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UNIVERSAL COAL AND ENERGY HOLDINGS SOUTH AFRICA (PTY) LIMITED NORTH BLOCK COMPLEX – GLISA SIDING PROJECT:

DRAFT BASIC ASSESSMENT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE PROPOSED PROJECT ASSOCIATED IN WITH THE REFURBISHMENT AND UPGRADING OF THE GLISA SIDING SITUATED ON REMAINING EXTENT OF PORTION 3, PORTIONS 11 AND 56 OF THE FARM TWEEFONTEIN 357 JT WITHIN EMAKHAZENI LOCAL MUNICIPALITY.

Submitted to: Department of Agriculture, Rural Development, Land and Environmental Affairs, Mpumalanga Province

Attention: Ms Charity Mthimunye (Case Officer)

Email: cnmthimunye@mpg.gov.za

EA REFERENCE NO.: 1/3/1116/1 N-263

CLIENT	SERVICE PROVIDER
UNIVERSAL COAL AND ENERGY HOLDINGS SOUTH AFRICA (PTY) LIMITED **NORTH BLOCK COMPLEX (PTY) LTD – GLISA SIDING** Reg Number: 2017/528665/07 North Block Complex, Spitskop Road, Paardeplaats, Belfast, 1100 PO BOX 275, Belfast, 1100 Contact person: Nokuthula Cebekhulu. Cell: +27 82 856 8588 Tel: +27 10 900 0358 Email: N.Cebekhulu@universalcoal.com	**LICEBO ENVIRONMENTAL AND MINING (PTY) LTD** Reg Number: 2009/022180/07 P.O. Box 20519, 49 Centaury Avenue, Ben Fleur, eMalahleni, 1034 Tel: +27 13 692 0212; Cell phone: +27 83 257 8869 E-Mail: ralph.repinga@licebo.co.za

PROJECT NUMBER: LEM-A0448-05-2020

REPORT NUMBER: A0448-05

DRAFT BA AND EMP REPORT

Prepared by

LICEBO ENVIRONMENTAL AND MINING (PTY) LTD

Prepared for:

NORTH BLOCK COMPLEX (PTY) LTD – GLISA SIDING PROJECT

DOCUMENT REVIEW AND APPROVAL

Client	Universal Coal and Energy Holdings South Africa (Pty) Limited North Block Complex (Pty) Ltd
Report Type:	Environmental Authorisation Process involving the undertaking of the Basic Assessment and Environmental Management Programme Report and Water Use Licence Applications associated with the refurbishment and upgrading of the Glisa Siding.
Project Name:	Glisa Siding Project
Project Number:	LEM-A0448-05-2020

Name and Surname	Position and Qualifications	Responsibility	Signature	Date
Boipelo Tshehla	Junior Environmental Scientist. BSc. (Hons Environmental Sciences: Hydrology and Geohydrology)	Report Compiler		
Bongani Motha	Senior Environmental Scientist BA. (Environmental Planning and Development)	Report Compiler		04 March 2021
Ralph Repinga (Pr Sci.Nat)	Principal Environmental Scientist MSc (Environmental Sciences) SACNASP Registration Number: 400097/02	Report Reviewer		10 March 2021

EXECUTIVE SUMMARY

North Block Complex (Pty) (Ltd herein referred as **'NBC'**) is a subsidiary of Universal Coal and Energy Holdings South Africa (Pty) Ltd (UCEHSA). NBC intends to move 300,000 tonnes of coal per month through Glisa Rail Facility (herein referred as Glisa Siding), which is Private Siding No. 849448. The coal will be transported as export coal via the Maputo Harbour and as domestic coal to local Eskom Power Stations. This siding was constructed in 1953 and is currently not utilised and takes off to the left of the Steelpoort main railway line. The proposed development is located within Remaining Extent of Portion 3, Portions of Portion 11 and 56 of the farm Tweefontein 357 JT which is located approximately 3 km southeast of the town of Belfast in eMakhazeni Local Municipality within Nkangala District Municipality, Mpumalanga Province.

This siding consists of two lines in loop formation and one dead-end line. Run-away points are installed on the inside of the siding at both ends of the siding. The total track infrastructure comprises of approximately 1.8 kilometres of mostly continuous welded track, 1 Stop block, and 5 turnouts. The coal stacking and loading area will be illuminated using high mast lighting (HML) structures which are approximately 30m high each. The power supply to the siding will be from the existing Eskom transmission line. Access to the site will be via the existing road which runs parallel to the railway line and connecting to the R33 which is approximately 1.7km.

NBC is intending to refurbish and upgrade the Siding in order to start using it. The upgrading of the Siding will require the mine to undertake an Environmental Authorisation, and Water Use Licence.

Activities to be undertaken include the:

- construction of an additional railway line of approximately 800 metres on the western perimeter of the terminal;
- construction of additional railway line of approximately 120 metres on the dead-end line;
- installing of a weighbridge;
- refurbishing of existing weighbridge;
- construction and upgrading of the electricity supply;
- upgrading and remodelling of the dead-end railway line of approximately 800 metres;
- upgrading the Pollution Control Dam and Stormwater management system;
- redesigning of the stockpile area to comply to the waste classification system in accordance with the National Environmental Management Waste Act, Act 59 of 2008 as amended applicable regulations;
- renovation of the gate control building;

- upgrading of approximately 1 km of the access road;
- construction of the conservancy septic tank;
- perimeter fencing and parking facilities; and
- construction of approximately 9000 litres of above ground diesel storage facility.

Licebo Environmental and Mining (Pty) Ltd (herein as referred to as "LEM") has been appointed as the Environmental Assessment Practitioner by NBC to undertake Environmental Authorisation (EA) process involving the Basic Assessment (BA) and Environmental Management Programme report (EMPr), and Water Use Licence application for the refurbishing and upgrading of the Glisa Siding.

Authorisation Process

NBC is intending to apply for the following environmental authorisations:

- **Environmental Authorisation involving Basic Assessment (BA) and Environmental Management Programme report (EMPr)** in terms of the National Environmental Management Act, Act 107 of 1998 as amended; and
- **Water Use Licence Application (WULA)** in terms of the Water Act, act 36 of 1998 as amended.

Environmental listed activities

Below is the list of the environmental listed activities that will be applied for as part his Environmental Authorisation process:

Activity No(s):	**Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended**	**Describe the portion of the proposed project to which the applicable listed activity relates.**
Activity 12	The Development of — (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres: or (ii) infrastructure or structures with a physical footprint of 100 square metres or more. where such development occurs— (a) within a watercourse; (b) in front of a development setback; or	Activity associated with the refurbishment and upgrading of the Glisa Siding infrastructure including the stockpile, canals (clean and dirty water), access road, conservancy tank, diesel storage tanks and the Pollution Control Dam.

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
	(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse	
Activity 19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	Activity associated with the construction of the Access Road to the Siding passing through the identified wetland areas.
Activity 24	The development of a road— (iii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.	Activity associated with the upgrading of the access road which connects to the R33 Provincial Secondary road. The access road is partially tarred, and the other portion is a dust road. NBC is intending to upgrade the section of the dust road in order to access the siding. This section of the road is approximately 1.7km.
Activity 27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity	Activity associated with the refurbishment and upgrading of the Glisa Siding and the associated access road within areas with indigenous vegetation.
Activity 28	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes, or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare	NBC is intending to refurbish and upgrade the Glisa Siding which is situated in Belfast. The Glisa Siding is located within an agricultural area and will need to be rezoned to industrial use.
Activity 34	The expansion [or changes to] of existing facilities or infrastructure for any process or	Activity associated with the refurbishment and upgrading of the

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
	activity where such expansion [or changes] will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i) where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies.	Glisa Siding. Water Use will be applied as part of this application.
Activity 48	The expansion of— (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; where such expansion occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	Activity associated with the refurbishment and upgrading of the Glisa Siding infrastructure including the stockpile, canals (clean and dirty water), access road, conservancy tank, diesel storage tanks and the Pollution Control Dam.
Activity 56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres.	Activity associated with the upgrading of the access road which connects to the R33 Provincial Secondary road. The access road is partially tarred, and the other portion is a dust road. NBC is intending to upgrade the section of the dust road in order to access the siding. This

Activity No(s):	Provide the relevant Basic Assessment Activity(ies) as set out in Listing Notice 1 of the EIA Regulations, 2014 as amended	Describe the portion of the proposed project to which the applicable listed activity relates.
		section of the road is approximately 1.7km.
Activity 64	The expansion of railway lines, stations, or shunting yards where there will be an increased development footprint, excluding— (iii) additional railway lines within the railway line reserve.	Activity associated with the expansion of the railway lines and construction of the new railway line that is approximately 800m as part of the siding activities.

Summary of the Baseline Environmental Conditions

Soils, Land use, and Land Capability

The conservation of limited soil resources with high agricultural potential is essential for human survival. The historic human activities on a landscape that have led to misuse of land have been brought about by the ignorance of correct land use and/or by economic pressure to produce at the expense of the land. It should be noted stability in agriculture can be achieved only by an appreciation of the natural factors by the application of land systems that ensure sustained productivity. In addition, there are natural factors governing the land use classification on the landscape which include: climate, topography, soil, and vegetation.

Five soil groups were encountered during the field assessment and these included Oxidic soils, Plinthic soils, Gleyic soils, Lithic soils, and Anthropic soils. The distribution of these soils groups within a landscape depicted that the project area traverses the Oxidic, Plinthic, Lithic, Gleyic and Anthropic catena. The Oxidic soil group and Plinthic soil group are the broad soil groups which are considered to contain soil forms which are ideal for arable agriculture due to, Sufficient depth for root growth, good drainage characteristics, adequate moisture content; and nutrient retention capacity to support the optimum growth and production.

Wetlands

The project area is located within the quaternary catchment B41A which forms This quaternary catchment normally receives summer rainfall patterns with approximately 601-800 mm of rainfall on an annual basis. The project area and surrounding area normally receive the lowest rainfall in June and highest in January. The evapotranspiration occurring within the project area and surroundings is estimated to range between 1601- 1800mm per annum.

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA)'s and Mpumalanga Wetlands (MPHW) databases were undertaken for the proposed project. The NFEPA and MPHW projects aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands, and estuaries. Identification of FEPA and Mpumalanga Wetlands is based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland dependant birds.

During the examination of NFEPA GIS database no wetland was found to be occurring within the project area. However, two hydrogeomorphic (HGM) units which were found to be occurring within investigation and at northern edge of the project area. During the examination of the MPHW GIS database one wetland was found traversing the northern portion of the project area. Two additional wetlands were also found occurring with the investigation area. The identified wetlands are classified as Seep, Channelled valley bottom and Unchanneled valley bottom wetlands.

Surface water

The Glisa siding is in the B41A quaternary catchment in the Steelpoort sub-catchment under Olifants catchment. The Olifants catchment is one of the nine water management areas, as delineated by the Department of Water Affairs.

The Olifants river catchment consists of 9 sub-catchments. These are upper Olifants, Wilge, Elands, Steelpoort, Middle Olifants, Blyde, Lower Olifants, Letaba and the Shingwidzi. The catchment is approximately 73 542 km^2 in extent. It has a mean annual runoff (MAR) of 2 650 Mm3/year.

The Steelpoort sub-catchment is the one within which the site is located. The Steelpoort sub-catchment covers 7 136km^2 which is about 10% of the total Olifants catchment. It has a Mean Annual Runoff of about 342Mm^3/year. It lies within an escarpment that ranges from about 1500 to about 2400 m above mean sea level (mamsl) save for the Steelpoort river valley which smoothly undulates between 900 and 1200 mamsl and the areas in proximity to Belfast and Stoffberg. These are classified as undulating Highveld country ranging between 1200 and 1800 mamsl.

Within the Steelpoort sub-catchment rain generally fall in the summer months between October and March, with January often receiving the heaviest rain. In this sub-catchment rainfall amount

range between 630 - 1000 mm/year. The rainfall is usually thunderstorms with associated low filtration of the soil and erosion in mountainous areas. The quaternary catchment B41A is drained by the Grootspruit River which then joins the Steelpoort River. The catchment measures 405 km^2 with a Mean Annual precipitation of 714 mm/year, a Mean Annual Evaporation of 1500 mm/year, and Mean Annual Runoff of 42.75 mcm/year.

Groundwater

The proposed Glisa Siding Coal Stockyard is located in a hilly area at an altitude of about 1920-1940 meters above sea level (mamsl). The site area is in the upper catchment region of the Langspruit, which is the main non-perennial stream draining towards Steelpoort River. The site is located on a partial cut and fill at an elevation of approximately 1930 mamsl on a fairly flat to moderately slope towards the west. The main water course flowing close to the proposed coal stockyard is a nonperennial streams named Langspruit. The site is currently bounded by agricultural farms on the eastern and western side. There are currently vandalized structures on the northern side of the coal stockyard siding, and partially overgrown concrete V-shape storm water channel running parallel to the western boundary and draining into a dam located south-western side. Several drainage depressions beyond 500m away from the proposed site areas are evident. The site is generally flat (Glisa Siding) but sloping towards the dam. The topography of the farm Tweefontein 357JT area slopes in a west northerly direction towards a non-perennial tributary Langspruit flowing on the northern side of the site from east to west. The elevation ranges between 1880 and 1930 meters above mean sea level (mamsl).

It well known that the geological formations determine the geohydrology to a large extent. Water movement, and thus the potential pollution migration through a geological system, is controlled by hydraulic conductivity (permeability), hydraulic gradient and the transmissivity of the aquifer.

The aquifers for the proposed coal stockyard are fractured, secondary aquifers. Movement of groundwater flow prefers secondary openings formed by fractured and geological lineaments (faults) or along the igneous intrusion zones (dolerite dykes or sills). The regional hydrogeological information indicates a low groundwater potential for the area with an average borehole yields in the order of 0,1 ℓ/s -0.5ℓ/s. Mostly of zones where the dolerite intrusions are found may exhibit good yield potential. Zones of shallow groundwater occurrences and seeps are normally associated with perched water table conditions as a result of impermeable sandstones or shale at shallow depths and limited weathering.

Water Balance

The water balance has been developed for the infrastructure using and existing data to create a current scenario water balance using Microsoft Excel. The water balance was set up to enable the user to view different monthly averages and total average.

The program objectives included the following: Identify the water users, advice on water saving initiatives, and predict water consumption once these initiatives are implemented.

All water feed sources and users need to recognize and defined to enable Glisa Siding to manage their water consumption. The water feed sources and users need to be identified and define to enable the coal siding to manage their water consumption. The Coal siding will generate a water balance for the circuit, as well as review the use of the infrastructure, with the aim of predicting future water consumption. The water balance is done performing a high-level balance over the coal siding circuit to establish the raw water requirements and an in depth look at the different water streams to ensure no imbalances exist within the process.

Geochemical Assessment and Waste Classification

The geochemical assessment studied the chemical compositions of coal product to be stockpiled at the site for railing, in consideration of geochemical processes that determine the occurrence and distribution of chemical elements and compounds in and emanating from the coal material, which may pose a risk of pollution of land and water resources.

Samples of the materials were taken from the present derelict siding, which had been abandoned by previous operators, as well as a sample of coal product from Glisa Colliery. The latter is representative of product that will be delivered to the siding and stockpiled for railing. Assessment of mineralogy and elemental chemical composition using X-Ray Diffraction and X-Ray Fluorescence spectroscopy, Acid-Base Accounting and Net Acid Generation tests, as well as and leachability tests were conducted on the samples. The materials were then classified according to ABA and NAG protocols, as well as the National Norms and Standards for Assessment of Waste for Landfill.

X-Ray Diffraction (XRD) results for both the siding and the colliery coal samples indicate that the materials are dominated by organic carbon, with high Loss on Ignition (LOI). The colliery product samples has relatively low mineral content, with Kaolite as the main contributor – though in small amounts. Thus, the representative product sample does not exhibit any significant mineral contamination, which is indicative of relatively good quality coal product.

Geotechnical

The geology underlying the existing siding area comprises of quartzitic cross-bedded sandstone with pebbles near the base, in places gritty and even sedimentary shale layers of the Vryheid Formation Geology. The study area has a climatic N-value of about 2.6, consequently the main mode of weathering of the bedrock is by means of chemical decomposition.

Five soil profiles were found to be occurring on the site namely, imported coal mixes, colluvium, residuum, decomposed sandstone, and sandstone of the Vryheid formation.

The site is blanketed with imported coal mixes that consist of dry, dark greyish lustre matrix consisting of subangular coal chips, coal dust with traces of sandstone and rhyolite gravels. The imported coal mixes are predominantly underlain by residual sandstone material. The residuum recorded a firm to stiff consistency. The colluvium has been grubbed across the site during the initial construction of the sidings, from the northern side towards the southern part, almost to the end. Decomposed sandstone was observed in test pits TP2, TP3 and TP4. The decomposed sandstone has a predominantly firm to stiff consistency, occurring at an average depth range of 0.6m to 2.1 below surface. The highly weathered sandstone horizon is present within a depth range of >1.5m to >2.6 and comprises creamy whitish speckled ivory, highly weathered, fine to medium grained, cross-bedded quartzitic sandstone of the Vryheid Formation.

Palaeontological

The rocks of the Karoo Supergroup are internationally acclaimed for their richness and diversity of fossils. The rocks of the Beaufort Group of South Africa cover approximately one-third of the land surface and have yielded an abundance of well-preserved therapsids and other tetrapods which have been used to subdivide this Group into eight faunal Assemblage Zones.

The Ecca Group, Vryheid Formation may contain fossils of diverse non-marine trace, Glossopteris flora, mesosaurid reptiles, palaeoniscid fish, marine invertebrates, insects, and crustaceans. Glossopteris trees rapidly colonised the large deltas along the northern margin of the Karoo Sea. Dead vegetation accumulated faster than it could decay, and thick accumulations of peat formed, which were ultimately converted to coal. It is only in the northern part of the Karoo Basin that the glossopterids and cordaitales, ferns, clubmosses and horsetails thrived.

Fossils likely to be found are mostly plants such as 'Glossopteris flora' of the Vryheid Formation. The aquatic reptile Mesosaurus and fossil fish may also occur with marine invertebrates, arthropods, and insects. Trace fossils can also be present. During storms, a great variety of leaves, fructifications and twigs accumulated and because they were sandwiched between thin films of mud, they were preserved to bear record of the wealth and the density of the vegetation around the pools. They make it possible to reconstruct the plant life in these areas and wherever they are found, they constitute most valuable palaeobotanical records and can be used in paleoenvironmental reconstructions.

Heritage

The Stone Age is the period in human history when lithic (stone) material was mainly used to produce tools. In South Africa, the Stone Age can be divided in basically into three periods. A basic sequence for the South African Stone Age is as follows:

Earlier Stone Age (ESA) up to 2 million – more than 200 000 years ago
Middle Stone Age (MSA) less than 300 000 – 20 000 years ago
Later Stone Age (LSA) 40 000 years ago – 2000 years ago

No Stone Age sites, or objects (such as stone tools) were identified in the area. If any Stone Age artifacts are to be found in the area then it would more than likely be single, out of context or scatters of stone tools near rivers or streams, or at the many pans that does occur in the larger area.

The Iron Age is the name given to the period of human history when metal was mainly used to produce metal artifacts. In South Africa it can be divided in two separate phases namely, Early Iron Age (EIA) 200 – 1000 A.D and Late Iron Age (LIA) 1000 – 1850 A.D.

No Early Iron Age sites are known to exist in the area, although there are a fairly large number of Late Iron Age stone walled sites in the bigger geographical area that includes Lydenburg, Dullstroom, Machadodorp, Badplaas and Belfast. Some of the sites might be related to the so-called Marateng facies of the Urewe pottery tradition of the LIA, dating to between AD1650 and 1840.

Project Alternatives

NBC developed 3 project alternatives in order to assess the potential impacts that each alternative will have on the receiving environmental as well as determine the most economic

viable option. The alternatives were determined based on the distance from the NBC, current traffic congestion due to transportation of coal using road link trucks and possibility of using an existing coal siding. Based on the category described above the following alternatives where developed:

- Alternative 1 – Use of road link trucks to transport coal to various destinations;
- Alternative 2 – Develop a new siding; and
- Alternative 3 – Refurbish and upgrade the existing Glisa Siding (Preferred Option).

Alternative 1 – Trucking impacts on traffic congestion, roads, and accidents

Aspect	Impact	Pre-mitigation	Rating Class	Mitigation measure	Post - Mitigation	Rate Class
Traffic	Traffic congestion	2.7	Moderate	Implement traffic management plan.	2.3	Moderate (Negative)
Transportation of coal using road link trucks	Damage of public roads	2.5	Moderate (Negative)		2.5	Moderate (Negative)
	Accidents	2.4	Moderate (Negative)	Ensure that all trucks are well maintained by checking the functioning of brakes and undertake vehicle tagging every three months and also monitor driving behaviour. Conduct toolbox talk with drivers before start of shift.		Moderate (Negative)

Aspect	Impact	Pre-mitigation	Rating Class	Mitigation measure	Post - Mitigation	Rate Class
Air Quality	Emission of gases	4.7	Very-high (Negative)	Ensure that all trucks are well maintained and in a good condition.	3.2	High (Negative)
Job creation	Employment	2.9	Moderate (Positive)	Ensure that local communities are considered during recruitment.	2.9	Moderate (Positive)

Alternative 2 – Construction of New siding close to the mine

Aspect	Impact	Pre-mitigation	Rating Scale	Mitigation measures	Post mitigation	Rating Scale
Job creation	Job creation	2.9	Moderate (Positive)	Ensure that local communities are considered during recruitment.	2.9	Moderate (Positive)
Vegetation	Loss of vegetation	3	Moderate (Moderate)	Undertake vegetation survey. Limit activities of footprint area.	2.3	Moderate (Negative)
Soil	Soil contamination Soil compaction	3	Moderate (Negative)	Limit activities to footprint area. Stockpile soil separately. Undertake rehabilitation as	2.5	Moderate (Negative)

Aspect	Impact	Pre-mitigation	Rating Scale	Mitigation measures	Post mitigation	Rating Scale
				soon as possible.		
Wetland	Loss of wetland function Contamination of wetland	4	Very-high (Negative)	Wetland off-setting. Clean any spillages immediately. Apply for Water Use Licence	3.4	High (Negative)
Visual	Loss of sense of place due to New siding	3	Moderate (Negative)	Undertake screening with topsoil stockpile to block visibility of proposed siding.	3	Moderate (Negative)

Alternative 2 A – Construction of New siding Access Road 1

Aspect	Impact	Pre-mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
Agriculture	Loss of Agricultural land having negative impacts on production.	2.3	Moderate (Negative)	NBC must engage landowner to develop a plan to recover land loss as result of the construction activities on their land.	2	Moderate (Moderate)

Aspect	Impact	Pre-mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
Traffic	Increase in traffic on farm roads	2.3	Moderate (Moderate)	Implement traffic management. Reduce movement of vehicle during peak hours.	2.1	Moderate (Moderate)
Job creation	Temporary job creation	2.9	Moderate (Positive)	Ensure that local communities are considered during recruitment. Develop community stakeholder.	3	Moderate (Positive)
Noise	Increase in ambient noise due to moving vehicles, impacting on the landowners and the rural community.	2.3 (Negative)	Moderate (Negative	All trucks should be in a good repair and well serviced in order to reduce noise. Undertake noise monitoring.	2	Moderate (Negative)
Visual	Loss of sense of place due to New siding	3	Moderate (Negative)	Undertake screening with topsoil stockpile to block visibility of proposed siding.	3	Moderate (Negative)

Alternative 2B – Construction of new siding Access Road 2

Aspect	Impact	Pre-mitigation measures	Rating Scale	Mitigation measures	Post mitigation measures	Rating scale
Job creation	Job creation	2.9	Moderate (Positive)	Ensure that local communities are prioritized during recruitment through engagement with local authorities.	2.9	Moderate (Positive)
Traffic	Possibility of traffic congestion where the main Belfast Road will connect to the Glisa Siding Access road.	3.1	High (Negative)	Implement traffic management. Limit movement of tracks during peak hours.	1.	Moderate (Negative)
Vegetation	Loss of vegetation	3	Moderate (Negative)	Limit activities to construction footprint.	3	Moderate (Negative)
Wetland	Loss of Wetland function.	4	High (Negative)	Wetland off setting. Apply for water use licence and limit activities from wetlands as much as possible	3.8	Moderate (Negative)
Visual	Loss of sense of place due to New siding	3	Moderate (Negative)	Undertake screening with topsoil stockpile to block visibility of proposed siding.	3	Moderate (Negative)

Preferred Alternative- Refurbishing and upgrading of the existing Glisa Siding.

Aspect	Impact	Pre-Mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
Vegetation	Loss of Vegetation	Moderate	1.9 Low (Negative	Glisa Siding has already been disturbed no vegetation Clearing will be undertaking. Develop Rehabilitation plan to define how rehabilitation will be undertaken	1.3	Low (Negative)
Wetland	Contamination of wetlands. Loss of wetland function due to construction close to wetlands.	Low (Negative)	1.9	No wetlands were previously undertaken and identified along the access road. However, specialist study has been undertaken to determine and assess the wetland areas. No construction to be undertaken within wetland areas. Where construction of road is within a wetland, General	1.3	Low (Negative)

Aspect	Impact	Pre-Mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
				Authorisation / WULA must be applied for with the Department of Water and Sanitation.		
Soil	Contamination of soil and soil compaction	Moderate (Negative)	2	Access road already constructed, and soil quality is disturbed. Construction activities must be limited to disturbed areas. Stockpile all top-soil and used during rehabilitation. Limit soil contamination and where accidental spillages occur clean spillages immediately.	1.7	Low (Negative)
Job creation	Job creation	Moderate	2.7 (Positive)	It is recommended that preference be given to the local community.	4	High (Positive)

Aspect	Impact	Pre-Mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
Traffic	Increase in traffic.	Moderate (Negative)	2.3	Implement traffic management system to improve traffic flow. Upgrade the Glisa Siding road to wider two-lane road. Where possible reduce movement of trucks during peak hours.	1.2	Low (Negative)
Migrant labour	Influx of migrant labour resulting increase in crime.	Moderate (Negative)	2.6	It is recommended that preference be given to the local community.	1.6	Low (Negative)
Visual	Sense of place already changed due to existing siding. Possible generation of dust	Moderate (Negative)	2.6	Implement dust monitoring and dust suppression.	1.6	Low (Negative)

Based on the assessment of alternatives, it was decided that the existing Glisa Siding is the preferred alternatives due to distance from NBC Glisa Colliery. The coal siding area was observed to already disturbed, thus preventing a situation whereby new impacts might be created. This siding already consists existing infrastructure that will only require refurbishment and upgrading, such as the railway lines, dirty water canals and the Pollution Control Dam. The siding is located within the eMakhazeni area and in close proximity to the Glisa Colliery.

As mentioned-above, the footprint of the siding has already been disturbed, thus the construction of this siding will have minor environmental impacts in respect to clearing of vegetation, soil, heritage and palaeontological resources, visual impacts, etc.

Reasons why the activity should be authorized or not.

No fatal flaws that could not be mitigated in the project have been identified thus through the BAR process. However, several environmental and social impacts are envisaged from construction phase through to post-closure, which will require careful mitigation and monitoring. This includes the concern in respect to the potential dust generation, potential of surface water impacts due to elevated mining related parameters such as sulphates and Total Dissolved Solids, increased traffic between the mine and the siding, impacts to wetland areas as part of the access road. Some positive impacts including potential business and job opportunities are envisaged, although this will be for a short-term period and mostly during the construction phase.

It is the opinion of the EAP that all major impacts have been identified and have been assigned appropriate management measures. Most of the Very High and HIGH negative impacts that were assessed without mitigation measures can be reduced to either MEDIUM or LOW significance when the proposed mitigation measures are implemented and adhered to.

It is recommended by the EAP that the proposed project could be authorised, on the assumption that the environmental and social management commitments included in this BAR and EMPr and as recommended by the specialists will be implemented and adhered to by NBC. The Siding will ensure continued coal supply to Eskom Power Station(s), other local and export markets.

EXPERTISE OF SPECIALISTS

Name:	Bongani Joseph Motha
Qualification:	Environmental Planning and Development
Experience in Years:	5 years
Experience	Bongani has worked in the environmental management field for four years. He has been involved in conducting and compilation of various public participation reports, community-based survey and socio-economic assessment, environmental authorisations and Water Use Licence applications for various mining projects including Pegasus Coal Mine Opencast, Khutala Colliery, Opgoedenhoop Coal Mine Opencast, Zibulo Colliery and Universal Coal (Pty) Ltd – Kangala Colliery. This also included various BA and EMPr application for prospecting right areas within Kwa-Zulu-Natal, Mpumalanga, and Limpopo provinces.
Name:	Ralph Mandla Repinga (Internal reviewer)
Qualification:	MSc. (Env.)
Professional Registration:	Pri. Sci. Nat. South African Council for the Natural Scientific Profession (SACNASP)
Experience in Years:	24 years in the Environmental management field.
Experience	Ralph Repinga has more than 22 years of experience in the field of Environmental Impact Assessment and management, with 12 of those years spent in the coal mining sector. He is a registered professional environmental scientist with an MSc (Environmental Sciences) degree and registered professional natural scientist with the South African Council for Natural Scientific Professions (SACNASP) (Registration number: 400097/02). He started his career as an Environmental Officer with the Mpumalanga Department of Environmental Affairs and Tourism. He also worked for Transvaal Sugar Ltd as a Safety, Health, Environmental and Quality Training Officer. In March 2001, he was appointed by Ingwe Collieries (now BHP Billiton Energy Coal South Africa (BECSA)) started as an Environmental Officer to Environmental Manager (for 6 years) within its various operations. He is currently working as the Managing Director and environmental consultant for Licebo Environmental and Mining (Pty) Ltd (LEM) since March 2012. He has an extensive environmental management experience especially focusing mostly on construction projects, water management and coal mining industry. Completed a number of projects involving Environmental Authorisation applications (S&EIR, BA and EMPr processes), Water Use Licences and Waste Management Licences applications.

DECLARATION OF INDEPENDENCE

I, Bongani Motha, declare that –

- I am contracted as the Environmental consultant for the Glisa Siding Project.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998), Environmental Impact Assessment Regulations 2010 and 2014, and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation.
- I will consider, to the extent possible, the matters listed in Regulation 8.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realize that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Bongani Motha

DECLARATION OF INDEPENDENCE

I, Ralph Repinga, declare that –

- I am contracted as the Environmental Assessment Practitioner Glisa Siding Project.
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998), Environmental Impact Assessment Regulations 2010 and 2014, and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations, and all other applicable legislation.
- I will consider, to the extent possible, the matters listed in Regulation 8.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realize that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

MR Repinga (Pr.Sci.Nat.)

ABBREVIATIONS AND ACRONYMS

Abbreviation/Acronym	Explanation
BAR	Basic Assessment Report
BID	Background information Document
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DHSWS	Department of Human Settlement, Water and Sanitation
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical conductivity
ECO	Environmental Control Office
ELM	eMakhazeni Local Municipality
ha	Hectares
I&APs	Interested and Affected Parties
mbgl	Metres below ground level
NEMA	National Environmental Management Act 107 of 1998, as amended
NEM: AQA	National Environmental Management: Air Quality Act 39 of 2004, as amended
NHRA	National Heritage Resources Act 25 of 1999
NDM	Nkangala District Municipality
NO_x	Nitrogen oxides
NO_2	Nitrogen dioxide

Abbreviation/Acronym	Explanation
NWA	National Water Act 36 of 1998
PM	Particulate Matter
Project site	Portion 3, 11 and 56 of the Farm Tweefontein 357 JT, Situated in Belfast, eMakhazeni Local Municipality
TFR	Transnet Freight Rail
WMA	Water Management Area
WUL	Water Use Licence

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SECTION A: PROJECT BACKGROUND

1. INTRODUCTION

Licebo Environmental and Mining (Pty) Ltd (herein as referred to as **'LEM'**) has been appointed as the Environmental Assessment Practitioner by NBC to undertake Environmental Authorisation (EA) process involving the Basic Assessment (BA) and Environmental Management Programme report (EMPr) and Water Use Licence (WULA) applications for the refurbishing and upgrading of the Glisa Siding.

North Block Complex (Pty) (Ltd herein referred as **'NBC'**) is a subsidiary of Universal Coal and Energy Holdings South Africa (Pty) Ltd (UCEHSA). NBC intends to move 300,000 tonnes of coal per month through Glisa Rail Facility (herein referred as Glisa Siding), which is Private Siding No. 849448. The coal will be transported as export coal via the Maputo Harbour and as domestic coal to local Eskom Power Stations. This siding was constructed in 1953 and is currently not utilised and takes off to the left of the Steelpoort main railway line. The proposed development is located within Remaining Extent of Portion 3, Portions of Portion 11 and 56 of the farm Tweefontein 357 JT which is located approximately 3 km southeast of the town of Belfast in eMakhazeni Local Municipality within Nkangala District Municipality, Mpumalanga Province.

This siding consists of two lines in loop formation and one dead-end line. Run-away points are installed on the inside of the siding at both ends of the siding. The total track infrastructure comprises of approximately 1.8 kilometres of mostly continuous welded track, 1 Stop block, and 5 turnouts. The coal stacking and loading area will be illuminated using high mast lighting (HML) structures which are approximately 30m high each. The power supply to the siding will be from the existing Eskom transmission line. Access to the site will be via the existing road which runs parallel to the railway line and connecting to the R33 which is approximately 1.7km.

NBC is intending to refurbish and upgrade the Siding to start using it. The upgrading of the Siding will require the mine to undertake an Environmental Authorisation and Water Use Licence.

Activities to be undertaken include the:

- construction of an additional railway line of approximately 800 metres on the western perimeter of the terminal;
- construction of additional railway line of approximately 120 metres on the dead-end line;

- installing of a weighbridge;
- refurbishing of existing weighbridge;
- construction and upgrading of the electricity supply;
- upgrading and remodelling of the dead-end railway line of approximately 800 metres;
- upgrading the Pollution Control Dam and Stormwater management system;
- redesigning of the stockpile area to comply to the waste classification system in accordance with the National Environmental Management Waste Act, Act 59 of 2008 as amended applicable regulations;
- renovation of the gate control building;
- upgrading of approximately 1 km of the access road;
- construction of the conservancy septic tank;
- perimeter fencing and parking facilities; and
- construction of approximately 9000 litres of above ground diesel storage facility.

2. CONTACT PERSON AND CORRESPONDENCE ADDRESS

2.1. Details of the applicatn

Applicant:	Universal Coal Energy Holdings SA (Hereafter referred as 'UCEHSA')		
Trading name (if any):	North Block Complex		
Contact person:	Maleho Musi (General Manager)		
Physical address:	North Block Complex, Spitskop Road, Paardeplaats, Belfast, 1100		
Postal address:	PO BOX 275 Belfast		
Postal code:	1100	**Cell:**	079 897 6241
Telephone:	010 900 0252	**Fax:**	012 460 2417
E-mail:	m.musi@universalcoal.com		

2.2. Details of the EAP who prepared the report

Licebo Environmental has been appointed as the independent EAP to undertake the environmental authorisation process involving the compilation of the BA and EMPr associated with the refurbishment and upgrading of the Glisa Siding, which is situated on Remaining Extent of Portion 3, Portions 11 and 56 of the Farm Tweefontein 357 JT within eMakhazeni Local Municipality in Nkangala District Municipality in Mpumalanga Province. The details of the EAP are provided in the Table below.

Practitioner company details	Licebo Environmental and Mining (Pty) Ltd
Name of the Practitioner	Mandla Ralph Repinga
Postal Address	Postal Address: P.O. Box 20519, Del Judor Extension 4, Witbank, 1044
Tel No.:	013 692 0212 or 013 692 0000 or 083 257 8869
Fax No.:	086 667 1169
E-mail address:	**ralph.repinga@licebo.co.za**

2.3. Expertise of the EAP

The Qualifications of the EAP (with evidence attached as Annexure A)

Qualification	BSc (Biochemistry and Microbiology (University of Zululand) BSc (Honours) Microbiology (University of Zululand); and MSc Environmental Science (University of Witwatersrand) ***Refer to Annexure A for the copy of the EAP's***

	Curriculum Vitae
Professional Affiliation	South African Council for Natural Scientific Professions (SACNASP)
Registration Number	400097/02

2.4. Summary of the EAP's past experience

(Attached the EAP's curriculum vitae as Appendix 1)

Ralph Repinga has more than 22 years of experience in the field of Environmental Impact Assessment and management, with 12 of those years spent in the coal mining sector. He is a registered professional environmental scientist with a MSc (Environmental Sciences) degree and registered professional natural scientist with the South African Council for Natural Scientific Professions (SACNASP) (Registration number: 400097/02).

He started his career as an Environmental Officer with the Mpumalanga Department of Environmental Affairs and Tourism. He also worked for Transvaal Sugar Ltd as a Safety, Health, Environmental and Quality Training Officer. In March 2001, he was appointed by Ingwe Collieries (now BHP Billiton Energy Coal South Africa (BECSA)) started as an Environmental Officer to Environmental Manager (for 6 years) within its various operations. He is currently working as the Managing Director and environmental consultant for Licebo Environmental and Mining (Pty) Ltd (LEM) since March 2012. He has an extensive environmental management experience especially focusing mostly construction projects, water management and coal mining industry.

As part of LEM, he has been involved in several environmental projects which includes environmental auditing (auditing of environmental authorisations and approvals), compilation of EIAs, EMPRs, WULs, Waste Management Licences, undertaking public participation, socio-economic assessments supervision of environmental projects and other environmental related projects. Refer to **Appendix A** for CV of EAP.

3. DESCRIPTION OF THE PROPERTY

3.1. Description of the property to which the authorisations are being applied

Tables below provide a description of the property to which the authorisations are being applied for:

Farm Name:	Tweefontein 357 JT
Application Area (Ha):	Approximately 13 ha
Magisterial District:	Belfast
Distance and direction from nearest town	The proposed Glisa Siding is situated approximately 3 km Southeast from the centre of Belfast town and by road the Glisa Siding is approximately 4 km from centre of Belfast town, which is situated in the eMakhazeni Local Municipality in Nkangala District Municipality.
21-digit Surveyor General Code for each farm portion	**Tweefontein 357 JT** Remaining Extent of Portion 3: T-0JT-000-0000-00357-00003 Portion 11: T-0JT-000-0000-00357-00011 Portion 56: T-0JT-000-0000-00357-00056

3.2. Location Glisa Siding

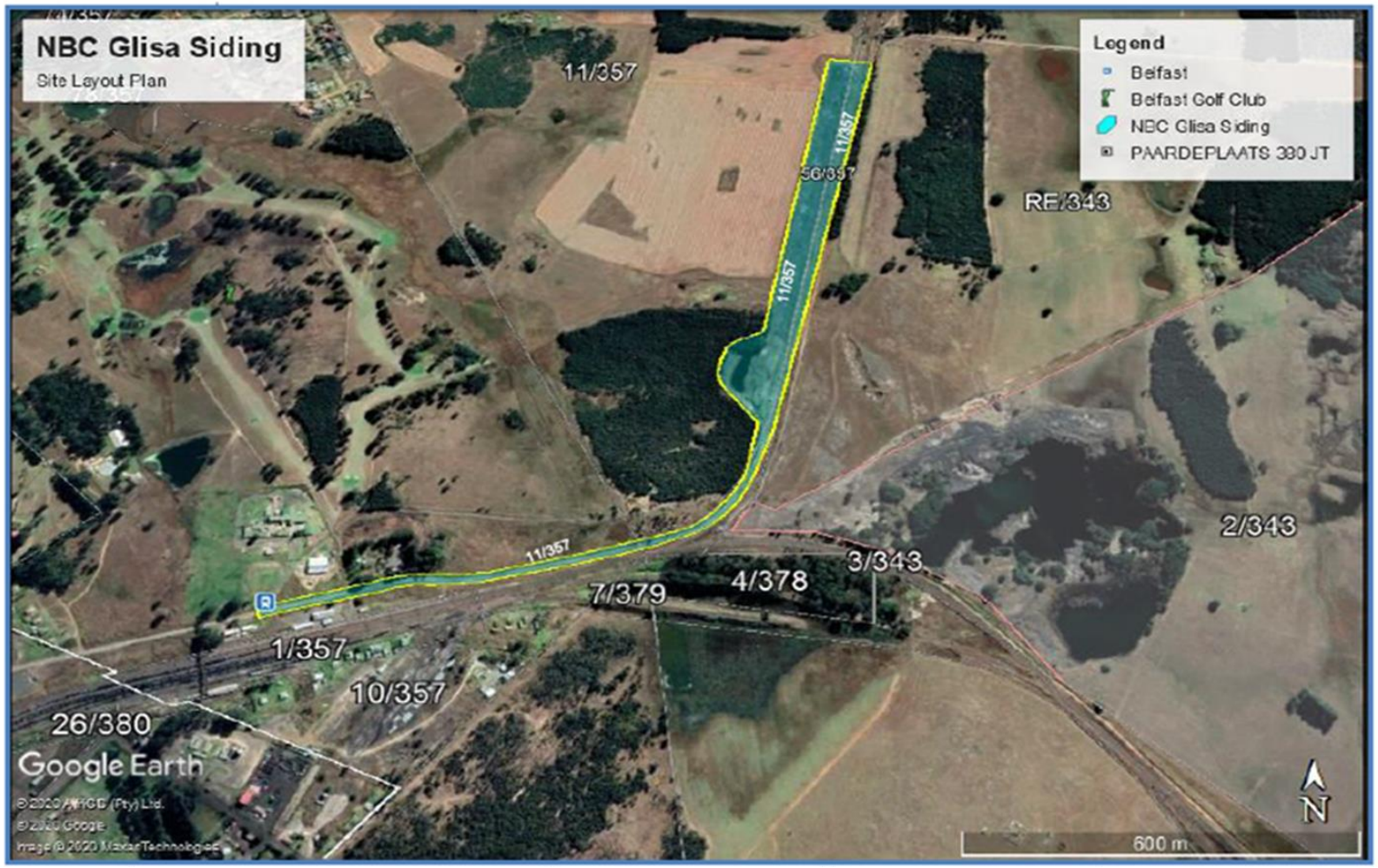
Site co-ordinates:

Indicate the position of the activity using the latitude and longitude of the centre point of the preferred site alternative. The co-ordinates must be in degrees, minutes and seconds using the Hartebeesthoek94 WGS84 co-ordinate system.

Latitude (S):			Longitude (E):		
30 °	3'55	45 “	25°	41'38 ‘	40"S “

In the case of linear activities:

Identification	Longitude	Latitude
A	30° 3'55.45"E	25°41'38.40"S
B	30° 3'54.43"E	25°41'38.54"S
C	30° 3'53.71"E	25°41'41.53"S
D	30° 3'52.09"E	25°41'41.36"S
E	30° 3'46.32"E	25°42'6.22"S
F	30° 3'44.27"E	25°42'8.10"S
G	30° 3'43.45"E	25°42'8.03"S
H	30° 3'43.89"E	25°42'8.94"S
I	30° 3'46.29"E	25°42'11.86"S
J	30° 3'44.59"E	25°42'15.92"S
K	30° 3'41.98"E	25°42'18.59"S
L	30° 3'29.06"E	25°42'21.77"S
M	30° 3'27.22"E	25°42'21.64"S
N	30° 3'28.17"E	25°42'21.64"S
O	30° 3'16.67"E	25°42'23.81"S
P	30° 3'16.90"E	25°42'24.33"S
Q	30° 3'26.05"E	25°42'22.15"S
R	30° 3'27.09"E	25°42'22.41"S
S	30° 3'25.14"E	25°42'22.21"S
T	30° 3'42.34"E	25°42'19.06"S
A	30° 3'55.45"E	25°41'38.40"S



	Project Name: NBC Glisa Siding	Project No.: LEM-A0448-05-2020	Date Drawn: 15 Feb 2021 (Ver 001)	Survey System: Hartebeeshoek WGS84 LO29

Figure 1: Locality Map

4. MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRIT WITHIN THE APPROCED SITE INCLUDING FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH THE PROPOSED PREFERRED SITE.

4.1. Details of all alternatives considered.

NBC has developed 3 alternatives to assess the potential impacts that each alternative will have on the receiving environmental as well as determine the most economic viable option. The alternatives were determined based on the distance from the NBC, disturbing green field, traffic congestion due to transportation of coal using road link trucks and possibility of using an existing coal siding. Base on the category described above the following alternatives where developed:

- Alternative 1 - Use of road link trucks to transport coals.
- Alternative 2 – Develop a New Siding.
- Alternative 3 – Use exiting siding.
- Alternative 4 – No-go option.

4.2. Alternative 1: Transportation of coal using road link trucks

Using road link trucks will result in the addition of number of trucks on the roads and this will result to Increase traffic, damage of public roads and emission of gasses.

Table 1: Alternative 1 – Road links transportation impacts on traffic congestion, roads, and accidents

Aspect	Impact	Pre-mitigation	Rating Class	Mitigation measure	Post - Mitigation	Rate Class
Traffic	Traffic congestion	2.7	Moderate	Implement traffic management plan.	2.3	Moderate (Negative)
Road Link Trucks	Damage of public roads	2.5	Moderate (Negative)		2.5	Moderate (Negative)
	Accidents	2.4	Moderate (Negative)	Ensure that all trucks are well maintained by checking the functioning of brakes and undertake vehicle tagging every three months and		Moderate (Negative)

Aspect	Impact	Pre-mitigation	Rating Class	Mitigation measure	Post - Mitigation	Rate Class
				monitor driving behaviour. Conduct toolbox talk with drivers before start of shift.		
Air Quality	Emission of gases	4.7	Very-high (Negative)	Ensure that all trucks are well maintained and in a good condition.	3.2	High (Negative)
Job creation	Employment	2.9	Moderate (Positive)	Ensure that local communities are considered during recruitment.	2.9	Moderate (Positive)

4.2.1. Alternative 2: New coal siding

The development of new coal siding will result to disturbance of green field; construction of access road which might have impacts on green fields and traffic on farm roads; will require new infrastructure (PCD, Drains, Electricity supply from substation, etc); and will be proximity to the National Road (N4) and within 500m of a wetland area.

Construction of new siding will require construction of access road. Two alternative access roads have been screened to determine the best option. **Table 2**, **Table 3**, **Table 4** and **Table 5** shows summary of impacts pre-mitigation and post mitigation.

Table 2: Alternative 2 – Construction of new siding close to the mine

Aspect	Impact	Pre-mitigation	Rating Scale	Mitigation measures	Post mitigation	Rating Scale
Job creation	Job creation	2.9	Moderate (Positive)	Ensure that local communities are considered	2.9	Moderate (Positive)

Aspect	Impact	Pre-mitigation	Rating Scale	Mitigation measures	Post mitigation	Rating Scale
				during recruitment.		
Vegetation	Loss of vegetation	3	Moderate (Moderate)	Undertake vegetation survey. Limit activities of footprint area.	2.3	Moderate (Negative)
Soil	Soil contamination Soil compaction	3	Moderate (Negative)	Limit activities to footprint area. Stockpile soil separately. Undertake rehabilitation as soon as possible.	2.5	Moderate (Negative)
Wetland	Loss of wetland function Contamination of wetland	4	Very-high (Negative)	Wetland off-setting. Clean any spillages immediately. Apply for Water Use Licence	3.4	High (Negative)
Visual	Loss of sense of place due to New siding	3	Moderate (Negative)	Undertake screening with topsoil stockpile to block	3	Moderate (Negative)

Aspect	Impact	Pre-mitigation	Rating Scale	Mitigation measures	Post mitigation	Rating Scale
				visibility of proposed siding.		

4.2.2. Alternative 2A: New coal siding – Access Road 1

Construction of new siding will require construction of access road, impacts of access road 1 are highlighted on table below.

Table 3: Alternative 2A – Construction of New siding Access Road 1

Aspect	Impact	Pre-mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
Agriculture	Loss of Agricultural land having negative impacts on production.	2.3	Moderate (Negative)	NBC must engage landowner to develop a plan to recover land loss as result of the construction activities on their land.	2	Moderate (Moderate)
Traffic	Increase in traffic on farm roads	2.3	Moderate (Moderate)	Implement traffic management. Reduce movement of vehicle during peak hours.	2.1	Moderate (Moderate)
Job creation	Temporary job creation	2.9	Moderate (Positive)	Ensure that local communities are considered during recruitment.	3	Moderate (Positive)

Aspect	Impact	Pre-mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
				Develop community stakeholder.		
Noise	Increase in ambient noise due to moving vehicles, impacting on the landowners and the rural community.	2.3 (Negative)	Moderate (Negative	All trucks should be in a good repair and well serviced to reduce noise. Undertake noise monitoring.	2	Moderate (Negative)
Visual	Loss of sense of place due to New siding	3	Moderate (Negative)	Undertake screening with topsoil stockpile to block visibility of proposed siding.	3	Moderate (Negative)

4.2.3. Alternative 2B: New coal siding – Access Road 1

Construction of new siding will require construction of access road, impacts of access road 2 are highlighted on **Table 4** below.

Table 4: Alternative 2B – Construction of New siding Access Road 2

Aspect	Impact	Pre-mitigation measures	Rating Scale	Mitigation measures	Post mitigation measures	Rating scale
Job creation	Job creation	2.9	Moderate (Positive)	Ensure that local communities are prioritized during recruitment through engagement with local authorities.	2.9	Moderate (Positive)

Aspect	Impact	Pre-mitigation measures	Rating Scale	Mitigation measures	Post mitigation measures	Rating scale
Traffic	Possibility of traffic congestion where the main Belfast Road will connect to the Glisa Siding Access road.	3.1	High (Negative)	Implement traffic management. Limit movement of tracks during peak hours.	3	Moderate (Negative)
Vegetation	Loss of vegetation	3	Moderate (Negative)	Limit activities to construction footprint.	3	Moderate (Negative)
Wetland	Loss of Wetland function.	4	High (Negative)	Wetland off setting. Apply for water use licence and limit activities from wetlands as much as possible	3.8	Moderate (Negative)
Visual	Loss of sense of place due to New siding	3	Moderate (Negative)	Undertake screening with topsoil stockpile to block visibility of proposed siding.	3	Moderate (Negative)

4.2.4. Preferred Alternative 3 – Refurbishing of the Existing Glisa Siding

The Glisa Siding is already developed and already has infrastructure that NBC can utilize. The siding is approximately 8 ha in size. The siding is the preferred alternative because the area is already disturbed and has infrastructure (PCD, Electricity supply, concrete drains, silt trap etc), close to Belfast / Steelpoort Transnet railway line; situated outside 500m from wetland areas and has access road.

The refurbishing of the Glisa Siding will have lower impacts on the Belfast environmental when compared to Alternative 1 and Alternative 2.

Table 5: Preferred Alternative – Refurbishing of the Existing Glisa Siding

Aspect	Impact	Pre-Mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
Vegetation	Loss of Vegetation	Moderate	1.9 Low (Negative	Glisa Siding has already been disturbed no vegetation Clearing will be undertaking. Develop Rehabilitation plan to define how rehabilitation will be undertaken	1.3	Low (Negative)
Wetland	Contamination of wetlands. Loss of wetland function due to construction close to wetlands.	Low (Negative)	1.9	No wetlands have been identified along the Access road. However, specialist study will be undertaken to determine wetland areas No construction to be undertaken within wetland areas. Where construction of road is within a	1.3	Low (Negative)

Aspect	Impact	Pre-Mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
				wetland, General Authorisation must be applied for with the Department of Water and Sanitation.		
Soil	Contamination of soil and soil compaction	Moderate (Negative)	2	Access road already constructed, and soil quality is disturbed. Construction activities must be limited to disturbed areas. Stockpile all top-soil and used during rehabilitation. Limit soil contamination and where accidental spillages occur clean spillages immediately.	1.7	Low (Negative)
Job creation	Job creation	Moderate	2.7 (Positive)	It is recommended that preference be	4	High (Positive)

Aspect	Impact	Pre-Mitigation measures	Rating scale	Mitigation measures	Post mitigation measures	Rating scale
				given to the local community.		
Traffic	Increase in traffic	Moderate (Negative)	2.3	Implement traffic management system to improve traffic flow. Upgrade the Glisa Siding road to wider two-line road. Where possible reduce movement of trucks during peak hours.	1.2	Low (Negative)
Migrant labour	Influx of migrant labour resulting increase in crime.	Moderate (Negative)	2.6	It is recommended that preference be given to the local community.	1.6	Low (Negative)
Visual	Sense of place already changed due to existing siding. Possible generation of dust	Moderate (Negative)	2.6	Implement dust monitoring and dust suppression.	1.6	Low (Negative)

4.3. Alternative 4 – No-go option.

The no go option will mean that the mine with continue with the transportation of coal using road link trucks on the local, district, provincial and national roads. The impact on the road infrastructure will continue to be severely impacted since a number of trucks will be on the road transporting the Glisa Colliery product coal to the various destinations.

5. DESCRIPTION OF THE SCOPE OF THE PROPOSED OVERALL ACTIVITY

5.1. Environmental listed and specified activities

Table 6 below shows all listed activities applied for in terms of the National Environmental Management Act, act 107 of 1998 as amended and Government Notice Regulation 327 Listing Notice 1.

Table 6: GNR 327 Listing Notice 1 Listed Activities

Indicate the number and date of the relevant notice:	**Activity No.(s) (in terms of the relevant or notice):**	**Describe each listed activity as per the detailed project description (and not as per wording of the relevant Government Notice):**
Government Notice Regulation 327 Notice 1. **17 April 2017**	Activity 12	The Development of — (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres: or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; — **Activity associated with the refurbishment and upgrading of the Glisa Siding infrastructure including the stockpile, canals (clean and dirty water), access road, conservancy tank, diesel storage tanks and the Pollution Control Dam.**
Government Notice Regulation 327 Notice 1. **17 April 2017**	Activity 19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.

Indicate the number and date of the relevant notice:	Activity No.(s) (in terms of the relevant or notice):	Describe each listed activity as per the detailed project description (and not as per wording of the relevant Government Notice):
		Activity associated with the construction of the Access Road to the Siding passing through the identified wetland areas.
Government Notice Regulation 327 Notice 1. **17 April 2017**	Activity 24	The development of a road— with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres. **Activity associated with the upgrading of the access road which connects to the R33 Provincial Secondary road. The access road is partially tarred, and the other portion is a dust road. NBC is intending to upgrade the section of the dust road in order to access the siding. This section of the road is approximately 1.7km.**
Government Notice Regulation 327 Notice 1. **17 April 2017**	Activity 27	The clearance of an area of 1 hectare or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity **Activity associated with the refurbishment and upgrading of the Glisa Siding and the associated access road within areas with indigenous vegetation.**
Government Notice 327 Notice 1. **17 April 2017**	Activity 28	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes, or afforestation on or after 01 April 1998 and where such development:

Indicate the number and date of the relevant notice:	Activity No.(s) (in terms of the relevant or notice):	Describe each listed activity as per the detailed project description (and not as per wording of the relevant Government Notice):
		(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare **NBC is intending to refurbish and upgrade the Glisa Siding which is situated in Belfast. The Glisa Siding is located within an agricultural area and will need to be rezoned to industrial use.**
Government Notice 327 Notice 1. **17 April 2017**	Activity 34	The expansion [or changes to] of existing facilities or infrastructure for any process or activity where such expansion [or changes] will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding— (i). where the facility, infrastructure, process, or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies. **Activity associated with Water Use Licence to support the activities to be undertaken by NBC.**
Government Notice 327 Notice 1. **17 April 2017**	Activity 48	The expansion of— (i) infrastructure or structures where the physical footprint is expanded by 100 square

Indicate the number and date of the relevant notice:	Activity No.(s) (in terms of the relevant or notice):	Describe each listed activity as per the detailed project description (and not as per wording of the relevant Government Notice):
		metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; where such expansion occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; **Activity associated with the refurbishment and upgrading of the Glisa Siding infrastructure including the stockpile, canals (clean and dirty water), access road, conservancy tank, diesel storage tanks and the Pollution Control Dam.**
Government Notice 327 Notice 1. **17 April 2017**	Activity 56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres. **Activity associated with the upgrading of the access road which connects to the R33 Provincial Secondary road. The access road is partially tarred, and the other portion is a dust road. NBC is intending to upgrade the section of the dust road in order to access the siding. This section of the road is**

Indicate the number and date of the relevant notice:	Activity No.(s) (in terms of the relevant or notice):	Describe each listed activity as per the detailed project description (and not as per wording of the relevant Government Notice):
		approximately 1.7km
Government Notice 327 Notice 1. **17 April 2017**	Activity 64	The expansion of railway lines, stations, or shunting yards where there will be an increased development footprint, excluding— (i) additional railway lines within the railway line reserve. **Activity associated with the expansion of the railway lines and construction of the new railway line that is approximately 800m as part of the siding activities.**

5.2. Atmospheric Licence

The National Environmental Management: Air Quality Act 39 of 2004 Listed Activities and Associated Minimum Emission Standards Identified in terms of Section 21 Of the National Environmental Management: Air Quality Act, 2004 (Act No.39 of 2004) published under Government Notice 893 in Government Gazette 37054 of 22 November 2013 and amended by: Gen N 551 GG 38863 2015/06/12, GN 1207 GG 42013 2018/10/31, GN 687 GG 42472 2019/05/22 and GN 421 GG 43174 2020/03/27, states that a Subcategory 5.1 Storage and handling of ore and coal not situated on the premises of a mine or works with a design to hold more than 100 000 tons requires an Atmospheric Licence Application (AEL). The Glisa Siding will be designed to handle 30 000 tons and thus does not require an AEL.

5.3. Project activities and phase description

This section provides a preliminary description of activities that will be undertaken as part of the construction, operational and decommission phase of the coal siding and transportation project. Each activity can be linked to the various activities associated with coal storage, waste management, coal transportation and any other associated activities that constitute the various coal siding operations. These activities act as driving forces that exert pressure on the natural environment, ultimately resulting in impacts on the biophysical, social, and cultural environments.

The Glisa Siding (Siding No. 849448) was constructed by Exarro Coal (Pty) Ltd in 1953. The siding is currently not being utilized. NBC is intending to refurbish the siding with the purposed of moving 30000 tonnes per month through the Glisa Siding. For NBC to utilize the siding the existing infrastructure will be refurbished, and new infrastructure will be constructed be constructed to meet applicable regulation standards. Activities that will be undertaken as part of the Glisa Siding are listed in **Table 7** below.

Table 7: Project Activities associated with Glisa Siding.

Activity	**Description**
Construction Phase	
Activity 1	Recruitment, procurement, and employment.
Activity 2	Transport of construction material.
Activity 3	Construction and site preparation of the proposed infrastructure areas.
Activity 4	Excavation and earthworks.
Activity 5	Backfilling, levelling, and lining of coal stockpile area.
Activity 6	Construction of surface infrastructure including water management infrastructure.
Activity 7	Temporary waste and sewage handling.
Activity 8	Demolishing, handling and disposal of waste from the existing infrastructure.
Operational Phase	
Activity 09	Employment and job opportunities
Activity 10	Transportation of coal from NBC coal processing plant to Glisa Siding
Activity 11	Handling, storing and loading of coal at the stockpile area
Activity 12	Use of water around site
Activity 13	Stormwater management and dirty water containment
Activity 14	General and hazardous waste management and disposal
Activity 15	Refuelling and diesel handling

Activity	Description
Activity 16	Sewage generation and disposal
Decommissioning and closure phase	
Activity 17	Downscaling and retrenchment
Activity 18	Demolition and dismantling of infrastructure no longer required
Activity 19	Rehabilitation of disturbed areas.
Post-closure phase	
Activity 20	Post-closure monitoring including aftercare and maintenance.

5.3.1. Construction phase

Activity 1 : Recruitment, procurement, and employment

Recruitment and employment of construction workers, as well as the procurement of personnel and construction contractors, materials and other required services will be done as part of this project (especially during construction). Preference will be given to the local employees within eMakhazeni Local Municipality.

Activity 2: Transport of construction material

Large trucks are used to transport construction material to the construction site via national, provincial, district and local roads. The existing roads will be used to transport and bring construction and development equipment and machinery onsite.

Activity 3: Construction site preparation

Site establishment will be undertaken prior to commencement of construction activities. Site preparation will include construction camp site establishment, camp site layout and provision of portable toilet facilities.

Activity 4: Excavation and earthworks

Excavation activities will involve the removal of the material especially the residue coal from the Glisa Siding using excavators and trucks, transporting, and disposing to the existing discard disposal facilities at NBC. This will be followed by removal of soil and stockpiling it on site for use at closure of the siding. All coal residues and/or carbonaceous containing soil will be disposed at the NBC discard facility or any type 3 waste disposal facility.

Topsoil is removed from construction areas using excavators and trucks, prior to the commencement of physical construction activities. This will be the case especially along the proposed access road where some of the areas have not yet been cleared and stripped of topsoil.

Activity 5: Backfilling, levelling, and lining of coal stockpile area.

Backfilling of the excavated area will be undertaken and followed by levelling, once the siding platform area has been levelled, where necessary the lining of coal stockpile area will be undertaken. The need for the liner will be in line with the waste classification requirements. It should be indicated that based on the geochemical assessment report, it shows that the Glisa Colliery product material that will be stockpiled and loaded at this siding is a type 4 waste that will need to be disposed of in a Class D waste facility.

Activity 6: Construction of surface infrastructure including water management infrastructure.

Construction of surface infrastructure such as offices, conservancy tank, car park, fuel tank and bund wall, railway line, weight bridge, access road including wetland crossings and fence as well as other required infrastructure will be undertaken at the siding.

Water management infrastructure to be upgraded and constructed will include:

- Refurbishment and upgrading of the PCD;
- Construction of new dirty water canal;
- Upgrading of the existing dirty water canal;
- Check existing pipe culvert for the capacity to safely convey the 50-year 24-hour rainfall event;
- Repair existing sediment trap;
- Construction of dust suppression filling point and pump station

Activity 7: Temporary waste and sewage handling

Temporary sewage handling and/or treatment facilities are required at the construction site. During the construction phase waste which will include general waste, hazardous waste and sewer waste will be generated. Waste storage facilities will be provided on site which will be serviced, collected, transported and disposed of by registered waste collection and disposal company. General waste that will be generated will be disposed of at a local municipality

landfill site, whilst hazardous waste will be disposed of at a registered and licensed hazardous waste landfill site.

Portable chemical mobile toilets will be provided on site during this phase and this will be serviced, maintained and collected for disposal by a registered and licensed sewer waste management service provider for disposed at a registered and licensed wastewater treatment facility.

Activity 8: Demolishing, handling and disposal of waste from the existing infrastructure

Existing infrastructure (office building, inspection building, fuel tank and bund wall) will be demolished. The waste that will be generated during the demolishing and dismantling of this infrastructure will be disposed of in line with the requirements of the National Environmental Management Waste Act, Act 59 of 2008 as amended.

5.3.2. Operational phase

The operational phase is the commencement of activities at the siding. All related coal handling activities, including transportation from NBC processing plant to Glisa Siding, disposal at Glisa Siding, loading on trains and transportation to markets forms part of this phase. The following activities are part of the operational phase:

Activity 9: Employment and job opportunities

The operation of the Glisa Siding and other support infrastructure requires numerous skilled and unskilled employees. Employment and business opportunities are likely to be created during the operational phase. Most of the jobs that will be required will be created will be linked with the transportation and loading of coal to the train wagons.

Activity 10: Transportation of coal from NBC coal processing plant to Glisa Siding

Coal will be transported from the NBC coal processing plant to the Glisa Siding using road link trucks. The NBC coal processing plant is situated approximately 8 kms from the Glisa Siding.

Activity 11: Handling, storing and loading of coal at the stockpile area.

The coal will be temporary stored at the Glisa Siding before loading to the trains and transported to markets. The coal will be separated and stockpiled based on the coal quality using loaders. Finally, this coal will be loaded into the train's wagons using loaders.

Activity 12: Use of water around site.

Dirty water collected within the siding will be diverted to the PCD and used for dust suppression. A pumpstation with a designated dust suppression filling point will be in place and operated to assist with dust suppression within the siding.

Activity 13: Stormwater management and dirty water containment

Dirty water will be generated within the dirty water catchment areas with the coal stockpile being the area with bigger surface area for dirty water run-off. This water will be channelled from the siding via dirty water canal into the PCD. The water will be stored in the PCD and used for dust suppression.

Activity 14: General and hazardous waste management and disposal

Domestic, industrial, and hazardous waste will be produced during the construction, operation, decommissioning and closure of the Siding. This includes waste cans, plastics, food, bottles, hydrocarbon contaminated soil and water, used oil, oily rags, all of which must be disposed of in an appropriate manner. This waste will be collected and transported by an appointed registered waste collection service provider for proper disposal into the municipal licensed landfill site (General and/or domestic waste) and registered and licensed hazardous landfill site (Hazardous waste).

Activity 15: Refuelling and diesel handling.

Refuelling of machinery (mainly) loaders and trucks working at the siding will be undertaken in line with NBC refuelling management procedure that will be defined by NBC. The proposed 9000 liter tank will constructed within a properly designed and constructed bund wall to prevent spillages. Any spillages will be management in accordance with NBC's hydrocarbon management procedure.

Activity 16: Sewage generation and disposal

Sewage produced from the Siding will be transferred into the designed and constructed septic systems conservancy tank (Sewage management facility). This waste will be collected by an appointed and registered sewer waste collection service provider for proper disposal into the municipal licensed sewer system.

5.3.3. Decommissioning and closure phases

The decommissioning phase involves the cessation of the use of the coal siding facility and associated activities. During this phase, all disturbed areas will be rehabilitated. The following activities are defined as part of the decommissioning phase:

Activity 17: Downscaling and retrenchment

The cessation of the coal siding activities will result in downscaling and retrenchment of staff and loss of business opportunities. Only staff involved in the demolition of infrastructure and/or rehabilitation activities will remain.

Activity 18: Demolition of infrastructure

Infrastructure that cannot be used after decommissioning will be demolished and removed and disposed in accordance to the applicable legal requirements including the NEM: WA as amended. This includes the pollution control dams and infrastructure such as the offices, weighbridge, railway tracks, diesel storage facilities etc. Coal residue removed from these facilities will be collected, transported and disposed of at NBC Glisa Colliery. But contaminated hazardous waste material will be disposed of as hazardous waste into a registered and licensed hazardous landfill site. Uncontaminated building rubble will be disposed of as general waste at a general landfill site. Any recyclable material that will be generated during the demolition and dismantling process will be collected by reputable recycling service providers.

Activity 19: Rehabilitation of disturbed areas.

Once all the infrastructure has been removed and the site cleared of all coal residues, the rehabilitation of the disturbed areas will then be initiated.

As detailed in the soil, land use and land capability assessment, it is recommended that the soil cover should be at least 0.8 m in depth, consisting of 0.5 m of subsoil and 0.3 m of topsoil on top of the reconstructed profile to mimic the pre-land use land capability. However, the soil cover must be at least 0.3 m depth in order to sustain the identified end land use of grazing. The soil quality will be investigated prior to the establishment of vegetation on the rehabilitated areas through representative sampling and laboratory analysis. Vegetation fertility and soil acidity will be corrected prior to vegetation establishment with fertilisers including lime. The topsoil placed and seed bed prepared area will be revegetated using indigenous native plant species. The rehabilitated land will be shaped to emulate the pre-land use drainage patterns.

5.3.4. Post-closure phase

Activity 20: Post-closure monitoring including aftercare and maintenance.

Aftercare and maintenance of the rehabilitated areas will be undertaken to ensure that the rehabilitated areas are sustainable. As indicated above the siding and associated infrastructure areas will be rehabilitated to a final land use that will sustain grazing.

As part of aftercare and maintenance activities, alien invasive vegetation will be identified and removed throughout this phase. Rehabilitation activities must be monitored to ensure that the pre-mining drainage pattern is emulated, and that vegetation establishment is successful. Annual vegetation survey will be undertaken to assess the success of the rehabilitation activities.

5.4. Infrastructure at Glisa Siding

The siding was constructed in 1953 and it is assumed that supporting infrastructure were also constructed as part of the siding amenities. Although there is no information available in respect of the infrastructure that were constructed, the existing infrastructure observed at the Glisa Siding does not reflect year of construction. It is therefore anticipated that some infrastructure was constructed in 1953 and other infrastructure constructed recently. NBC is planning to upgrade and refurbish this infrastructure.

The infrastructure that will be constructed, refurbished, and upgraded will include the:

- Construction of the additional railway line of approximately 800 metres on the western perimeter of the terminal;
- Construction of the additional railway line of approximately 120 metres on the dead-end line;
- Construction of an additional weighbridge next to the existing weighbridge;
- Refurbishing of the existing weighbridge;
- Construction and upgrading of the electricity supply;
- Upgrading and remodelling of the dead-end railway line of approximately 800 metres;
- Upgrading the Pollution Control Dam and Stormwater management system;
- Redesigning of the stockpile area to comply to the waste classification system in accordance to the National Environmental Management Waste Act, Act 59 of 2008 as amended applicable regulations;
- Renovation of the gate control building;
- Upgrading of approximately 1 km of the access road;
- Construction of the conservancy septic tank;
- Perimeter fencing and parking facilities; and
- Construction of approximately 9000 litres of above ground diesel storage facility.

5.4.1. Railway Line

NBC is intending to refurbish the existing Railway line and construct an additional railway line of approximately 800 meters on the western perimeter. The existing railway line is connected to the Belfast station rail network and the railway line will refurbished from the Glisa Siding to the connection line situated outside the Glisa Siding. The additional railway line will be connected to the existing line that will be refurbished and cross along the Siding entrance towards the western perimeter of the Siding. This will allow NBC to load two trains at the same time depending on the demand of coal.

Figure 2: Existing Railway at Glisa Siding to be refurbished.

5.4.2. Weighbridge

The existing weighbridge and office have been vandalized and steel material has been stolen. This infrastructure (weighbridge and office) will be refurbished, and an additional weighbridge will be constructed next to the existing weighbridge. This will result in two weighbridges (inbound and outbound).

Figure 3: Existing Weighbridge and office to be refurbished.

5.4.3. Electricity

The power supply to the siding was from a pole-mounted outdoor type step-down transformer which is presumed stolen. The wooden poles supporting the low voltage aerial bundled conductor are in a fair condition and no visible damages observed. The power will be sourced from a 22kV powerline from Belfast to a farm stead which runs over the siding. NBC will install a 22kV step-down transformer which will step-down the power to 11kV to power supply in the siding.

5.4.4. Lighting infrastructure

The coal stacking and loading area were illuminated by 4 steel high mast lighting (HML) structures. Each HML is 30m long and the spacing between them is 200m. Each HML had 4 high-pressure sodium (HPS) luminaires, mounted on a lighting ring, and raised to the top of the mast by means of an electrical/mechanical winch. The HML structure will be refurbished and used for lighting at the Siding.

5.4.5. Pollution Control Dam (PCD)

The PCD was constructed to contain contaminated water generated from the siding. It was noted that this PCD is not lined. The size of the PCD will be maintained and as recommended on the geohydrological and geochemical assessment, NBC will need to consider the lining of this containment facility in order to prevent dirty water seepages. In line with the design plans and criteria, it has been planned that the PCD will be lined using an HDPE liner to prevent any seepages and to ensure compliance to the requirements of the NWA as amended. Concrete stormwater drains, spillway and sediment trap have also been constructed these infrastructures will be refurbished and repaired to ensure that they are operating optimally. A dirty water channel will collect runoff water the PCD. The water collected in the PCD will be used for dust supressing. Refer to **Annexure 0** for the proposed infrastructure design plans and criteria.

Figure 4: Glisa Siding PCD

5.4.6. Access road and entrance area

The gravel access road will be upgraded into a compacted dirty road from where the tarred roads end within Remaining Extent of Portion 3 of the Farm Tweefontein 357 JT. The total road to be upgraded is approximately 1.1 km and this will be associated with the road construction infrastructure such as drains and culverts to allow surface water flow and ensure

that there is no altering and impeding of the flow of water from the identified wetland areas and drainage areas.

	Project Name: NBC Glisa Siding	Project No.: LEM-A0448-05-2020	Date Drawn: 15 Feb 2021 (Ver 001)	Survey System: Hartebeeshoek WGS84 LO29

Figure 5: Glisa Siding Access road

5.4.7. Stormwater management system

The existing stormwater management canal were constructed using concrete and based on the assessment conducted by NBC the canals will be sufficient to contain stormwater within the Siding. The canals will be refurbished, and additional canals will be constructed where required.

5.4.8. Conservancy septic tank

There are currently no toilet facilities at the Glisa Siding. NBC is intending to construct a conservancy septic tanks and toilet facilities for the siding. The tank capacity will be 30m^3 and as planned it will be serviced every two weeks or when need arises refer to **Table 8.**

Table 8: Conservancy septic tank details

Tank	Design flow litres a day	Length	Width	Depth of fluid (D)	Fluid volume m^3	'd' invert depth	Emergency storage m^3	Cleaning cycle week
Glisa Conservancy Tank	2 520	5 000	3 000	2 000	30	0.600	48 Hrs	2 Weeks

The tank will be buried below ground and will be serviced once in two weeks by a sewage handling contractor. **Figure 6** below illustrates a conservancy tank.

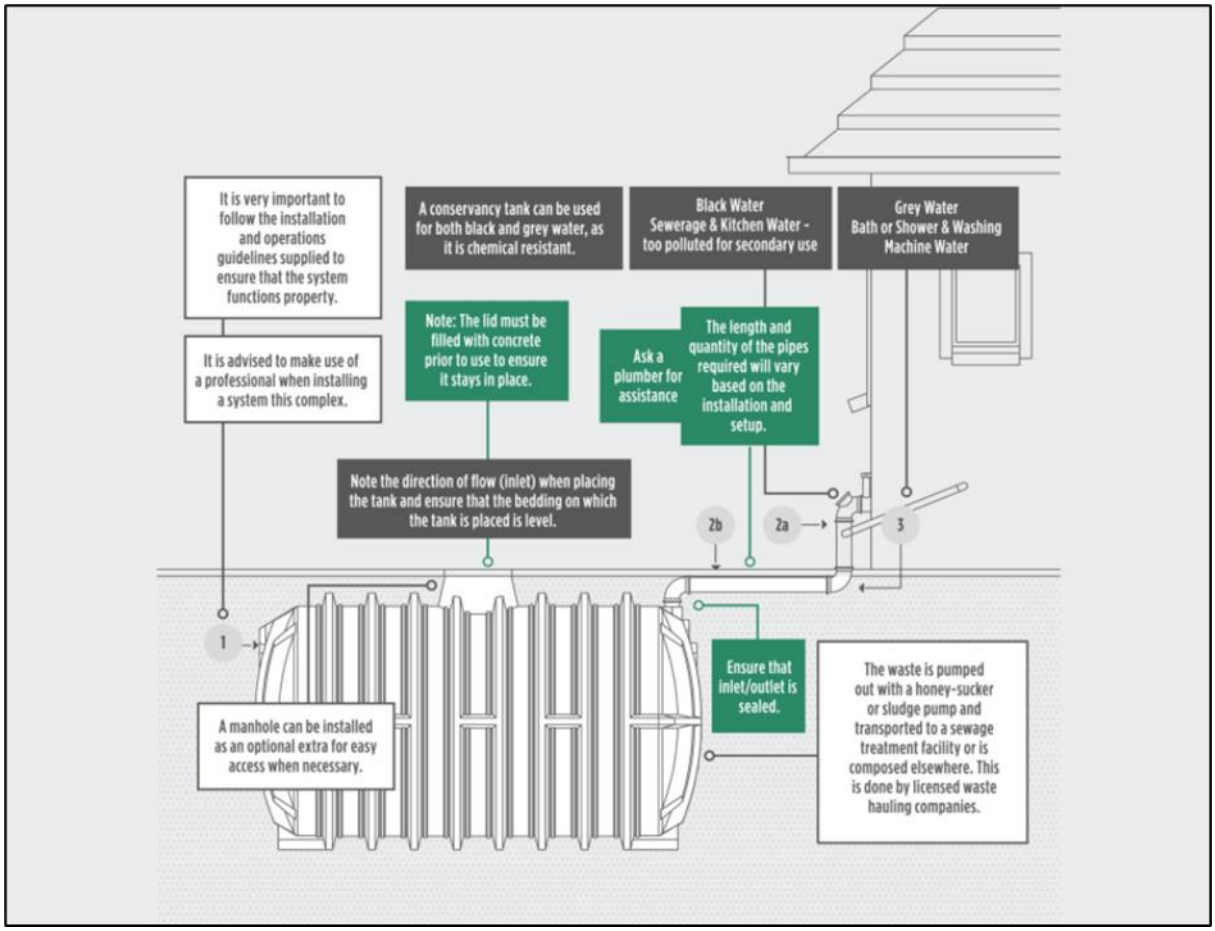


Figure 6: Below ground conservancy tank.

5.4.9. Perimeter fencing and parking facilities

A perimeter fence and parking facilities will be constructed in around the siding. Currently none of these infrastructures are available at the siding. A security gate will also be installed to monitor movement of vehicles and for safety and security.

5.4.10. Above ground diesel storage facility

The existing diesel bay will be demolished and a 9000 liters above ground diesel storage facility will be constructed. The facility will be bunded and refiling procedure will be developed to prevent spillages of hydrocarbons.

5.4.11. Potable water

Currently there is no potable water available at the siding. Drinking water that will be used at the siding will, be sourced from the mine using water bowser and stored in tanks that will be provided to ensure that water for ablution and drinking is available at the siding.

5.4.12. Transport

Trucks will transport the coal from the NBC coal processing plant to Glisa Siding. Front-end loaders will load the train that will transport the coal to the various clients. The coal products will be transported off site via the Belfast railway line to supply the various markets that will be relying on this coal supply.

5.5. Waste Stream Identification

5.5.1. Domestic Waste

Domestic waste will be generated on site, primarily at the office associated with the consumption of food or drink on site. Normal office type waste will also be generated. Typical general waste includes:

- General compactable and non-compactable wastes being primarily cans, paper, plastic packets, food scraps and packaging materials.

5.5.2. Hazardous waste

Hazardous waste that will be produced during the construction, operation, decommissioning and closure of the Siding, such as hydrocarbon contaminated soil and water, used oil, oily rags, etc., will be collected and transported by an appointed registered hazardous waste

collection service provider for proper disposal into registered and licensed hazardous landfill site.

6. POLICY AND LEGISLATIVE CONTEXT

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				**How does this development comply with and respond to the legislation and policy context?** (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	**Reference where applied**
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
Environmental rights	**Constitution of the Republic of South Africa, Act 108 of 1996 as amended**	24. Environment	Everyone has the right— (a) to an environment that is not harmful to their health or well-being; and	Consideration for environmental protection and prevention of pollution and ecological degradation. Consideration to sustainable development and use of natural resources as part of the development of	Whole document

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
			(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that— (i) prevent pollution and ecological degradation;	this proposed project	

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
			(ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.		
EIA Process and Listed	**National Environmental Management Act, Act 107 of**	Section 2 of NEMA	Sets out the principles of environmental management	Section 2 principles are to be considered during the	Whole document

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				**How does this development comply with and respond to the legislation and policy context?** (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	**Reference where applied**
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
	1998 as amended			environmental impact assessment process	
		Chapter 5 of NEMA	Integrated environmental management, provides information on environmental management tools that promote the implementation of principles set out in Section 2 of NEMA	Environmental management tools are to be considered during the EIA process for the project.	Whole document
Glisa Siding		Regulation 326	Chapter 2: Timeframes	BAR and EMPr must be	Whole document

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
			Chapter 3: General requirements for applications Chapter 4: Application for environmental authorisation Part 1 and 2) Chapter 6: Public participation process Chapter 7: General matters	undertaken in accordance to Regulation 326	

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				**How does this development comply with and respond to the legislation and policy context?** (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	**Reference where applied**
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
		Regulation 327 (Listing Notice 1)	Lists activities requiring a basic environmental assessment	Environmental authorisation must be obtained prior to commencement with listed activities	Whole document
		Guideline 4 and Guideline Series 7	Public Participation in support of the EIA regulations Public Participation Guideline	The public participation process to be followed.	Appendix 8 Public Participation Report and Section 8
		General Notice 891 of 2014	Guideline on need and desirability in terms of the Environmental	Determination of need and desirability of the project	Section 7

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				**How does this development comply with and respond to the legislation and policy context?** (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	**Reference where applied**
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
			Impact Assessment (EIA) Regulations, 2010		
		Guideline 5	Assessment of Alternatives and Impacts	The EIA process to be followed	Section 4
Biodiversity	**National Environmental |Management: Biodiversity Act, Act 10 of 2004 as amended**	Regulation 151 Publication of critically endangered, vulnerable and protected species	No person may carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit.	A permit might be required prior to removal of endangered, vulnerable and protected species that might be identified and impacted within the study area.	Currently no endangered, vulnerable and protected species have been identified within the study area.

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
	National Forests Act, Act 84 of 1998	Notice 835 List of Protected tree species under the Act	No person may carry out a restricted activity on any protected tree except if there is a licence granted by the minister.	A licence might be obtained prior to removing any protected trees on site.	Currently no protected trees have been identified within the study area.
	Mpumalanga Nature Conservation Act, Act 10 of 1998	Section 2 Protected Plants	No person shall remove protected plants without a permit.	A permit will be required for the removal of protected plants that may be cleared as a result of the extension project.	Section 91
Waste Manag	**National Environmental**	NEMWA variuos	Waste management	Management of waste that will be	The proposed

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
	Management: Waste Act, Act 59 of 2008 as amended	applicable sections	as part part of the project's construction and operation.	generated as part of this project to prevent environmental pollutin and littering.	development will not trigger waste activities.
Water Use	**National Water Act, 36 of 1998 as amended**	NWA variuos applicable sections	Water management as part part of the project's construction and operation.	Water management as part of this project to prevent the contamination and pollution of water resources.	Section 5.1, 9.

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				**How does this development comply with and respond to the legislation and policy context?** (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	**Reference where applied**
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
Protection of water resources	**National Water Act, 36 of 1998** **GN 704**	All applicable regulation forming part of GN 704	Regulations on use of water for mining and related activities aimed at the protection of water resources.	Application for the exemption from the requirements of the identified activities.	Section 9.1.8 with respect to Surface Water
Heritage Resources	**National Heritage Resources Act , Act 11 of 1999**	Section 38	Any person who intends to undertake a linear development exceeding 300m and undertaking a development exceeding 5	South African Heritage Resources Agency (SAHRA) has to be notified of the proposed development.	Section 9.1.14

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
			000m² must inform the responsible heritage resources authority.		
Noise	**National Environmental Management: Air Quality Act, Act 39 of 2004 as amended**	Section 34	Control noise in general, by specific machinery, activities or in specified places or areas; Also with respect of determining definition for noise and	Applicant is to adhere to the national standards for noise.	Section 9.1.6

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
			maximum levels of noise.		
Veld Fires Use	**National Veld and Forest Act 101 of 1998**	Chapter 4 Section 12	Places a duty on owners to prepare and maintain firebreaks. The procedure in this regard and the role of adjoining owners and the fire protection association are dealt with.	A firebreak must be maintained around the mine perimeter fence.	Section 9
Land Management	**Conservation of Agricultural Resources Act 1983 (Act No 43 of 1983)**	Regulation 280 of 2001	Requires the landowner to manage agricultural resources i.e.	An alien invasive species plan must be developed for the mine and a	Section 9

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				How does this development comply with and respond to the legislation and policy context? (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	Reference where applied
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
			the removal of invasive species, protection of soils against water and wind erosion and the management of water resources.	land use and soil management plan must be developed.	
	eMakhazeni Local Municipality Municipal By-Law on Spatial Planning and Land Use Management, 2015 (Draft 3: 23 April 2015).	Part C: Dealing with the rezoning of land	Section 62. Application for amendment of a land use scheme by rezoning of land	Requires that an applicant, who wishes to rezone land, must apply to the Municipality for the rezoning of the land in the manner	A separate application need to be done by mine to the eMakhazeni Local Municipalty

Applicable legislation and guidelines used to compile the report. (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are appliable to this activity and are to be considered in the assessment process)				**How does this development comply with and respond to the legislation and policy context?** (E.g., In terms of the National Water Act a Water Use Licence has/has not been applied for)	**Reference where applied**
	Legislation	**Regulations / Guidelines**	**Description / Requirement**	**Project Implication**	
				provided for in Chapter 6.	

7. NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

7.1. Project motivation for need and desirability

7.1.1. Economic Consideration

The proposed project involves refurbishing and upgrading the existing Glisa Siding. The proposed development will result in the increase supply of coal and thus ensure that the support the local and national economic and social needs.

7.1.2. Social Consideration

The proposed activity will also realise several advantages for the local community. The proposed activity will provide an income generation for the area, as well as a cash injection into the country's economy. Employment will be generated during the construction and operational phases of activity. A Social and Labour Plan has been developed for the proposed NBC, the SLP will form part of the environmental authorisation. The development of the NBC will result in the implementation of the SLP which will contribute to the empowerment of both the workforce and local community.

In addition to the aforesaid the socio-economic benefits associated with the proposed development will result in temporary employment opportunities and skills development in the area. NBC will endeavour to source the majority of the workforce from the eMakhazeni Local Municipality, more specifically from the local communities surrounding the Siding. The company will conduct a skills audit within the local communities to ascertain the type of skills that exist, the gap and the potential impact the project will have in terms of skills development through employment opportunities and through social upliftment programmes run by the mine to uplift the local communities.

7.1.3. Environmental Consideration

The proposed project aims improve the current environmental conditions through the following processes which have been discussed below:

- Separation of clean and dirty water; and
- Development of a Stormwater Management Plan (SWMP).

A SWMP will be developed to assist in the separation of clean and dirty water, preventing the dirty water from entering the natural environment by capturing the dirty water in a PCD. Clean water will be allowed to flow freely and diverted away from the potential source of contamination.

7.1.4. Health and Safety Consideration

It is anticipated that the Glisa Siding activities will generate dust which might have impact on the health of the employees during construction and operational phase. Movement of vehicles are also anticipated to cause safety concerns. These health and safety risks will be addressed as part of the proposed recommended mitigation measures as per the specialist's recommendations.

8. DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

Public participation is a key element of the environmental decision-making process, and stakeholder engagement formed part of the Environmental Authorisation as well as the WULA processes of this proposed development. **Figure 7** and **Figure 8** briefly outlines the broad timeframes and the various technical and stakeholder engagement activities being undertaken during the phases of these applications (Pre-application, application, Impact Assessment and Decision-making) of the integrated environmental decision-making process relating to the proposed development.

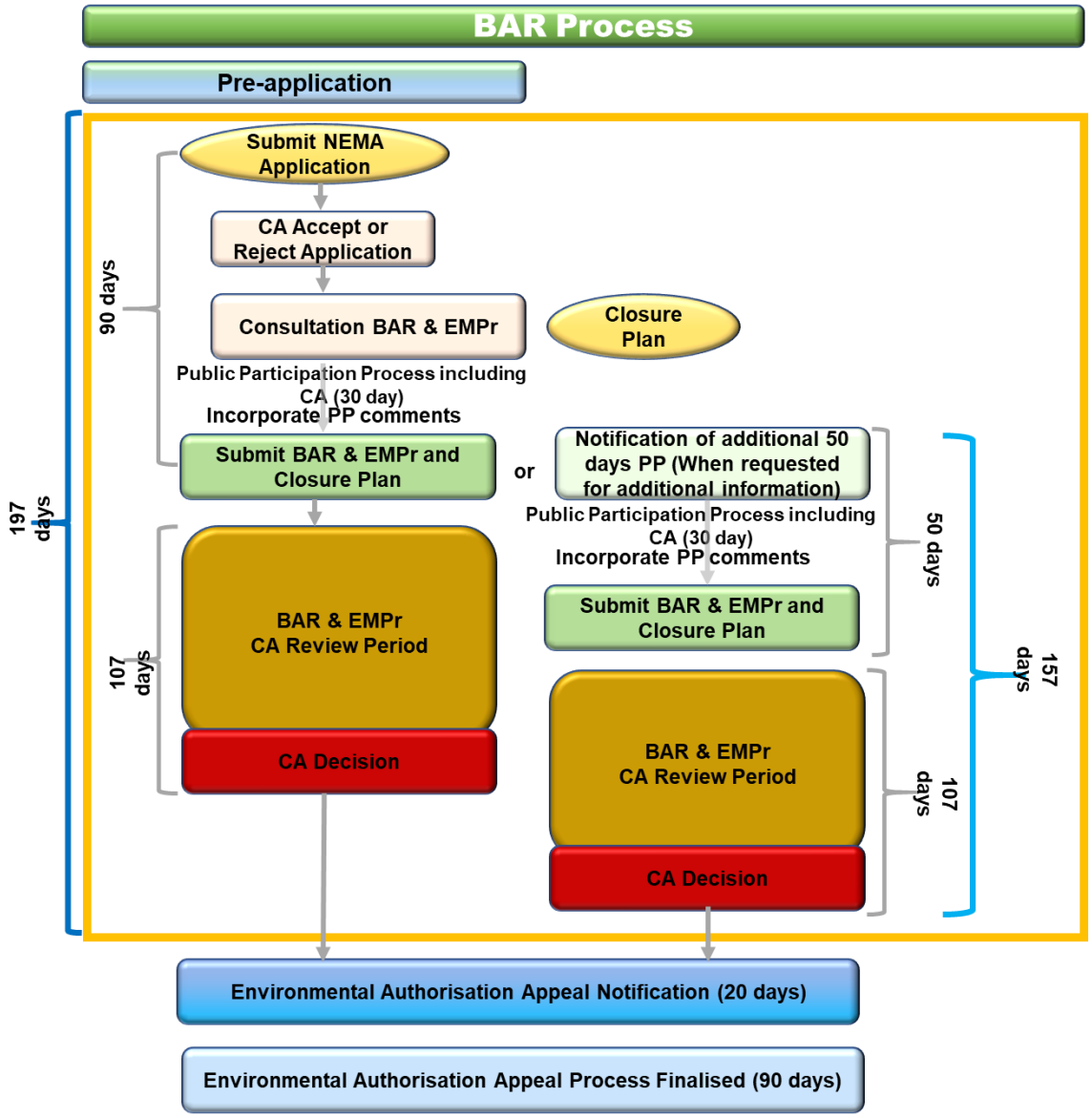


Figure 7: NEMA Environmental Authorisation application and associated Public Participation Process

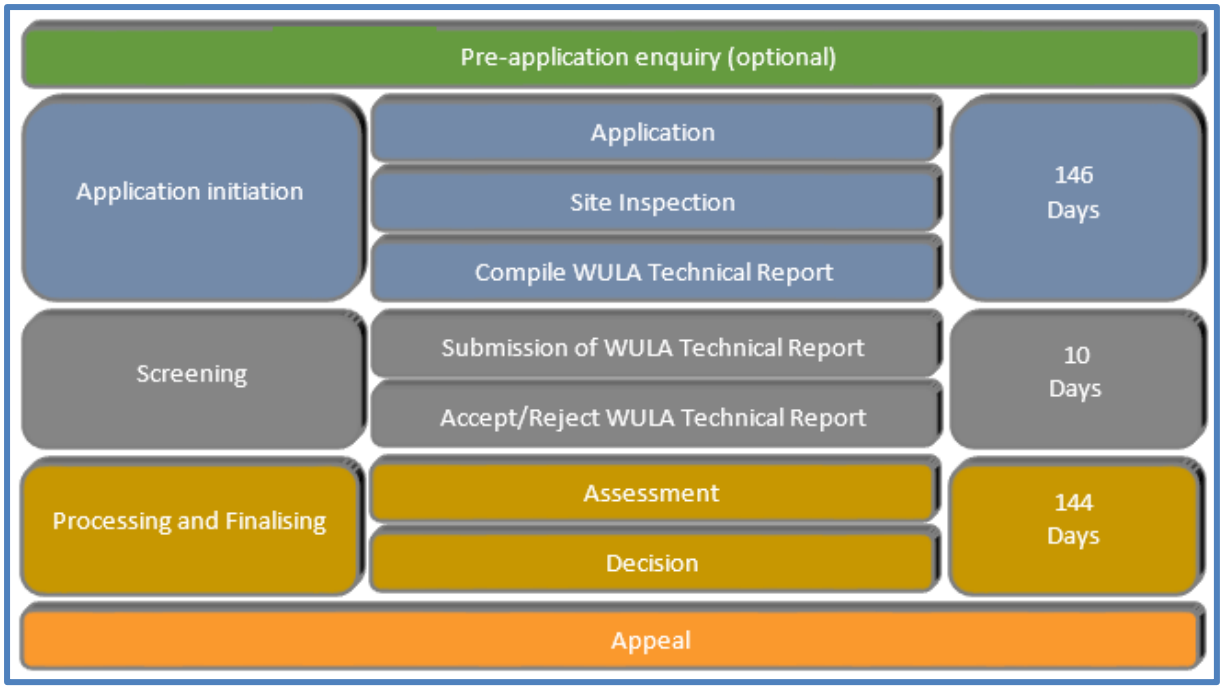


Figure 8:WULA compilation and approval process on e-WULAAS

The public will be notified of the proposed development in line with Chapter 6 of the EIA Regulations (2014) as amended. The EIA Regulations (2014) as amended allow for an integrated and comprehensive Public Participation Process to be adopted, which provides IA&Ps with accessible information, presented in an objective manner. Based on this, and during the various phases of the Environmental Authorisation Process, this enables IAPs to:

- Raise comments and make recommendations that will have to be considered during the impact assessment phase;
- Provide comment on project alternatives and the proposed process of assessment;
- Verify that issues raised were recorded and understood;
- Contribute local knowledge to the process; and
- Comment on the findings of the Specialist Studies and the BAR and EMPr.

Throughout the process a register of IA&Ps will be created and maintained. This provided the platform from which correspondence and comments received from IA&Ps were recorded and maintained. The public participation process for this application is being undertaken in accordance with Chapter 6 of the NEMA EIA Regulations GN R982 as amended. **Table 9** provides more detail about the public participation activities undertaken thus far, together with referencing materials included as Appendices.

Table 9: PPP BAR Phase Activities

Activity	Details
Identification of stakeholders	A stakeholder database will be developed which includes I&APs from various sectors of society – this includes directly affected and adjacent landowners, in and around the proposed project area.
Distribution of announcement letter and BID	A BID, announcement letter with Registration and Comment Form will be distributed from the 12th of March 2021.
Placing of newspaper advertisement	An English advert will be placed on Friday 12th of March 2021 in the Middelburg Observer.
Placement of site notices	English site notices will be placed at the proposed project site and other accessible public spaces on 12th of March 2021.
Announcement of BAR	Announcement of availability of the draft BA and EMPr will be distributed to stakeholders together with the formal project announcement on Friday, 12th of March 2021. The electronic copies of the draft BA and EMPr will be made available on www.licebo.co.za (under Public Documents: http://www.licebo.co.za/projects/public-review-documents/nbcglisasidingproject-environmental-authorisation) and/or requested from Licebo's offices. (30-day comment period for the draft BA and EMPr: Friday, 12th of March 2021 to Tuesday, 14th of April 2021).
Stakeholder Meetings	Due to Covid-19 regulations no public meeting will be held. One on one meetings with authorities or stakeholder can be arranged through Licebo. Only virtual meetings can be held.
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders during this phase will be captured in the CRR.

8.1. Public Review of the Draft Basic Assessment Report

This Environmental Impact Report has been prepared in accordance with Appendix 2 of the GNR 326 as amended. The Draft BAR and EMPr will be made available for 30 days public review. Registered IA&Ps will be informed of the availability of the Draft BAR and EMPr for review. Comments received from the Draft BAR and EMPr will be recorded in the Comments and Response Report. This will form part of Annexure C of the public participation report and the Final Basic Assessment Report, which will be submitted to the MDARDLEA for consideration and acceptance. The Draft BA and EMP report and the WULA will be made available for 30 days public review from **12 March 2021** to **13 April 2021**. Comments should be sent to LEM before or on the 14th of April 2021.

8.2. Public Meeting

Due to the Covid-19 Pandemic no public meeting will be held. Meetings will be held via Skype, Zoom, Microsoft Team and Telephone. Comments raised by stakeholders will be captured and addressed in the Comment and Response Report (CRR). Consultation for this process will be undertaken throughout the environmental authorisation process.

8.3. Summary of issues raised by Interested and Affected Parties

Summary of issues raised by interested and affected parties will be captured in the Public Participation Report and CRR. The PPP chapter including the CRR of issues and comments already received is attached as **Annexure D**.

9. THE ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT

9.1. Baseline Environment

9.1.1. Geology

According to the 1:250 000 geological maps 2528 Pretoria and 2530 Barberton, the Glisa Siding area is situated within the Witbank Coal field of the main Karoo Basin (Karoo Supergroup). The site underlying geology comprises sedimentary rocks of the Karoo Supergroup (including fine to coarse grained sandstone, shale, mudstone, carbonaceous shale, and coal).

The coal reserves are found in the Vryheid Formation (Ecca Group) and consist predominantly of fine, medium, and coarse-grained sandstone with sub-ordinate mudstone, shale, siltstone, and carbonaceous shale. The Dwyka Group tillite forms the base of the coal seam deposits. Dolerite intrusions (dykes and sills) of the late Karoo age are widespread in the project area. A fault zone is located 440 meters away from Glisa Siding Coal stockyard on the western side of the Coal.

9.1.2. Climate

9.1.2.1. Temperature

Monthly mean, maximum and minimum temperatures are given in **Table 10**. Temperatures ranged between -0,34°C and 30.9°C. The highest temperatures occurred in December and the lowest in June and July.

Table 10: Monthly temperature summary (January 2019 to December 2020).

Monthly Minimum, Maximum and Average Temperatures (°C)												
Month	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Min	11.1	11.1	9.5	3.8	0.8	-0.9	-3.4	-1.2	1.2	2.6	4.6	9.5
Max	30.9	28.9	27.1	25.1	20.4	18.0	17.4	23.1	25.2	29.2	28.6	29.6
Ave	19.8	19.9	18.4	14.8	11.5	8.6	8.0	11.3	14.6	16.8	18.4	20.2

9.1.2.2. Precipitation

Precipitation has an overall dilution effect and cleanses the air by washing out particles suspended in the atmosphere. Rainfall is important to air pollution studies since it represents

an effective removal mechanism of atmospheric pollutants. Monthly rainfall obtained from the measured Belfast station data is presented in **Figure 9**.

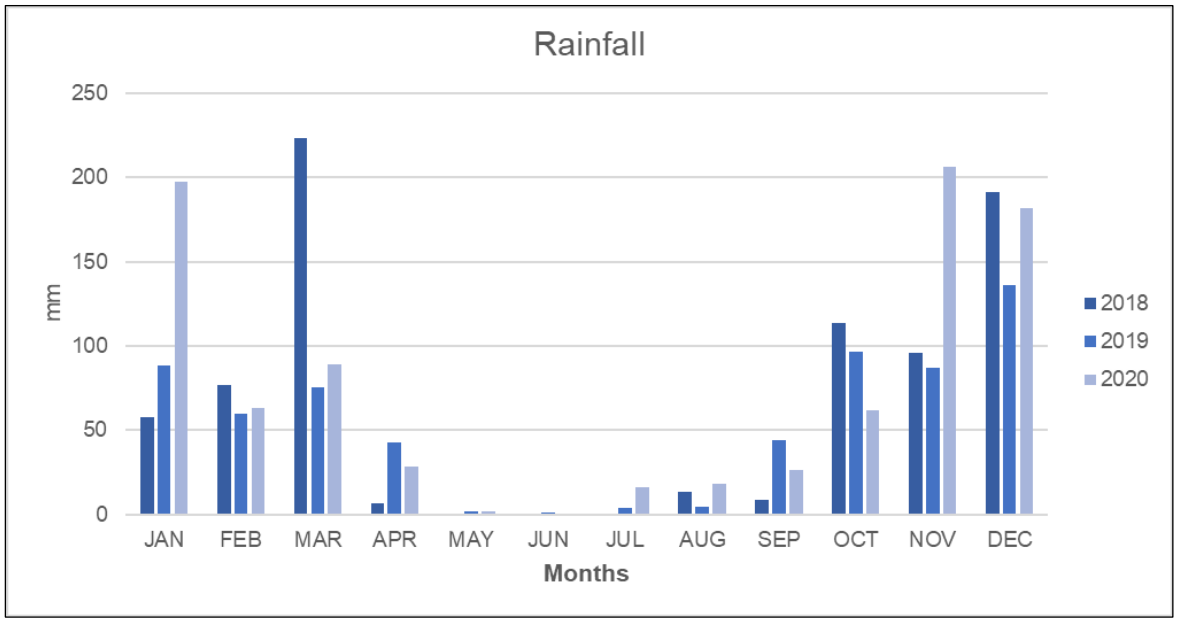


Figure 9: Rainfall data

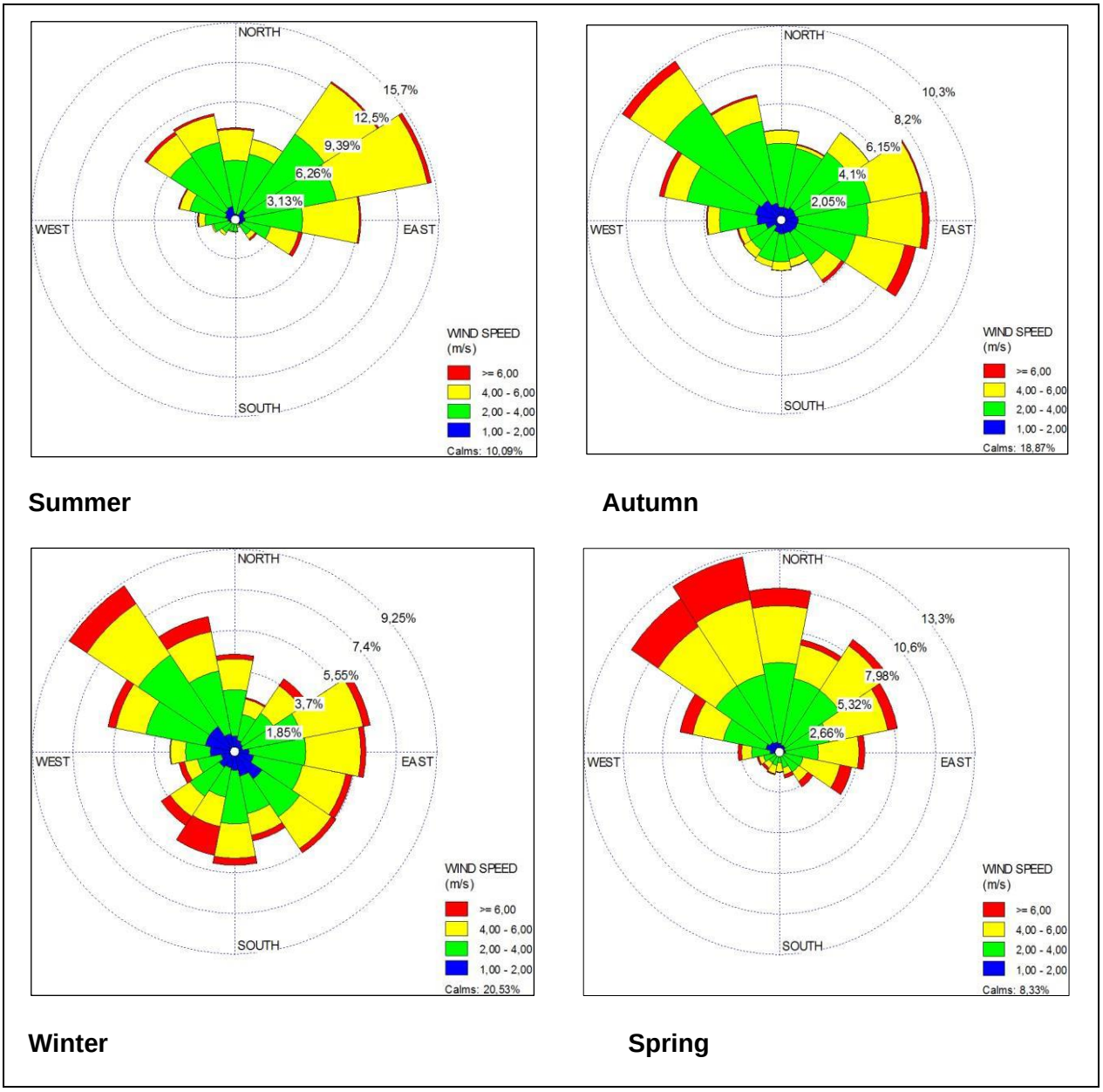


Figure 10: Seasonal variation of winds Wind rose for Belfast.

9.1.3. Biodiveristy

Information regarding the Biodiversity of the Glisa study area was obtained from the destktop Biodiversity Assessment undertaken by Ecology International in February 2021. The report is attached as **Annexure G**.

9.1.3.1. Regional Vegetation

The Glisa Siding study area is located within the Grassland Biome, which is part of the global Temperate Grassland Biome. The Grassland Biome in South Africa occurs mainly in the high

central plateau (Highveld), the inland areas of the eastern seaboard, the mountainous areas of KwaZulu-Natal, and the central parts of the Eastern Cape (Mucina & Rutherford, 2006).

The Grassland Biome is further divided into smaller units known as vegetation types. The delineation and characterisation of vegetation units was originally done by Mucina & Rutherford (2006). However, a further refinement of the vegetation units (particularly in KwaZulu-Natal), was recently undertaken by the SANBI in 2012 and again more recently in 2018, resulting in additional vegetation units being delineated. Based on the revised vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006; updated 2018), the study area is directly associated with only one vegetation unit, namely the Steenkampsberg Montane Grassland unit.

9.1.3.2. Threatened Ecosystems

According to the National List of Ecosystems that are Threatened and in need of Protection (promulgated under NEMBA, Government Notice 1002 of 2011), the proposed Glisa Siding study area study area falls within a listed Threatened Ecosystem, namely the Dullstroom Plateau Grassland Ecosystem. An estimated 85% of the ecosystem remains in a natural state, while approximately 5% of the original extent of the ecosystem is formally protected. However, subsequent assessments conducted as part of the National Biodiversity Assessment (2018) has resulted in the area of the proposed Glisa Siding to be reclassified within the Steenkampsberg Montane Grassland which was determined to be of Least Concern.

9.1.3.3. Protected Areas

According to the Department of Environmental Affairs' Protected Area Database (DEA, 2020), no formally Protected Areas are associated with the proposed Glisa Siding study area. However, the Greater Lakenvlei Protected Environment which is located approximately 7km north of the proposed Glisa Siding study area, while the Langkloof Private Nature Reserve is located approximately 11km north-east of the study area.

9.1.3.4. Important Bird and Biodiversity Areas

Based on the current delineations of IBAs in South African, the proposed Glisa Siding is located within the Steenkampsberg Important Bird Areas (IBA). This IBA lies on South Africa's central plateau and consists primarily of rolling high-altitude (1 700–2 100 m a.s.l.) grassland interspersed with rocky outcrops. IBA trigger species associated with the Steenkampsberg IBA include:

- Globally threatened species: Southern Bald Ibis, Wattled Crane, Blue Crane, Grey Crowned Crane, White-winged Flufftail, Rudd's Lark, Yellow-breasted Pipit, Denham's Bustard, Blue Korhaan (*Eupodotis caerulescens*) and Secretarybird (*Sagittarius serpentarius*).
- Regionally threatened species: African Marsh Harrier, Black-rumped Buttonquail (*Turnix nanus*), Striped Flufftail (*Sarothrura affinis*), White-bellied Korhaan, African Grass Owl, Black Stork and Lanner Falcon (*Falco biarmicus*).
- Restricted-range and biome-restricted species are Kurrichane Thrush (*Turdus libonyanus*) and Buff-streaked Chat, both of which are common. Rudd's Lark, Yellow-breasted Pipit and Gurney's Sugarbird are uncommon, while Whitebellied Sunbird (*Cinnyris talatala*) is fairly common.

9.1.3.5. Terrestrial Flora

According to data obtained from MTPA (2021), approximately 24 plant species of conservation concern at either a national or provincial level have been recorded within the larger general area associated with the proposed Glisa Siding study area (refer **Table 11**).

Table 11: Recorded plant species of conservation concern potentially associated with the proposed Glisa Siding study area.

Scientific Name	Conservation Status*	
	National	Provincial
Aloe reitzii var. reitzii	NT	NT
Bowiea volubilis	VU	VU
Callilepis leptophylla	Declining	Declining
Centrostigma occultans	LC	Rare
Cymbopappus piliferus	VU	VU
Eucomis autumnalis	Declining	Declining
Eucomis montana	Declining	Declining
Eucomis pallidiflora (=E. pole-evansii)	NT	NT
Eulophia cooperi	LC	Rare
Eulophia parvilabris	LC	Rare
Gladiolus malvinus	VU	VU
Gnidia variabilis	VU	VU
Gunnera perpensa	Declining	Declining
Helictotrichon natalense	VU	SA

Scientific Name	Conservation Status*	
	National	Provincial
Khadia carolinensis	VU	VU
Kniphofia rigidifolia	LC	Rare
Kniphofia triangularis subsp. Obtusiloba	Rare	Rare
Moraea robusta	LC	Rare
Protea parvula	NT	NT
Prunus africana	VU	VU
Riocreuxia aberrans	NT	NT
Streptocarpus latens	Rare	Rare
Watsonia occulta	LC	Rare
Zantedeschia pentlandii	VU	VU

* LC = Least Concern; NT = Near Threatened; VU = Vulnerable

9.1.3.6. Terrestrial Fauna

Data pertaining to the presence of faunal species potentially associated with the proposed Glisa Siding study area was obtained from the Global Biodiversity Information Facility, the Animal Demographic Unit of the University of Cape Town, as well as data obtained from Mpumalanga Tourism and Parks Agency. Based on the results obtained, the following is the estimated terrestrial faunal diversity that could be associated with the proposed Glisa Siding study area:

- 35 species of mammals, of which 11 species is of conservation concern and one is regarded as data deficient;
- 216 species of birds, of which 21 species are of conservation concern;
- 39 species of reptiles, one of which is of conservation concern at a national level while a further three are of conservation concern at a provincial level;
- 17 species of frogs, none of which are of conservation concern; and
- 66 species of Lepidoptera, none of which are of conservation concern.

Table 12 provides a list of terrestrial faunal species of conservation concern likely to occur within or be associated with the proposed Glisa Siding study area based on available records. As with the plant species, many of the faunal species of conservation concern are likely to be associated with the wetland and grassland features that may be present within the study area, although several species are likely to show a preference for the disturbed areas.

Table 12: Terrestrial faunal species of special concern potentially associated with the proposed Glisa Siding study area.

Scientific Name	Common Name	Threat Status*
Mammals		**National, Provincial**
Amblysomus robustus	Robust Golden Mole	VU, VU
Amblysomus septentrionalis	Highveld golden mole	NT, NT
Atelerix frontalis	Southern African Hedgehog	NT, NT
Chrysospalax villosus	Rough-haired Golden Mole	VU, VU
Crocidura mariquensis	Swamp Musk Shrew	NT, NT
Georychus capensis (Mpumalanga subpopulation)	Cape Mole-rat	DD, DD
Leptailurus serval	Serval	NT, NT
Ourebia ourebi	Oribi	EN, EN
Panthera pardus	Leopard	VU, VU
Rhinolophus blasii	Vaal Rhebok	NT, NT
Rhinolophus swinnyi	Blasius's Horseshoe Bat	NT, NT
Ourebia ourebi ourebi	Oribi	EN, EN
Leptailurus serval	Serval	NT, NT
Amblysomus robustus	Robust Golden Mole	VU, VU
Chrysospalax villosus	Rough-haired golden mole	VU, VU
Georychus capensis (Mpumalanga subpopulation)	Cape mole-rat	DD, DD
Amblysomus septentrionalis	Highveld golden mole	NT, NT
Atelerix frontalis	Southern African hedgehog	NT, NT
Avifauna		**Regional, Global**
Anthus chloris	Pipit, Yellow-breasted	VU, VU
Balearica regulorum	Crane, Grey Crowned	EN, EN
Charadrius pallidus	Plover, Chestnut-banded	NT, NT
Ciconia abdimii	Stork, Abdim's	NT, LC
Circus macrourus	Harrier, Pallid	NT, NT
Circus ranivorus	Marsh-Harrier, African	EN, LC
Coracias garrulus	Roller, European	NT, LC
Eupodotis caerulescens	Korhaan, Blue	LC, NT
Eupodotis senegalensis	Korhaan, White-bellied	VU, LC
Falco biarmicus	Falcon, Lanner	VU, LC

Scientific Name	Common Name	Threat Status*
Mammals		**National, Provincial**
Geocolaptes olivaceus	Woodpecker, Ground	LC, NT
Geronticus calvus	Ibis, Southern Bald	VU, VU
Grus carunculata	Crane, Wattled	CR, VU
Grus paradisea	Crane, Blue	NT, VU
Gyps coprotheres	Vulture, Cape	EN, EN
Heteromirafra ruddi	Lark, Rudd's	EN, EN
Neotis denhami	Bustard, Denhams	VU, NT
hoeniconaias minor	Flamingo, Lesser	NT, NT
Sagittarius serpentarius	Secretarybird	VU, VU
Sarothrura ayresi	Flufftail, White-winged	CR, CR
Tyto capensis	Grass-Owl, African	VU, LC
Herpetofauna		**National, Provincial**
Acontias breviceps	Short Head Legless Skink	LC, VU
Acontias plumbeus	Giant Legless Skink	LC, NT
Amplorhinus multimaculatus	Many-spotted Snake	LC, NT
Chamaesaura aenea	Coppery Grass Lizard	NT, NT

* CR = Critically Endangered; EN = Endangered; VU = Vulnerable; NT = Near Threatened; DD = Data Deficient; LC = Least Concern

9.1.3.7. Aquatic Biodiversity

The proposed Glisa Siding study area is located within the Southern Temperate Highveld freshwater ecoregion, which is delimited by the South African interior plateau sub-region of the Highveld aquatic ecoregion, of which the main habitat type, in terms of watercourses, is regarded as Savannah-Dry Forest Rivers. Aquatic biotas within this bioregion have mixed tropical and temperate affinities, sharing species between the Limpopo and Zambezi systems. The Southern Temperate Highveld freshwater ecoregion is considered to be bio-regionally outstanding in its biological distinctiveness and its conservation status is regarded as Endangered. The ecoregion is defined by the temperate upland rivers and seasonal pans (Nel et al., 2004; Darwall et al., 2009; Scott, 2013).

9.1.3.8. Aquatic Fauna

Data pertaining to the presence of aquatic faunal species potentially associated with the proposed Glisa Siding study area was obtained from various scientific collection databases

including the Global Biodiversity Information Facility, Animal Demographic Unit, South African Institute for Aquatic Biodiversity, Albany Museum, and from the provincial records of Mpumalanga Tourism and Parks Agency. It should be noted that no fish species were expected to be associated with the study area due to the lack of suitable watercourses which would otherwise support such fish. Nevertheless, the following is the estimated aquatic faunal diversity that could be associated with the proposed Glisa Siding study area:

- No fish species are likely to be associated with the proposed Glisa Siding;
- Approx. 107 species of Odonata (Dragonflies and Damselflies), four of which are of conservation concern;
- Approx. three species of crab, one of which is newly described and of conservation concern; and
- Approx. 14 species of mollusc, none of which are of conservation concern

provides a list of aquatic species of conservation concern occurring or potentially occurring within the larger Glisa Siding area.

Scientific Name	**Common Name**	**Threat Status***
Odonata		
Diplacodes pumila	Dwarf Percher	EN
Phyllomacromia monoceros	Black Cruiser	NT
Pseudagrion assegaii	Spearhead Sprite	VU
Pseudagrion makabusiense	Green-striped Sprite	NT
Crabs		
Potamonautes flavusjo	Yellowcrest River Crab	EN

* EN = Endangered; NT = Near Threatened

9.1.4. Soils

Information regarding the soil assessment of the Glisa study area was obtained from the Soil, Land Use, Land Capability and Land Potential Assessment undertaken by Umongo Environmental Services (Pty) Ltd in July 2020. Land Use, Land Capability and Land Potential Assessment is attached as **Annexure F**.

The conservation of limited soil resources with high agricultural potential is essential for human survival. The historic human activities on a landscape that have led to misuse of land have been brought about by the ignorance of correct land use and/or by economic pressure to produce at the expense of the land. It should be noted stability in agriculture can be achieved only by an appreciation of the natural factors by the application of land systems that ensure sustained productivity. In addition, there are natural factors governing the land use classification on the landscape which include: climate, topography, soil, and vegetation.

Five soil groups were encountered during the field assessment and these included Oxidic soils, Plintihic soils, Gleyic soils, Lithic soils, and Anthropic soils. The distribution of these soils groups within a landscape depicted that the project area traverses the Oxidic, Plinthic, Lithic, Gleyic and Anthropic catena. The Oxidic soil group and Plinthic soil group are the broad soil groups which are considered to contain soil forms which are ideal for arable agriculture due to, Sufficient depth for root growth, good drainage characteristics, adequate moisture content; and nutrient retention capacity to support the optimum growth and production.

Table 13: Land Capability and Land Potential Classes for the soil forms occurring within the project area.

Soil Forms	**Land Capability**	**Climatic Class**	**Land Potential**	**Areal Extent (ha)**	**Sum of Extent (ha)**	**Percentage (%)**
Hutton	Arable (Class I)	Class 2 (Slight limitation)	Very High potential	0.61	21.16	10
Nkonkoni/Vaalbos	Arable (Class II)	Class 2 (Slight limitation)		20.55		
Glencoe/Avalon	Arable (Class III)	Class 2 (Slight limitation)	High potential	18.38	18.38	9

Soil Forms	Land Capability	Climatic Class	Land Potential	Areal Extent (ha)	Sum of Extent (ha)	Percentage (%)
Wasbank/Longlands	Arable (Class IV)	Class 2 (Slight limitation)	Good potential	0.79	0.79	0.4
Katspruit	Watercourse (Class V)	Class 2 (Slight limitation)	Vlei	0.84	0.84	0.4
Dresden	Grazing (Class VI)	Class 2 (Slight limitation)	Very Restricted potential	0.38	5.82	3
Mispah/Glenrosa				5.44		
Witbank	Wildlife (Class VIII)	Class 2 (Slight limitation)	L6 (Very restricted potential)	37.35	37.35	17

***The remaining 60% is attributed to open water areas and infrastructural areas which are not included in the table above since they are not considered in the land capability and land potential classificatio**n system**.**

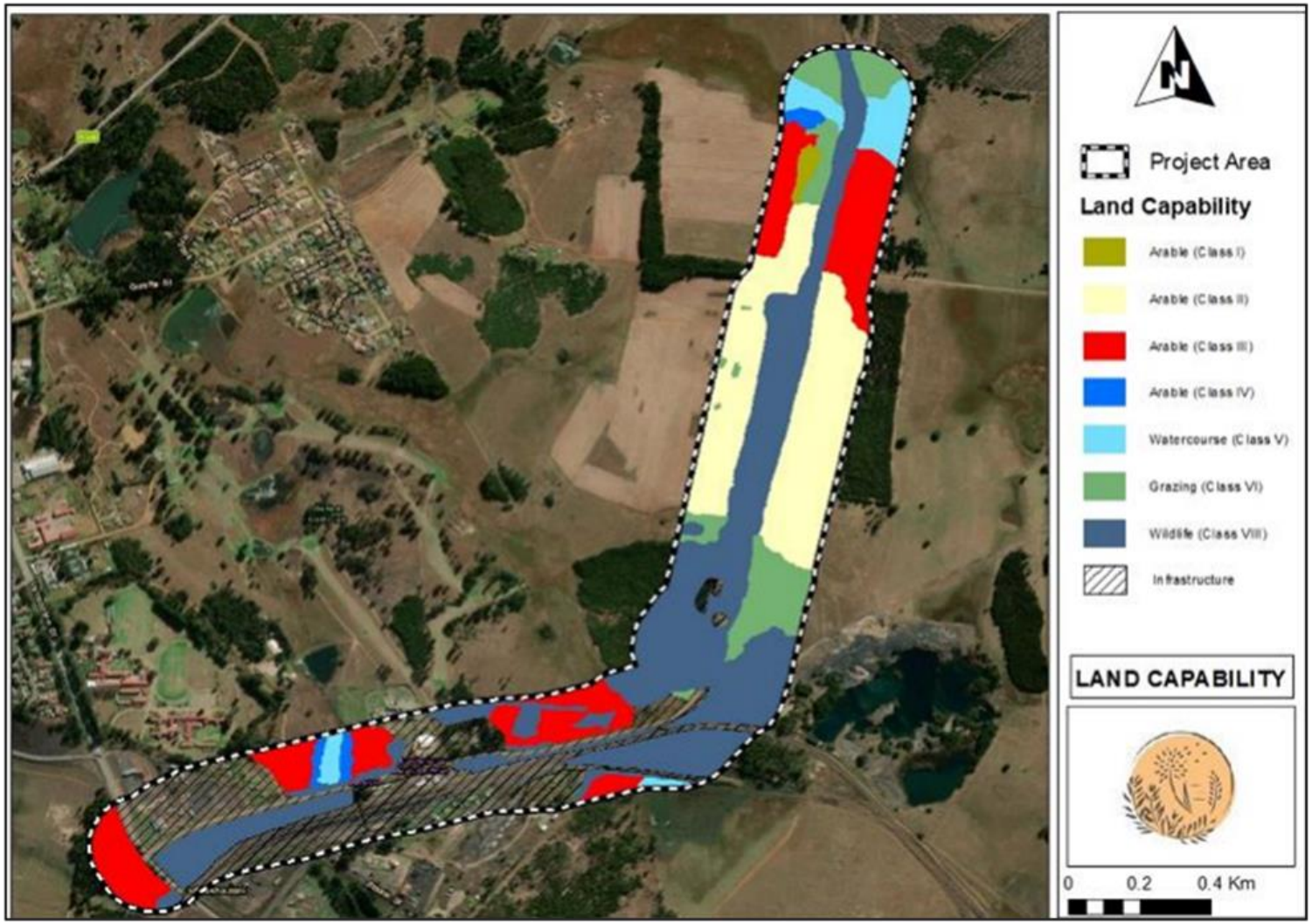


Figure 11: Map depicting land capability classification of the identified soil forms occurring within the project area.

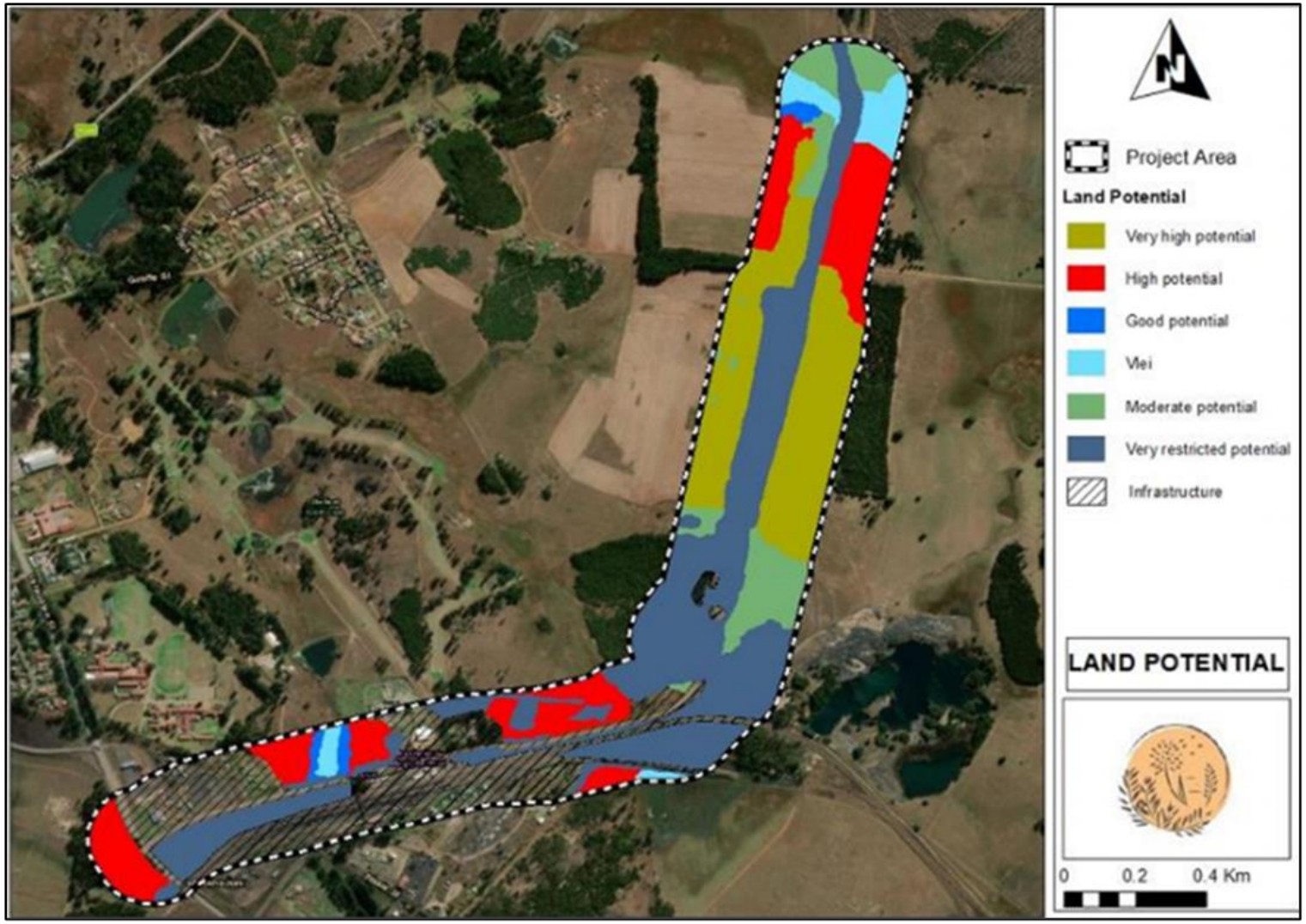


Figure 12: Map depicting land potential classes of the identified soil forms occurring within the project area.

9.1.5. Land use

The conservation of limited soil resources with high agricultural potential is essential for human survival. The historic human activities on a landscape that have led to misuse of land have been brought about by the ignorance of correct land use and/or by economic pressure to produce at the expense of the land. It should be noted stability in agriculture can be achieved only by an appreciation of the natural factors by the application of land systems that ensure sustained productivity. In addition, there are natural factors governing the land use classification on the landscape which include: climate, topography, soil, and vegetation. During the site assessment, the dominant land uses observed within the project area and surroundings consisted of cultivated agriculture, plantation, mining-related activity (Old Glisa Siding), grazing, residential areas, industrial areas, and open space/wildlife. Land uses observed during the field assessment are present in Figure 13 below.

Figure 13: Photographs illustrating the dominant land use within the project area.

9.1.6. Air Quality

9.1.6.1. Dispersion Model

The Dispersion model was used to determine the potential Air Quality impacts that will arise as part of the Glisa Siding. Dispersion simulations were undertaken for the following scenarios to determine:

- Predicted ground-level impacts from all key sources for TSP (as dust fallout), PM_{10} and $PM_{2.5}$ for construction activities associated with the Glisa Railway Siding.
- Predicted ground-level impacts from all key sources for TSP (as dust fallout), PM_{10} and $PM_{2.5}$ for mining activities associated with the Glisa Railway Siding.

9.1.6.2. Findings of the dispersion models

Airborne particulates are the most significant of these emissions and may contain airborne particulate sizes up to about 100 microns in diameter. Particles of sizes larger than about 75 microns tend to deposit out of the plume relatively nearby their emission source. Particles less than about 20 microns, on the other hand, can be carried for considerable distances before depositing out. **Figure 14**, **Figure 15**, **Figure 16** and **Figure 17** below show the extent of airborne particle emission.

Figure 14: Predicted Annual PM_{10} Concentrations construction (Upgrade) Phase.

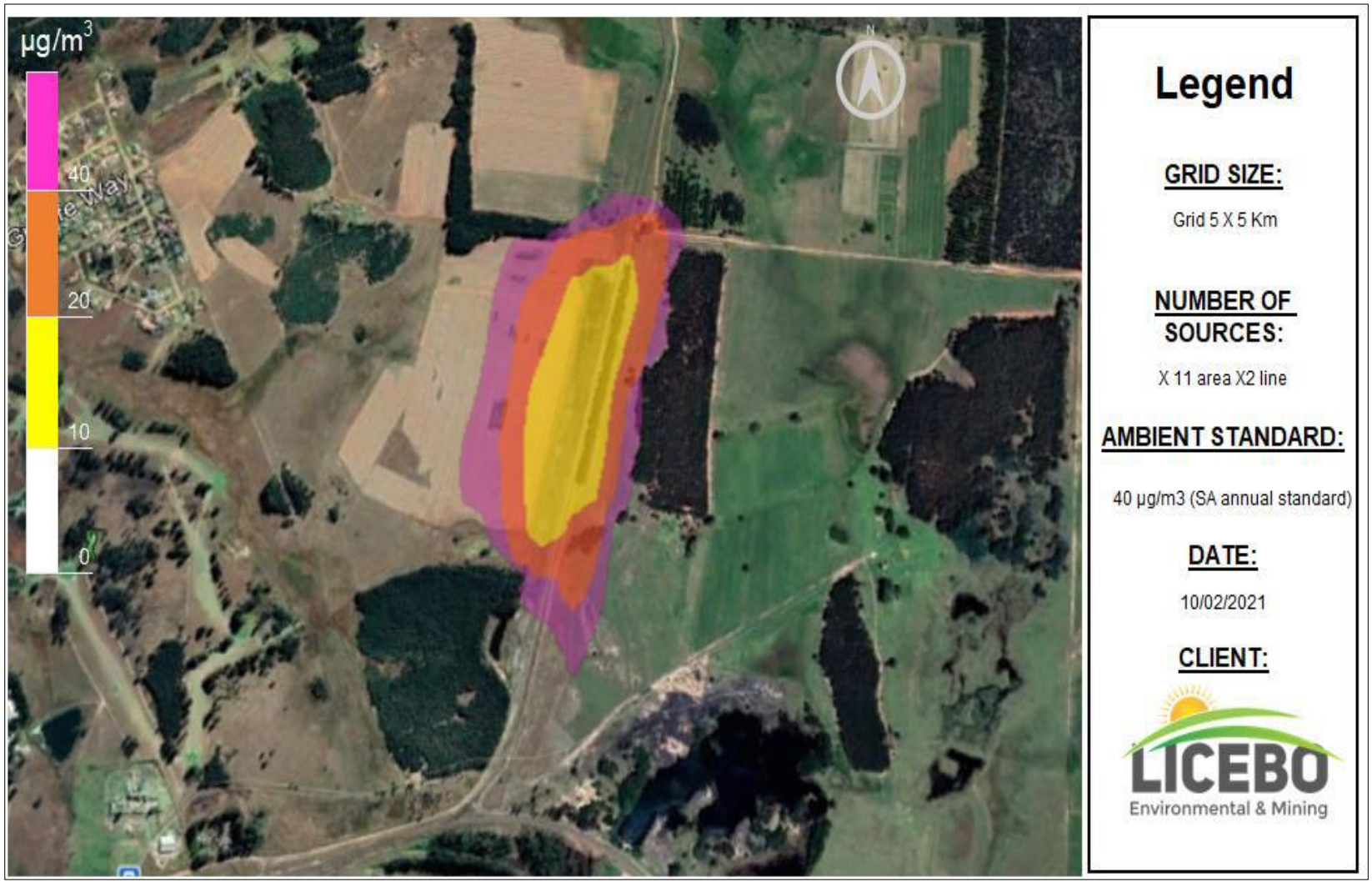


Figure 15: Predicted Annual PM_{10} Concentrations Operational Phase

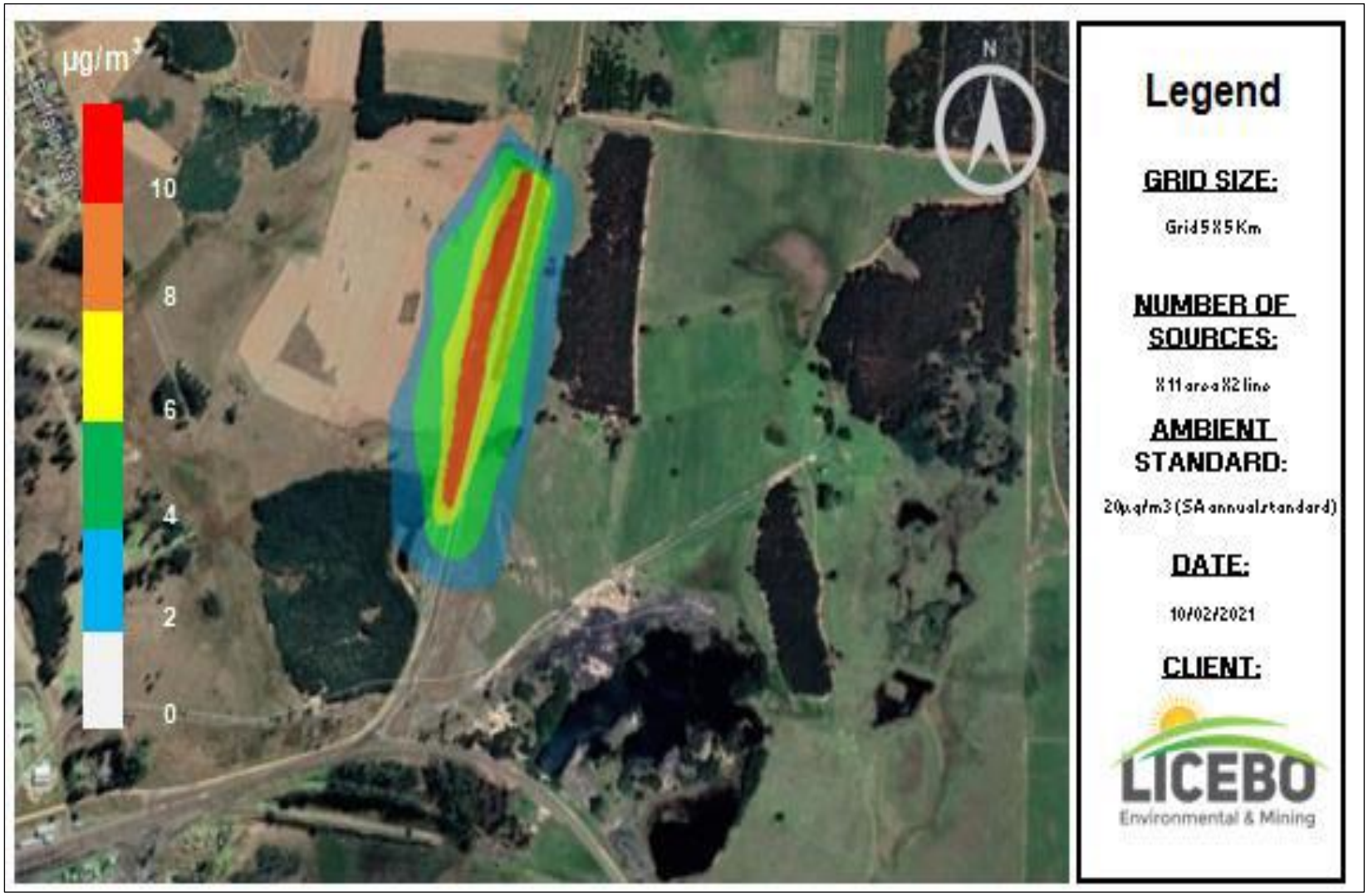


Figure 16: Figure 7: Predicted Annual $PM_{2.5}$ Concentrations Construction (Upgrade) Phase

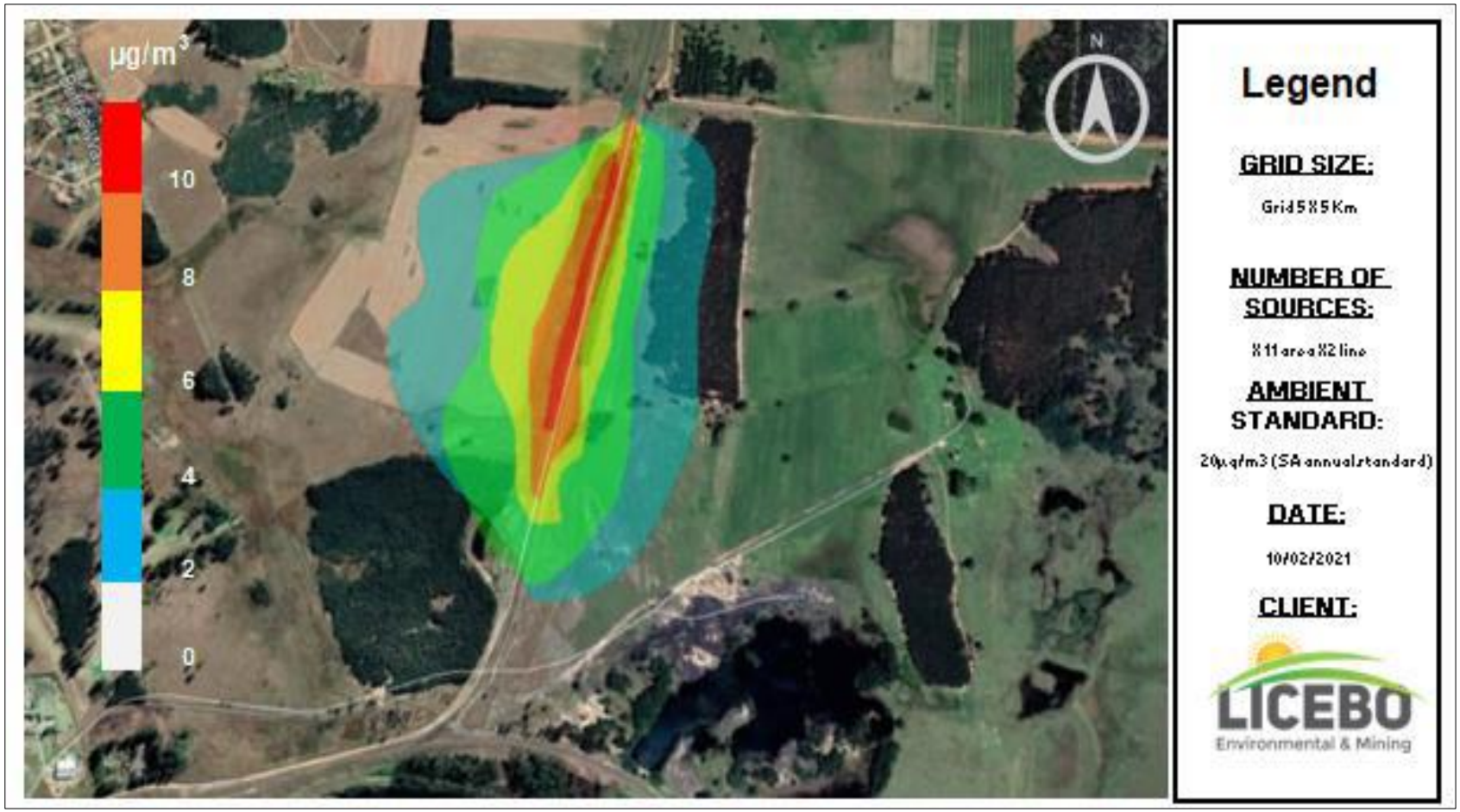


Figure 17: Predicted Incremental Annual $PM_{2.5}$ Concentrations Operational Phase

9.1.7. Wetlands

Information regarding the wetland assessment of the Glisa study area was obtained from the Wetland Delineation, Functional and Impact Assessment undertaken by Umongo Environmental Services (Pty) Ltd in August 2020. The Wetland Delineation, Functional and Impact Assessment is attached as **Annexure N**.

The project area is located within the quaternary catchment B41A which forms This quaternary catchment normally receives summer rainfall patterns with approximately 601-800 mm of rainfall on an annual basis. The project area and surrounding area normally receive the lowest rainfall in June and highest in January. The evapotranspiration occurring within the project area and surroundings is estimated to range between 1601- 1800mm per annum.

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA)'s and Mpumalanga Wetlands (MPHW) databases were undertaken for the proposed project. The NFEPA and MPHW projects aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands, and estuaries. Identification of FEPA and Mpumalanga Wetlands is based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland dependant birds.

During the examination of NFEPA GIS database no wetland was found to be occurring within the project area. However, two hydrogeomorphic (HGM) units which were found to be occurring within investigation and at northern edge of the project area. During the examination of the MPHW GIS database one wetland was found traversing the northern portion of the project area. Two additional wetlands were also found occurring with the investigation area. The identified wetlands are classified as Seep, Channelled valley bottom and Unchanneled valley bottom wetlands.

9.1.7.1. Wetland Functionality and Sensitivity Assessment

Following the field assessment, various wetland related assessments were undertaken to determine the Present Ecological state (PES), Ecological Importance and Sensitivity (EIS) and

services provision provided by the wetland areas including the Recommended Management Objective (ROM) based on the wetland PES and EIS scores.

Due to the relatively homogenous wetland characteristics of some of the wetlands within the investigation area, the Present Ecological State (PES), EIS and Eco-services assessment of these wetlands are reported in a combined fashion. It should be noted this section only focuses on wetlands that are within the project area and/or close proximity of the project area.

9.1.7.1.1. Results of the assessment of the Unchannelled Valley Bottom wetlands Group

The Unchannelled Valley Bottom (UCVB) wetlands within this group are UCVB 1, UCVB 4 and UCVB 6. These wetlands have relatively homogenous wetland characteristics and consist of relatively similar impacts such hydrological, geomorphological and vegetation alteration within these wetlands. The construction of the dams within the boundaries of these wetlands (UCVB 1 and 4) have significantly impacted the hydrology and hydrodynamics into and through these wetlands. It should be noted, no dam has been constructed within the UCVB 6. However, this wetland has been significantly impacted by historic and current dominant land use in the area. These land uses have significantly altered the integrity and functionality of this wetland. Refer to

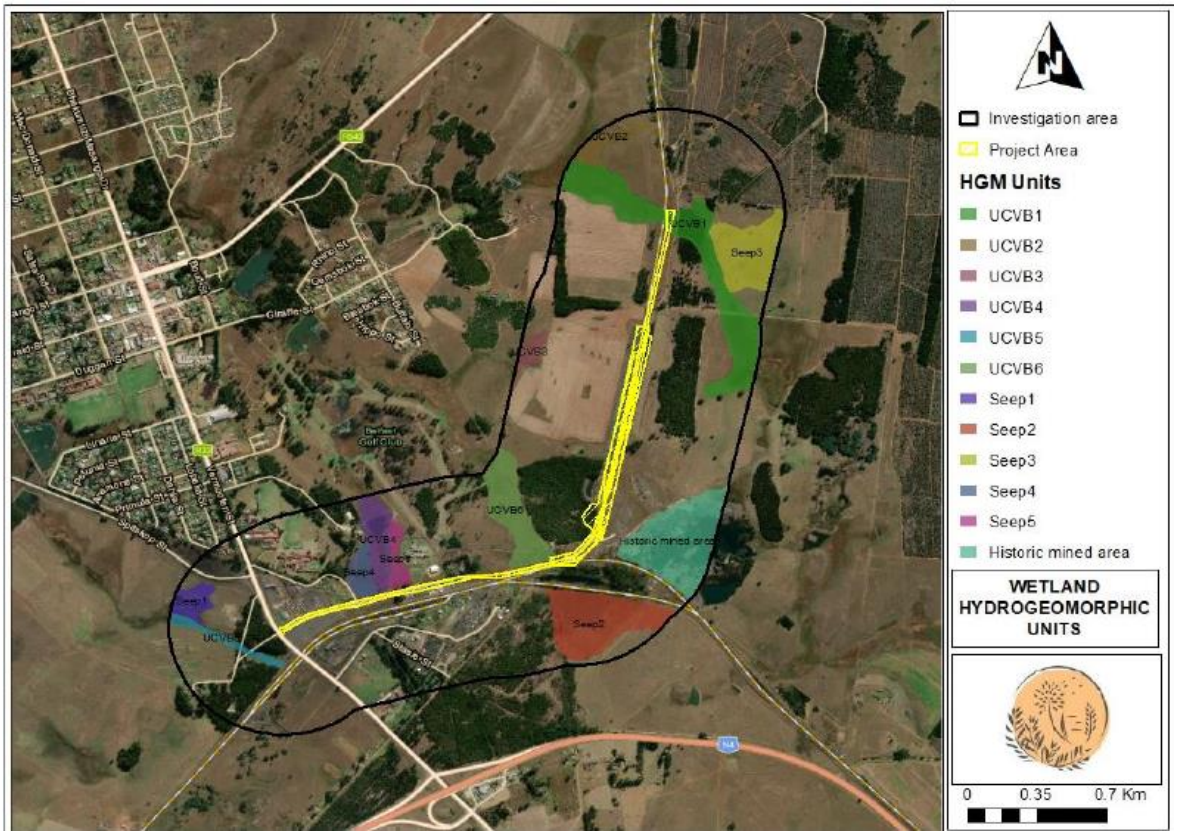


Figure 18: A representation of the hydrogeomorphic (HGM) units associated with the identified wetlands within the project area and investigation area

9.1.7.1.2. Present Ecological State (PES) Category: E (Seriously modified)

The hydrological processes, geomorphological setting and vegetation structure and species composition of these wetlands have undergone significant alteration, primarily due to impacts associated with historic and current land uses (i.e., plantation, agriculture and industrial related activities) occurring in the immediate and greater catchment. Soil disturbance may potential, led to proliferation of alien invasive plant species and change in the geomorphic setting of these wetlands. As the result, the wetland hydrology (i.e., concentration time and hydroperiods) within wetland have been altered. This may possibly increase the water loss from these wetlands through evapotranspiration. The ecological state of these wetlands has been seriously modified by the dominant land use within the intermediate and greater catchment of the project areas. Refer to Table 14 for the PES scores.

Table 14: Summary of the Present Ecological State (PES) Score

Hydrology	Geomorphology	Vegetation	Present Ecological Score (Category)
7.5	4.1	6.8	E (6.3)

9.1.7.1.3. Ecological Importance and Sensitivity (EIS) Category: Moderate

The results of the EIS assessment indicate that these wetlands are deemed to be of Moderate ecological importance and sensitivity. This is largely attributable to the level to ecological services these wetlands provide to the surrounding biodiversity such as habitat and feeding site for less sensitive avifaunal species and small mammal species. It should be noted, these wetlands are of importance within the catchment with specific reference to the ability of these wetlands to flatten the rainfall –runoff hydrograph during rainfall events as slowly discharging this water through the soil medium to the down gradient receiving water resources. Refer to Table 15 for the EIS scores.

Table 15: Summary of the Ecological Importance and Sensitivity (EIS)

Hydrology	Score	Confidence	Category
Ecological Importance and Sensitivity	1.67	2.00	Moderate

9.1.7.1.4. Eco-services provided by these wetlands: Intermediate

After significant decrease in the ecological integrity of these wetlands. These wetlands still provide an intermediate level of indirect benefits (ecological services) such as flood attenuation, biodiversity maintenance, assimilation of nitrates, phosphates, erosion control and toxicants. Eco-services such as biodiversity maintenance, water supply and carbon storage are provided by these wetlands at an intermediate level. This is primarily due to characteristics of these wetlands such as moderate surface roughness due to fairly good basal cover and occurrence of chemical reactive soil (hydric soils) within these wetlands which aid in the provision of these services.

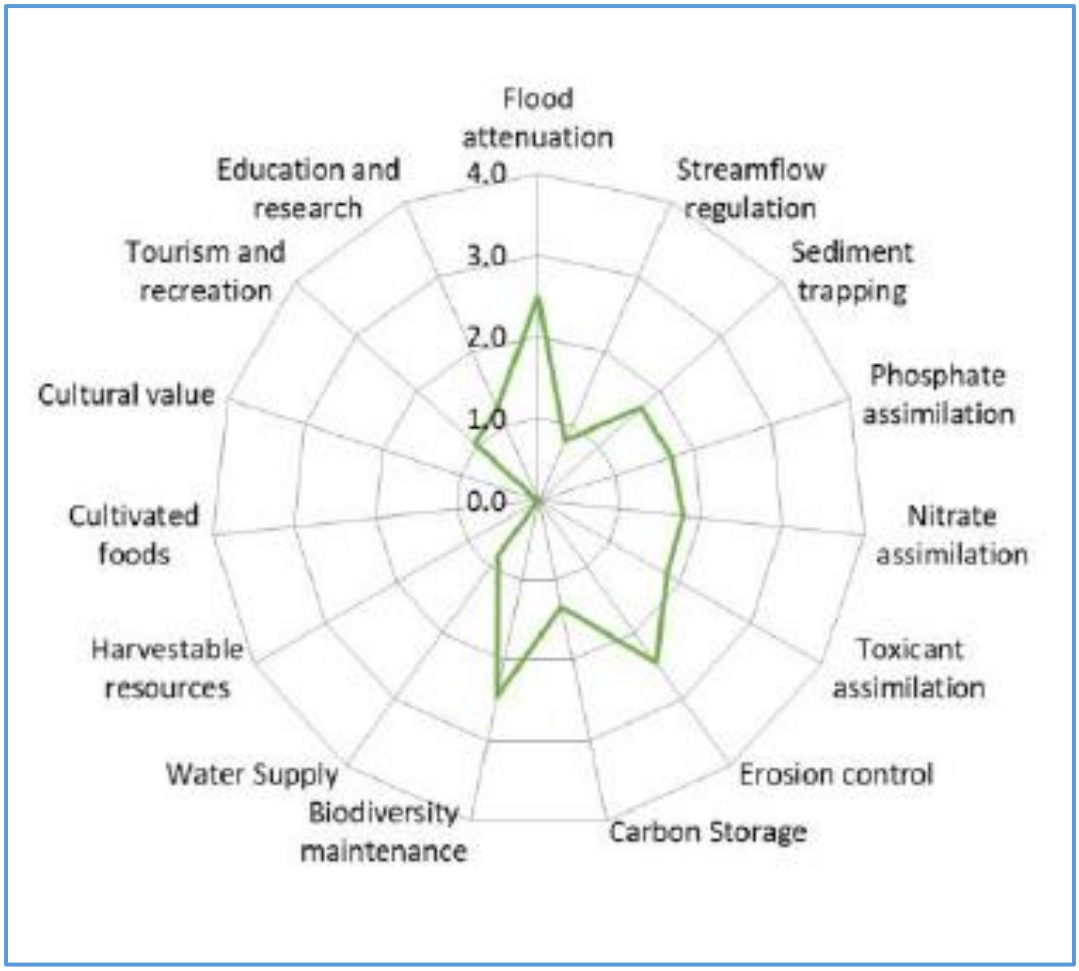


Figure 19: Graphical presentation of Eco-services provided by the UCVB wetlands

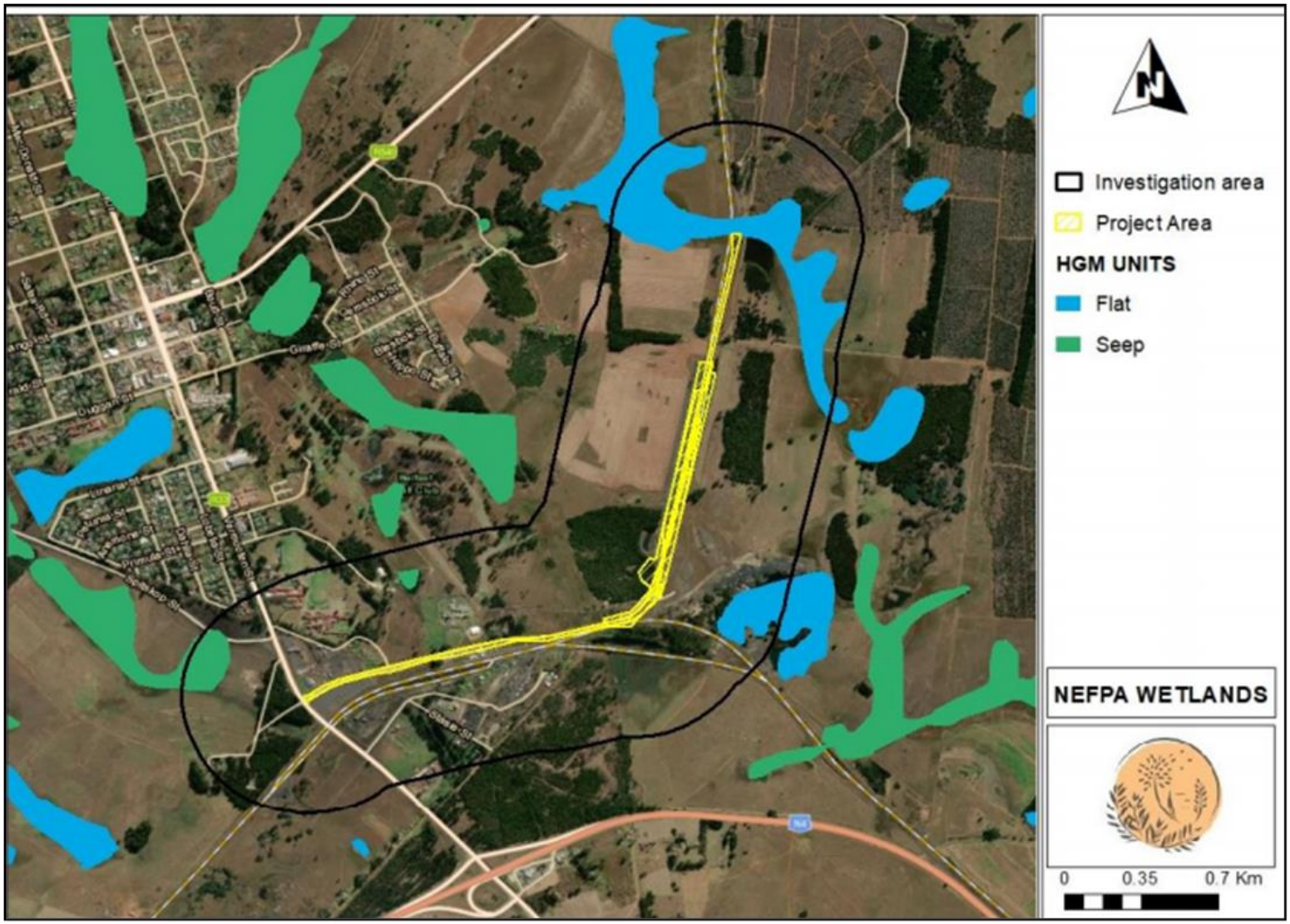


Figure 20: HGM Units of the wetland areas associated with the project area and investigation area according to NFEPA (2011)

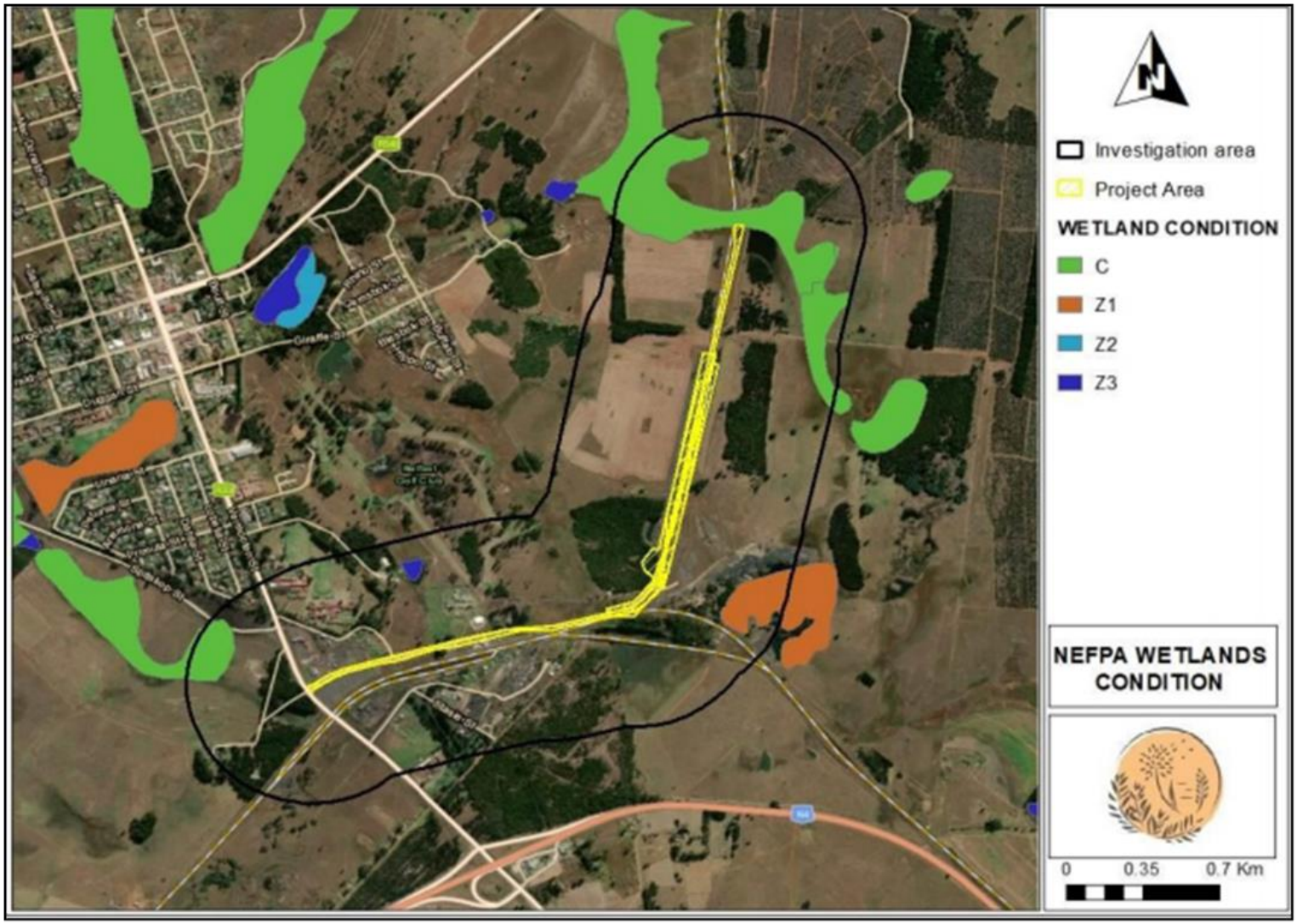


Figure 21: The condition of wetlands associated with the project area and investigation area as identified by the NFEPA Database (2011)

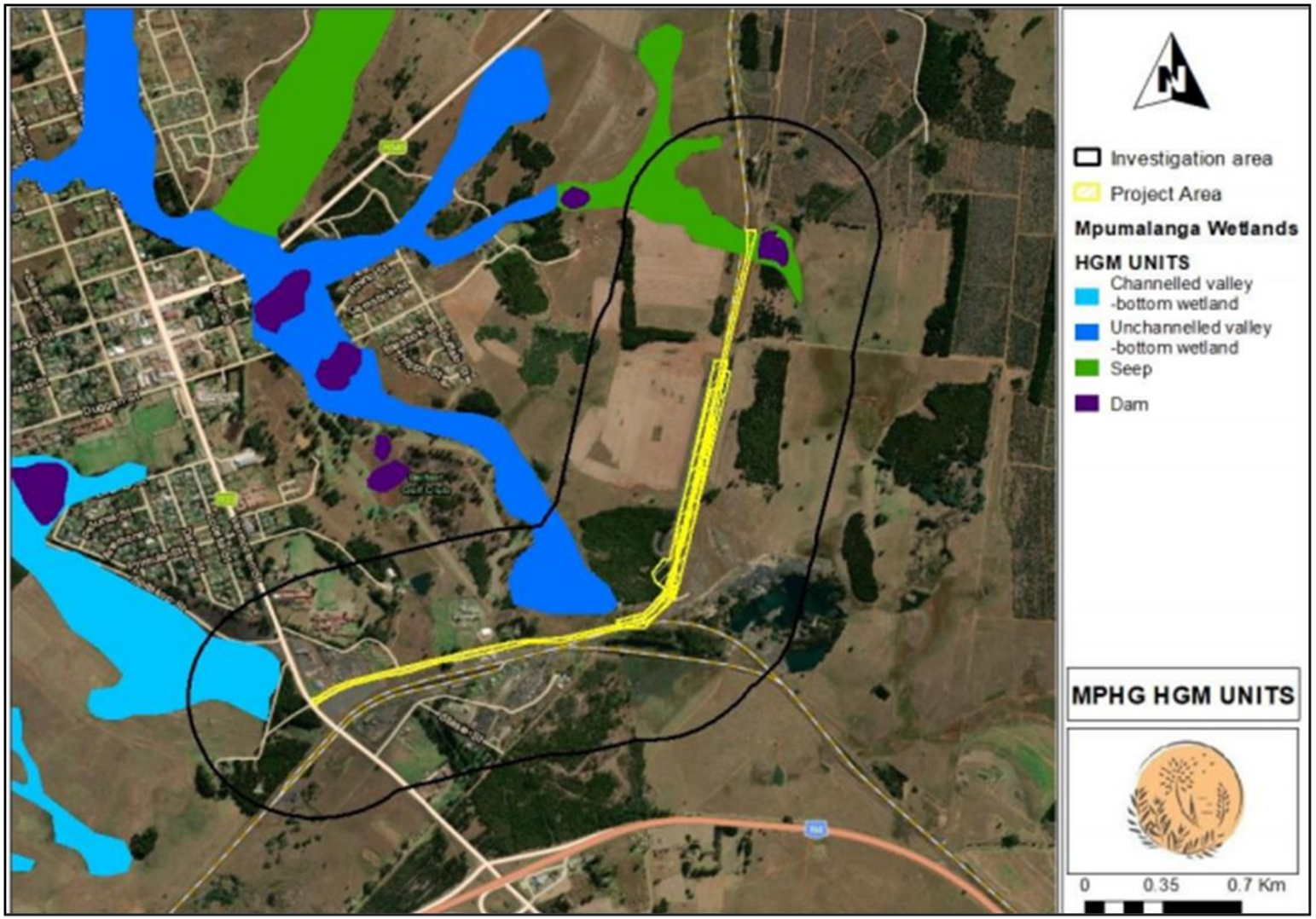


Figure 22: HGM Units of the wetland areas associated with the project area and investigation area according to MPHW Database (2014)

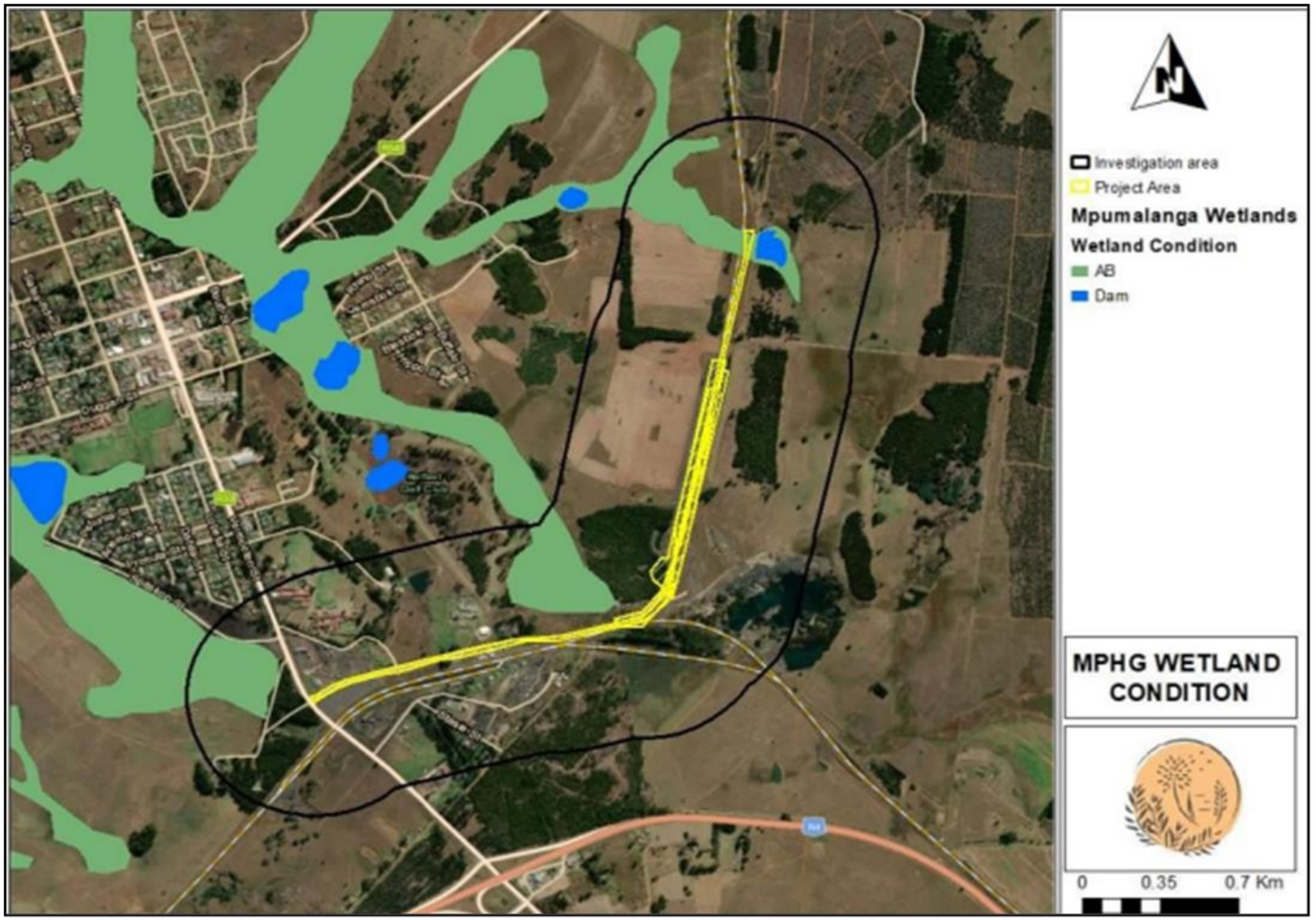


Figure 23: The condition of the wetlands associated with the project area and investigation area as identified by the MPHW Database (2014)

9.1.8. Surface water

Information regarding the Surface water assessment of the Glisa study area was obtained from the Wetland Delineation, Functional and Impact Assessment undertaken by Sisimo Group in December 2020. The Hydrological Impact Assessment is attached as **Annexure K**.

9.1.8.1. Quaternary Catchments

The Glisa siding is in the B41A quaternary catchment in the Steelpoort sub-catchment under Olifants catchment. The Olifants catchment is one of the nine water management areas, as delineated by the Department of Water Affairs.

The Olifants river catchment consists of 9 sub-catchments. These are upper Olifants, Wilge, Elands, Steelpoort, Middle Olifants, Blyde, Lower Olifants, Letaba and the Shingwidzi. The catchment is approximately 73 542 km^2 in extent. It has a mean annual runoff (MAR) of 2 650 Mm^3/year.

The Steelpoort sub-catchment is the one within which the site is located. The Steelpoort sub-catchment covers 7 136km^2 which is about 10% of the total Olifants catchment. It has a Mean Annual Runoff of about 342Mm^3/year. It lies within an escarpment that ranges from about 1500 to about 2400 m above mean sea level (mamsl) save for the Steelpoort river valley which smoothly undulates between 900 and 1200 mamsl and the areas in proximity to Belfast and Stoffberg. These are classified as undulating Highveld country ranging between 1200 and 1800 mamsl.

Within the Steelpoort sub-catchment rain generally fall in the summer months between October and March, with January often receiving the heaviest rain. In this sub-catchment rainfall amount range between 630 - 1000 mm/year. The rainfall is usually thunderstorms with associated low filtration of the soil and erosion in mountainous areas. The quaternary catchment B41A is drained by the Grootspruit River which then joins the Steelpoort River. The catchment measures 405 km^2 with a Mean Annual precipitation of 714 mm/year, a Mean Annual Evaporation of 1500 mm/year, and Mean Annual Runoff of 42.75 mcm/year.

Table 16: WMA and Quaternary Catchments Descriptions (WR2012, 2017)

WMA	Quaternary Catchment	Catchment Area (km^2)	MAP (mm)	MAE (mm)	MAR (mm)
Olifants WMA	B41A	405	714	1500	42.75

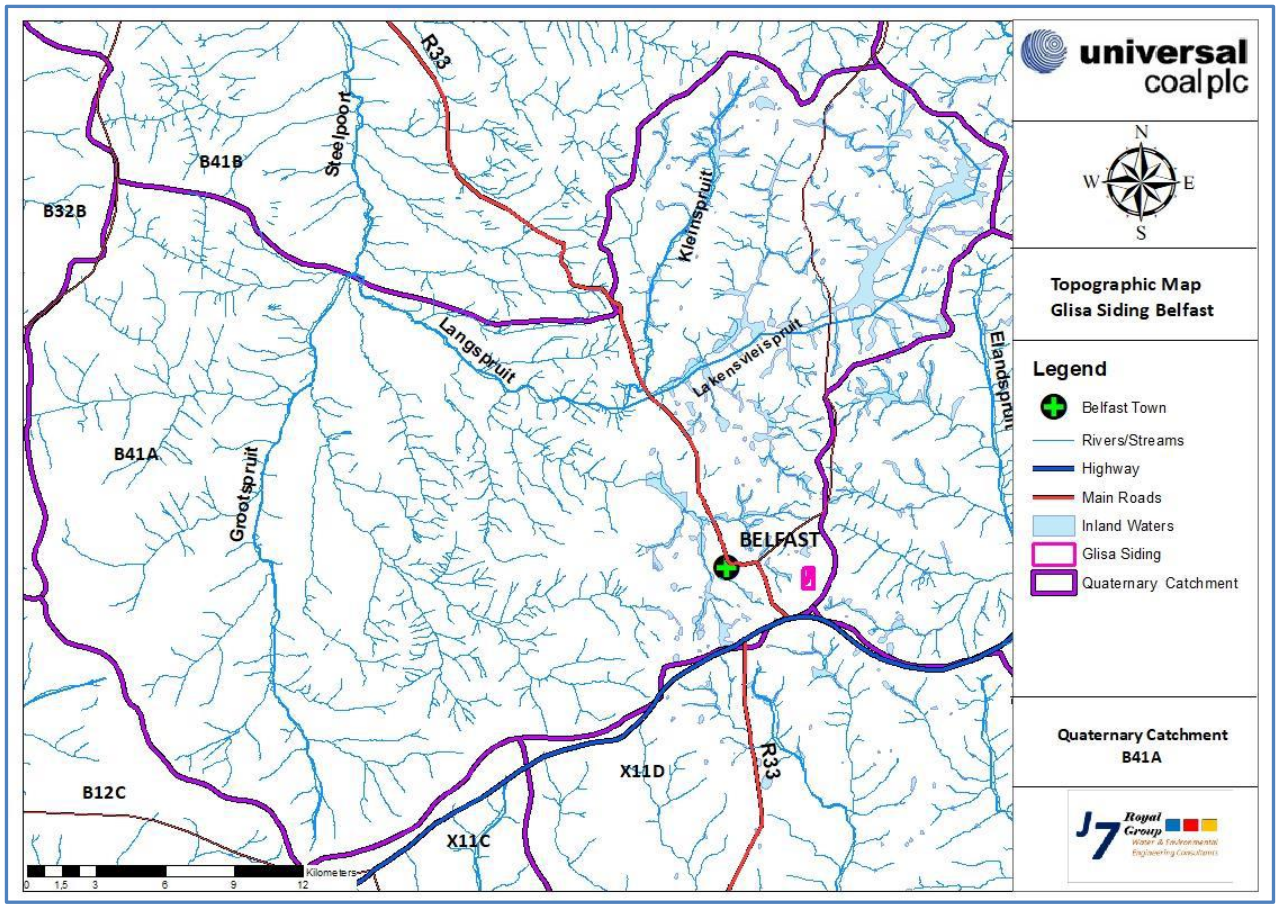


Figure 24: Quaternary catchments and local surface water drainages

9.1.8.2. Water Quality

According to Pollard and Laporte (2014), the water quality issues in the Steelpoort sub-catchment are mostly related to salinity, eutrophication, toxicity and sediment. The mining and agricultural activities in the catchment are named as the main cause for salinity and eutrophication challenges. While the toxicity problems are attributed to the use of pesticides and herbicides this requires confirmation by further monitoring. The Steelpoort river system by reported to be characterized by seasonally variable TDS concentrations (120 – 800mg/l), mostly slightly alkaline with pH values mostly between 7.5-8.8 and occasionally acidic with values between 6.7- 6.9 while the sulphates concentrations also show seasonal variations ranging between 5 – 100 mg/l. These observations are also linked to industrial activities in the catchment which are seemingly now impacting on the water quality (WRC, 2011).

9.1.8.3. Surface water flow

The surface water flow of the site is shown in Figure 25. The site is in close proximity to a watershed. The proximity of the site to the watershed reduces the chances of a lot of water from outside the site

draining into the site. This makes the management of stormwater on site easier and reduces the amount of the water to be diverted away from the site.

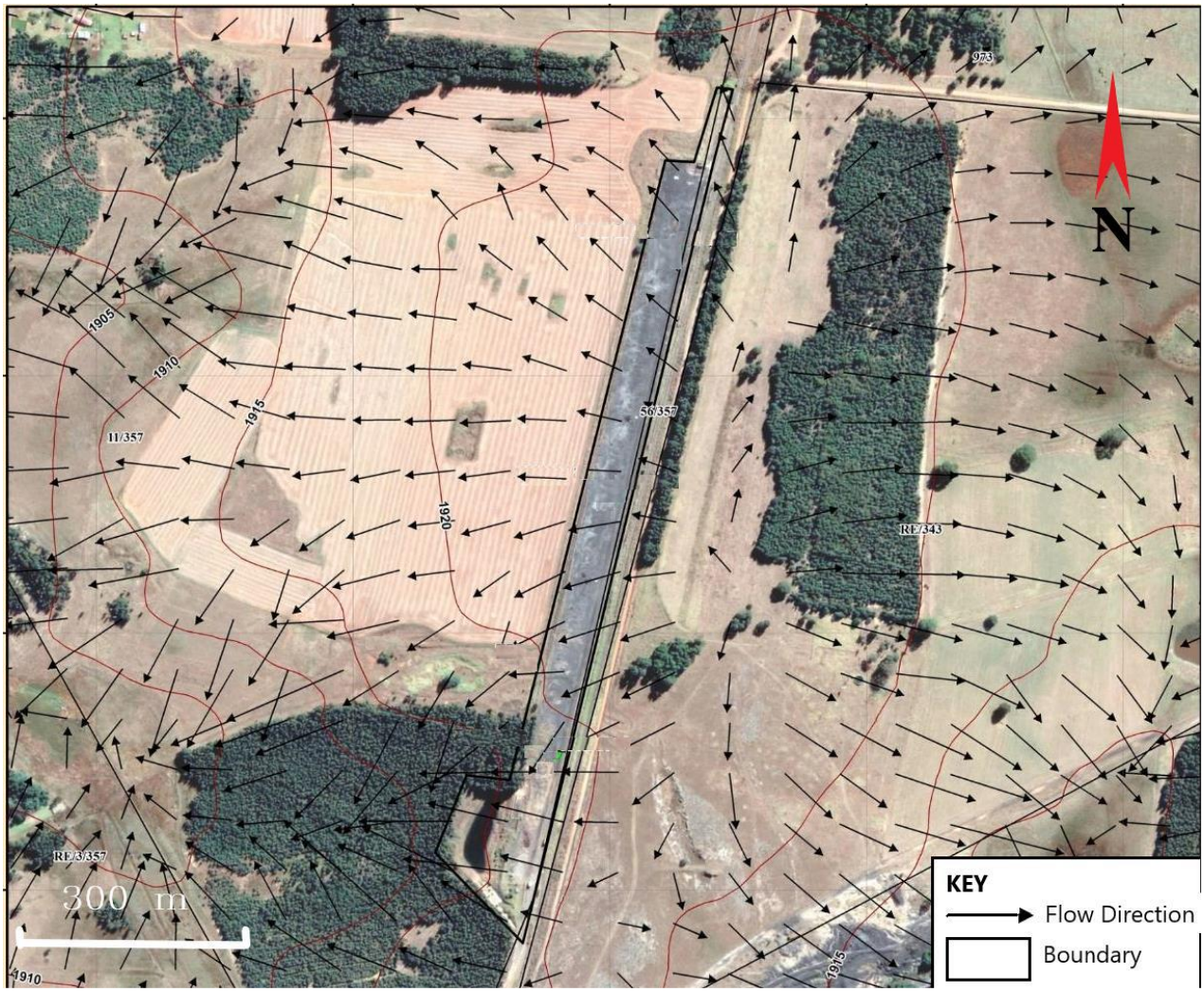


Figure 25: Site Watershed

9.1.8.4. Site Catchment Rainfall Peak Flows

The site covers approximately 0.06 km^2 and gently slopes towards the south west direction towards the onsite dam. The volume of water generated on site for a 1:50 and 1:100-year flood event was determined using the Rational method. The parameters and catchments characteristics shown in Figure 3.3 and the values are given in

Table 17.

Table 17: Peak flood flow

Return Period	**1:2**	**1:5**	**1:10**	**1:20**	**1: 1:50**	**1:100**
Peak Flood Flow (m^3/s)	0.22	0.34	0.44	0.57	0.85	1.17

9.1.8.5. Floodlines and Water Bodies

Figure 26 shows the surface water resources in the vicinity of the study area. The siding is located on a watershed as shown in Figure 25 which presents a likehood of water emanating from the site draining into a nearby stream. However, there are no watercourse reaches traversing the study area, and there are other land uses and infrastructure between the site and the nearest down-gradient watercourses. Thus, the siding is not likely to be affected by 1:100-year floodlines of any watercourse, and the floodlines and hydrological regimes of the said watercourses will not be affected by the siding up to the 100-year flood return period. Moreover, the size of the project site (0.06 km^2) coupled with the siding's locality being on a watershed render the site negligible in terms of impact on floodlines of the nearest watercourses, which are down-gradient from the siding.
Furthermore, no runoff from the siding will drain to any of the watercourses up to 100-year flood recurrence interval. On that determination of not having any waterbodies within a 100-metre radius of the site, no floodlines determinations were carried out.

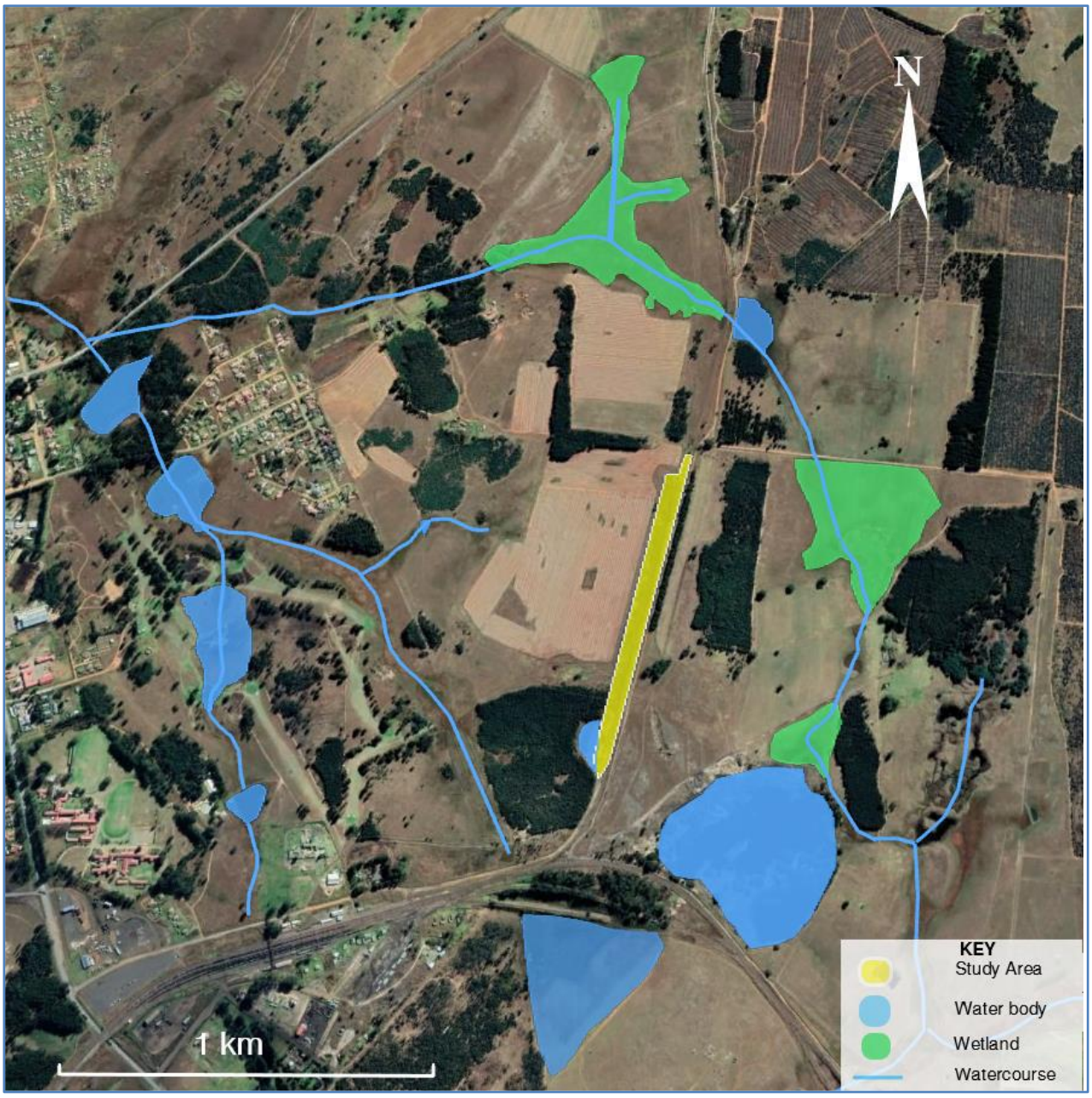


Figure 26: Surface water resources near the study area

9.1.8.6. Proposed Stormwater Infrastructure

Informed by the baseline hydrology of the site and the surroundings discussed in section 2 and 3 of the hydrological report, a review of the proposed surface infrastructure has been undertaken, and a series of design principles for stormwater management have been developed to ensure compliance with the requirements of the NWA.

The proposed conceptual stormwater management plan is presented in Figure 27, the proposed stormwater infrastructure includes the following:

- Clean stormwater drains to the east of the site are proposed to divert water around the site.
- Dirty stormwater drains at the west bottom part of the site will convey dirty water from the whole site and deposit it in the PCD at the bottom south west corner. The dirty stormwater drains will be lined to prevent ingress of the dirty water into the ground water resources.
- Pollution control dam (PCD) at the south western corner of the site to contain a 1:50 year flood.

The peak flow values for the determination of volumes for the sizing of the stormwater channels and drains and the PCD are given on

Table 17. The anticipated stormwater volume for 1:50 and 1:100-year flood occurrence is given in Table 18.

Table 18: Stormwater Volumes

Return Period	**1:50**	**1:100**
Stormwater Volume (m^3)	5800	7950

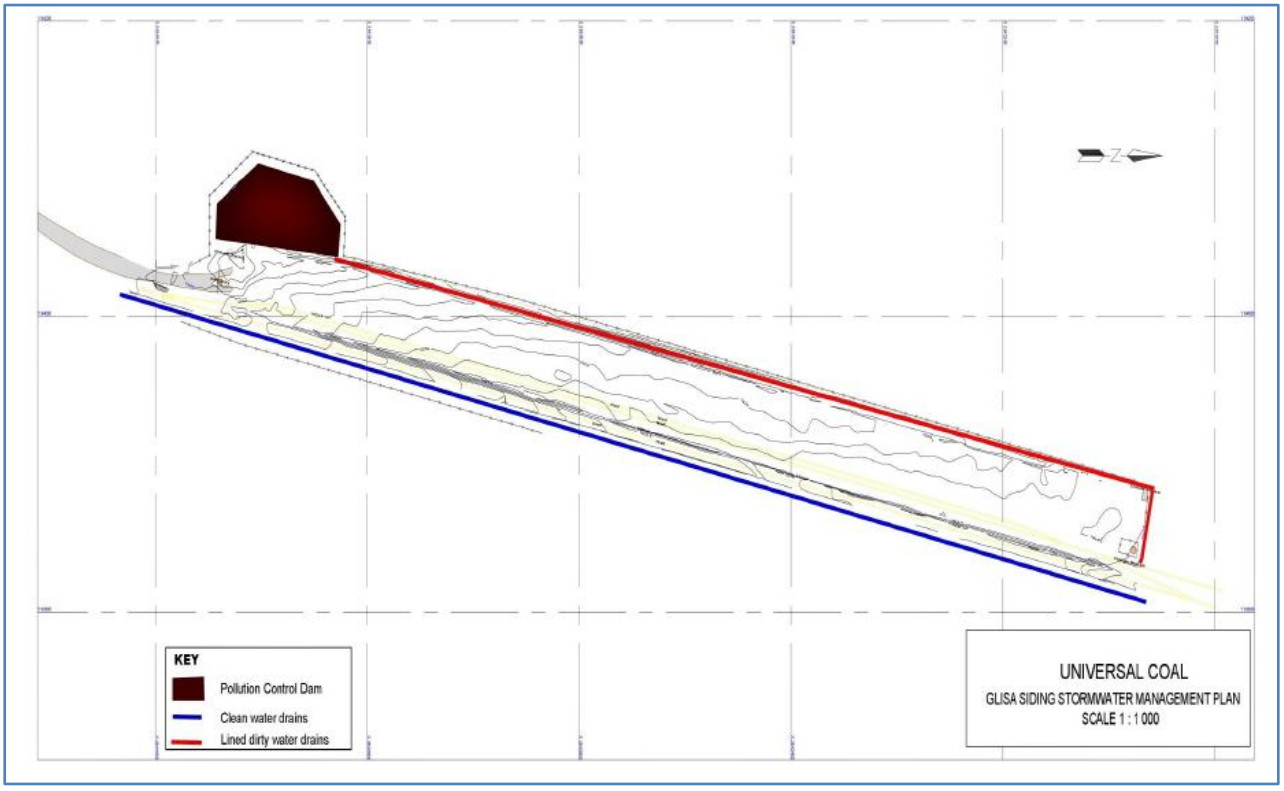


Figure 27: Proposed Stormwater Management Plan

9.1.9. Groundwater

Information regarding the Surface water assessment of the Glisa study area was obtained from the Wetland Delineation, Functional and Impact Assessment undertaken by J7 Royal Group (Water & Environmental) in November 2020. The Hydrogeological Impact Assessment is attached as **Annexure E**.

The proposed Glisa Siding Coal Stockyard is located in a hilly area at an altitude of about 1920-1940 meters above sea level (mamsl). The site area is in the upper catchment region of the Langspruit, which is the main non-perennial stream draining towards Steelpoort River. The site is located on a partial cut and fill at an elevation of approximately 1930 mamsl on a fairly flat to moderately slope towards the west. The main water course flowing close to the proposed coal stockyard is a nonperennial streams named Langspruit. The site is currently bounded by agricultural farms on the eastern and western side. There are currently vandalized structures on the northern side of the coal stockyard siding, and partially overgrown concrete V-shape storm water channel running parallel to the western boundary and draining into a dam located south-western side. Several drainage depressions beyond 500m away from the proposed site areas are evident. The site is generally flat (Glisa Siding) but sloping towards the dam. The topography of the farm Tweefontein 357JT area slopes in a west northerly direction towards a non-perennial tributary Langspruit flowing on the northern side of the site from east to west. The elevation ranges between 1880 and 1930 meters above mean sea level (mamsl).

It well known that the geological formations determine the geohydrology to a large extent. Water movement, and thus the potential pollution migration through a geological system, is controlled by hydraulic conductivity (permeability), hydraulic gradient and the transmissivity of the aquifer.

The aquifers for the proposed coal stockyard are fractured, secondary aquifers. Movement of groundwater flow prefers secondary openings formed by fractured and geological lineaments (faults) or along the igneous intrusion zones (dolerite dykes or sills). The regional hydrogeological information indicates a low groundwater potential for the area with an average borehole yields in the order of 0,1 ℓ/s -0.5ℓ/s. Mostly of zones where the dolerite intrusions are found may exhibit good yield potential. Zones of shallow groundwater occurrences and seeps are normally associated with perched water table conditions as a result of impermeable sandstones or shale at shallow depths and limited weathering.

9.1.9.1. Operational and post operational groundwater levels patterns

The total simulation period is subdivided into a specified amount of time periods. Transient modelling depends on the initial conditions that are usually established during a steady state model. Transient modelling needs additional parameters to be specified (Spitz & Moreno, 1996):

- Storativity of 8.3 x 10-6 for fractured rock

A transient modelling approach is used to determine the extent of the contaminant concentration and plume throughout the life of the Coal Stockyard and Pollution Control Dam (PCD), the PCD collects seepages from the Coal Stockyard. Specific periods are selected that is five (5), ten (10), fifteen (15) and twenty (20) years period to evaluate both the formation of a groundwater rise or mound and contaminant plume migration. Periods are divided into monthly time steps and recharge assigned on a monthly basis. The groundwater rises or mound after five (5) to twenty (20) years are displayed in Figure 28 to Figure 32 as shown below.

Continual deposition and the resultant seepage increase as the Coal Stockyard subsequently grows; all the seepage is then channeled into PCD downstream. The seepages rates are applied as recharge at the base of the facility as this is the point of entry into the natural groundwater system. Time-variant head cells are assigned to the area that is covered by the basin to account for the effect of a constant pool, as is the case during the operational phase. Therefore, maximum seepage is expected from the ridges and banks where the phreatic surface is maintained by controlled seepage. The modelling revealed the evolution of a localized groundwater mound surrounding the Coal Stockyard with a maximum peak at the embankments, declining in a narrowed manner as it gets channeled into PCD downstream.

9.1.9.2. Solute Transport Model

The migration of the contaminant plume is modelled by means of a numerical mass transport package developed MT3DMS developed by Zheng & Wang (1999). The package makes use of hydrodynamic dispersion and advection of contaminant species to calculate the movement of contaminants through a porous medium. Following the potential operational geochemical assessment to classify Glisa Siding coal stockyard material and a concreted pollution control dam (PCD) to capture flows from coal stockyard, the values of Sulphates (SO_4) quantified was adapted as a conservative application of the data.

From various knowledge on coal stockyards coal mining it is evident that sulphates are water quality constituents used to identify possible contamination from activities. The following assumptions are made for the transport modelling of SO_4:

- An effective porosity is 0.13 (Spitz & Moreno, 1996);

- Longitudinal Dispersivity is 100m;
- The ratio of horizontal transverse Dispersivity to longitudinal Dispersivity is taken at 0.1 and the effective molecular diffusion coefficient is set to 0 m^2 /s;
- An initial concentration of 5 mg/l was assumed for the modelled area, as the natural background values for both SO_4 are of negligible concentrations as based on groundwater quality samples taken from boreholes surrounding the Coal Stockyard;
- The contaminant concentrations are introduced to the groundwater through artificial recharge at the base of the Coal Stockyard. Source concentrations of 300mg/l for SO_4 is selected, following the potential operational geochemical assessment to classify Glisa Siding coal stockyard material (Figure 28);
- It is assumed that neither sulphate will decay of be retarded whilst the plume is migrating, thereby simulating a conservative worst-case scenario; and
- The calculated water levels from the steady state calibration are used as an initial hydraulic head in the model.

Table 19: Glisa Siding relative abundances of acid and buffer capacity

No.:	Variable	Fresh Material Sulphates (mg/L)	Old Site Material (mg/L)
1	Geochemical Assessment Sample Analyzed (J7 Royals, 2020)	300	40

9.1.9.3. Predictive modelling

Predictive modelling of the contaminant plume emanating from the coal stockyard and pollution control dam downstream represents future estimations of the plume shape and expected concentrations throughout the groundwater system. The continual seepage of contaminated water at the base of the facility will be modelled for a total of 240 months representing the depositional phase of the coal stockyard. The plume shape and concentrations were evaluated at five (5) years, ten (10) years, fifteen (15) years and twenty (20) years. This scenario represents the “worst-case” where there is a constant recharge of seepage with a concentration of 300mg/ℓ SO_4. No trenches and abstraction boreholes are included in this scenario. As can be seen from the SO_4 simulations the plume is expected to spread in the direction of the natural drainage i.e., from east to north-west towards the non-perennial stream

The following observations can be made:

The primary plume of SO_4 is likely to be contained with coal stockyard siding area, with medium to less impact on the surrounding environment as it is located near agricultural field’s site. Most of generated pollution will be channelled into pollution control dam located down-gradient of the site.

All pollution will be contained in the PCD during and after operational phase. The PCD will be able to contained volumes or seepages from the coal stockyard.

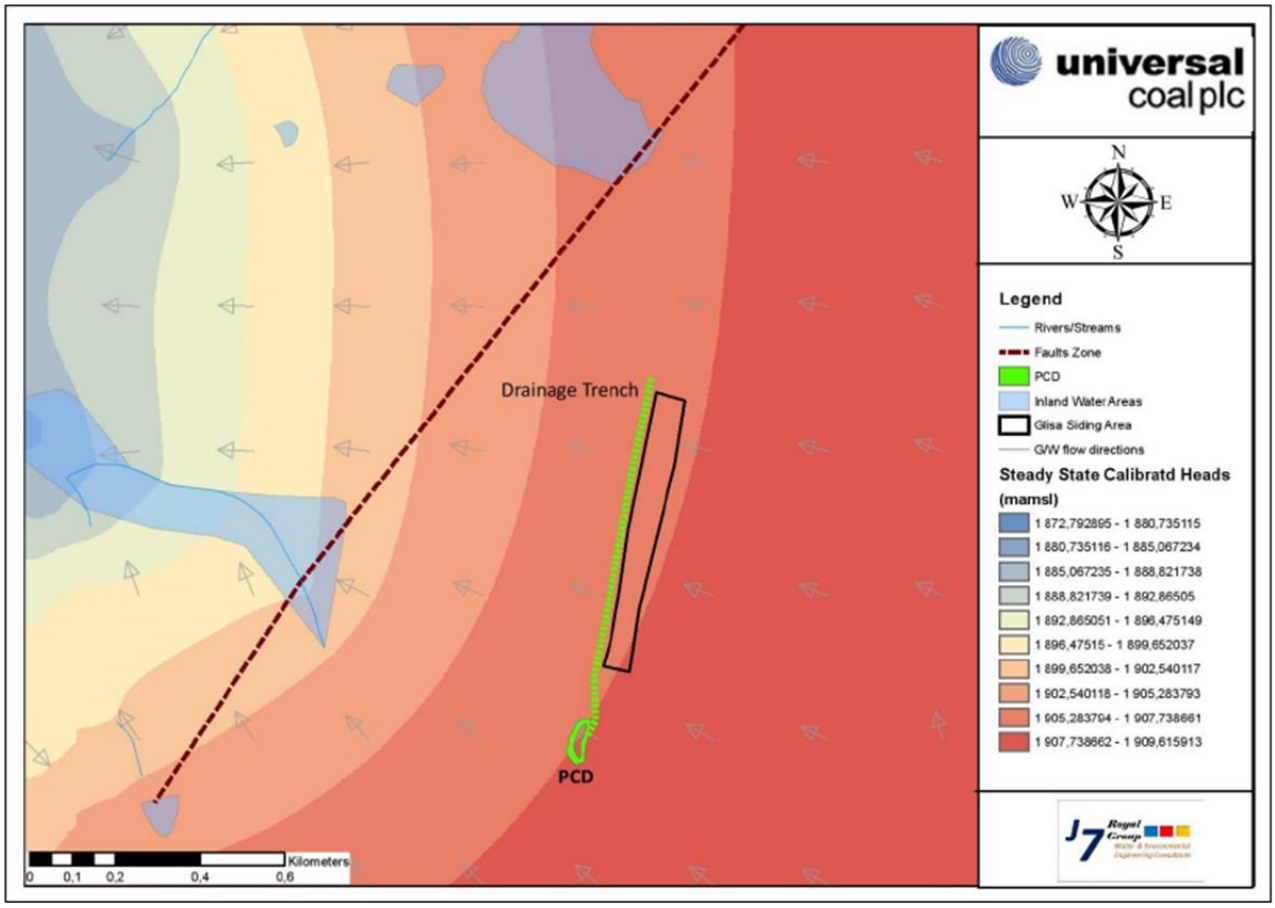


Figure 28: Location of mass discharge drainage system trench lines

9.1.9.4. Contaminant load estimation

A zoned water budget calculation in the PMWIN groundwater modelling package is used to determine the total groundwater flux moving across the selected drainages systems. These drainages systems are used to determine the total mass discharge across the entire face of the coal stockyard to the pollution control dam. One drainages system is located as to intersect the contaminant plume in the predominant flow direction i.e., toward the PCD. A water balance reports an amount of 36,133 m^3/d will be channeled through drainage system into PCD during operational phase (Figure 28). The simulation results indicate a slow migration of mass from the proposed coal stockyard and the simulation was developed for a period of 20 years with 5 years interval simulation.

A zone of influence1km radius of influence has been created to shown possible impacts off-site as shown in Figure 29 to Figure 32. The Sulphates seepage from the proposed Glisa Siding coal stockyard and the PCD area are contained in the immediate facility

The following is observed:

- The sulphates tend to migrate towards the west to north direction probably because of the groundwater movement directions;
- All pollution and surface water run-off within the coal stockyard will be captured by a storm-water management dam and channelled into pollution control dam (PCD) facility;
- The total migration distance towards from coal stockyard is approximately less than 300m during the life of the coal siding (20 years) towards north –west direction; and
- Groundwater monitoring boreholes should be drilled up gradient and down-gradient of the proposed coal stockyard and pollution control dam both shallow (12m) and deep (50m) boreholes to monitor the aquifer pollution impacts.

As expected, contaminant migration is seen to take place predominantly to the north -west, along the topographic and groundwater gradients. The contaminant migration away from the pollution sources takes place at a relatively slow rate (partially also due to dilution from recharge). The spatial extent of the contaminant plumes in the shallow aquifer remains limited – even at the end of coal siding operations. No contaminant impacts are expected on the non-perennial streams that occur to north west side of the coal stockyard.

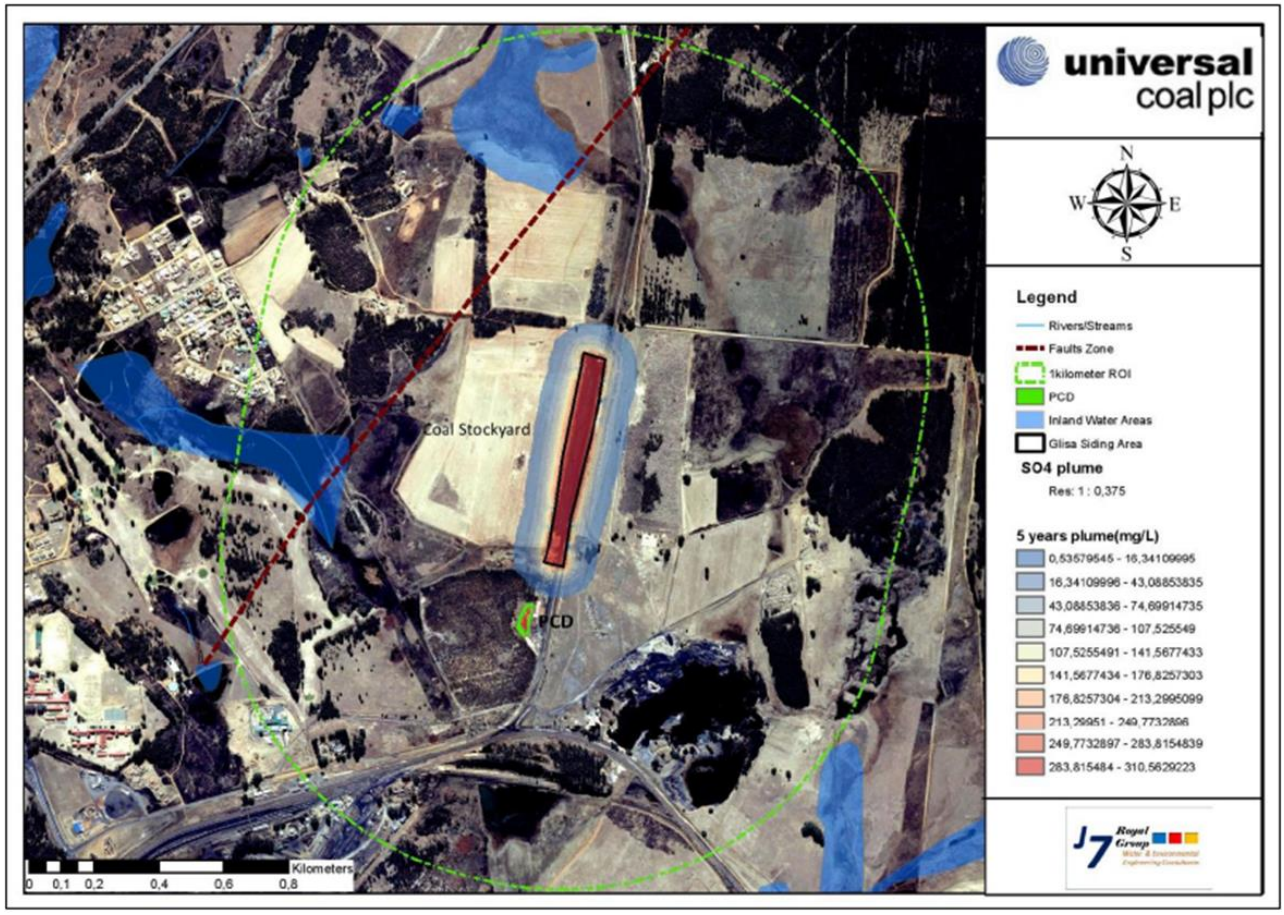


Figure 29: Sulphates concentration simulated plume in five (5) years

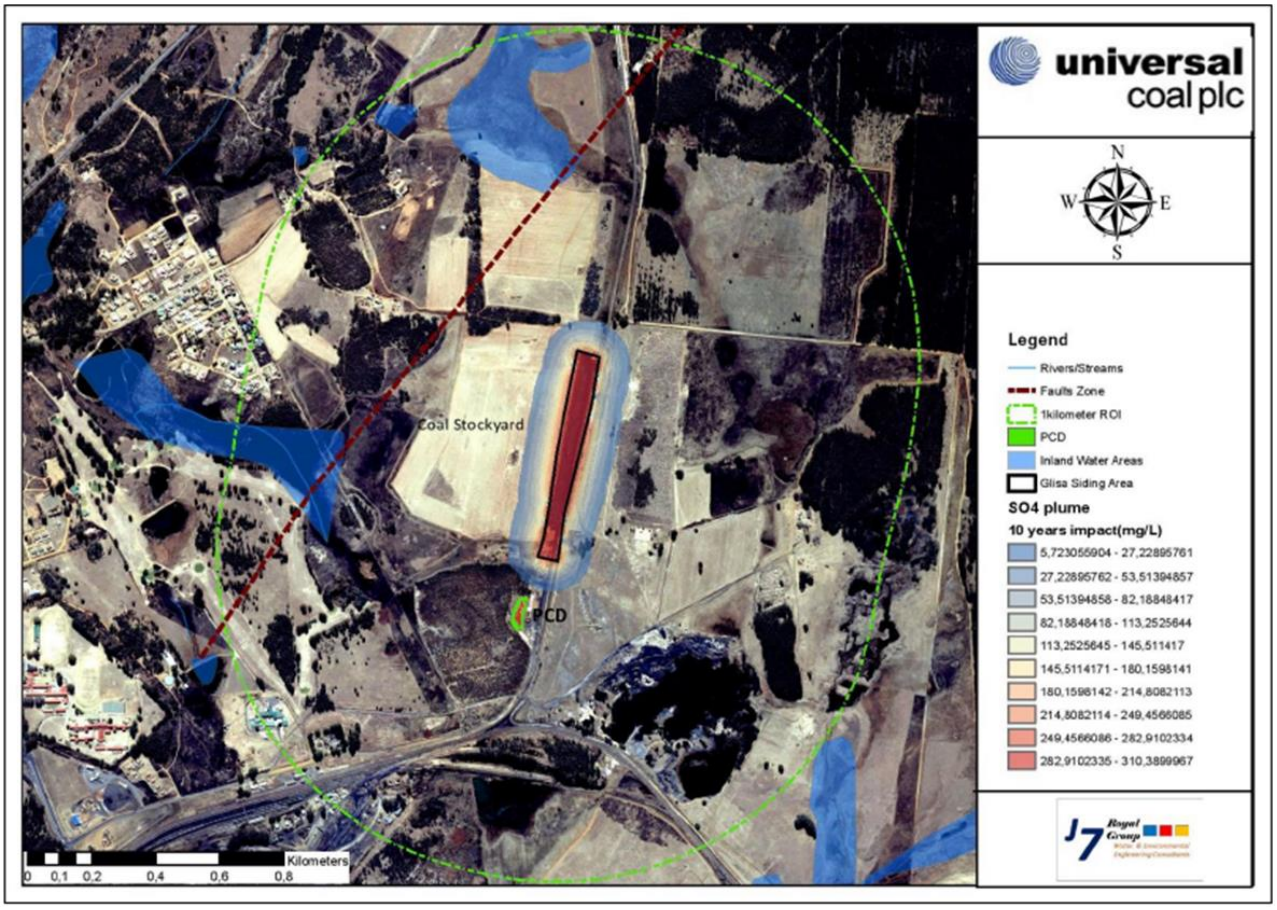


Figure 30: Sulphates concentration simulated plume in ten (10) years

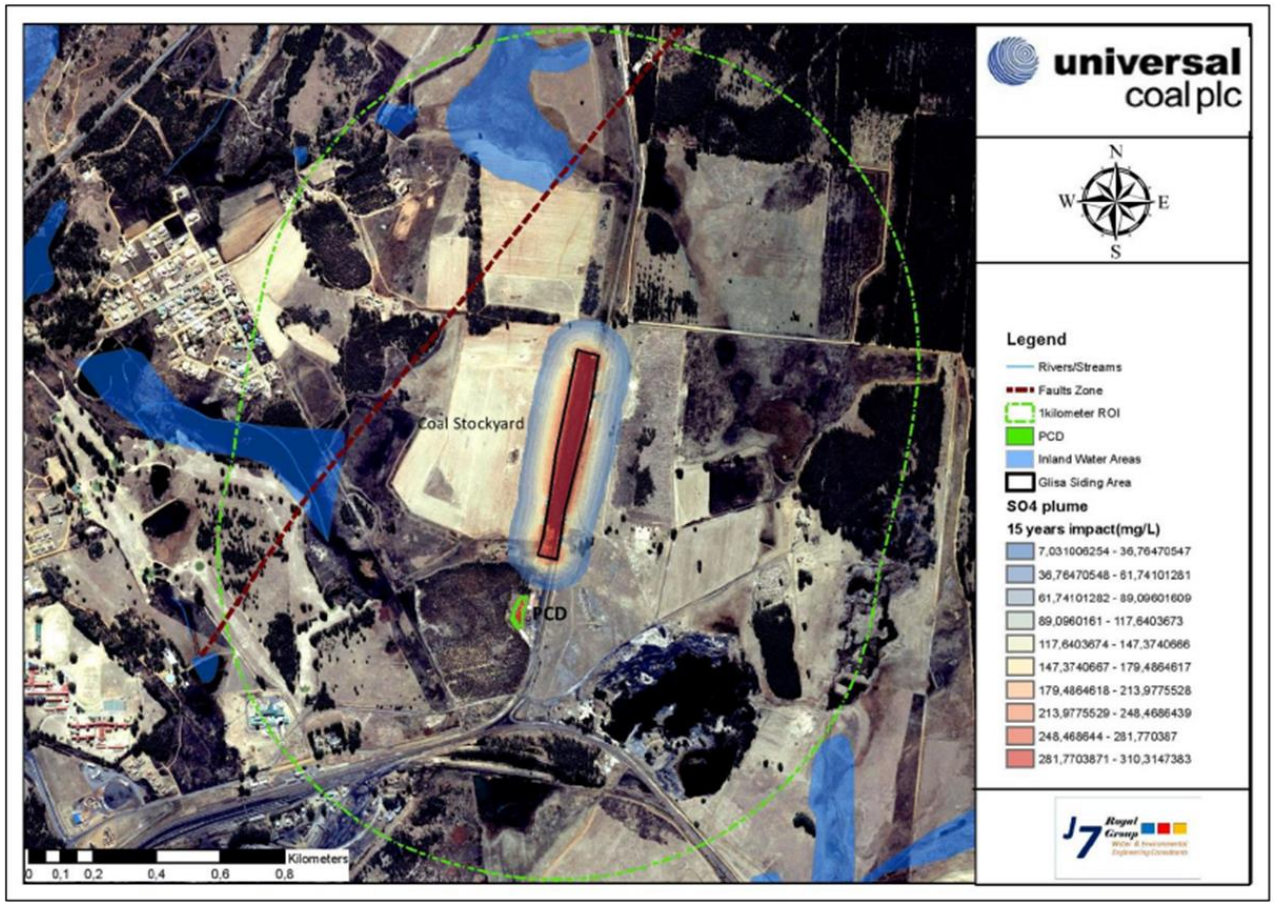


Figure 31: Sulphates concentration simulated plume in fifteen years (15) years

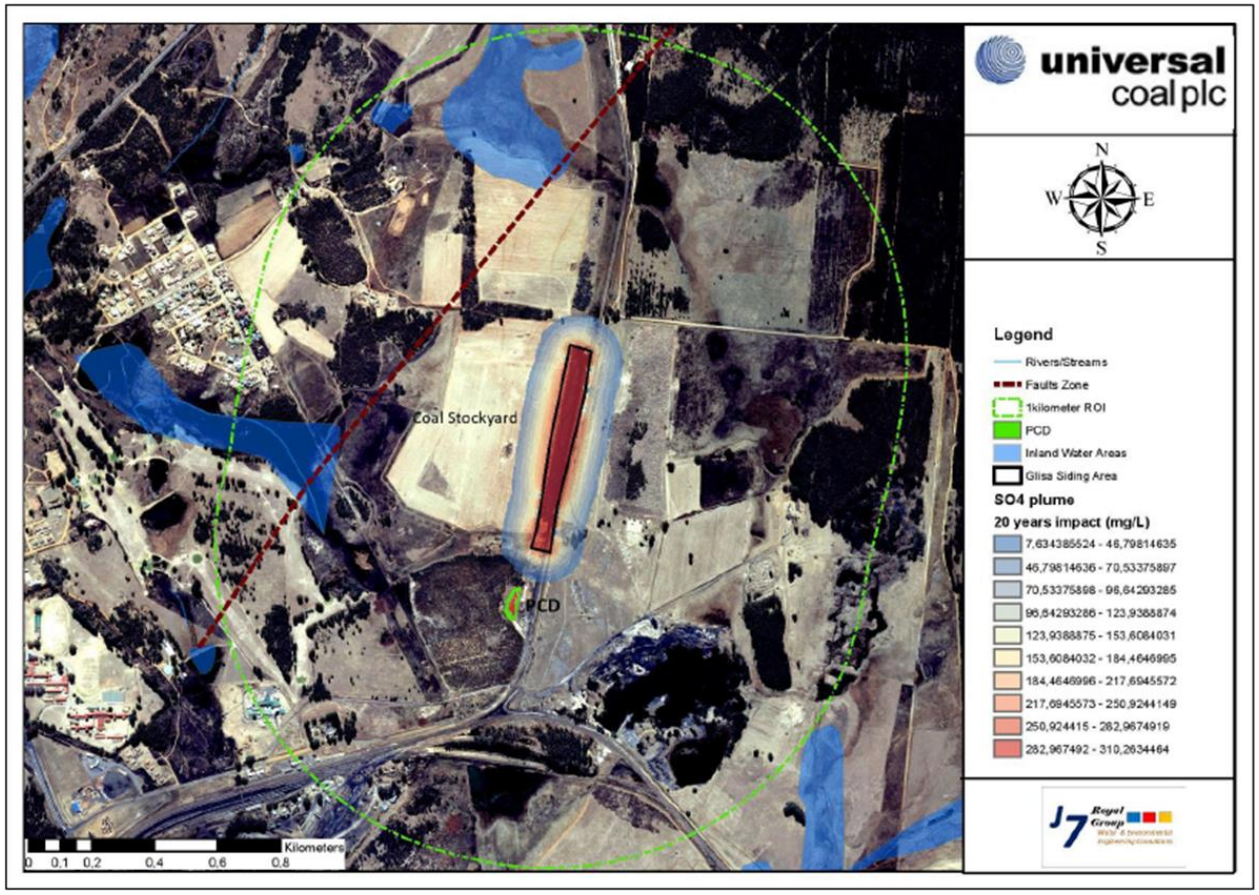


Figure 32: Sulphates concentration simulated plume in 20 years

9.1.9.5. Results and Discussion

It should be noted that there are only two (2) existing boreholes on the site within 1km radius from site and therefore NGA data was used to provide the following information's below:

- Inflow /recharge into the Glisa Siding coal stock yard is estimated as 3m3/d, runoff will be captured by the Pollution Control Dam (PCD) downstream;
- Groundwater levels on average is around 24 mbgℓ;
- Water quality in the area indicates $CaMgHCO_3$ type (Hardness);
- Boreholes Water TDS is around 658 mg/L, borehole water not good for consumptions;
- Karoo aquifers underlying the site have a low hydraulic conductivity, although groundwater is available in these aquifers, the storage coefficients are several orders lower than the storage coefficient;
- In general, the weathered aquifer in the immediate vicinity of the Glisa Siding coal stockyard is anticipated to go dry with time due to human activities; possibly by minimizing recharge due to the development;
- The project poses possible minor impacts on groundwater due to the proposed operation, however monitoring of groundwater (water levels and water quality) is necessary at all times;

Numerical groundwater model was used to determine groundwater flows and movement of possible contaminant in the groundwater from the coal stockyard and pollution control dam (PCD) as source of contaminant. The groundwater model also took into account liner systems for the coal stockyard siding, PCD and associated recharge into the aquifer through these liner systems.

The following finishes can be made for this project:

- No external groundwater users will be affected by the coal stockyard and PCD expected contaminant plume;
- The plume is well contained within the coal stockyard and pollution control dam during operational and post closure phase;
- The maximum movement of the contaminant plume is expected to be less than 300 m within the 20 years of coal stockyard operation at present groundwater gradients;
- The maximum movement of the contaminant plume in PCD is expected to be well contained within the PCD facility itself;
- Sulphate concentration of 180 mg/ℓ is expected to be reached immediately below the stockyard in the groundwater zone within five (5) years, although this is not expected to reach any external users within the period of operations and there are no external groundwater users within 1000 m of the stockyard;
- Remediation measures should be established during life of coal stockyard to minimise contamination of the aquifer;
- Sulphates concentrations for the plume were modelled in five (5) years intervals. The first simulation was done for five (5) years, ten (10) years, fifteen (15) years and twenty (20) years respectively– the latter being predicted for aquifers impacts underlying the main sources of potential pollution ('hotspots-coal stockyard);
- The numerical assessment indicates that status quo Sulphates concentrations could vary between 10 - 180 mg/ℓ in groundwater directly underneath these 'hotspots' (Glisa Siding Coal Stockyard);
- Overtime the mass plume, Sulphates in this instance, would have migrated (20 years+) with the direction of groundwater flow, and for coal stockyard it will be towards western to northern side of the coal stockyard towards the Langspruit. All the streams near the coal stockyard site are non-perennial reporting into Langspruit, which is over one (1) 1kilometers away from site through non-perennial streams. The most outer edge of the visible plume depicts a concentration of less than 180 mg/ℓ of Sulphate concentration (note that this is non-cumulative); and
- The project poses possible minor impacts on groundwater due to the proposed operation, however monitoring of groundwater (water levels and water quality) is necessary at all times.

- In case contamination is observed on site, the groundwater abstraction from strategic boreholes around the coal stockyard and PCD must be used to manage or contain the contamination plume to an extent at the constant pumping rate of 0,1 ℓ/s. This will minimize migration of the contamination plume around the coal stockyard and PCD to impact groundwater resources;

However, the increased groundwater abstraction from long periods of time could have an adverse effect on the availability of groundwater as a resource due to the formation of large cones of depression around the abstracting boreholes.

9.1.10. Water Balance

Information regarding the Surface water assessment of the Glisa study area was obtained from the Wetland Delineation, Functional and Impact Assessment undertaken by J7 Royal Group (Water & Environmental) in December 2020. The Water Balance Assessment is attached as **Annexure K**.

The water balance has been developed for the infrastructure using and existing data to create a current scenario water balance using Microsoft Excel. The water balance was set up to enable the user to view different monthly averages and total average.

The program objectives included the following: Identify the water users, advice on water saving initiatives, and predict water consumption once these initiatives are implemented.

All water feed sources and users need to recognize and defined to enable Glisa Siding to manage their water consumption. The water feed sources and users need to be identified and define to enable the coal siding to manage their water consumption. The Coal siding will generate a water balance for the circuit, as well as review the use of the infrastructure, with the aim of predicting future water consumption. The water balance is done performing a high-level balance over the coal siding circuit to establish the raw water requirements and an in depth look at the different water streams to ensure no imbalances exist within the process.

9.1.10.1. Current water balance results

Water balance developed for the current Glisa Siding infrastructure which covers key water infrastructure and reticulation relevant to the simulation of water flows and storage volumes.
Water balance developed for the current Glisa Siding infrastructure which covers key water infrastructure and reticulation relevant to the simulation of water flows and storage volumes **Table 20.**

- The Glisa Siding intends to transport 30 000 tons of coal per month and 30% of export coal is assumed to be moisture which amounts to 90 000 m^3/month;
- The Glisa Siding will have a capacity storage of 33867m^3/month of moisture from export coal materials loaded on site;
- Approximately 3388m^3/moth will be pumped from the proposed borehole dedicated for drinking and sanitation (e.g., sewage);
- Stormwater Channels will transport approximately 33145m^3/moth to the pollution control dam;

- Seepage of 1084m^3/month will be collected and sent to the pollution control dam via V-shaped storm water drains to the current pollution control dam (PCD).

Table 20: Glisa Siding water balance.

No.	Source	Inflow (m^3 /mon)	Water Balance: Rainfall Conditions	Outflow (m^3 /mon)	Sink	Balance (m^3 /mon)
1	Rain + runoff + infiltration	313,00	**Glisa Stockpile Siding yard**	-18 063	Evaporation	
2	Coal Moisture	90 000,00		-33 867	Storage Glisa Siding	
3	Borehole Water (Proposed)			-3 888	Drinking & Sewage	
4	Stormwater Drainage			-33 145	Stormwater Channels to the Dam	
5	Water recovered from Sump			-1 084	Seepage	
6	Pollution Control Dam					
		90 313		**-90 047**		**266**
7	**Total Sources**	**90 313**	**Summary**	**-90 047**	**Total Sinks**	**0**
8	**Total Rain + Runoff+ Infiltration**	**313**				
9	**External Makeup Sources**	**90 000**				

9.1.11. Geochemical Assessment and Waste Classification

Information regarding the Geochemical Assessment and Waste Classification of the Glisa study area was obtained from the Geochemical Assessment and Waste Classification for Glisa Coal undertaken by Joubert Bulasigobo in January 2021. The Geochemical report is attached as **Annexure K**.

The geochemical assessment studied the chemical compositions of coal product to be stockpiled at the site for railing, in consideration of geochemical processes that determine the occurrence and distribution of chemical elements and compounds in and emanating from the coal material, which may pose a risk of pollution of land and water resources.

Samples of the materials were taken from the present derelict siding, which had been abandoned by previous operators, as well as a sample of coal product from Universal Coal's Glisa Colliery. The latter is representative of product that will be delivered to the siding and stockpiled for railing. Assessment of mineralogy and elemental chemical composition using X-Ray Diffraction and X-Ray Fluorescence spectroscopy, Acid-Base Accounting and Net Acid Generation tests, as well as and leachability tests were conducted on the samples. The materials were then classified according to ABA and NAG protocols, as well as the National Norms and Standards for Assessment of Waste for Landfill.

X-Ray Diffraction (XRD) results for both the siding and the colliery coal samples indicate that the materials are dominated by organic carbon, with high Loss on Ignition (LOI). The colliery product samples has relatively low mineral content, with Kaolite as the main contributor – though in small amounts. Thus, the representative product sample does not exhibit any significant mineral contamination, which is indicative of relatively good quality coal product.

9.1.11.1. Geochemical Testing and Results

The mineralogical composition of the samples was determined by means of X-ray Diffraction (XRD). X-ray Diffraction (XRD)tests allow for the measurement of the crystal structures within a sample to determine the mineralogical composition of the material. X-Ray Fluorescence (XRF4) test determines the elemental composition of a material. These two tests are done to evaluate and interpret the origin of any potential environmental contaminants that can leach from the ore and waste rock materials on site.

9.1.11.2. Test results

XRD mineralogy assessment results are presented in the tabulation and figure overleaf. The figure indicates that both samples are dominated by organic carbon. Kaolite is present as the key mineral in in both samples.

Siding Coal Sample: The coal samples at the siding are dominated by organic carbon (76.1 %) and thus has a very high Loss on Ignition (LOI). Kaolite is present as the major mineral in the material, followed by quartz though in minor amount. Loss of organic carbon as the material has been exposed to heat, due to the siding not being operational for extended periods (over a year), which results in a relative increase in mineral content in percentage by mass should also be considered. Soil dust fallout including that from the surrounding gravel roads may be contributing to the amount quartz in the samples. The coal sample also contains trace amounts of dolomite and gypsum, with pyrite relatively insignificant.

Glisa Colliery Product Sample: The coal product sample is mainly composed of organic carbon (86.6 %) and thus has a very high LOI. The product has relatively low mineral content, with Kaolite as the main contributor although in small amounts. In contrast with siding sample, the product sample does not exhibit any significant mineral contamination and is indicative of relatively good quality product. It should be considered that the sample is representative of the material that is proposed to be temporarily stored at the siding before railing to export market.

All the major oxides in both samples are below the AUC values. The LOI values of each of the samples suggests that the materials are dominated by organic carbon, with relatively high loss on ignition. Elemental concentrations above the AUC are, however, not an indication of the leachability of these trace elements and metals. The leachability of the elements is examined in the waste classification results, which indicates only Sulphate in the siding sample being above leachable concentration threshold zero (LCT0).

Table 21: Simplified classification of identified minerals

Mineral	*****	**Formula**	**Mineral type/group**	**Sub-group**
Calcite		$CaCO_3$	Anhydrous Carbonates	Calcite group

Mineral	*	Formula	Mineral type/group	Sub-group
Dolomite		$CaMg\ (CO_3)^2$	Anhydrous Carbonates	Dolomite Group
Gypsum		$CaSO_4 \cdot 2(H_2O)$	Sulphates	Hydrated Acid and Sulphates
Kaolinite		$Al_2Si_2O_5(OH)_4$	Phyllosilicate 1:1 layer	Kaolinite group
Quartz		SiO_2	Tectosilicate	Tectosilicates
Pyrite		FeS^2	Sulphides	Pyrite Group
Siderite		$FeCO_3$	Anhydrous Carbonate	Calcite group

* Mineral Type: Blue = Carbonates, Red = Phyllosilicates, Green = Tectosilicates, Yellow = Sulphides and sulphates, Black = Oxides

Table 22: X-Ray Diffraction composition (weight %)

Mineral	Red Bag – Siding	Black Bag – Product
Dolomite	1.1	2.4
Kaolinite	16.8	9.9
Calcite	-	0.9
Quartz	3.6	-
Gypsum	2.2	-
Pyrite	0.1	0.1
Siderite	0.1	-
Organic C	76.1	86.6

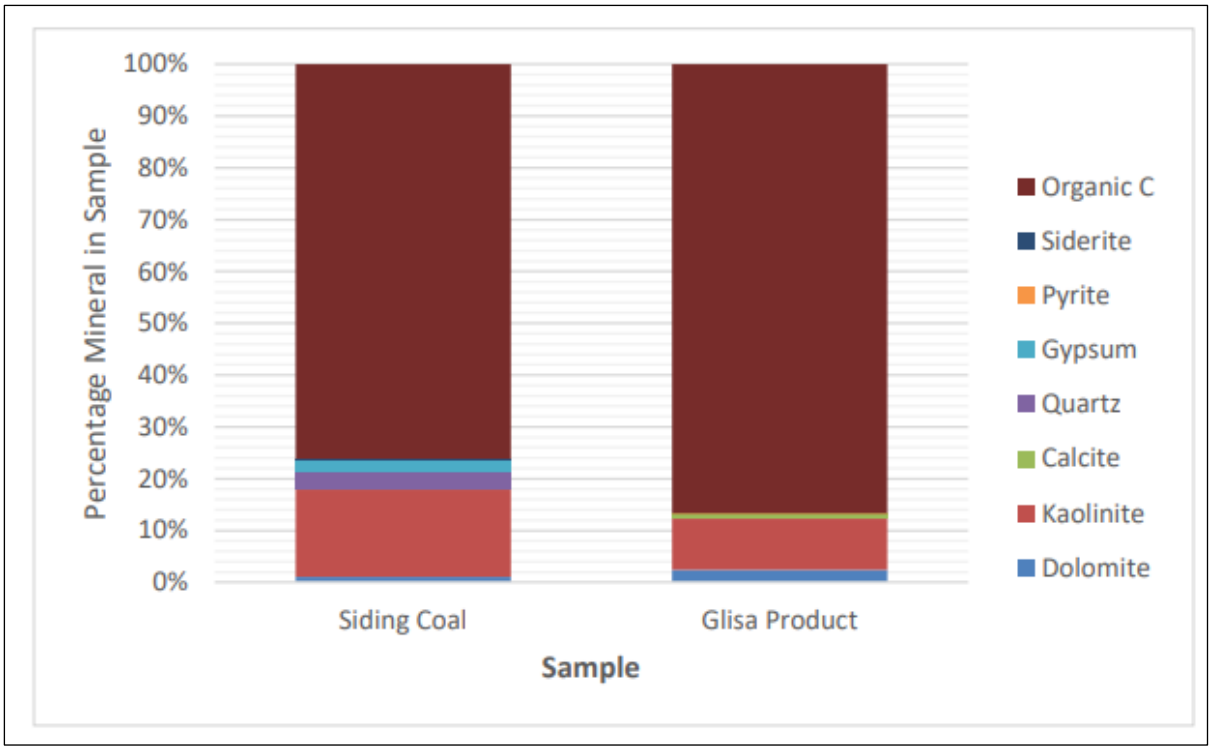


Figure 33: Mineral distribution in sample

Table 23: X-ray fluorescene major oxides (weight %)

Sample ID		LOI	Al2O3	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SiO2	TiO2	SO3
Red Bag – Siding		79.66	5.51	1.1	0.04	1.80	0.10	0.32	0.02	<0.01	0.11	9.29	0.26	0.37
Black Bag – Product		89.26	3.46	1.62	0.01	0.45	0.04	0.50	0.01	<0.01	0.11	3.85	0.13	0.58
AUC	Above AUC		15.40	3.59	See trace	11.20	2.80	2.48	0.10	3.27	0.15	66.60	0.64	
	3-5 times above AUC		46.2	10.77	See trace	33.6	8.4	7.44	0.3	9.81	0.45	199.8	1.92	
	> 5 times higher than AUC		77	17.95	See trace	56	14	12.4	0.5	16.35	0.75	333	3.2	

* AUC: Average Upper Crust

Table 24: X-ray fluorescence trace elements (ppm)

Sample ID		LOI	As	Ba	Bi	Cl	Co	Cu	Nb	Ni	Pb	Rb	Sr	Th	U	V	Zn	Zr
Red Bag – Siding		79.66	<10	180	<10	1280	150	50	10	110	30	10	730	10	10	60	50	160
Black Bag – Product		89.26	<10	140	<10	1340	80	40	10	110	20	10	990	10	20	10	80	80
AUC	Above AUC		4.8	628	0.16	294	17.3	28	12	47	17	82	320	10.5	2.7	97	67	193
	3-5 times above AUC		14.4	1884	0.48	882	51.9	84	36	141	51	246	960	31.5	31.5	291	201	579
	> 5 times higher than AUC		24	3140	0.8	1470	86.5	140	60	235	85	410	1600	52.5	52.5	485	335	965

* AUC: Average Upper Crust

9.1.11.3. Acid-Base Test Results

Acid Base Accounting (ABA) assessment results are presented in the table below. The paste pH of the Siding Coal Material currently on site and the fresh Glisa Colliery Product sample are 6.2 and 7.8, respectively. The siding sample paste pH may be attributed to acidification of the coal stockpad under oxidising conditions over time, since the siding has been derelict. The colliery sample is representative of the material to be stockpiled at the siding before railing, and it (i.e., the product sample) registered a fairly neutral paste pH.

Table 25: ABA test results

Acid – Base Accounting **Modified Sobek (EPA-600)**	**Sample Identification**		
	Red Bag – Siding	**Black Bag – Product**	**Black Bag – Product**
Sample Number	**101664**	**101665**	**101665 D**
Paste pH	6.2	7.8	7.8
Total Sulphur (%) (LECO)	0.41	0.30	0.29
Acid Potential (AP) (kg/t)	13	9.22	9.18
Neutralization Potential (NP)	17	27	28
Nett Neutralization Potential (NNP)	3.80	18	19
Neutralising Potential Ratio (NPR) (NP: AP)	1.30	2.96	3.03
Rock Type	II	II	II

Table 26: Rock classification guidelines

TYPE I	Potentially Acid Forming	Total S (%) > 0.25% and NP:AP ratio 1:1 or less
TYPE II	Intermediate	Total S (%) > 0.25% and NP:AP ratio 1:3 or less

TYPE III	Non-Acid Forming	Total S (%) < 0.25% and NP:AP ratio 1:3 or greater

The NP/AP indicates the potential for the sample to generate acid drainage, whereas the %S indicated whether this drainage will be over the long term. The total Sulphur content of both samples was above the 0.25 % guideline value, indicative of potential for acid generation if neutralisation potential is not adequate to buffer acid formation. However, the Neutralisation Potential Ratio (NPR) of both samples is greater than 1:1 ratio. Hence, the material ABA rock classification is Intermediate (i.e., Type II Rock). Whilst both samples have Net Neutralisation Potential (NNP) greater than zero, it is noted that the NNPs are less than +20, which may render the samples potentially acid generating.

It is noted that the sample representative of product that may be stockpiled registered a much higher Neutralisation Potential Ratio (NPR). However, both materials should be considered as likely to be potentially acid generating.

The XRD indicated the presence of pyrite in both samples, however, in small amounts (0.1 %). Notably, the relatively higher neutralization potential recorded for the Glisa Colliery product may be attributed to calcite and dolomite content in the sample.

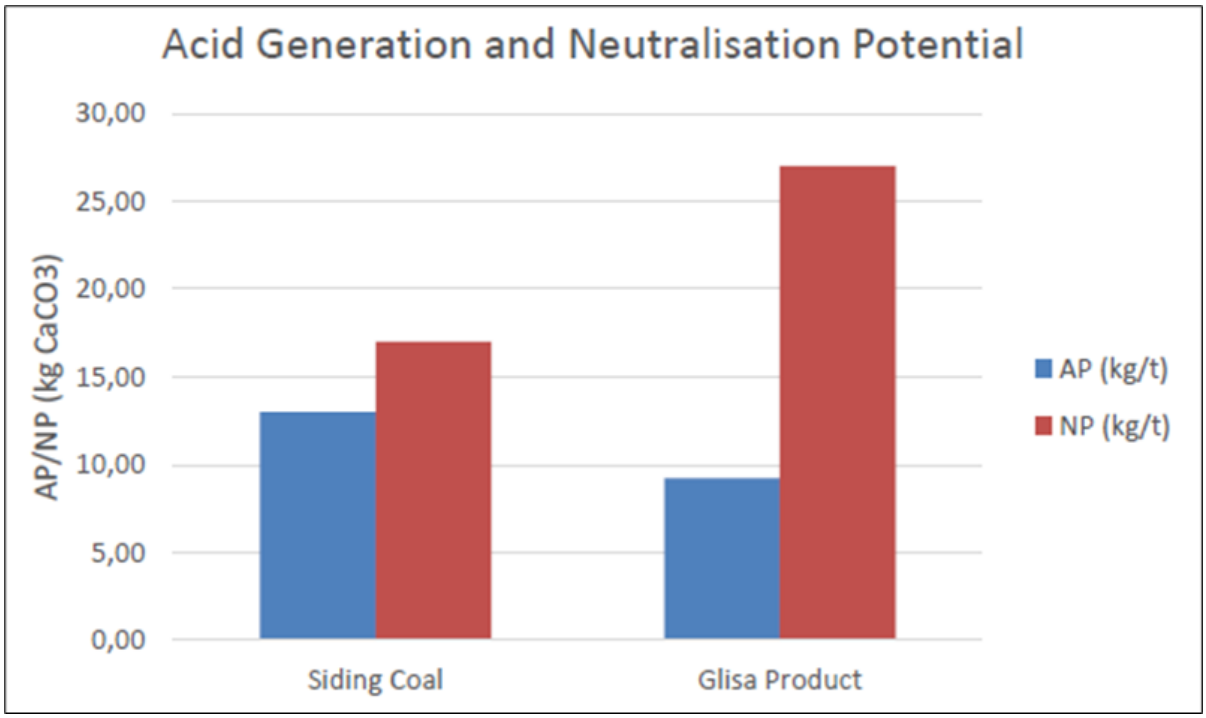


Figure 34: Acid generation and neutralisation potential

With the likelihood of acid generation under oxidising conditions, coal product stockpiling at the siding must not be in a manner that may allow oxidation, whilst taking the time that material remains on site before railing. Furthermore, groundwater monitoring programme must include salts and metals discussed, since acidification could lead to liberalisation of elements and compounds, resulting in potential for pollution of water resources.

9.1.11.4. Waste Classification Results

The Total Concentrations (TC) for metal ions and anions analysed are presented the table overleaf. All the TCs for both coal the Glisa Colliery product and the coal material presently at the siding are below threshold zero values. Notably, the concentrations of most the metals are also below the AUC values, which is in line with expectations for (processed) coal product. The represents the average concentration of elements in the upper continental crust including rock (sub)-outcrops and serves as a background reference for the geochemical composition of rock near the earth's surface.

The Leachable Concentrations (LC) for both samples are presented in **Table 27**. All LCs are below threshold zero, with the exception of the LC of Sulphate observed in the Siding Coal sample.

The materials are thus classified as follows:

The Siding coal materials currently on site is hereby classified as Type 3 Waste due to the Leachable Concentration (LC) of Sulphate, which exceeds threshold zero but is within LCT1. The Glisa Colliery sample representative of material to be stockpiled at the site may be classified as Type 4 Waste, if only inorganic analyses are considered. All the inorganic chemical parameters assessed in this sample are within threshold zero values in the norms and standards for assessment of waste for landfill. However, the material to be stockpiled for railing at the site should at least be treated as Type 3 Waste until further assessments are undertaken. Additional assessments inclusive of analyses for organic compounds must be undertaken.

- The coal material presently at the siding is classified as Type 3 Waste due to the observed LC of Sulphate.
- The Glisa Colliery product could be classified as Type 4 while still neutral (e.g., during operation). However, Total Concentrations of organic compounds including Total Organic Carbon (TOC), BTEX, Mineral Oils and Pesticides would have to be determined as required in terms of the norms and standards. Since the material may acidify over the long-term upon oxidation, they should be classified as Type 3 waste

and managed accordingly. However, the low leachable concentrations of the constituents of concern indicate that the risk of water resource pollution due to contaminant mobilization can be considered low over the short term (during operational phase).

Table 27: Waste Classification Total Concentration Results (mg/kg)

Chemical Element/Substance	**Siding**	**Glisa Colliery Product**	**TCT0**	**TCT1**	**TCT2**
As, Arsenic	0.020	0.020	5,8	500	2000
B, Boron	0.982	1.16	150	15000	6000
Ba, Barium	0.875	1.18	62,5	6250	25000
Cd, Cadmium	0.020	0.020	7,5	260	1040
Cr_{Total}, Chromium	<0.500	<0.500			
Co, Cobalt	<0.500	<0.500	50	5000	20000
Cu, Copper	<0.200	<0.200	16	19500	78000
Hg, Mercury	<0.020	<0.020	0,93	160	640
Mn, Manganese	2.57	<0.500	1000	25000	100000
Mo, Molybdenum	<0.500	<0.500	40	1000	4000
Ni, Nickel	<0.500	<0.500	91	10600	42400
Pb, Lead	<0.020	<0.020	20	1900	7600
Sb, Antimony	<0.020	<0.020	10	75	300
Se, Selenium	<0.020	0.051	10	50	200
V, Vanadium	<0.500	<0.500	150	2680	10720
Zn, Zinc	<0.500	<0.500	240	160000	640000
Cl, Chloride	<40	<40	NS	NS	NS
NO3, Nitrate	<2.0	<2.0	NS	NS	NS
SO4, Sulphate	5140	40	NS	NS	NS
F, Fluoride	<4.0	<4.0	100	10000	40000

*NS- Not specified in the waste regulations.

Table 28: Waste Classification Leachable Concentration Results (mg/L)

Chemical Element/Substance	Siding	Glisa Colliery Product	LCT0	LCT1	LCT2	LCT3
As, Arsenic	<0.001	<0.001	0,01	0,5	1	4
B, Boron	0.049	0.058	0,5	25	50	200
Ba, Barium	0.044	0.059	0,7	35	70	280
Cd, Cadmium	0.020	<0.001	0,003	0,15	0,3	1.2
Cr_{Total}, Chromium	<0.001	<0.025	0,5	25	50	200
Co, Cobalt	<0.025	<0.025	0.1	5	10	40
Cu, Copper	<0.025	<0.010	2,0	100	200	800
Hg, Mercury	<0.010	<0.001	0,006	0,3	0,6	2.4
Mn, Manganese	<0.001	<0.025	0,5	25	50	200
Mo, Molybdenum	0.129	<0.025	0.07	3,5	7	28
Ni, Nickel	<0.025	<0.025	0,07	3,5	7	28
Pb, Lead	<0.025	<0.025	0,01	0,5	1	4
Sb, Antimony	<0.001	<0.001	0.02	1.0	2	8
Se, Selenium	<0.001	0.003	0,01	0,5	1	4
V, Vanadium	<0.025	<0.025	0,2	10	20	80
Zn, Zinc	<0.025	<0.025	5,0	250	500	2000
Chloride as Cl	<2	<2	300	15 000	30 000	120 000
Sulphate as SO4	257	2	250	12 500	25 000	100 000
Nitrate as N	<0.1	<0.1	11	550	1100	4400
Fluoride as F	<0.2	<0.2	1,5	75	150	600

9.1.12. Geotechnical

Information regarding the Geotech of the Glisa study area was obtained from the Geotechnical Report undertaken by Bertie Cilliers in November 2020. The Geotechnical report is attached as **Annexure L.**

The geology underlying the existing siding area comprises of quartzitic cross-bedded sandstone with pebbles near the base, in places gritty and even sedimentary shale layers of the Vryheid Formation Geology. The study area has a climatic N-value of about 2.6, consequently the main mode of weathering of the bedrock is by means of chemical decomposition.

Five soil profiles were found to be occurring on the site namely, imported coal mixes, colluvium, residuum, decomposed sandstone, and sandstone of the Vryheid formation.

The site is blanketed with imported coal mixes that consist of dry, dark greyish lustre matrix consisting of subangular coal chips, coal dust with traces of sandstone and rhyolite gravels. The imported coal mixes are predominantly underlain by residual sandstone material. The residuum recorded a firm to stiff consistency. The colluvium has been grubbed across the site during the initial construction of the sidings, from the northern side towards the southern part, almost to the end. Decomposed sandstone was observed in test pits TP2, TP3 and TP4. The decomposed sandstone has a predominantly firm to stiff consistency, occurring at an average depth range of 0.6m to 2.1 below surface. The highly weathered sandstone horizon is present within a depth range of >1.5m to >2.6 and comprises creamy whitish speckled ivory, highly weathered, fine to medium grained, cross-bedded quartzitic sandstone of the Vryheid Formation.

9.1.12.1. Engineering Soil Properties

Soil laboratory tests were carried on representative disturbed and undisturbed samples taken during the site investigation. The imported materials, colluvium, residuum, decomposed and highly weathered sandstone bedrock have been examined and tested to determine their engineering properties according to the following criteria: -

- Potential heave in the residual soils determined from soil gradings and Atterberg limits;
- Strength and bearing capacities of the founding materials determined from DCP values and compaction values;
- Compressibility of the founding materials expressed in terms of their consistencies and deformation moduli estimated from laboratory results;
- In situ moisture contents;

- Estimated hydraulic conductivities;
- Predicted settlement from the above factors;
- Excavatability and compatibility;
- Slope stability

Activity of the in-situ soil

The imported coal mixes recorded no activity, with the transported colluvial soil being found to be 'Low' active according to the Van Der Merwe classification. The residual sandstone recorded ''High and very high'' activity, with the decomposed sandstone classifying as low and medium active and therefore problems of heave are anticipated. The sub-soil's reactivity is clearly demonstrated by the smooth slicken sided structural features noted within the profiles of the test pits.

The soil layer thickness information together with the clay content, grading modulus, plasticity index and percentage material passing the 0,425mm sieve were used to assess the activity of the site soils. The plasticity values and heave activity of the different horizons are summarized in **Table 29** below.

Table 29: Plasticity ranges of the soils

Sample No	**Depth**	**Origin**	**Description**					
				GM	**LL**	**PI**	**LS**	**Clay %**	**Heave**
TP1/DS1A	0.5-1.4	Decomposed Sandstone	Clayey Sand	0.67	35	15	7	5	Low to medium
TP2/DS2A	1.1-2.0	Residuum	Silty Clay	0.43	71	33	16	25	High
TP3/DS3A	0.6-2.1	Residuum	Silty Clay	0.20	84	41	20	33	Very high
TP3/DS3C	2.1-2.6	Decomposed sandstone	Silty Clay	0.23	77	34	17	24	High
TP5/DS5A	0.1-0.3	Imported coal mixes	Silty Clay	2.1	2	1	0	1	Non
TP5/DS5B	1.0-1.2	Residuum	Clayey Sand	0.73	46	23	11	15	Medium
TP6/DS6A	0.3-1.3	Residuum	Silty Clay	0.23	65	35	17	31	Very high

Sample No	Depth	Origin	Description						
				GM	LL	PI	LS	Clay %	Heave
TP6/DS6B	2.0-2.6	Colluvium	Silty sandy	0.91	25	9	4	6	Low

Moisture Contents

The moisture contents of disturbed samples have been determined and are attached to the soil laboratory results – Appendix B. The moisture content percentage ranges are listed below in **Table 30**.

Table 30: Moisture Contents

Material description	Average depth range (m)	Average moisture content (%)
Imported coal mixes	03-1.1	6.1
Colluvium	Surface to 0.6 >2.0-2.6	10.6
Residuum	0.7-2.4	15.9-32.7
Decomposed sandstone	0.6-2.6	9.6-27.1
Highly weathered sandstone	>1.5	N/A

The average moisture contents recorded of the imported coal mixes, transported-, residual- and decomposed silt-clay mixes derived from in situ decomposed sandstone are well below the liquid limits and as rule of thumb, heaving of the underlying active clays should occur when wetted up.

Hydraulic Conductivity

Estimated Values Based on Soil Classifications

The following hydraulic conductivity parameters estimated from the soil classifications are provided in **Table 31**.

Table 31: Hydraulic Conductivity

Material Type	Permeability - K cm/s
Imported coal mixes – silty sand	$5.9x10^{-1}$
Colluvium – silty sand	$4.8x10^{-5}$
Residuum – clayey sand & silty clay	$1.7x10^{-6}$ to $4.0x10^{-8}$
Decomposed sandstone – clayey sand & silty clay	$4.5x10^{-6}$ to $6.9x10^{-8}$

Material Type	Permeability - K cm/s
Highly weathered sandstone	$>1x10^{-8}$

Permeabilities are expected to be high in the imported coal mixes due to the high gravelly sand fraction. Any contamination is likely to move rapidly within the imported materials, whilst the underlying colluvium, residuum and decomposed sedimentary sandstone will be less permeable.

At depths below the test pit final recorded depths, the permeability will be largely influenced by the bedding and degree of fracturing of the in-situ sandstone and shale bedrock. It is expected that the dipping of the bedrock will be similar to the topography, that is towards the south-west.

In situ permeability tests

Three (3) falling head permeability tests were carried out at selected holes across the site. Some information of the three falling head permeability tests conducted within excavated holes are summarized in **Table 32** below.

Table 32: Constant Head Permeability Tests Locations

Hole No	Location	Hole depth (m)	Horizon
P1	Between TP1 & TP2	1.2 – 1.5	Decomposed sandstone
P2	Between TP3 & TP4	1.0 – 1.3	Residuum
P3	Between TP5 & TP6	1.0 – 1.3	Residuum

Permeability, also known as hydraulic conductivity, has the same units as velocity and is generally expressed in m/sec or cm/sec. Coefficient of permeability is dependent on void ratio, grain-size distribution, pore-size distribution, roughness of mineral particles, fluid viscosity, and degree of saturation.

Figure 35: Falling head permeability test setup.

The test was done by excavating a hole of predetermined dimensions (±300x300x300mm), soaking the test hole, and then filling it up again to measure the drop in water level at intervals of firstly 1,2,3,5 minutes and then every five minutes. The percolation rate has then been recorded as a drop in water level (mm/min) and then also as time taken to drop 25mm.

Table 33: Estimated Permeabilities

Location	Material origin	Hole depth	Inferred DCP and Profile Consistency	Unified Soil Class	Coefficient of permeability K (cm/s)
P1	Decomposed sandstone	1.2 – 1.5	Firm to stiff	CL	$k = 3.08 \times 10^{-7}$
P2	Residuum	1.0 – 1.3	Firm	OH	$k = 7.30 \times 10^{-7}$
P3		1.0 – 1.3	Firm	CL & CH	$k = 5.21 \times 10^{-7}$

As indicated by **Table 33** above, the test results generally recorded low permeability values as expected with the high clay content.

Laboratory permeability tests

Measurements were made of the various rates of flow under a falling head test of six (6) undisturbed representative samples. The 'typical K values of compacted soils' is tabulated on the following page.

Table 34: Range of Permeabilities for Site Soils

Origin of Site Materials	Unified Soil Class Range	Permeability K* Natural Block Samples (cm/s)	K ** Typical K Values of Soils cm/s
Residuum – clayey sand & silty clay	OH, CL, CH - Organic clays with medium to high plasticity	1.17×10^{-6} to 4.15×10^{-6}	1×10^{-6} & 1×10^{-8}
Decomposed sandstone – clayey sand & silty clay	CL, OH - Organic clays with low to high plasticity	6.84×10^{-4} to 4.83×10^{-7}	1×10^{-6} & 1×10^{-8}

Where: - K*: Laboratory Tested, K**: Typical Permeability Values of Soils based on triaxial testing (Table from Heymann, 2018), Pervious: K cm/s > 10^{-1} < 10^{-} Semi-Pervious: K cm/s > 10^{-6} < 10· Impervious: K cm/s > 10-9

Estimated allowable bearing capacity.

The presumed bearing capacities provided in **Table 35** below are based on in situ test pit profile observations and tabulated values, supported by the site's hand-held DCP test results. Note that bearing capacity refers to the ability of the foundation soil to withstand the load imposed without undergoing catastrophic shear failure. It therefore does not indicate the settlement that may occur in the soil under the applied pressure, which could lead to performance failure of the structure.

Typical bearing capacity tables provide an indication of the soil's bearing capacity based on soil composition and consistency and allow for settlement of up to 25mm. Detailed settlement analyses for a variety of footing designs are therefore required to optimize the bearing pressures which provide for a tolerable settlement of the proposed structure.

Table 35: Estimated Allowable Bearing Capacities

Soil / Bedrock	*Average Thickness Range (m)	*Average Depth Range (m)	Consistency	Inferred Average N-Value	Estimated Bearing Values (KPa)
Imported coal mixes – silty sand	0.3 – 1.1	Surface to 0.3 – 1.1	Medium dense to dense	30 – 50	N/A
Colluvium – silty sand	>0.3 – 0.6	Surface to 0.6 >2.0 – 2.6	Medium dense	10 – 30	150
Residuum – clayey sand & silty clay	0.8 - 1.7	0.7 – 2.4	Firm to stiff	4 – 15	75 – 150
Decomposed sandstone – clayey sand & silty clay	>0.3 – 0.8	0.6 – 2.6	Firm to stiff	4 – 15	75 – 150
Highly weathered sandstone	N/A	>1.5	Very soft rock	>30 – 50	200 – 300

***Depth to base of layer based on DCP correlations with test pit profiles. **Estimated allowable bearing capacity from visual inspection, DCP values and tabulated values.**

The best founding material throughout the site in terms of the load bearing capacity (200KPa) is on the highly weathered, very soft sandstone bedrock provided they are in the dense substrate at an average depth ranging from 1.5m to 2.6m. However, the very soft rock horizon is located on average >1.5m to 2.6m below surface and to prevent structural distress to buildings due to soil movements, an engineered fill will be required – especially for light structures with shallow foundations. However, for lighter loads a safe bearing can be obtained by compacting or treating the shallow site soils. Larger structures with higher loads will require individual investigations.

Although the imported coal mixes recorded a medium dense to dense consistency, it is not recommended as a founding medium, due to the firm underlying soils as well as the open structure (voids) recorded within the profile.

*Note that the above founding depths have been averaged over the site which is based on the soil profile and DCP tests information.

Note 1. The estimated presumed bearing values of the foundation materials are only an empirical guide to the maximum load that can be placed on the soil/weathered rock without shear failure, and as such do not account for settlement (or heave) that may occur at foundation pressures up to the bearing capacity of the soil.

Note 2. The allowable bearing capacity includes a factor of safety of approximately 2 to 3 on design loads (presently not known), which in addition to reducing the likelihood of shear failure, accommodates predicted settlement to within tolerable limits.

Note 3. The presumed bearing values above are based on the materials exposed in situ in the test pits and ignore any improvement, which may be obtained by compacting, or treating the site soils. The allowable bearing capacities given in Table 5.4.1 on the previous page are based on the materials exposed in situ in the test pits and as encountered during dynamic cone penetrometer testing (DCP) and therefore ignore any improvement that may be obtained by compacting or treating the site soils.

Estimated Compressibility

The results of the visual assessment of the soil consistency together with the DCP and laboratory tests have been interpreted into the compressibility descriptions, represented by the estimated constrained moduli given in **Table 36** below. Note that the foundation ratings are based on a bearing pressure of 200KPa.

Table 36: Estimated Compressibility

Soil / Bedrock	***Average Thickness Range (m)**	***Average Depth Range (m)**	**Consistency**	**Predicted Constrained Modulus (MPa)**	****Foundation Rating (at 200kPa)**
Imported coal mixes – silty sand	0.3 – 1.1	Surface to 0.3 – 1.1	Medium dense to dense	26 – 40	N/A
Colluvium – silty sand	>0.3 – 0.6	Surface to 0.6 >2.0 – 2.6	Medium dense	26	fair
Residuum – clayey sand & silty clay	0.8 – 1.7	0.7 – 2.4	Firm to stiff	11 - 26	Poor to fair

Soil / Bedrock	*Average Thickness Range (m)	*Average Depth Range (m)	Consistency	Predicted Constrained Modulus (MPa)	**Foundation Rating (at 200kPa)
Decomposed sandstone – clayey sand & silty clay	>0.3 – 0.8	0.6 – 2.6	Firm to stiff	11 - 26	Poor to fair
Highly weathered sandstone	N/A	>1.5	Very soft rock	>40 – 68	Very good

** Depth recorded from test pit profiles and DCP penetration results.*

The least compressible horizon is the highly weathered soft rock sandstone provided they are in the dense substrate located on average >1.5m to 2.6m below surface.

he residuum and decomposed sandstone are generally firm to stiff and have a low to medium compressibility and is therefore acceptable for single storey structures with some foundation modifications. Note though that once the clayey sub strata have been wetted up, the consistency becomes soft and the bearing capacity thereof is insufficient.

*It is recommended that the Structural Engineer verifies the Serviceability Limit State of the proposed structures that will be erected according to the structural and geo-mechanical parameters and permissible/allowable settlements.

Construction Materials as Liners

It is understood that the coal loading area where the coal will be stockpiled should be lined with a low permeable liner and therefore the suitability as potential construction materials was determined.

The material properties of the on-site soils for the use of liner construction materials are discussed and compared to the recommended properties by Brink (1980) for dam construction materials below in **Table 36**.

Table 37: Comparison Between the on-Site Soils with the Properties Recommended by Brink (1980)

	Soil Properties					Recommended Soil Properties		
SOIL TYPE	**Transported material (colluvium)**	**Residuum**	**Decomposed sandstone**	***Highly weathered sandstone**		**Impermeable core**	**Semi-permeable zone**	**Permeable shell**
SOIL PARAMETERS								
PLASTICITY INDEX PI	9	23 – 41	15 – 34	*5		10-30	<10	<5
CLAY CONTENT %	6	15 – 33	5 – 24	*5		10-30	5-10	<5
GRADING MODULUS	0.91	0.20 – 0.73	0.23 – 0.67	*1.75		Fine (<.002-0.150)	Medium-coarse (0.150-0.250)	Coarse (0.250-2.0)
Ave PERMEABILITY cm/s	*4.8 X 10^{-5}	*2.85 X 10^{-7} **6.3 X 10^{-7} ***1.17 x 10^{-6} to 4.15 x 10^{-6}	*5.7 X 10^{-7} **3.1 X 10^{-7} ***6.84 x 10^{-4} to 4.83 x 10^{-7}	*1.0 X 10^{-8}		1 x10^{-9}	1 x10^{-7}	1x10^{-5}
OPTIMUM MOISTURE CONTENT %	12-15	28.7 – 38.1	*30	*10 – 15		12-25	10-15	8-12

MODIFIED AASTHO DRY DENSITY Kgm^{-3}	*1650	1306 – 1510	1450	*1750 - 1900		1400-1650	1550-1750	1650-1900

**Estimated tabulated values.*

***Insitu falling head tests.*

****Laboratory falling head permeability tests.*

The residuum and decomposed sandstone may be suitable for use as construction materials for a semipermeable zone or even with some modifications an impermeable core. The colluvium can be used as a permeable shell or even a semi-permeable layer with the grading modulus slightly exceeding the recommended soil properties.

Excavation Characteristics

The Bell 416 SJ 4x4 was able to excavate through the imported coal layer, transported-, residual-, decomposed- and upper section of the very soft rock sandstone materials. The TLB experienced slow excavation within the very soft rock sandstone to depths as tabled on the following page. The predicted excavatability of the site soils and bedrock is classified according to SABS 1083 in **Table 38** below.

Table 38: Excavatability Summary

Material/Rock Type	**Excavatability SABS 1083**	***Average Depth Range (m)**	**Proposed Excavation Method**
Imported coal mixes	Soft	Surface to 0.3 – 1.1	TLB
Colluvium	Soft	Surface to 0.6 >2.0 – 2.6	TLB
Residuum	Soft	0.7 – 2.4	TLB
Decomposed sandstone	Soft	0.6 – 2.6	TLB
Highly weathered sandstone	Intermediate to hard	>1.5	Excavator, hard ripping

The recorded test pit soil profiles, the TLB excavation performance on site and the DCP data were used to compile the excavatability summary above. Soft excavation can be expected for the majority of the site to a depth range of 1.9m to 2.6m below surface. Intermediate to hard excavation is expected within the sandstone bedrock.

No boulders are expected within the cover soils and residual material.

Compaction Characteristics

Three (3) disturbed samples representing the transported and deeper soil types identified on the site were submitted for compaction tests and foundation indicators - refer to the laboratory test results attached as Appendix B. The transported and residual materials present at the various depths and weathering stages were tested and found to comply with the operational requirements of the following pavement construction material classes – refer to **Table 39** below. The residual soils generally classify as >G9 Spoil class construction material that is suitable for fill and selected layers. Engineered fill will have to be sourced from a commercial supplier or a local borrow pit source.

Slope Stability

The partial cut and fill sidings site slopes fairly towards the south-west. No adverse features were observed which are indicative of landslide activity. However, failure of the side walls of excavations deeper than >1.5m may occur.

Good water management practices must be employed to prevent seepage of groundwater. Ponding is expected in various places across the site.

Table 39: Summary of The Compaction Tests

LL2262: Summary of Soil Test Results													
Sample No	**Depth (m)**	**Description**	**MDD**	**OMC**	**CBR at % Compaction**							**Soil Classifications**	
					100	**98**	**97**	**95**	**93**	**90**	**Swell**	**Unified**	**COLTO**
TP2/DS2A	1.1-2.0	Residuum	1444	29.9	4	4	3	3	3	3	1.2	OH	Spoil
TP3/DS3A	0.6-2.1	Residuum	1306	38.1	5	5	4	4	4	4	3.4	OH	Spoil
TP6/DS6A	0.3-1.3	Residuum	1510	28.7	15	13	12	11	10	8	1.0	CH	Spoil

**Abbreviations: MDD – Modified AASTHO, OMC – Optimum Moisture Content, CBR – California Bearing Ratio Unified Classification = OH&CH- Organic clays with medium to high plasticity*

9.1.13. Paleontological

Information regarding the Palaeontology in the Glisa study area was obtained from the Phase I Paleontological assessment undertaken by Dr H. Fourie (2020). Paleontological Assessment is attached as **Annexure I.**

Fossils likely to be found are mostly plants such as 'Glossopteris flora' of the Vryheid Formation **Figure 36**. The aquatic reptile Mesosaurus and fossil fish may also occur with marine invertebrates, arthropods, and insects. Trace fossils can also be present. During storms, a great variety of leaves, fructifications and twigs accumulated and because they were sandwiched between thin films of mud, they were preserved to bear record of the wealth and the density of the vegetation around the pools. They make it possible to reconstruct the plant life in these areas and wherever they are found, they constitute most valuable palaeobotanical records and can be used in palaeo environmental reconstructions.

The potential impact of the development on fossil heritage is VERY HIGH therefore a field survey was necessary for this development (according to SAHRA protocol). A Phase 2: Palaeontological Impact Assessment Mitigation is only recommended if fossils are found during clearing, excavating, drilling, and blasting.

Details of the location and distribution of all significant fossil sites or key fossiliferous rock units are often difficult to be determined due to thick topsoil, subsoil, overburden, and alluvium. Depth of the overburden may vary a lot.

The threats are: - earth moving equipment/machinery (front end loaders, excavators, graders, dozers) during construction, the sealing-in or destruction of fossils by development, vehicle traffic, and human disturbance.

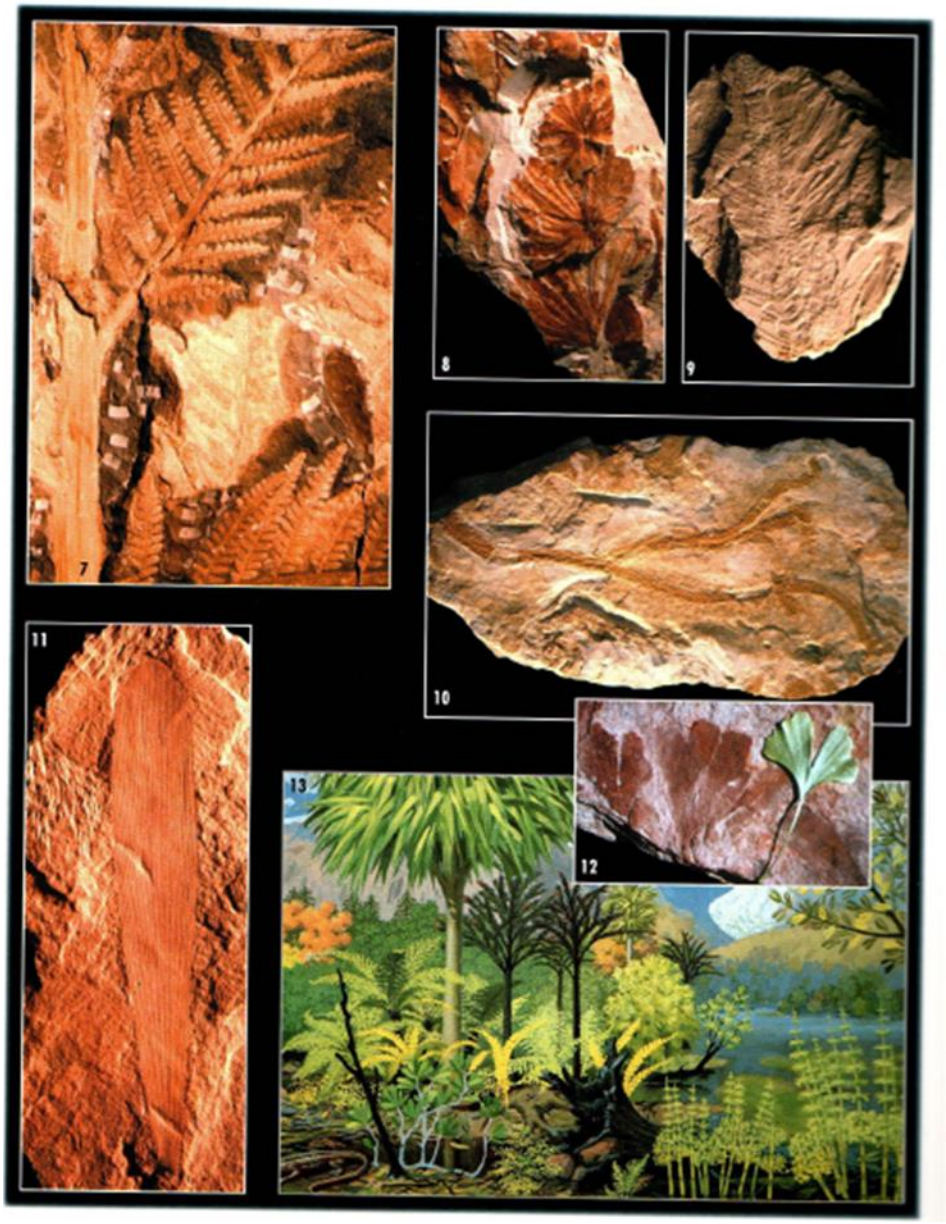


Figure 36: Examples of Vryheid Formation fossils

9.1.14. Heritage Impact Assessment

Information regarding the Heritage Impact Assessment (HIA) in the Glisa study area was obtained from the Phase I HIA assessment undertaken by Apelser Archaeological Consulting in July 2020. HIA is attached as **Annexure H**.

The Stone Age is the period in human history when lithic (stone) material was mainly used to produce tools. In South Africa, the Stone Age can be divided in basically into three periods. A basic sequence for the South African Stone Age is as follows:

Earlier Stone Age (ESA) up to 2 million – more than 200 000 years ago
Middle Stone Age (MSA) less than 300 000 – 20 000 years ago
Later Stone Age (LSA) 40 000 years ago – 2000 years ago

No Stone Age sites, or objects (such as stone tools) were identified in the area. If any Stone Age artifacts are to be found in the area then it would more than likely be single, out of context or scatters of stone tools near rivers or streams, or at the many pans that does occur in the larger area.

The Iron Age is the name given to the period of human history when metal was mainly used to produce metal artifacts. In South Africa it can be divided in two separate phases namely, Early Iron Age (EIA) 200 – 1000 A.D and Late Iron Age (LIA) 1000 – 1850 A.D.

No Early Iron Age sites are known to exist in the area, although there are a fairly large number of Late Iron Age stone walled sites in the bigger geographical area that includes Lydenburg, Dullstroom, Machadodorp, Badplaas and Belfast. Some of the sites might be related to the so-called Marateng facies of the Urewe pottery tradition of the LIA, dating to between AD1650 and 1840.

9.1.15. Social Assessment

Information regarding the Social demographics of Belfast was obtained from the eMakhazeni Local Municipality 2017-2022 Integrated Development Plan.

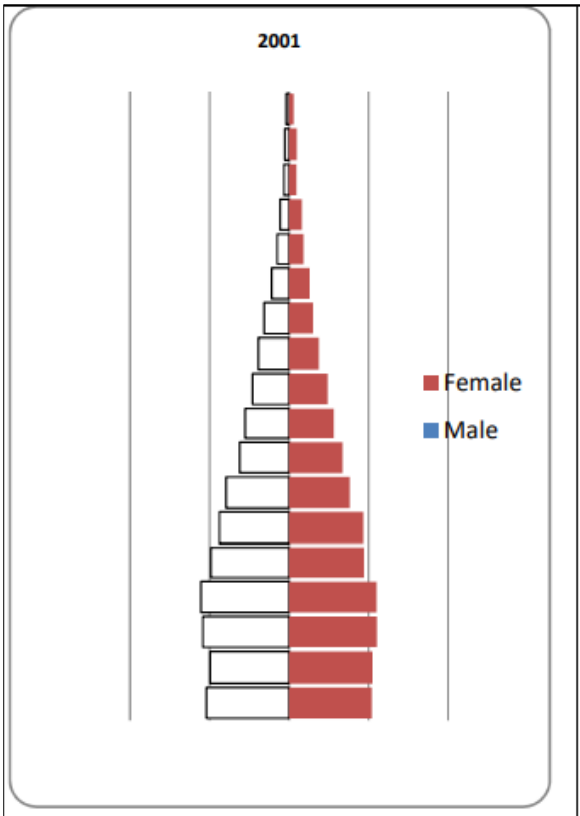
9.1.15.1. Demographic Information

According to CS 2016 (figure), eMakhazeni recorded a slight increase in its population although the total number shows that the municipality still has the lowest number of population size in Nkangala District Municipality. Emakhazeni recorded the fourth slowest growth in terms of the population size. The population grew by 0.4% (47216 – 48 149) from 2011 to 2016. This increased figure means that eMakhazeni's population constitutes a total of 3.3% of the total population of Nkangala. The growth presents the municipality with pressure on its infrastructure and this will be increased as the population is expected to grow to about 50 900 by the year 2030. The total number of households grew from 13 722 in 2011 to 14 633 in 2016 and this contribute to 3.5% of the number of households in Nkangala. Youth population grew by 1.6% per annum between 2011 & 2016 and forms 39.6% of the total population.

Interestingly, in 2016 the male population remained higher than the female population as it was the case in 2011 census. The male population is 51.3% and females 48.7% in 2016.

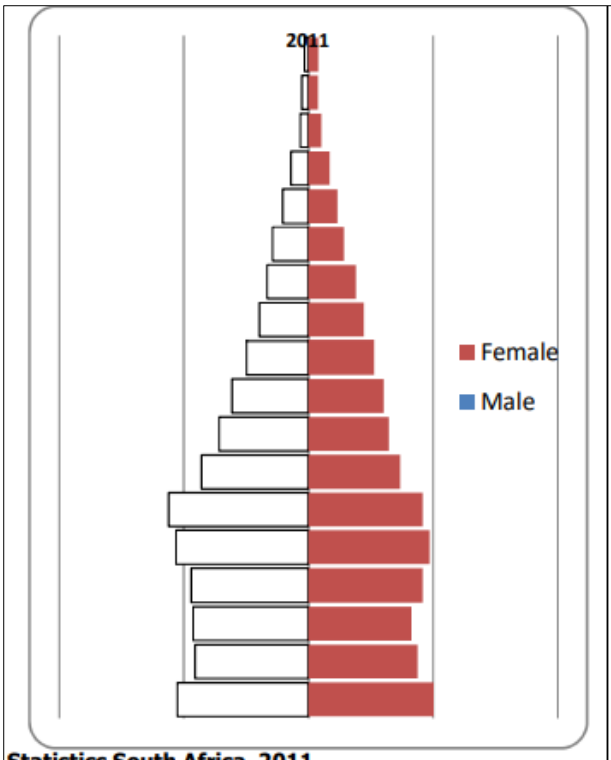
9.1.15.2. Age and sex structure

The age and sex structure of the population is a key determinant of population change and dynamics. The shape of the age distribution is an indication of both current and future needs regarding educational provision for younger children, health care for the whole population and vulnerable groups such as the elderly and children, employment opportunities for those in the economic age groups, and provision of social security services such as pension and assistance to those in need. The age and sex structure of smaller geographic areas are even more important to understand given the sensitivity of small areas to patterns of population dynamics such as migration and fertility. If one can understand better components of population growth in a local municipality, such information can be used as a direct indicator of the needs of the population.



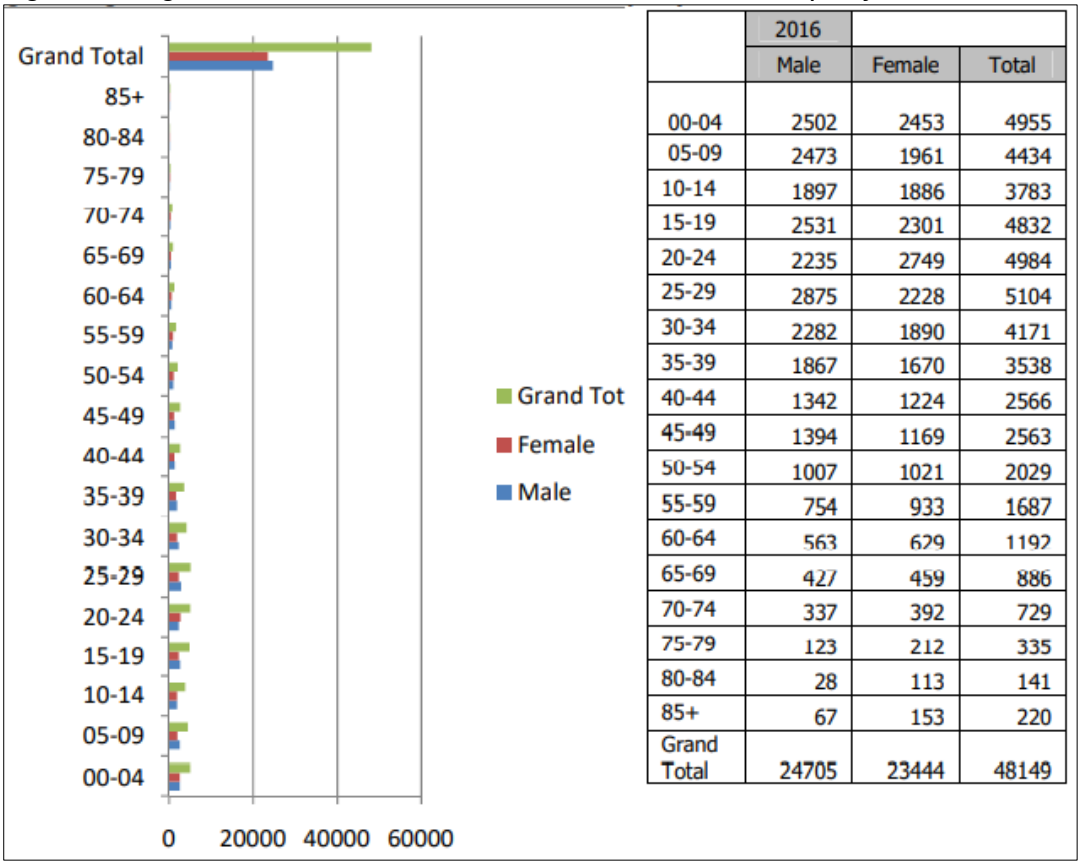
	2001	
	Male	**Female**
0-4	2238	2235
5-9	2128	2250
10-14	2333	2377
15-19	2385	2362
20-24	2110	2026
25-29	1877	2013
30-34	1700	1642
35-39	1341	1449
40-44	1188	1207
45-49	983	1046
50-54	827	799
55-59	669	649
60-64	477	557
65-69	315	385
70-74	242	347
75-79	138	197
80-84	112	207
85+	74	123
	21137	**21871**

Figure 37: Age and Sex Structure of Emakhazeni Local Municipality between 2001 & 2011



	2011	
	Male	Female
0 - 4	2482	2376
5 - 9	2146	2066
10 - 14	2185	1946
15 - 19	2223	2164
20 - 24	2507	2293
25 - 29	2649	2167
30 - 34	2029	1734
35 - 39	1693	1522
40 - 44	1446	1422
45 - 49	1172	1242
50 - 54	931	1044
55 - 59	780	899
60 - 64	679	676
65 - 69	491	550
70 - 74	330	401
75 - 79	156	248
80 - 84	125	180
85+	75	188
	24099	23118

Figure 38: Age and Sex Structure of Emakhazeni Local Municipality 2011



	2016		
	Male	Female	Total
00-04	2502	2453	4955
05-09	2473	1961	4434
10-14	1897	1886	3783
15-19	2531	2301	4832
20-24	2235	2749	4984
25-29	2875	2228	5104
30-34	2282	1890	4171
35-39	1867	1670	3538
40-44	1342	1224	2566
45-49	1394	1169	2563
50-54	1007	1021	2029
55-59	754	933	1687
60-64	563	629	1192
65-69	427	459	886
70-74	337	392	729
75-79	123	212	335
80-84	28	113	141
85+	67	153	220
Grand Total	24705	23444	48149

Figure 39: Age and Sex Structure of Emakhazeni Local Municipality 2016

The population of Emakhazeni municipality shows a typical age structure of a very young population distribution. In 2001, there was a slight evidence of declining fertility, which was observed from a steady decline in the population 10-14 and 5-9, but this stalled in the municipality is concentrated in younger age group. The distribution is similar for both males and females, except observably larger male population at all age groups.

Based on the population structure of the municipality between 2001,2011 and 2015 the dominance of youth is clearly evident, as well as for those in the age groups from birth to 13 years. This simply means that the municipality needs to pay close attention on the youth and children programmes. The slight difference in the number of women as compared to men at different age group should also inform the services that need to be focused (mainstreaming) on women and their needs in terms of skills and job creation.

Table 40: Percentage distribution of eMakhazeni Municipality by population group-2011

Group	**Total**	**%**
Black African	41168	87.2%:
Coloured	563	1.2%
Indian or Asian	330	0.7%
White	5076	10.8%
Other	79	0.2%

Table 41: Percentage distribution of eMakhazeni Municipality by Population Group - 2016

Group	**Total**	**%**
Black African	43025	89.4%
Coloured	322	0.6%
Indian or Asian	156	0.3%
White	4646	9.7%
Total	48149	100%

Table 40 and **Table 41** above indicates a slight increase in the Black African population while there is a noticeable decrease in the Coloureds, White and Indian population. Based on statistics SA 2011 87.2% of the population was Black, 10.8% White, 1.2% Coloureds, Indian and/or Asian 0.7% and other is 0.2%. The percentages have since changed as indicated in CS2016 to 89% Blacks, 0.6% Coloureds, and 0.3% Indian/ Asian and 9.7% Whites. There could be a number of reasons regarding this change and among others could be that the other three population groups have decided to move to other areas due to economic conditions or it could be that they decide to move closer to their immediate families in other parts of the country. The implications for this increase in Black African numbers increasing in Emakhazeni could be an increase in the demand for RDP houses and that could cause additional demand on the bulk infrastructure of the municipality. The above is mainly informed by the fact that the housing demand could be informed by the fact that there have not been any major housing developments (GAP and/or Middle class) hence the reliance on the RDP houses. There could also be additional demand for land as among these people could be those who may intend to build their own houses.

9.1.15.3. Unemployment

The pattern of overall unemployment rate in Emakhazeni has changed as compared to 2001 when we were at 30% and in 2011 the percent was further reduced to 25.92 percent. Employment opportunities are favourable in the municipality, particularly for males, about 80% of males and 66% females were employed in 2011. Figure 7 below shows employment status for the population in the economically active group (15 to 65 years old) and further indicate that there has been a reduction in the percentage of unemployed in the district between 2001 and 2011 for both males and females. The decline is similar for males and females, although employment remains higher for males than for females.

The unemployment rate of Emakhazeni decreased from 25.92% in 2011 to 23.8% in 2015. In 2015, the unemployment rate was the 7th lowest among all the municipal areas of Mpumalanga. In 2015, unemployment rate for females was 29.2% and that of males 19.9%. Youth unemployment rate according to the Census figures 45.1% - challenge with especially very high youth unemployment rate of females. It must be noted that the largest employing industries in Emakhazeni are trade, community services and private households – more than 50% of total employment. High labour intensity is in construction, trade & agriculture industries.

Based on the above statistics and the national and provincial directives on job creation, the municipality uses all capital projects, infrastructure projects, environmental and social partners projects for massive job creation within the municipality.

9.1.15.4. Access to water

The distribution of eMakhazeni local municipality households by water source is indicated in the **Figure 40.** The majority of households have access to safe drinking water, either piped within the dwelling or from a source outside the dwelling. There were major improvements in provision of piped water inside the dwelling between 2001, 2011 to 2016. Evidence suggest that provision of basic services focused attention towards lowering the number accessing pipe water from the yard and those that access it from a source outside the dwelling. It can be observed that access to safe drinking water is high within the municipality and this can be attributed to the implementation provincial priorities on water and sanitation.

	2001	2011
Inside Dwelling	39	57.44
Inside Yard	37	36.31
Communal Tap	13	11.23

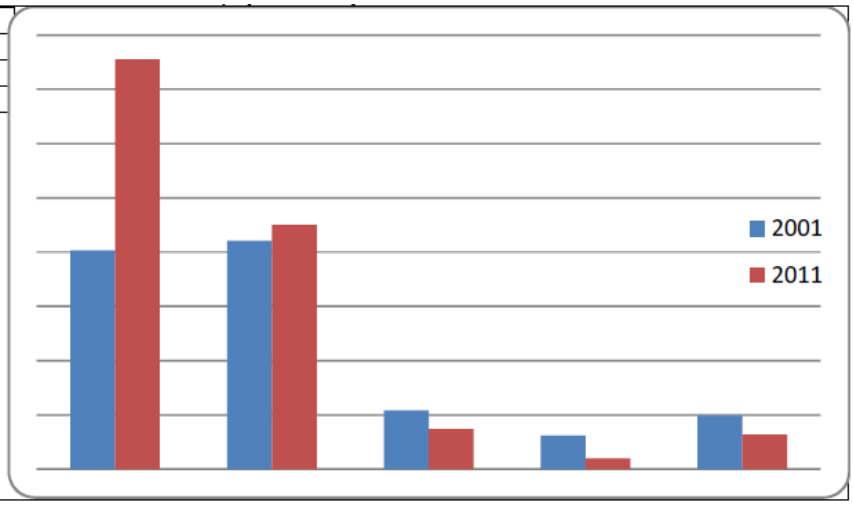


Figure 40: Household by Water source between 2001 and 2011 (Pipe Water)

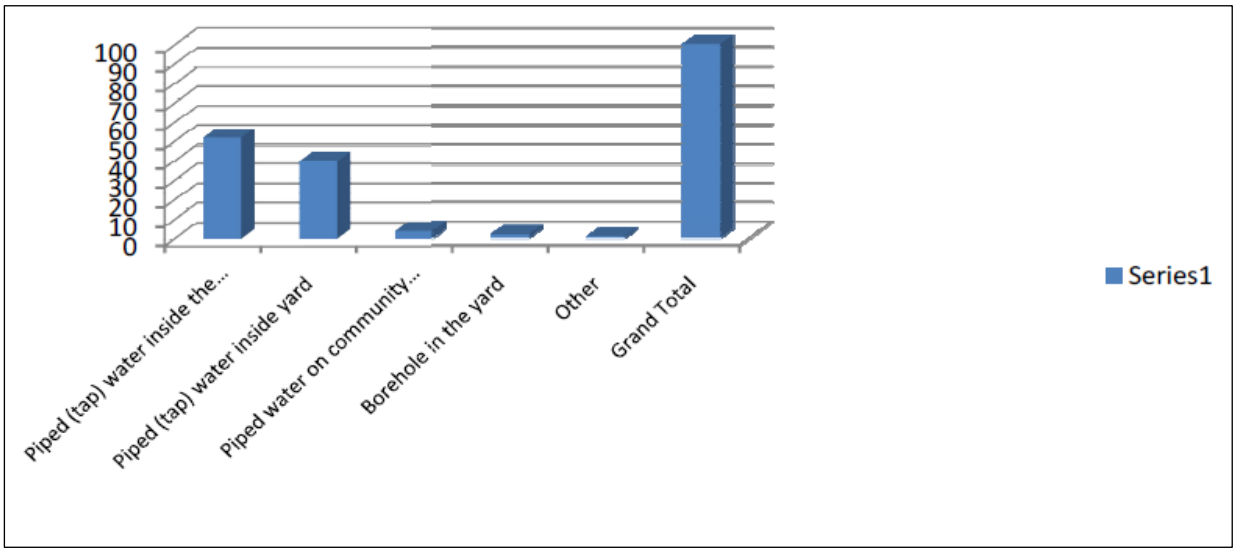


Figure 41: Household by Water source in 2016 (Pipe Water)

9.1.15.5. Access to Sanitation

The percentage distribution of eMakhazeni Municipality households by access to sanitation facilities between 2001, 2011 and 2016 shows a huge improvement as indicated in **Figure 42**. In 2016, about 74% households had access to flushed toilet connected to a public sewerage system as compared to 55% in 2011. This shows clear evidence of a municipal campaign to replace pit latrines without ventilations with those that are ventilated to promote safer sanitation facilities. These waterborne sanitation projects are ongoing and mainly implemented in the farming areas as this is where they are mainly used.

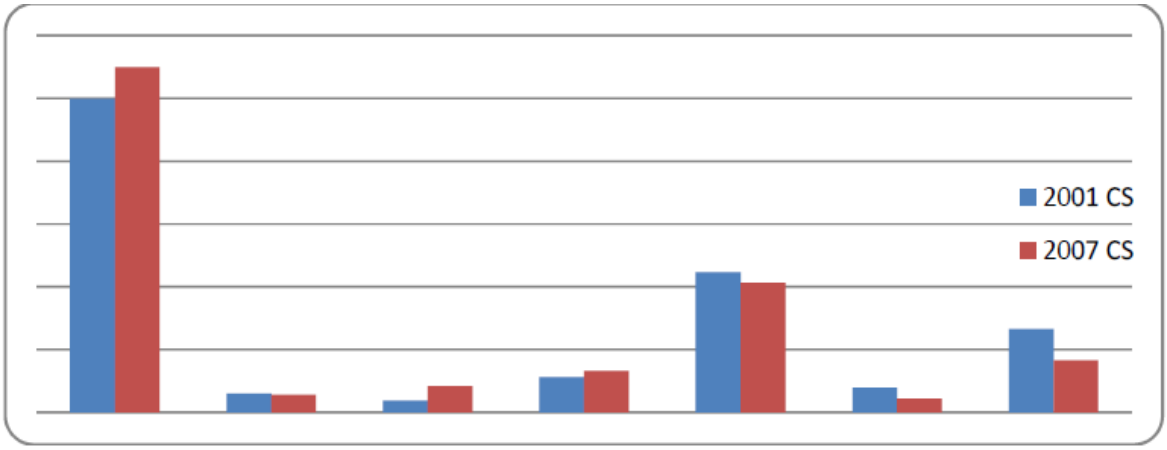


Figure 42: Percentage distribution of households by type of toilet facility

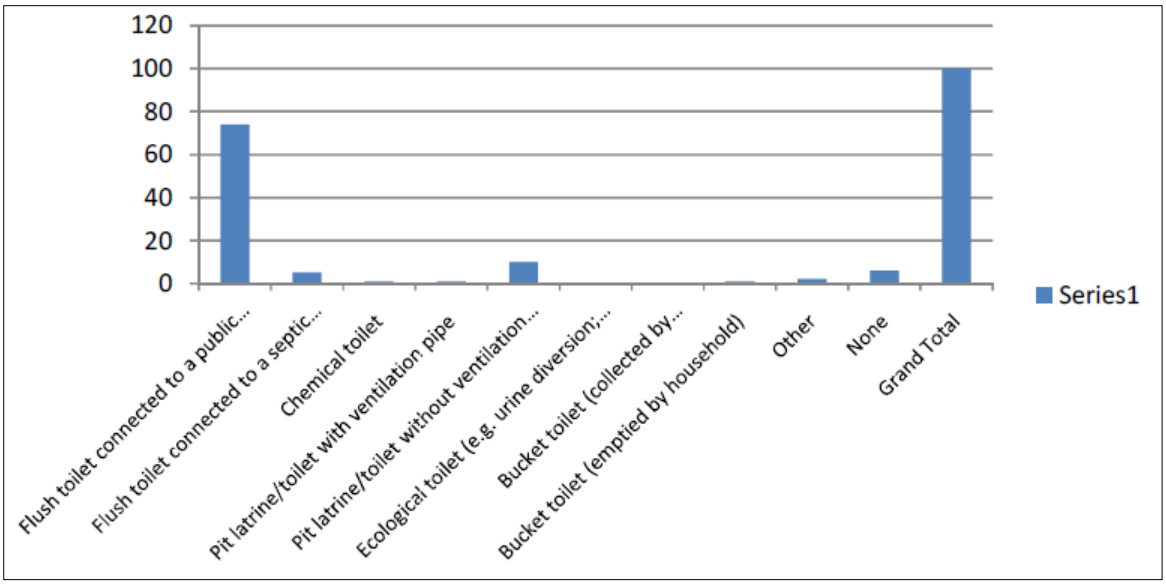


Figure 43: Percentage distribution of households by type of toilet facility (2016)

9.1.15.6. Access to Electricity

Access to electricity for lighting, cooking and heating is an important indicator of provision of one of the key resources in households. **Figure 44** the percentage of households that have access to electricity in the municipality as well as other types of energy sources used by other households in the absence of electricity.

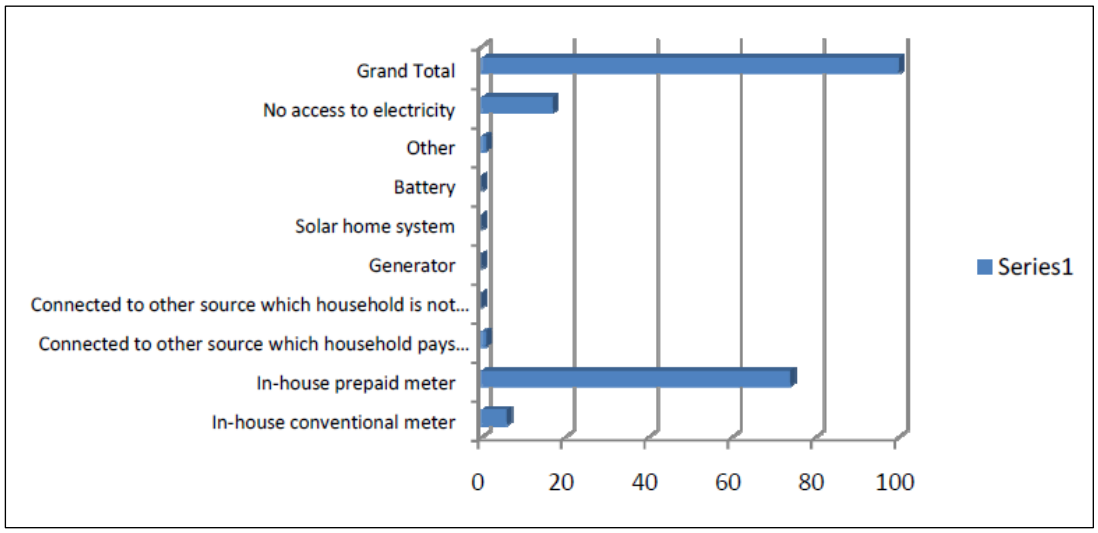


Figure 44: percentage of household's access to electricity

Electricity was the leading source of energy for all users as indicated by CS2016. It can be observed from **Figure 45** that the usage of electricity as a source of lighting stands at more than 80% while there is still 17% household that have no access to electricity. The implication is that the risk of houses being burnt in this 17% is high as the source use is unknown.

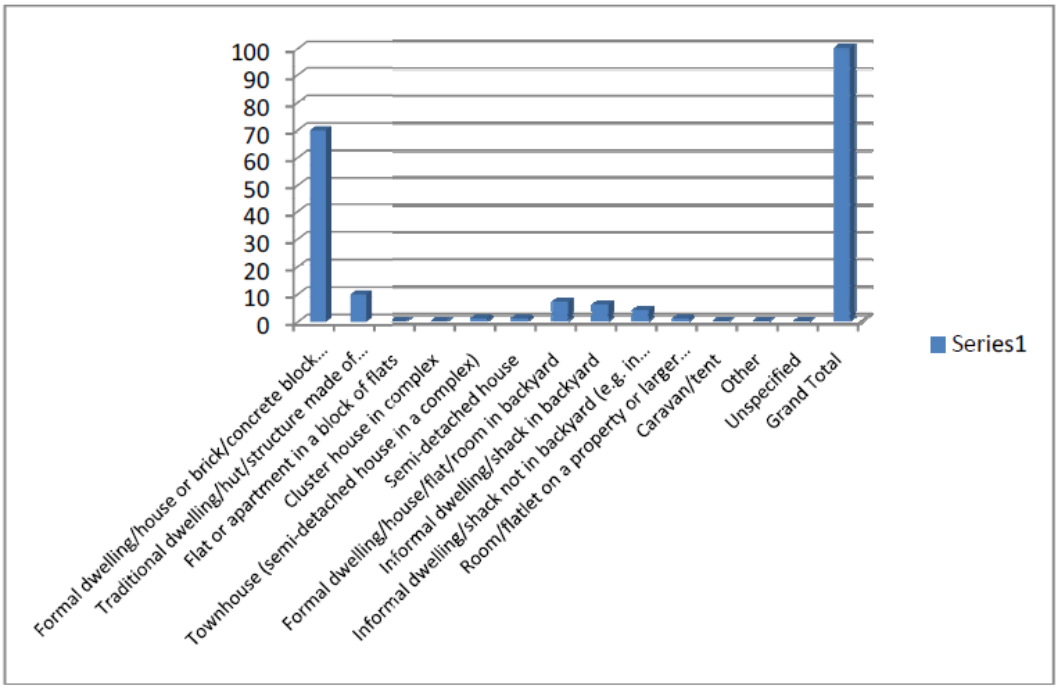


Figure 45: Dwelling type

About 70% of household's lives in formal dwelling/ house or brick/ concrete block structure within the municipality while 10% live in traditional dwelling or structure made of traditional mater. This 10% may be households living in rural areas. There is still, however 4% living in informal settlements and a further 6% living in informal dwelling/ shack in the backyard. This means that the municipality need to prioritize and/or expedite the finalization of township establishments in order to settle these people.

9.1.15.7. Economic Analysis

The municipality's economic sectors are mainly Mining, Tourism, Trade and community services. The average annual economic growth rate for municipality over a period from 1996 to 2015 has been noticeably low at 2.0%. More than 52% of the municipality's economy is from 3 industries – with mining at around18.5%, trade 17.0% and community services (17.0%). Fastest growing industries between 2011 & 2015 were construction at 1.5% annually, community services at 1.2% and transport at 1.1%. With a GDP of R 2.88 billion in 2014 (up from R 1.04 billion in 2004), the eMakhazeni Local Municipality contributed 2.45% to the Nkangala District Municipality GDP of R 117 billion in 2014 increasing in the share of the Nkangala from 2.69% in 2004. The municipality's contribution to the Mpumalanga economy is 1% and this translates to the 4th smallest economy in the province and 2nd smallest in Nkangala. The size of the economy in 2015 was estimated at more or less R2.7 billion in current terms and R2.1 billion in 2010 constant prices. Comparative advantages are in agriculture, mining, utilities, trade & transport. Tourism expenditure in the area as a percent of the local GDP is approximately 21.3%, which was the 3rd highest in Mpumalanga.

SECTION B: IMPACT ASSESSMENT

10. METHODOLOGY USED IN DETERMINING AND RANKING THE NATURE, SIGNIFICANCE, CONSEQUENCES, EXTENT, DURATION AND PROBABILITY OF POTENTIAL IMPACTS AND RISKS.

Impact Ranking Criteria to be used.

The criteria used for assessing the assessing the significance of the impacts are given in Table 42.

The impact assessment method takes into account the current environment, the details of the proposed project and the findings of the specialist studies. Cognizance has been given to both positive and negative impacts that may result from the development. The significance of the impact is dependent on the consequence and the probability that the impact will occur.

Impact significance = (consequence x probability)
Where:
Consequence = (severity + extent)/2
and
Severity = [intensity + frequency + duration]/3

Each criterion is given a score from 1 to 5 based on the definitions given in Table 42 although the criteria used for the assessment of impacts attempts to quantify the significance, it is important to note that the assessment is generally a qualitative process and therefore the application of this criteria is open to interpretation. The process adopted will therefore include the application of scientific measurements and professional judgement to determine the significance of environmental impacts associated with the project. The assessment thus largely relies on experience of the environmental assessment practitioner (EAP) and the information from the specialists' studies for the BAR.

Where the consequence of an event is not known or cannot be determined, the "precautionary principle" will be adhered to and the worst-case scenario assumed. Where possible, mitigation measures to reduce the significance of negative impacts and enhance positive impacts will be recommended. The detailed actions, which are required to ensure that mitigation is successful, will be provided in the Environmental Management Programme report, which will form part of the BAR Phase.

Consideration will be given to the phase of the project during which the impact occurs. The phase of the development during which the impact will occur, will be noted to assist with the scheduling and implementation of management measures.

Table 42: Criteria for assessing the impact significance.

SEVERITY CRITERIA

INTENSITY = MAGNITUDE OF IMPACT	**RATING**
Insignificant: impact is of a very low magnitude	1
Low: impact is of low magnitude	2
Medium: impact is of medium magnitude	3
High: impact is of high magnitude	4
Very high: impact is of highest order possible	5

FREQUENCY = HOW OFTEN THE IMPACT OCCURS	**RATING**
Seldom: impact occurs once or twice	1
Occasional: impact occurs every now and then	2
Regular: impact is intermittent but does not occur often	3
Often: impact is intermittent but occurs often	4
Continuous: the impact occurs all the time	5

DURATION = HOW LONG THE IMPACT LASTS	**RATING**
Very short-term: impact lasts for a very short time (less than a month)	1
Short-term: impact lasts for a short time (months but less than a year)	2
Medium-term: impact lasts for the for more than a year but less than the life of operation.	3
Long-term: impact occurs over the operational life of the proposed extension.	4
Residual: impact is permanent (remains after mine closure)	5

EXTENT

EXTENT = SPATIAL SCOPE OF IMPACT/ FOOTPRINT AREA / NUMBER OF RECEPTORS	**RATING**
Limited: impact affects the mining area	1
Small: impact extends to the neighbouring farmers	2
Medium: impact extends to surrounding farmers beyond the immediate neighbours	3
Large: impact affects the area covered by the municipal area	4
Very Large: The impact affects an area larger than the municipal area	5

PROBABILITY

PROBABILITY = LIKELIHOOD THAT THE IMPACT WILL OCCUR	**RATING**

Highly unlikely: the impact is highly unlikely to occur	0.2
Unlikely: the impact is unlikely to occur	0.4
Possible: the impact could possibly occur	0.6
Probable: the impact will probably occur	0.8
Definite: the impact will occur	1

IMPACT SIGNIFICANCE

NEGATIVE IMPACTS

≤1	Very low	Impact is negligible. No mitigation required.
>1≤2	Low	Impact is of a low order. Mitigation could be considered to reduce impacts. But does not affect environmental acceptability.
>2≤3	Moderate	Impact is real but not substantial in relation to other impacts. Mitigation should be implemented to reduce impacts.
>3≤4	High	Impact is substantial. Mitigation is required to lower impacts to acceptable levels.
>4≤5	Very High	Impact is of the highest order possible. Mitigation is required to lower impacts to acceptable levels. Potential Fatal Flaw.

POSITIVE IMPACTS

≤1	Very low	Impact is negligible.
>1≤2	Low	Impact is of a low order.
>2≤3	Moderate	Impact is real but not substantial in relation to other impacts.
>3≤4	High	Impact is substantial.
>4≤5	Very High	Impact is of the highest order possible.

11. IMPACT AND RISKS IDENTIFIED INCLUDING THE NATURE, SIGNIFICANCE, CONSEQUENCE, EXTENT, DURATION, AND PROBABILITY OF THE IMPACT, INCLUDING THE DEGREE TO WHICH THESE IMPACTS.

Table 43: potential Environmental Impact and Risk ranking before and after mitigation.

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
Construction Phase						
Recruitment, procurement, and employment.	Job Creation	influx of migrant labours resulting to community instabilities	Activity 1	Moderate	Priorities local community when undertaking recruitment.	Moderate
Transport of construction material.	Air quality	Dust generation from the movement of vehicles	Activity 2	Moderate	A dust suppressant must be applied to gravel or dirt roads;	Low
		Traffic congestion		Moderate	Traffic speeds must be reduced and adhere to the set speed limit.	Low
	Topography and Visual Environment	Damage of roads		Moderate	Liaise with the local authorities to ensure that roads are well maintained;	Low
		Dust generation from the movement of vehicles		Moderate	A dust suppressant to be utilised on the roads to prevent and suppress dust; and	Low
					Vehicles will always obey the speed limits.	
	Surface Water	Hydrocarbon spillages from the vehicle movement		Moderate	All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated;	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	
					All vehicles and machinery to be serviced in a hard park area or at off-site locations;	
		Occurrence of Hydrocarbon spillages on site.		Moderate	Accidental spillages and leaks of hydrocarbons must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973);	Low
					Hydrocarbons and storage facilities must be in a hard park bunded facility; and	
					Vehicles with leaks must have drip trays in place.	
	Noise	Noise pollution from the vehicles as the results of poor vehicular maintenance and lack of service.		Moderate	Vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Transport of construction materials must be restricted to daytime hours, where viable.	
3. Site preparation	Air Quality	Dust generation from the movement of vehicles	Activity 3	Moderate	Dust suppression must be undertaken on all dirty roads at all times	Low
		Dust generation as the results of excavation of the coal residue.		Moderate	Dust suppression to be undertaken during the excavation of the coal residue.	Moderate
	Topography and Visual Environment	Dust generation from the vehicular movement		Moderate	Dust suppression must be undertaken to prevent dust on dirty roads.	Moderate
	Noise	Increased ambient noise levels from vehicular movement		Moderate	Vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers.	Moderate
					Transport of construction materials must be restricted to daytime hours, where viable.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Vegetation	Disturbance of vegetation on the access road construction		Moderate	Vegetation and topsoil removal to be minimised and restricted to the required footprint areas.	Low
	Soil	Soil disturbance due to the excavation activities		Moderate	All vehicles and machinery to be serviced in a hard park area or at off-site locations.	Low
					Trenches and excavations shall be closed as soon as possible after services have been laid on them. To prevent them from posing hazards to staff, traffic, and animals as well as to prevent wind and soil erosion.	
	Surface water	Impacts to the surface water bodies as are result of elevated sulphate concentrations form the dirty water from the coal stockpile and PCD.		High	Implement the proposed surface water monitoring sites and undertake the monthly surface water sampling and analysis of the indicated parameters.	High
	Groundwater	Impacts to the groundwater regime as are result of elevated sulphate			Drill monitoring boreholes up-gradient to lower gradient before operations starts; and	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		concentrations form the dirty water from the coal stockpile and PCD.				
4. Earth works	Air Quality	Dust generation from the movement of vehicles	Activity 4	Low	Dust suppression must be undertaken at all times during the earth works preparation.	low
					Implementation of dust fallout and Pafrticulate Matter monitoring programme should be in place.	
		Decrease in air quality associated with construction activities including wind erosion, fugitive dust emissions from materials handling operations.		Moderate	Dust emanating from the exposed soil surfaces shall be minimised at all times. Any unpaved roads / tracks must be sprayed with dust suppressants.	Moderate
					Excavation, handling and transportation of erodible materials shall be avoided under high winds conditions.	
	Soil	Soil compaction by heavy duty vehicles		Moderate	Construction activities must be limited to disturbed areas.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		Disturbance of the soil during stockpiling.		Moderate	Implement soil stockpiling monitoring programme to minimise severe impacts on soil	Low
		Potential loss of vegetation type during construction of infrastructure		Moderate	Re-vegetation and rehabilitation of the cleared areas shall be undertaken once construction has been completed.	Low
		Loss of fauna as the results of having access to the operations and may be killed by the people		Low	No fauna encountered on-site may be trapped, captured, disturbed, injured, or killed. Animals may be trapped when such animal poses a hazard to staff or where the animal itself is in danger of being harmed by the activities in the area.	Low
	Noise	Noise impacts on surrounding environment associated with construction activities (heavy duty vehicles and equipments)		Moderate	Ensure that all vehicles and equipments are well maintained and in a good working order. Excessively noisy machinery must only be used during operating hours not after hours where possible.	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Waste	Generation of additional / litter and building rubble / hazardous material during the construction.		Low	Water shall not be mixed prior to classification and all waste types generated must be kept separated. All hazardous chemicals, hydrocarbons and contaminated containers will be removed and disposed of by a certified hazardous waste removal company and dumped at a certified hazardous waste site.	Low
	Traffic	Increased traffic due to construction activities		Moderate	Implement traffic management plan to control all vehicles on site and remain on the designated roads. Ensure all road users adhere to all road signs erected on site. Single direction traffic shall be controlled through stop-go system.	Low
5. Construction and lining the coal stockpiles.	Air Quality	Dust generation from the vehicular activity	Activity 5	Moderate	Dust suppression must be undertaken at all times during the earth works preparation.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		Dust generation during shallow excavation activity		Moderate	Implementation of dust monitoring programme should be in place.	Low
					Dust suppression must be undertaken at all times during the earth works preparation.	
	Soil	Contamination of soils through accidental spillage of chemicals such as hydrocarbon-based fuels and oils or lubricants spilled from vehicles and other chemicals from operational and maintenance activities e.g., paints.		Low	Implementation of dust monitoring programme should be in place.	Low
					Correct lining measures should be in place.	
					Scarification of soil on the compacted soils after the completion of construction	
					All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated;	
	Noise	Increased ambient noise levels from vehicular movement		Moderate	Vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					effective e.g., installed exhaust mufflers.	
					Implement noise monitoring programme.	
					Ensure that all vehicles and equipments are well maintained and in a good working order.	
					Excessively noisy machinery must only be used during operating hours not after hours where possible	
6. Construction of surface infrastructure	Air Quality	Decrease in air quality associated with construction activities including: Wind erosion	Activity 6	Moderate	The areas of disturbance should be minimised and restricted to the required footprint areas;	Low
		Dust generated from gravel surfaces		Moderate	Dust suppressants to be implemented on exposed surfaces and roads; and	Moderate
		Increased speeding of heavy vehicles on the gravel surfaces.		Moderate	Graders and heavy vehicle speeds should be reduced to prevent dust emissions.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		Fugitive dust emissions from materials handling operations; Vehicle entrained dust from roads.		Low	Implementation of dust monitoring programme should be in place.	Low
	Topography and Visual Environment	Soil erosion: and Negative visual impact caused by the construction of surface infrastructure		Moderate	Limit the footprint area of surface infrastructure;	Moderate
					Access and service roads should be contoured to limit erosion from surface infrastructure, preventing further alteration to the topography;	
					Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape;	
					Construction activities at night must be limited and down lighting must be used to minimise light pollution	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Fauna and flora	Loss of wetlands near the proposed development/activity.		Low	Wetland areas and the surrounding grasslands should form part of a biodiversity corridor and managed as conservation areas (including the rehabilitation to natural grasslands and the removal of cattle grazing), should an IWUL not be granted for the mining of the wetlands	Low
		Loss of fauna and flora habitats		Moderate	Clearance of vegetation to consider the sensitive floral and faunal areas.	Low
					Surveys should be conducted to monitor faunal biodiversity within the road crossing wetland areas.	
					Control alien invasive vegetation establishment	
					Site clearing must be kept to the required footprints and limited, where possible.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Alien invasive vegetation to be identified and removed throughout the proposed project.	
					Alien invasive vegetation to be identified and removed throughout the proposed project.	
	Wetlands	Loss of wetlands		Low	A 100 m buffer must be implemented around the wetlands, unless stated otherwise by the WULA:	Low
					Establish artificial wetlands if necessary and ensure water stays within artificial wetlands long enough to adequately treat water quality.	
					Construction activities to avoid the wetland systems; and	
					Should the wetlands be cleared and mined, a wetland off-set strategy must be implemented.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Surface Water	Disruption of natural surface and sub-surface flow		Low	The design, construction, operation, and maintenance of water management facilities must be implemented in terms of the NWA requirements: and	Low
					The PCD must have a freeboard of 0.8 m and must be able to contain a 1:50 year, 24-hour storm event	
		Increased erosion and associated with siltation on site.		Low	Where required the compacted erosion control measures must be considered in areas of high risk for erosion.	Low
					Monitor area for erosion and pooling and rehabilitate if necessary.	
	Noise	Noise impacts on surrounding environment associated with operational activities		Moderate	Vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers;	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		(heavy duty vehicles and equipment).			Construction activities to be restricted to daytime hours, where viable; and	
					Equipment must be switched off when not in use.	
7. Temporary waste and sewage handling facility (Conservancy Tank)	Soil	Soil contamination through hydrocarbons.	Activity 7	Low	General and hazardous waste must be removed and disposed of frequently at a registered disposal site.	Low
		Use of hazardous chemicals during sewage treatment may pollute underground water if proper infrastructure has not been constructed.		Moderate	Proper maintenance must be undertaken on ablution maintained and waste collection vehicles. Spills should be cleaned up immediately by removing the spills together with the polluted soil and disposing thereof at a recognised facility.	Low
	Surface water	Contamination of clean water resources		Moderate	Waste must be separated at source and stored in demarcated areas.	Moderate

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					The design, operation and maintenance of the conservancy tanks and reticulation to the tank must be conducted in a manner that can accommodate the number of people it is designed for and be in compliance with the NWA in terms of water management and prevention of spillages.	
					The sewage facilities must be maintained and monitored at frequent intervals to prevent and detect leaks and discharges;	
	Groundwater	Groundwater contamination		Moderate	Waste must be separated at source and stored in appropriately designated areas for disposal at a licensed facility or by a reputable contractor.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					The design, operation and maintenance of the sewage treatment must be conducted in a manner that can accommodate the number of people it is designed for and be in compliance with the NWA;	
					The sewage management facilities must be monitored and maintained to ensure there are no leaks or discharges;	
					Waste must be separated at source and stored in appropriately designated areas for disposal at a licensed facility or by a reputable contractor;	
					Ensure that a storm water management plan is in place to separate clean and dirty water; and	
	Waste	Generation of additional waste / litter and building		Moderate	All waste generated shall be classified into separate waste	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		rubble / hazardous material during the construction phase.			streams (i.e., general waste, hazardous waste, and recyclables)	
					Waste shall not be mixed prior to classification and all waste types generated must be kept separate.	
					Construction workers must not access stores for hazardous materials without permission.	
8. Decommissioning of existing infrastructure.	Air Quality	Decrease in air quality associated with operational activities including: Wind erosion; Fugitive dust emissions from materials handling operations; and Vehicle entrained dust from roads.	Activity 8	Moderate	The areas of disturbance should be minimised and restricted to the required footprint areas;	Moderate
					The area of disturbance must be restricted to the required footprint size;	
					Demolition activities should be undertaken judiciously during windy periods (winds greater than 5.4 m per second)	
					A dust monitoring system should be installed around the site with	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					dust to be monitored on a monthly basis.	
	Topography and Visual Environment	Disruption of surface water flow		Very Low	The area of disturbance must be minimised to limit the area exposed to wind erosion.	Very Low
		Loss of soil quality		Low	Demolish all unnecessary infrastructures;	Low
		Soil erosion		Low	Ensure that all demolished infrastructure is removed from site's surface; and ensure it disposed of at a certified disposal facility.	Low
	Soil	Compaction of soils during the movement of earth moving machines		Low	Ensure that rehabilitated areas are rehabilitated and vegetated.	Low
		Soil contamination through the spillage of hydrocarbons		Moderate	Ensure that demolished infrastructure is removed off-site and disposed of by a reputable contractor;	Very Low
					All potential hydrocarbon spillages and leaks must be	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					cleaned up immediately and the soils remediated;	
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	
					All vehicles and machinery to be serviced in a hard park area or at an off-site location	
	Fauna and Flora	Loss of fauna and flora		Low	Vehicles with leaks must have drip trays in place.	Very Low
					Restrict vehicles and machinery to existing roads and designated areas to prevent vegetation destruction; and	
					Arrange to remove problem animals in an appropriate manner. Do not kill or injure animals	
					pathways and landscaped open space areas must be planted with indigenous vegetation.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Alien invasive vegetation to be identified and removed throughout the Life of the Project; and	
	Wetlands and Aquatic Ecology	Loss of vegetation		Low	Establish and implement an Alien Invasive Management Programme.	Low
		Loss of wetlands ecosystem		Low	Restrict vehicles and machinery to existing roads and designated areas to prevent vegetation destruction;	Low
		Loss of Aquatic ecology		Low	All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated.	Very Low
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	
					All vehicles and machinery to be serviced in a hard park area or at an off-site location.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Surface Water	Surface water contamination as the result of hydrocarbons spillages		High	Implement a bi-annual Aquatic Monitoring Programme to monitor potential impacts and implement corrective actions, should it be required.	Low
					Reputable and accredited contractors will be used for the transport and disposal of wastes and demolished material off-site;	
					All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated;	
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills; and	
	Noise	Noise impacts on surrounding environment associated with demolishing activities		Moderate	Daytime and night-time noise assessment should be conducted with regards to the surrounding communities.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		(heavy duty vehicles and equipment).				
		Noise and vibrations during demolition of existing infrastructure		Moderate	Ensure demolition activities only take place during daylight hours;	Low
					Demolition related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g., installed exhaust mufflers); and	
					Ensure equipment and machinery is switched off when not in use.	
OPERATIONAL PHASE						
9. Employment of workers	Job Creation	Job creation	Activity 9	Moderate	Preference should be given to the local community	Moderate
10. Transportation of coal from NBC Glisa Colliery to Glisa Siding	Air Quality	Dust generation from the heavy vehicles and equipment	Activity 10	Moderate	Travel speeds of vehicles must be reduced to prevent excessive dust generation.	Moderate
					Dust fallout will be monitored and analysed on a monthly basis.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					All trucks should be covered with sail to prevent dust.	
					A dust suppressant must be undertaken to exposed surfaces and dirt and gravel roads during use	
	Topography and visual environment	Negative visual impact caused by dust generation		Moderate	Limit the footprint area of surface infrastructure.	Low
					Access and service roads should be contoured to limit erosion from surface infrastructure, preventing further alteration to the topography.	
					Construction activities at night must be limited and down lighting must be used to minimise light pollution	
	Wetlands	Loss of wetlands ecosystem		Very Low	No siding activities must take place within 100 m distance of the wetlands, unless stated in the WULA or approved as part of the WUL.	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Siding activities must avoid the wetland systems.	
					Should the wetlands be cleared, a wetland management plan must be implemented.	
	Surface water	Contamination of clean water resources through hydrocarbons spillages		Moderate	All vehicles and equipments must be maintained in order to minimise the risk of leakage and possible contamination of the stormwater by hydrocarbons	Low
	Soils	Soil contamination as the results of hydrocarbon spillages and leaks from movement vehicles		Low	All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated;	Low
		Soil degradation due to compaction from heavy trucks and machinery		Low	Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	Low
		Soil erosion		Low	All vehicles and machinery to be serviced in a hard park area or at off-site locations;	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Vehicles with lead must have drip trays in place.	
					Access routes must be minimised to reduce any unnecessary compaction from occurring; and	
					Should erosion occur corrective actions (as outlined in the soil rehabilitation plan) to be implemented to minimise additional erosion from taking place.	
	Noise	Excessive noise resulting from vehicular activities impacting on surrounding sensitive receptors.		High	Machinery and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers;	Low
					Conduct noise assessment survey which will focused on existing daytime and night-time activities as recommended in SANS 10328:2003.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Equipment must be switched off when not in use	
11. Tipping and storage of coal at the stockpile area	Air Quality	Dust generation emanating from coal dumping and vehicular movement.	Activity 11	Low	The area of disturbance to be kept to a minimum during operational phase activities;	Low
					Drop heights to be minimised when loading or unloading of coal;	
					Travel speeds of vehicles must be reduced to prevent excessive dust generation; and	
					A dust suppressant must be applied to exposed surfaces and dirt and gravel roads during use.	
	Soils	Soil contamination and degradation; and Soil erosion.		Moderate	The stockpile should be compacted, and dirty water run-off be rerouted to the dirty water drains..	Very Low
	Wetlands	Loss of wetlands		Low	No siding activities must take place within 100 m distance of the wetlands, unless stated in the	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					WULA or approved as part of the WUL:	
					Both siding activities must avoid the wetland systems; and	
					Should the wetlands be cleared and mined, a wetland management plan must be implemented.	
	Surface water	Contamination of clean water resources		High	Dirty water from the coal stockpile areas must be diverted by channels and berms and separated from clean water. The dirty water must be stored in the PCD.	Low
					Trucks should be inspected for contamination while offloading.	
					Trucks should be inspected for contamination while offloading.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Stormwater management plan must be implemented with clean and dirty water channels and berms constructed to convert runoff to the appropriate storage dams.	
					No mining activities must take place within 100 m distance of a watercourse, unless stated in the WULA or approved as part of the WUL.	
	Noise	Excessive noise resulting from vehicular activities impacting on surrounding sensitive receptors.		Moderate	Heavy machinery and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers;	Low
					Equipment must be switched off when not in use.	
	Health and safety	Dust from coal may result in long term sickness		High	Any person working near the stockpiles must be made aware of the Personal Protective	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Equipment (PPE) requirements and he/she shall use the prescribed PPE.	
					Dust suppressants must be applied on the stockpiles	
	Groundwater	Creation of pressure head, groundwater mounding and alteration of groundwater gradients		Low	Inflow /recharge into the Glisa Siding coal stock yard is estimated as $3m^3/d$, runoff will be captured by an Pollution Control Dam (PCD) downstream;	Low
		Elevation of SO_4 concentrations inside the Glisa Siding area through disposal of Coal (Export & Local) contaminated water infiltration		High	Construct and operate the coal stockpile areas with liner adequate to maintain Type 4 waste. All waste water should be diverted to PCD.	Moderate
		Contamination plume of elevated concentrations reaching clean water drainage system		Low	Construct and operate the coal stockpile areas with liner adequate to maintain Type 4 waste. All waste water should be diverted to PCD.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		Prolonged contamination of groundwater and surface water, erosion		Moderate	Construct and operate the coal stockpile areas with liner adequate to maintain Type 4 waste. All waste water should be diverted to PCD.	Moderate
		No indication of how to manage seepage water from Glisa Siding Coal stockyard into groundwater		Very Low	Undertake quarterly groundwater monitoring.	Very Low
		Flooding of the Glisa Siding Coal stockyard and surrounding land uses		Low	All water generated from Glisa Stockpile area must be contained with diverted to the PCD.	Low
		Prolonged contamination of groundwater and surface water, erosion		Moderate	All water generated from Glisa Stockpile area must be contained with diverted to the PCD.	Low
		Impact on available groundwater resources and water levels in the area must be minimised		High	Undertake quarterly groundwater monitoring: water levels and quality.	Moderate

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		Potential for acid generating seepage to groundwater from Coal Stockyard and PCD		Low	Construct and operate the coal stockpile areas with to comply with Type 4 waste. All waste water should be diverted to PCD.	Low
		Potential groundwater contamination caused by spillages and accidents Coal Stockyard and PCD		Low	Construct and operate the coal stockpile areas with to comply with Type 4 waste. All waste water should be diverted to PCD.	Low
12.Handling of coal at Glisa Siding.	Air Quality	Dust generation from the vehicular movement	Activity 12	Moderate	Reduce heights to be minimised when handling of coal.	Low
					Travel speeds of vehicles must be reduced to prevent excessive dust generation	
					Dust fallout monitoring programme should be implemented.	
					A dust suppressant must be undertaken to exposed surfaces and dirt and gravel roads during use.	
				Low	Limit the footprint area of surface infrastructure;	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Topography and visual environment	Negative visual impact caused by dust from movement of vehicles.			Access and service roads should be contoured to limit erosion from surface infrastructure, preventing further alteration to the topography; Operation activities at night must be limited and down lighting must be used to minimise light pollution	
	Soil	Soil contamination and degradation		Moderate	Coal stockpile lining management plans should be implemented	Low
	Surface water	Contamination of clean water resources		High	Dirty water from the coal stockpile area must be diverted by channels and berms and separated from clean water. The dirty water must be stored in the PCD. Stormwater management plan must be implemented with clean and dirty water channels and berms constructed to convert	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					runoff to the appropriate storage dams.	
					No Glisa Siding activities must take place within 100 m distance of a watercourse, unless stated in the WULA or approved as part of the WUL.	
	Wetlands	Loss of wetlands		Very Low	No siding activities must take place within 100 m distance of the wetlands, unless stated in the WULA or approved as part of the WUL:	Very Low
					Siding activities must avoid the wetland systems; and	
					Should the wetlands be cleared and mined, a wetland omanagement plan must be implemented.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Noise	Increased noise level emanating from earth moving machinery.		Moderate	Conduct noise assessment survey which will focused on existing daytime and night-time activities as recommended in SANS 10328:2003.	Low
13. Loading of coal on trains	Air Quality	Dust generation from the loading of coal	Activity 13	Moderate	Dust suppression must be undertaken on the exposed surfaces around the Glisa Siding.	Low
		Emissions of noxious gases from the heavy trucks		Moderate	Travel speeds of vehicles must be reduced to prevent excessive dust generation	Low
					Diesel opacity assessment should be conducted.	
					Implement air quality management plans to monitor excessive emissions of gases.	
	Topography and visual impact	Negative visual impact caused by dust		Low	Limit the footprint area of surface infrastructure to the planned disturbance areas.	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Operation activities at night must be limited and down lighting must be used to minimise light pollution.	
	Noise	Excessive noise resulting from vehicular activities impacting on surrounding sensitive receptors.		Moderate	Heavy machinery and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers when required;	Low
					Equipment must be switched off when not in use.	
					Implement noise monitoring programme.	
14. Water use around site.	Soil	Dirty water from the coal contaminates and degradation the soil	Activity 14	High	Dirty water from the coal stockpile areas must be diverted by channels and berms and separated from clean water. The dirty water must be stored in the PCD.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Stormwater management plan must be implemented with clean and dirty water channels and berms constructed to convert runoff to the appropriate storage dams.	
	Surfaced water	Dirty water from the coal causes surface water contamination		High	Stormwater management plan must be implemented with clean and dirty water channels and berms constructed to convert runoff to the appropriate storage dams.	Moderate
					Dirty water from the coal stockkpile areas must be diverted by channels and berms and separated from clean water. The dirty water must be stored in the PCD.	
15. Containment of dirty water into the PCD.	Wetlands	Degradation of wetlands including the contamination and	Activity 15	Very Low	Glisa Siding activities should be conducted at least 500m buffer zone from the wetland systems,	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		sedimentation of the wetlands.			unless stated in the WULA or approved as part of the WUL;	
					The PCD must be constructed and operated according to the NWA requirements:	
					The PCD must have a minimum freeboard of 0.8 m and must be able to contain a 1:50 year, 24-hour storm event: and	
					Should further wetlands areas be cleared and disturbed, a wetland management plan must be implemented.	
	Surface Water	Contamination surface water		High	All water from the coal stockpiles must be diverted and stored in the PCD to prevent the contamination of clean water resources; and	Low
		Risk of collapsing on dam wall		High	The operation and maintenance of the PCD must be in accordance with the NWA	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					requirements and must have a minimum freeboard of 0.8 m.	
					Dam wall should be inspected within a specific time frame in line with the requirements of the NWA.	
	Groundwater	Development of cracks on the surface		Low	The operation and maintenance of the PCD must be in accordance with the NWA Regulations and applicable legal requirements.	Very Low
		Risk of dam overflowing		High	The PCD must be monitored for potential leaks and structure failures;	Low
		Poor lining conditions		Low	Potential leaks and spills must be contained and cleaned up immediately, as well as the leakage location repaired.	Very Low
		Poor quality on ground water		Very High	Implement a groundwater programme to monitor the	Moderate

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					impacts form the stockpile and PCD.	
					Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage.	
	Topography and Visual Environment	Poor scenery		Low	Limit the footprint area of the waste management facilities;	Very Low
					Waste must be stored away from surface water and drainage lines; and	
					General and hazardous waste must be removed and disposed of frequently at a registered disposal site.	
	Air quality	Bad odour due to mixture of hydrocarbons, fuels, and acids.		High	Install water reuse strategy such as dust suppression to avoid affected water to remain in the dam for a longer period.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Biodiversity	Loss of life on aquatic species.		Moderate	Where possible capture of aquatic species struggling to survive at the PCD into freshwater systems.	Very Low
	Health and safety	Risk of drowning when working near water		Moderate	The dam must be fenced to prevent unauthorised access to enter the PCD.	Very Low
					Signages and protective equipments should always be visible on the dam.	
16. Waste and sewage generation and disposal	Soils	Soil contamination and degradation	Activity 16	Moderate	Waste must be separated at source and stored in demarcated areas.	Very Low
	Surface Water	Surface water contamination from sewage generation		Very High	The design, operation and maintenance of the sewage facility must be conducted in a manner that can accommodate the number of people it is designed for and be in compliance with the requirements of NWA.	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		Unauthorised disposal can result in surface water contamination		Very High	The sewage facility must be maintained and monitored at frequent intervals to prevent and detect leaks and discharges;	Low
					Waste must be separated at source and stored in appropriately designated areas for disposal at a licensed facility or by a reputable contractor.	
	Visual	Change in the appearance of the landscape		Moderate	Contracting company should be appointed to manage waste on site.	Low
	Groundwater	Groundwater contamination.		Very High	The design, operation and maintenance of the sewage facility must be conducted in a manner that can accommodate the number of people it is designed for and be in compliance with the requirements of the NWA.	Moderate
					The sewage facility must be monitored and maintained to	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					ensure there are no leaks or discharges;	
					Waste must be separated at source and stored in appropriately designated areas for disposal at a licensed facility or by a reputable contractor.	
					Ensure that a storm water management plan is in place to separate clean and dirty water.	
					Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage.	
	Socio-economic	Opportunity of employment		Moderate	Preference should be given on the local community contracting companies to manage waste	Moderate
17. Refuelling and diesel handling	Soil	Soil contamination and degradation	Activity 17	Very High	All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated;	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	
					Storage of hydrocarbons must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973);	
					Hydrocarbon's storage facilities must be in a hard park bunded facility; and	
					Storm water Management Plans must be implemented and maintained;	
	Surface water	Surface water contamination as the results of spillage and leaks from refuelling and diesel tank		Very High	Storm water Management Plans must be implemented and maintained;	Low
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					All vehicles and machinery to be serviced in a hard park area or at off-site locations;	
					Storage of hydrocarbons and explosives must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973);	
					Hydrocarbons and explosives storage facilities must be in a hard park bunded facility; and	
					Vehicles with leaks must have drip trays in place.	
					Surface water monitoring programme must be undertaken to ensure a sustainable resource and identify impacts on local users.	
	Groundwater	Groundwater contamination.		Very High	All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated;	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	
					All vehicles and machinery to be serviced in a hard park area or at off-site locations;	
					Storage of hydrocarbons must be managed according to the Hazardous Substances Act, 1973 (Act No. 15 of 1973);	
					Hydrocarbons' storage facilities must be in a hard park bunded facility;	
					Vehicles with leaks must have drip trays in place; and	
					Groundwater monitoring of the water quality and levels must be undertaken to ensure a sustainable resource and identify impacts on local users.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Health and safety	Improper use of hazardous material		Moderate	Á competent personnel should be assigned to conduct refuelling of diesel on site All relevant MDSSs should always be on site.	Very Low
Decommissioning and closure phase						
18. Retrenchment	Jobs	Loss of employment as the results of retrenchment	Activity 18	Moderate	Implement retrenchment monitoring programme as per Social and Labour Plan.	Low
19. Demolition of infrastructure	Air Quality	Dust generation from the infrastructure demolition	Activity 19	Moderate	The areas of disturbance should be minimised and restricted to the required footprint areas; The area of disturbance must be restricted to the required footprint size;	Low
		Dust generation from the vehicular movement demolition the infrastructure		Moderate	Demolition activities should not be undertaken during windy periods.	Low
	Topography and Visual Environment	Disruption of surface water flow		Low	The area of disturbance must be minimised to limit the area exposed to wind erosion.	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
		Loss of soil quality		Moderate	Demolish all unnecessary infrastructures;	Very Low
		Soil erosion		Moderate	Ensure that all demolished infrastructure is removed from site's surface; and	Low
	Soil	Soil contamination; and Soil erosion		Moderate	Ensure that rehabilitated areas are rehabilitated and vegetated.	Very Low
					Ensure that demolished infrastructure is removed off-site and disposed of by a reputable contractor;	
					All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated;	
					Spillage control kits will be readily available on site to contain the mobilisation of contaminants and clean up spills;	
					All vehicles and machinery to be serviced in a hard park area or at an off-site location.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Fauna and Flora	Loss of fauna and flora		Moderate	Vehicles with leaks must have drip trays in place.	Low
					Restrict vehicles and machinery to existing roads and designated areas to prevent vegetation destruction; and	
					Alien invasive vegetation to be identified and removed throughout the LoM.	
	Wetlands and Aquatic Ecology	Los of wetlands and vegetation		Moderate	Establish and implement an Alien Invasive Management Programme.	Very Low
					Restrict vehicles and machinery to existing roads and designated areas to prevent vegetation destruction;	
					All potential hydrocarbon spillages and leaks must be cleaned up immediately and the soils remediated;	
					Spillage control kits will be readily available on site to	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					contain the mobilisation of contaminants and clean up spills;	
					All vehicles and machinery to be serviced in a hard park area or at an off-site location; and	
	Surface Water	Surface water contamination as the result of hydrocarbons spillages		Very High	Implement a biannual Aquatic Monitoring Programme to monitor potential impacts and implement corrective actions, should it be required.	Low
					Reputable and accredited contractors will be used for the transport and disposal of wastes and demolished material off-site;	
					All potential hydrocarbon spillages and leaks to be cleaned up immediately and the soils remediated;	
					Spillage control kits will be readily available on site to contain the mobilisation of	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					contaminants and clean up spills; and	
	Noise	Excessive noise resulting from machinery and vehicular activities impacting on surrounding sensitive receptors.		Moderate	Vehicles with leaks must have drip trays in place.	Low
					Ensure demolition activities only take place during daylight hours;	
					Demolition related machines and vehicles should be serviced on a regular basis to ensure noise suppression mechanisms are effective (e.g., installed exhaust mufflers); and	
					Ensure equipment and machinery is switched off when not in use.	
20. Final replacement of topsoil and revegetation	Air quality	Dust generation from the vehicular movement	Activity 20	Moderate	Vegetation to be established as soon as possible to reduce the number of exposed soils to wind and erosion; and	Low
					Dust fallout monitoring should be conducted.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Vegetation establishment to be monitored. Conduct annual vegetation survey of the rehabilitated areas.	
	Topography and Visual Environment	Soil erosion and topsoil loss		Low	The stockpile and siding surface areas must be topsoiled with a layer of at least 0.3m; and	Low
					Once topsoil is placed, the area must be vegetated.	
	Soil	Soil degradation and the decrease in land capability		Moderate	The soil layers must be backfilled in reverse order of stripping, with the subsoil replaced prior to the topsoil;	Very Low
					The yellow and red soils must be replaced in the upland landscape positions, with the wetland soils placed in the lower landscape positions;	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					It is recommended that the soil cover should be at least 0.8 m in depth, consisting of 0.5 m of subsoil and 0.3 m of topsoil on top of the reconstructed profile to mimic the pre-mining land capability. However, the soil cover must be at least 0.3 m depth in order to sustain the identified end land use of grazing:	
					The soil quality must be investigated prior to the establishment of vegetation on the rehabilitated areas through representative sampling and laboratory analysis. Vegetation fertility and soil acidity must be corrected prior to vegetation establishment; and	
					The rehabilitated land must be shaped to emulate the pre-mining drainage patterns.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Fauna and Flora	Invasion of alien invasive vegetation		Moderate	Alien invasive vegetation must be identified and removed throughout the LoM.	Very Low
					Revegetate the landscape with native plant species	
	Surface water	Disruption of surface water flow		Low	Rehabilitation activities must be monitored to ensure that the pre-mining drainage pattern is emulated, and that vegetation establishment is successful;	Very Low
					The backfilled areas should be vegetated as soon as possible to prevent dust and siltation of the water bodies; and	
					Where rehabilitation (grass seeding of topsoil cover) is not effective, the associated soil erosion must be mitigated by installing silt traps in affected areas.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Groundwater	Groundwater contamination		Moderate	The subsoil levelled and shaped material must be compacted where possible and the pre-use drainage pattern must be emulated;	Low
					Groundwater monitoring of the water quality and levels must take place quarterly to identify potential impacts and leaks or seepage. The monitoring programme will assist with the identification of potential AMD occurring. All contaminated water must be contained in the PCD; and	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					The rehabilitation material must be placed in such a manner to reduce the potential leaching impacts on the underlying aquifers. Material with a high neutralising effect needs to be placed at the bottom. The top layers can again be material with a high neutralising capacity. The coal residue that will remain on the stockpile shall be loaded and disposed of as waste at the mine's disposal facility (Discard dump). The top layer needs to ensure free draining of the rainwater from the rehabilitated areas.	
	Noise	Excessive noise resulting from machinery and vehicular activities impacting on surrounding sensitive receptors.		Moderate	Machinery and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers;	Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Equipment must be switched off when not in use.	
21. Waste and sewage handling	Soils	Soil contamination and degradation	Activity 21	Moderate	Waste must be separated at source and stored in demarcated areas.	Low
	Surface Water	Surface water contamination as the result of waste		High	The design, operation and maintenance of the sewage management facility must be conducted in a manner that can accommodate the number of people it is designed for and to comply with the requirements of the NWA;	Low
					The sewage facility must be maintained and monitored at frequent intervals to prevent and detect leaks and discharges;	
					Waste must be separated at source and stored in appropriately designated areas for disposal at a licensed facility or by a reputable contractor.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Groundwater	Groundwater contamination.		High	The design, operation and maintenance of the sewage treatment must be conducted in a manner that can accommodate the number of people it is designed for and to comply with the requirements of the NWA;	Moderate
					The sewage facility must be monitored and maintained to ensure there are no leaks or discharges;	
					Waste must be separated at source and stored in appropriately designated areas for disposal at a licensed facility or by a reputable contractor;	
					Ensure that a storm water management plan is in place to separate clean and dirty water; and	
					Groundwater monitoring of the water quality and levels must	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					take place quarterly to identify potential impacts and leaks or seepage.	
	Health	Create airborne diseases		Moderate	Immediate response to waste for waste removal by certified contractors/personnel.	Low
	Visual and topography	Loss of topographic appearance		Low	Appointment of contracting company should be appointed to manage waste on site	Very Low
Post-closure phase						
22. Post-closure monitoring and rehabilitation	Visual	Abundance of stockpiles	Activity 22	High	Rehabilitation of the area must be done as soon as the siding is decommissioned.	Very Low
					All land will be rehabilitated to a state that facilitates compliance with current national environmental quality objectives including air quality objectives and water quality guidelines.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
	Soil	Soil Compaction		Moderate	During rehabilitation, soil samples should be taken to determine soil chemical and physical parameters to determine amelioration requirements. Treatments specifications from pedologist should be applied.	Very Low
		Soil contamination		Moderate	Monitor area for erosion and pooling and rehabilitate if necessary.	Very Low
		Soil Erosion		Moderate	Machinery should be minimised on site to reduce compaction	Very Low
	Flora	Loss of vegetation		Moderate	Eradicate and control all alien invasive species on-site. Rehabilitate and re-vegetate all areas where alien invasive species were removed.	Very Low
					Rehabilitate disturbed areas with natural indigenous vegetation / seed mix.	

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Monitor rehabilitated areas for cover abundance. Conduct annual vegetation surveys.	
					Suitable species of vegetation are sown / planted and established to achieve the nominated post-siding land uses	
					Monitor and manage rehabilitation areas until the vegetation is self-sustaining	
	Surface and groundwater	Surface and ground water pollution		High	Rehabilitation of the surface infrastructure where necessary to minimize infiltration into the underground water regime (the philosophy of concentration and containment)	Low
					Rehabilitation to minimise contamination of surface water resources (the philosophy of dilution and dispersion).	
	Air quality	Dust generation decreases air quality		Moderate	Dust fallout monitoring should be conducted.	Very Low

Item No.	Aspect	Impact	Activity No	Significance Rating Before Mitigation Measures	Mitigation Measures	Significance Rating After Mitigation Measures
					Dust suppression should be undertaken at all times.	
	Noise	Excessive noise resulting from machinery and vehicular activities impacting on surrounding sensitive receptors.		Low	Machinery and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g., installed exhaust mufflers;	Very Low

12. REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORIZED

12.1. Reasons why the activity should be authorized or not.

No fatal flaws that could not be mitigated in the project have been identified thus through the BAR process. However, several environmental and social impacts are envisaged from construction phase through to post-closure, which will require careful mitigation and monitoring. This includes the concern in respect to the potential dust generation, potential of surface water impacts due to elevated mining related parameters such as sulphates and Total Dissolved Solids, increased traffic between the mine and the siding, impacts to wetland areas as part of the access road. Some positive impacts including potential business and job opportunities are envisaged, although this will be for a short-term period and mostly during the construction phase.

It is the opinion of the EAP that all major impacts have been identified and have been assigned appropriate management measures. Most of the Very High and HIGH negative impacts that were assessed without mitigation measures can be reduced to either MEDIUM or LOW significance when the proposed mitigation measures are implemented and adhered to.

It is recommended by the EAP that the proposed project could be authorised, on the assumption that the environmental and social management commitments included in this BAR and EMPr and as recommended by the specialists will be implemented and adhered to by NBC. The Siding will ensure continued coal supply to Eskom Power Station(s), other local and export markets.

13. UNDERTAKING

The EAP undertakes that the information provided is correct, and that the comments and inputs from stakeholders and Interested and Affected parties will be captured and addressed in the Draft BAR and EMPr.