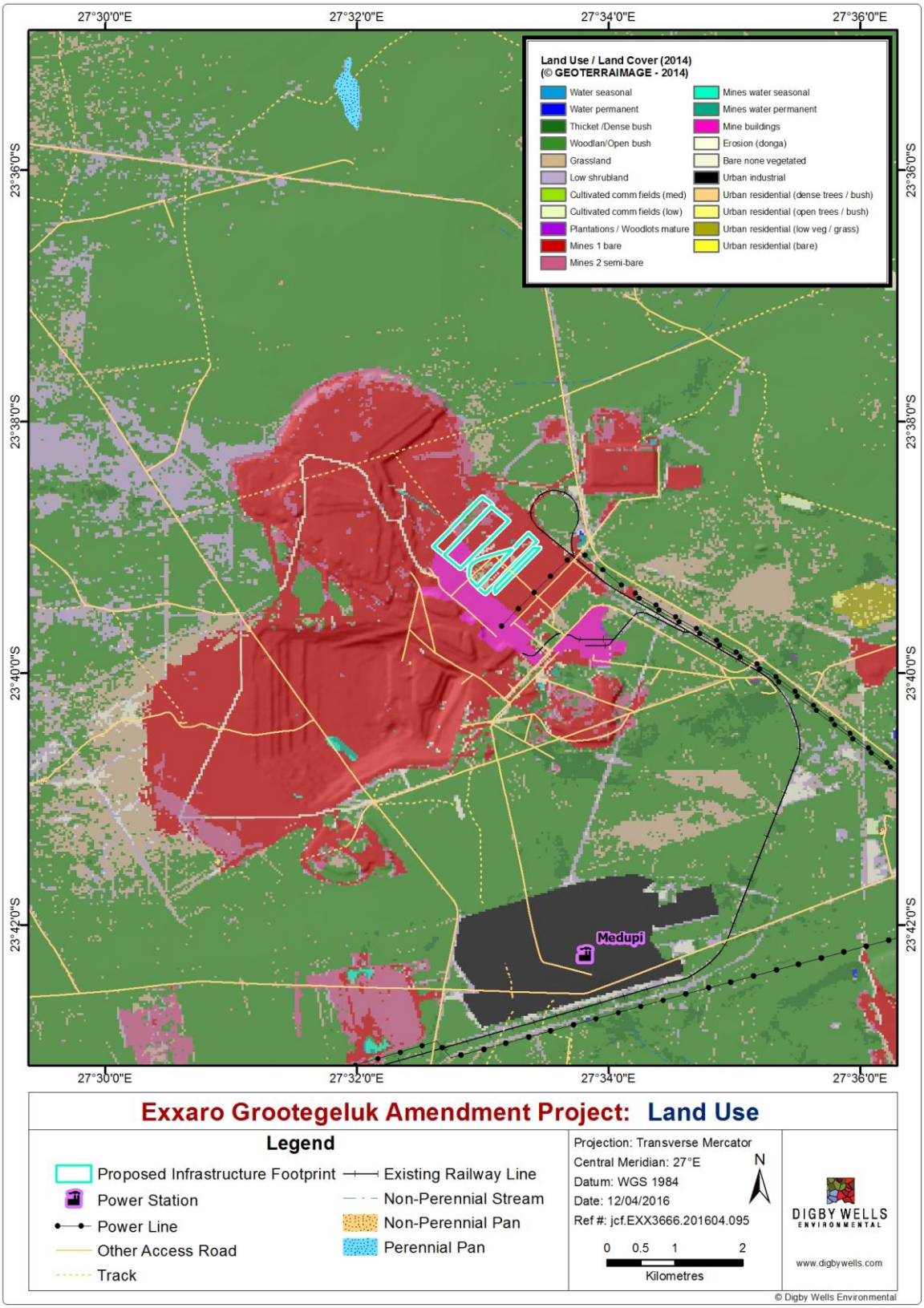
The current land use within the proposed project area surrounding Grootegeluk Coal Mine is wilderness while the land use within the proposed stockpile areas is mining related as a result of historical disturbances from mining activities.



Plan 1: The Land Type map for the Exxaro Grootegeluk Amendment Project (Land Type Survey Staff, 1976-2006)



Plan 2: The Land Capability map for the Exxaro Grootegeluk Amendment Project (Land Type Survey Staff, 1976-2006)



Plan 3: The Land Use map for the Exxaro Grootegeluk Amendment Project

5 Impact Assessments

The following activity has been identified that may result in impacts to the soil environment:

- Expansion of the coal stockyard and stockpiles

5.1 Impact Rating

The environmental impact assessment is designed to identify impacts related to various mining activities and how to mitigate these impacts. However with the correct mitigation measures being put in place these impacts can be reduced.

5.1.1 Construction Phase

During the construction phase, the work carried out will mainly be related to the construction of stockpiles. The development of stockpiles will require the removal of all soil materials to a depth of at least 1.5m. This activity will provide needed soil cover material for rehabilitation purposes. The impact will be loss of topsoil as a result of erosion and possible contamination of the soil by fuel and oils. Also soil compaction caused by heavy machinery.

5.1.1.1 Impact: Loss of topsoil as a resource

The construction phase impacts described are rated in Table 5-1

Table 5-1: Impact Rating

Activity and Interaction: Site clearing and vegetation removal; topsoil removal and stockpiling.			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The movement of heavy machinery on the soil surface causes compaction, which reduces the vegetation's ability to grow and as a result erosion could occur. Areas of land will be cleared increasing the runoff potential of the area. During any excavation activity the soil physical and chemical properties are impacted on.			
Prior to mitigation/ management			
Duration	Medium/Long terms (4)	Usable soil will be stripped and stockpiled if this is done without following the mitigation measures the impact will have a long term effect.	Medium – High (-77)
Extent	Local (3)	Loss of usable soil will only occur within the Project	

Intensity	Serious (4)	Loss of usable soil may result in loss of land capability and land use	
Probability	Definite (7)	By excavating the soil it will certainly impact on the soil	
Nature	Negative		
Mitigation/Management actions			
■ The topsoil will be stripped by means of an FEL or similar equipment and loaded onto dump trucks; ■ Topsoil is to be stripped when the soil is dry, as to reduce compaction, if possible; ■ Prior to stockpiles being utilised for rehabilitation purposes, fertility analysis should be conducted on these stockpiles to determine the fertiliser requirements; ■ The handling of the stripped topsoil will be minimised to ensure the soil's structure and quality does not deteriorate; ■ Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; ■ Prevent unauthorised borrowing of stockpiled soil; ■ If erosion occurs, corrective actions must be taken to minimise any further erosion from taking place; and ■ Soils will be stripped according to the soil types and recommended depths.			
Post- mitigation			
Duration	Medium/Long terms (4)	Loss of usable soil makes land less productive.	Negligible (-36)
Extent	Limited (2)	Loss of usable soil will occur within the project	
Intensity	Moderate (3)	Loss of usable soil may result in loss of land capability and land use	
Probability	Probable (4)	If the mitigation is followed then the probability of the impact can be reduced.	
Nature	Negative		

5.1.1.2 Impact: Hydrocarbon pollution

Table 5-2: Impact Rating

Activity and Interaction: Potential contamination to soil as a result of hydrocarbon spillages as a result of the movement of heavy machinery.			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Hydrocarbon spills can occur when heavy machinery is used because they contain large volumes of oils and diesels. There is a chance of the machines breaking down or leaking during site establishment phase and site clearing.			
Prior to mitigation/ management			
Duration	Short term (2)	Contamination of soil is most likely to occur due to spillages	Minor (-40)
Extent	Very limited (1)	The impact is limited to the project area	
Intensity	Serious (5)	The impact is very significant on soils and damaged can be not reversible	
Probability	Likely (5)	The impact it is most likely to occur on soils	
Nature	Negative		
Mitigation/ Management actions			
■ Emergency spill response plan is required to handle any unplanned spillages; ■ If a spill occurs it is to be cleaned up immediately; ■ All vehicles are to be serviced in a designated area or offsite at a workshop; ■ Place drip trays where the leak is occurring if vehicles are leaking; ■ Ensure spill clean-up kits are readily available in the event of a spillage; and ■ Contaminated soils should be removed and disposed of in the registered waste disposal facility.			
Post- mitigation			

Duration	Short term (2)	If the mitigation measures are implemented the impact will be for less	Negligible (-24)
Extent	Very limited (1)	Impact is limited to the project area	
Intensity	Serious (5)	Contamination of soils is serious	
Probability	Unlikely (3)	The impact is certain that it will occur if mitigation measures are not followed	
Nature	Negative		

5.1.1.3 Impact: Land Capability and Land Use

Table 5-3: Impact Rating

Activity: Impacts to Land capability and land use			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Removal of soil layers will impact on the land capability and land use thus altering the potential for the area to be utilised for other purposes. It must be noted that that the area has been previously impacted upon, thus the impact to the land use and land capability for the proposed stockpiling activities is seen as minor.			
Prior to mitigation/ management			
Duration	Short term (2)	Removal of soil reduces the land capability to non-classifiable and the impact is permanent if not mitigated	Minor (-40)
Extent	Very limited (1)	Impact will occur on the project area	
Intensity	Serious (5)	Land capability will be reduced	
Probability	Likely (5)	Removing the usable soil, the impact on land capability is certain	
Nature	Negative		
Mitigation/ Management actions			

No land capability mitigation is possible during construction phase because the land capability will be significantly reduced, however could be reinstated when rehabilitation is undertaken.

5.1.2 Operational Phase

Soil erosion caused by wind and runoff, and soil pollution by means of hydrocarbon contamination may be encountered during this phase. Potential coal contamination may occur. Spillages are common at mine sites due to the large volumes of diesel and oil consumed by construction vehicles.

5.1.2.1 Impact Ratings

The operational phase impacts described are rated in Table 5-4.

Table 5-4: Impact Rating during Operational Phase

Activity: Hydrocarbon pollution and loss of stockpiled topsoil			
Dimension	**Rating**	**Motivation**	**Significance**
Impact description: Hydrocarbon spills can occur where heavy machinery are parked such as the hard park area because they contain large volumes of lubricating oils, hydraulic oils and diesel to run. Topsoil losses can occur during the operational phases as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles where steep slopes are present. Prevention is especially important because the dominant soils in the area**.**			
Prior to mitigation/ management			
Duration	Short term (2)	Contamination of soil is most likely to occur due to spillages	Minor-low(-40)
Extent	Very limited (1)	The impact is limited to the project area	
Intensity	Serious (5)	The impact is very significant on soils and damaged can be not reversible	
Probability	Likely (5)	The impact it is most likely to occur on soils	
Nature	Negative		

Mitigation/ Management actions			
■ Emergency spill response plan is required to handle any unplanned spillages; ■ If a spill occurs it is to be cleaned up immediately; ■ All vehicles are to be serviced in a designated area or offsite at a workshop; ■ Place drip trays where the leak is occurring if vehicles are leaking; ■ Ensure spill clean-up kits are readily available in the event of a spillage; and ■ Maintenance on the stockpiles must be done regularly to check for compaction and erosion has not occurred which may result in the loss of usable soil as a resource. The maintenance will include inspection for erosion and loss of soil and vegetation establishment on these stockpiles.			
Post- mitigation			
Duration	Short term (2)	If the mitigation measures are implemented the impact will be for less	Negligible (-24)
Extent	Very limited (1)	Impact is limited to the project area	
Intensity	Serious (5)	Contamination of soils is serious	
Probability	Unlikely (3)	The impact is certain that it will occur if mitigation measures are not followed	
Nature	Negative		

5.1.3 Decommissioning Phase

Excavations must be filled, levelled and covered with a minimum layer of topsoil, fertilised and re-vegetated. Should rehabilitation not take place and the area is not backfilled soils could be washed off resulting in the permanent loss of valuable topsoil. Soils would most likely have been compacted on site during operations due to heavy machinery movement and will need to be ripped. Should the site not be ripped during rehabilitation, the capability of the land will be negatively affected.

5.1.3.1 Impact Ratings

The decommissioning and rehabilitation phase impacts are described in

Table 5-5: Impact Rating Decommissioning and Rehabilitation Phase

Activity: removal of major equipment, rehabilitation of disturbed areas including stockpile dumps			
Dimension	**Rating**	**Motivation**	**Significance**
Impact description: Should rehabilitation not take place immediately and the site is not backfilled and levelled prior to the high rainfall event, soils could be washed away. This will result in the permanent loss of valuable topsoil and sedimentation of rivers streams. The site will be compacted due to heavy machinery on the site, affecting land capability.			
Prior to mitigation/ management			
Duration	Beyond project life (6)	The impact is most likely to occur and it is long term	Minor (-60)
Extent	Limited (2)	The impact is limited to occur on the project site.	
Intensity	Minor (2)	Minor effects could occur and minimised during this phase if mitigation is followed	
Probability	Almost Certain (6)	The impact is certain to occur and loss of topsoil is irreversible	
Nature	Negative		
Mitigation/ Management actions			
■ Follow rehabilitation guidelines; ■ Backfill areas using stockpiled soil material; ■ Stockpiles are to be revegetated and erosion free; ■ Soil stockpiles are to be used for their designated uses only; ■ All compacted areas will be ripped to loosen the soils during rehabilitation and vegetation cover re-instated; and ■ All hydrocarbons are to be removed from the site and disposed of at a registered municipal waste handling facility.			
Post- mitigation			
Duration	Medium term (3)	The impact is likely to occur	Low (-21)

Extent	Very limited (1)	Compaction, erosion and contamination will occur on a limited scale	
Intensity	Moderate (3)	The intensity of the impact will be reduced if mitigation measures are followed	
Probability	Unlikely (3)	The impact will occur if mitigation measures are not followed	
Nature	Negative		

6 Conclusion

The majority of the soils present within the project site are represented by deep yellow-brown, red and shallow soils. These soils are dominated by Clovelly, Hutton and Mispah soil types. The present soil fertility status is poor; soils need to be limed with calcitic lime to increase calcium levels as well as magnesium. NPK fertilizer source can be used to boost phosphorus and potassium levels since these elements are essential for plant growth.

The soil types and depths dictate the land capability which was classified as Class V (Moderate grazing). The land uses are mines and mine buildings.

The following recommendations are made to minimise the impact on the soils:

- All soils are only to be stripped during the dry season, if possible;
- The top soil stockpiles cleared from the stockpile footprints should be well managed and vegetated to prevent erosion; and
- The soils must be stripped according to the soil stripping guideline.

7 References

Land Type Survey Staff. 1972 – 2006. Land Types of South Africa: Digital Map (1:250 000) and soil inventory databases. Agricultural Research Council - Institute for Soil, Climate and Water, Pretoria.

Soil Classification of Working Group. 1991. Soil Classification A Taxonomic System for South Africa. Pretoria: The Department of Agricultural Development.