



Seriti Coal (Pty) Ltd: New Denmark Colliery

Proposed Pyrolysis Plant

Scoping Report

DRAFT FOR PUBLIC COMMENT

Report date: February 2020

Reference: 74 MR



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References

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1. Details of project applicant and environmental assessment practitioner

1.1. Details of the project applicant

Name of operation	New Denmark Colliery
Applicant	Seriti Coal (Pty) Ltd
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Responsible person	Gavin Silver
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Company registration no.	2016/416619/07

1.2. Details of the environmental assessment practitioner

EAP	Shangoni Management Services (Pty) Ltd.: Lee-Anne Fellows
Tel No	(012) 807 7036
Fax No	(012) 807 1014
e-mail Address	leeanne@shangoni.co.za

1.3. Expertise of the environmental assessment practitioner

Name and Surname	Qualifications and summary of experience
Lee-Anne Fellows	Lee-Anne has a B-tech degree in Nature Conservation from the Tshwane University of Technology and holds a National Diploma in Nature Conservation. She gained valuable experience in the conservation and the environmental field through her employment at Gauteng's Department of Agriculture, Conservation and Environment for a period of 5 years. Her areas of expertise include alien invasive surveys & conservation plans, Environmental Impact Assessments (EIA), Environmental Management Programmes (EMP), Section 24G Rectification Applications, Basic Assessments and Project Management. Lee-Anne has 14 years' experience at Shangoni Management Services as project lead to EIA's and EMP's. Lee-Anne has been registered as a Professional Natural Scientist in the field of Conservation Science Registration number: 115574 and is registered as an environmental impact assessment practitioner Registration number: 2019/850.



2. Description of the property

Table 1: Description of the properties applicable to the proposed activities

Fame Name	Remaining Extent of the farm 353 Slagkraal IS
Magisterial District	The New Denmark Colliery is situated in the Lekwa Local Municipality within the Gert Sibande District Municipality in Mpumalanga Province South Africa.
Distance and Direction from Nearest Town	25 km to the south south-east of Secunda 25 km north north-east of Standerton 30 km west of Morgenzon 33 km south south-west of Bethal
21-digit Surveyor General Code	TOIS00000000035300000



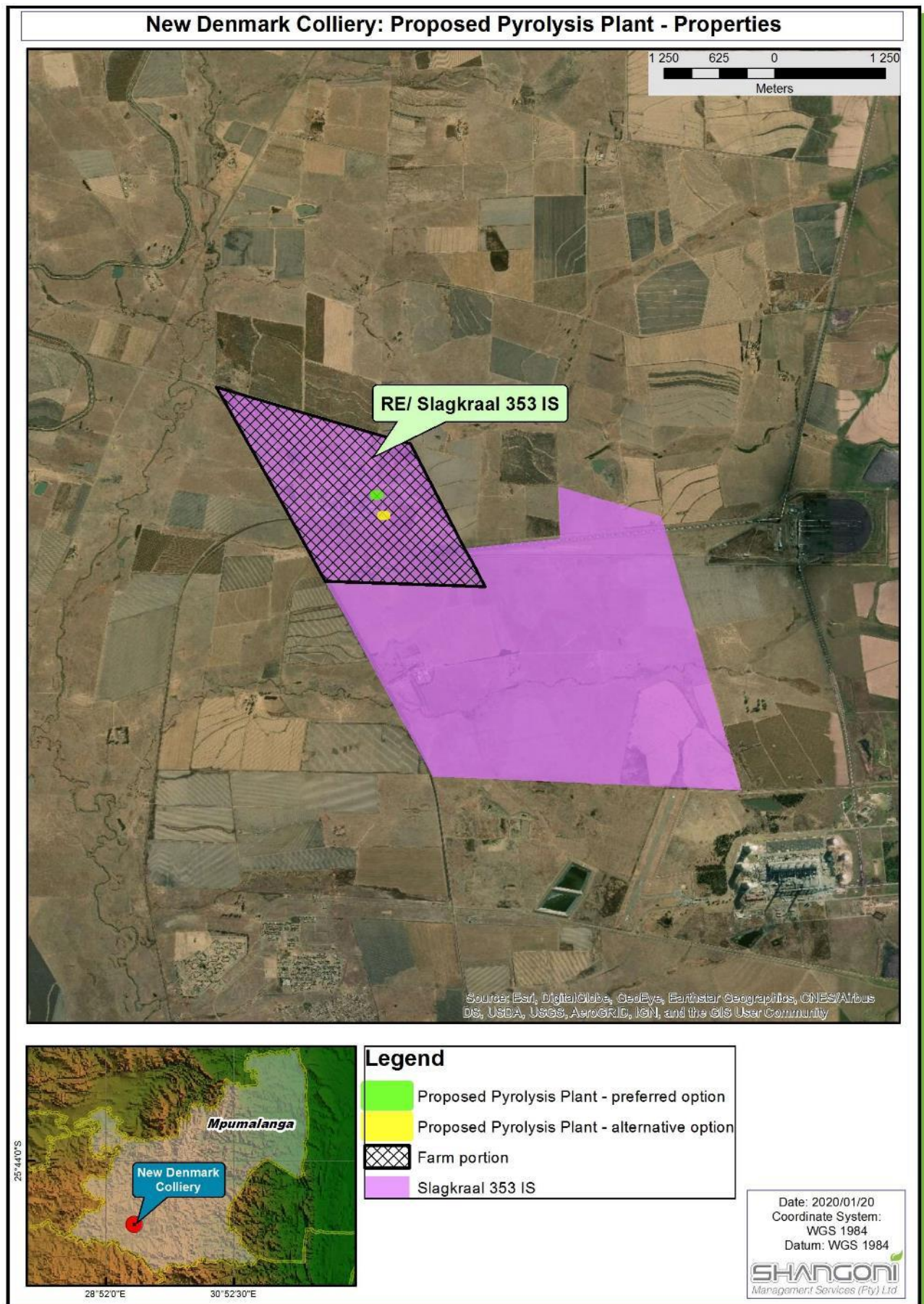


Figure 1: Affected properties associated with the proposed Pyrolysis Plant

3. Locality of the project

3.1. Magisterial district and administrative boundaries

New Denmark Colliery falls within the administrative boundaries presented in Table 2.

Table 2: Administrative boundaries

Province	Mpumalanga Province
District Municipality	Gert Sibande District Municipality
Local Municipality	Lekwa Local Municipality
Ward	13
Department of Mineral and Energy (“DMRE”) Local Office-the Competent Authority (“CA”)	DMRE (Emalahleni)
Department of Human Settlements, Water and Sanitation (“DHWS”) Local Office	DHWS (Bronkhorstspuit)
Department of Agriculture, Rural Development, Land and Environmental Affairs (“DARDLEA”)	DARDLEA (Emalahleni)
Department of Agriculture, Forestry and Fisheries (“DAFF”) Local Office	DAFF (Emalahleni)
Catchment Zone	Grootdraai Dam Catchment
Sub catchments	Leeuspruit, Rietspruit and Blesbokspuit
Water Management Area	Upper Vaal water
Quaternary catchment	C11K, C11H and C12E

3.2. Location of the mine

New Denmark Colliery (“NDC”) is situated in the Mpumalanga Province of South Africa. The mine lies approximately 25 km to the south south-east of Secunda, 25 km north north-east of Standerton, 30 km west of Morgenzon and 33 km south south-west of Bethal. The mine boundary and surrounding areas are well served by provincial and district roads. The main Bethal - Standerton road (R38) flanks the eastern border of the Mining Right Area (“MRA”) area and the main Standerton - Secunda road (R546) passes close to the western border of the MRA. The Central Shaft area is accessed via the district road R1682, the North Shaft area via district road R516 and the Okhazini Shaft area via district road R1545.

3.3. Location of the proposed activities

The activities as part of the proposed Pyrolysis Plant are to be undertaken on the Remaining Extent of the farm Slagkraal 353 IS. The location of the proposed activity is indicated in Figure 3.



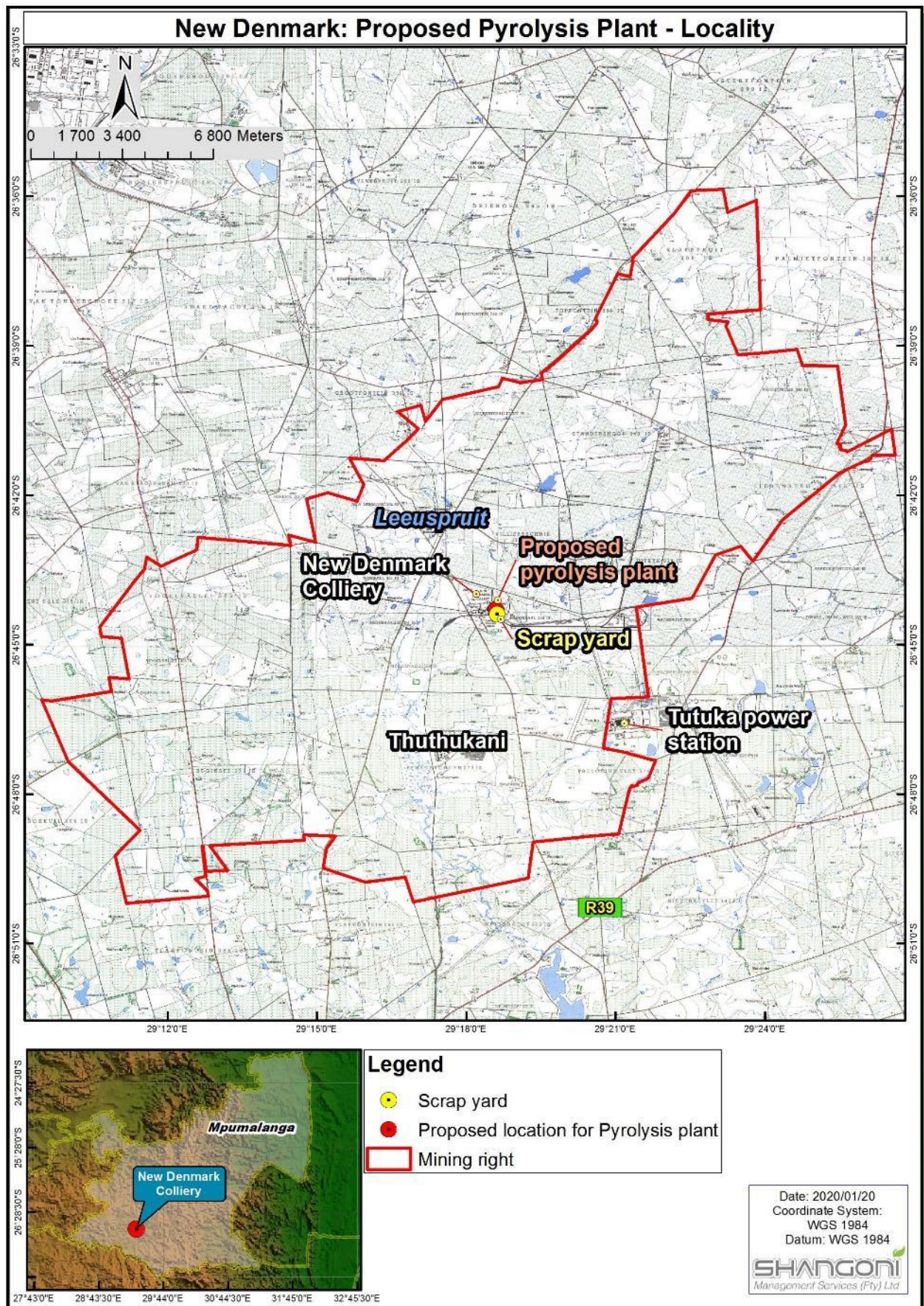


Figure 2: Locality of the proposed activity at New Denmark Colliery



Figure 3: Proposed location of Pyrolysis Plant

4. Description of the scope of the proposed overall activity

4.1. Listed and specified activities applied for

The proposed Pyrolysis Plant will trigger the following authorisations:

- An Environmental Authorisation (“EA”) for listed activities contained in the Environmental Impact Assessment Regulations Listing Notice 2 of 2014 (GN R984 of 4 December 2014) (“GNR 984”), as amended published in terms of Sections 24(2), 24 (5), 24D, 44 and 47(A) (1) (b) of the NEMA.
- Waste Management License (“WML”) in terms of Section 19 of the National Environmental Management Waste Act (Act No. 59 of 2008) (“NEM:WA”) and the List of Waste Management Activities (“GN.R 921”) dated 29 November 2013, as amended.

For the EA and WML applications, a Scoping and Environmental Impact Assessment (“S&EIR”) will be required in compliance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) (“NEMA”) and the NEMA Environmental Impact Assessment Regulations, 2014 (GN R982 of 4 December 2014) (“GN R982”), as amended.

Listed activities have been identified as associated with the proposed Pyrolysis Plant are provided in Table 3. The construction and operational activities have been identified and form part of this application. Decommissioning listed activities do not form part of this application and will be applied for as part of a separate environmental authorisation application prior to undertaking decommissioning in future. The proposed Pyrolysis Plant triggers waste listed activities that are relevant to storage and treatment of general and hazardous waste. These are included in the table below.



Table 3: Activities and listed activities associated with the proposed Pyrolysis Plant

Name of Activity	Arial Extent of Activity Ha or m ²	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985 ¹)	Waste Management Authorisation (Mark with X)	Applicable Waste Activity (GN 921)
Proposed Pyrolysis Plant					
The development ² of a Pyrolysis Plant situated within the existing salvage yard area at Central Shaft and within the Mining Right Area of New Denmark Colliery. The plant will generate 1000 kW of power from 1000 kg of dry waste.	10 000 m ²	X	Activity 6 of Listing Notice 2 (GNR 984 of GG 40772 of 7 April 2017): <i>The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.</i>	X	<u>Category A Activity 12:</u> <i>The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity)</i> <u>Category B: Activity 10:</u> <i>The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).</i>
General waste will be sorted, shredded, grinded, crushed and/or bailed before the pyrolysis process at the scrap yard.	10 000 m ²	NA ³	NA	X	<u>Category C Activity 6:</u> <i>The sorting, shredding, grinding, crushing, screening or baling of general waste at a waste facility that has an operational area that is 1000m² and more.</i>

¹ GNR 985 was taken into account when a review of the proposed activities was done, however, no such activities are triggered.

² “development” means the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same facility in the same location, with the same capacity and footprint.

³ NA= Listed and specified activities were considered when a review of the proposed activities was done, however, no listed or specified activities are triggered.



Name of Activity	Arial Extent of Activity Ha or m ²	Listed Activity (Mark with X)	Applicable Listing Notice (GN R983, GN R984, GN R985 ¹)	Waste Management Authorisation (Mark with X)	Applicable Waste Activity (GN 921)
The reuse or recycling of hazardous waste in excess of 1 ton per day at the Pyrolysis Plant.	10 000 m ²	NA	NA	X	<u>Category B: Activity 2:</u> <i>The reuse or recycling of hazardous waste in excess of 1 ton per day.</i>
The treatment of hazardous waste at the Pyrolysis Plant to handle 1 ton of waste per day.	10 000 m ²	NA	NA	X	<u>Category B: Activity 4:</u> <i>The treatment of hazardous waste in excess of 1 ton per day calculated as a monthly average; using any form of treatment.</i>
The storage of general waste at the scrap yard.	600 m ²	NA	NA	X	<u>Category C: Activity 1:</u> <i>The storage of general waste at a facility that has the capacity to store in excess of 100m³ of general waste at any one time.</i>
The storage of hazardous waste at the scrap yard.	600 m ²	NA	NA	X	<u>Category C: Activity 2:</u> <i>The storage of hazardous waste at a facility that has the capacity to store in excess of 80m³ of hazardous waste at any one time.</i>



4.2 Description of the proposed activities to be undertaken

NDC is an underground mine and has been operational since 1983, extracting coal through both bord-and-pillar and longwall mining methods. The coal mined at NDC is transported via conveyors, from the Central Shaft to the stockyard located at Eskom's Tutuka Power Station. The mine comprises four main operations areas, namely Central Shaft, North Shaft, Okhozini Shaft and a Crusher Plant. Infrastructure (such as offices, workshops, etc.) has been provided at all three shafts, but the main surface operations are located at Central Shaft. The mine's main offices are located adjacent to Central Shaft. The coal mined at NDC is supplied to Eskom's Tutuka Power Station, to generate power for the national grid. The coal is transported via conveyors, from the Central Shaft and the North Shaft, to the stockyard located at Eskom's Tutuka Power Station. The contaminated surface water is accumulated within the Stockyard Dam (the main pollution control dam). The groundwater pumped out of the underground workings is pumped to the Stockyard Dam. Water from the Stockyard Dam is then pumped to the Tutuka Power Station for treatment via reverse osmosis. In the treatment of the mine contaminated water, brine is produced that used to be stored in the 321-underground compartment, but since 2014 the brine is pumped to the constructed Brine Ponds, for which NDC has a Water Use Licence ("WUL").

NDC proposes to install a pyrolysis plant to incinerate waste produced on the mine and convert the energy into electricity.

Proposed Pyrolysis Plant

The intended use of the proposed plant is as a swallow-all facility for the general and hazardous wastes produced by the mine. Any exclusions from the feed material are still to be determined by the waste analysis. The core technology is pyrolysis, which is the thermal degradation in the absence of air and oxygen. The plant consists of a size reduction area, a pyrolysis unit, condensers and gas clean-up section, and engines that will use syngas produced in the process to produce electricity. Waste is fed to a shredding system in the amount of 1000 kg/hr dry basis where the size is reduced. The shredder reduces the incoming waste to a passing size of 15 mm. The shredder discharge is then fed to a storage silo that will hold the waste before being fed into a dryer where moisture is removed to less than 10 % by mass.

The pyrolysis reactor (phase pyrolizer) converts the feed material through various thermochemical reactions into a vapour product containing liquid (oil) and gas (syngas) fractions, and a solid product (residue/char). The pyrolizer is heated externally by combustion of Liquefied Petroleum Gas ("LPG"), syngas or solid residue from the pyrolysis process. The actual conversion takes place inside the reactor, in the absence of oxygen, thus preventing combustion of the feed material from taking place and allowing for production of higher calorific value gas at the exit. The pyrolysis reactor is sized for a load of 1000 kg/hr on a dry basis. Down-stream equipment is sized for the maximum expected gas flow rate as the design basis. The maximum expected gas flows are determined by testing representative samples on Technotherms laboratory scale pyrolysis reactors. The vapour discharge is separated from the residue product in a dropout box and further in a hot gravity settling chamber and hot cyclone. The vapour product proceeds to the gas clean-up section and the residue product proceeds to the pyrolysis



furnace where it is combusted to recover any remaining energy. The vapour product passes through a heat exchanger followed by three condensers to remove all condensable material at standard temperature and pressure ("STP") and possibly a scrubber to remove any entrained solids and liquids from the gas product. A secondary gas clean-up line is installed as a standby.

The gas is then taken for storage in a gas bladder from which it is diverted for use in the pyrolysis furnace should more energy be required by the pyrolysis reactor, or to gas engines that generate electricity. The gas bladder also serves the purpose of homogenising the produced gas to improve process stability. The liquid product removed in the condensers are used as a secondary fuel for the pyrolysis process and are combusted to provide heat on the outside of the reactor. Waste products from the process include combustion gases and scrubber discharge/blowdown. Any oil spillage due to leakages and blockages will be cleaned up with an oil clean-up kit (saw dust/wood shavings/chemical adsorbent) and either pyrolyzed or sent for correct disposal. In the interest of operational health and safety, any oil will be treated as hazardous prior to full material safety data sheets being established.



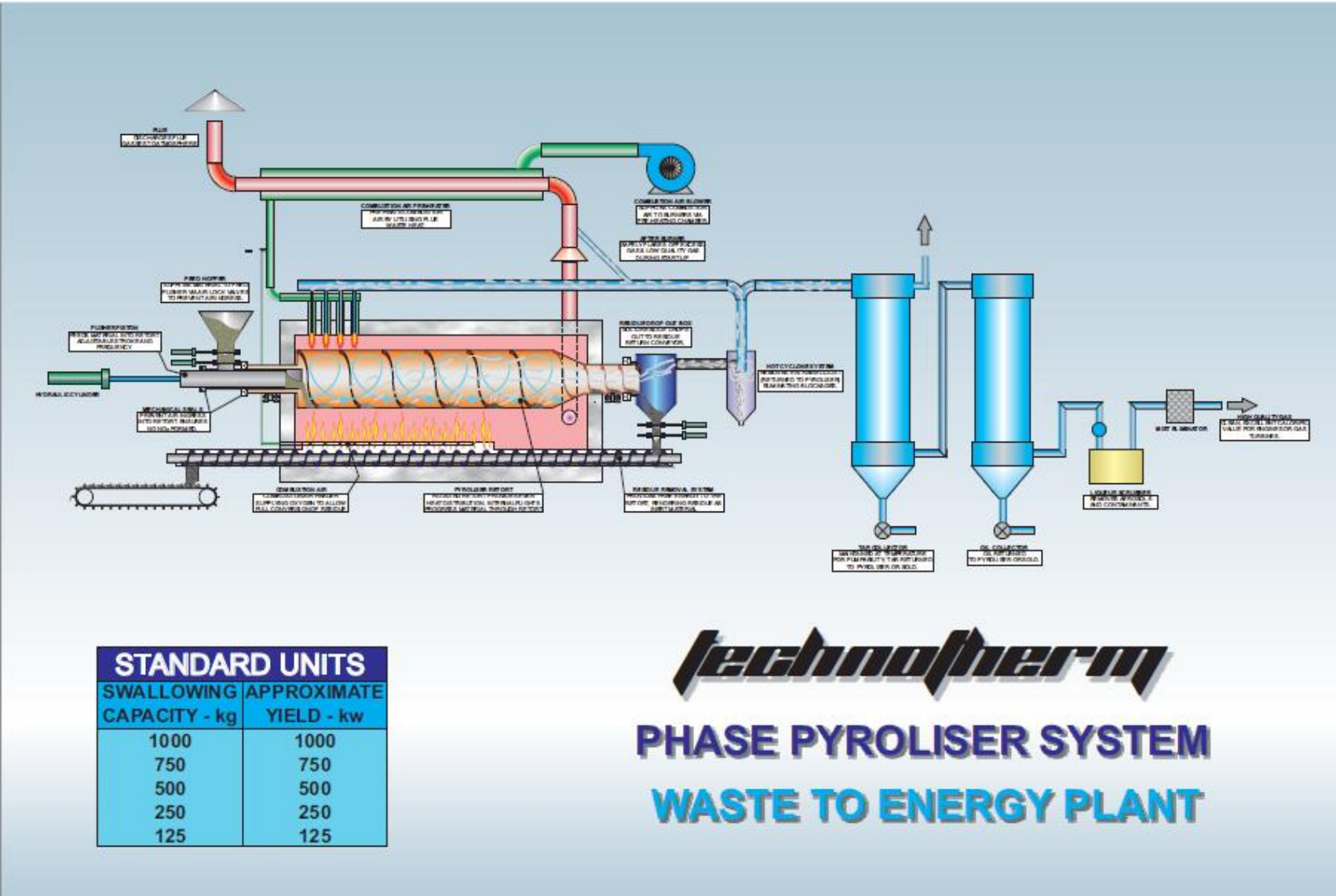


Figure 4: Proposed Pyrolysis Plant with 1000 kg swallowing capacity



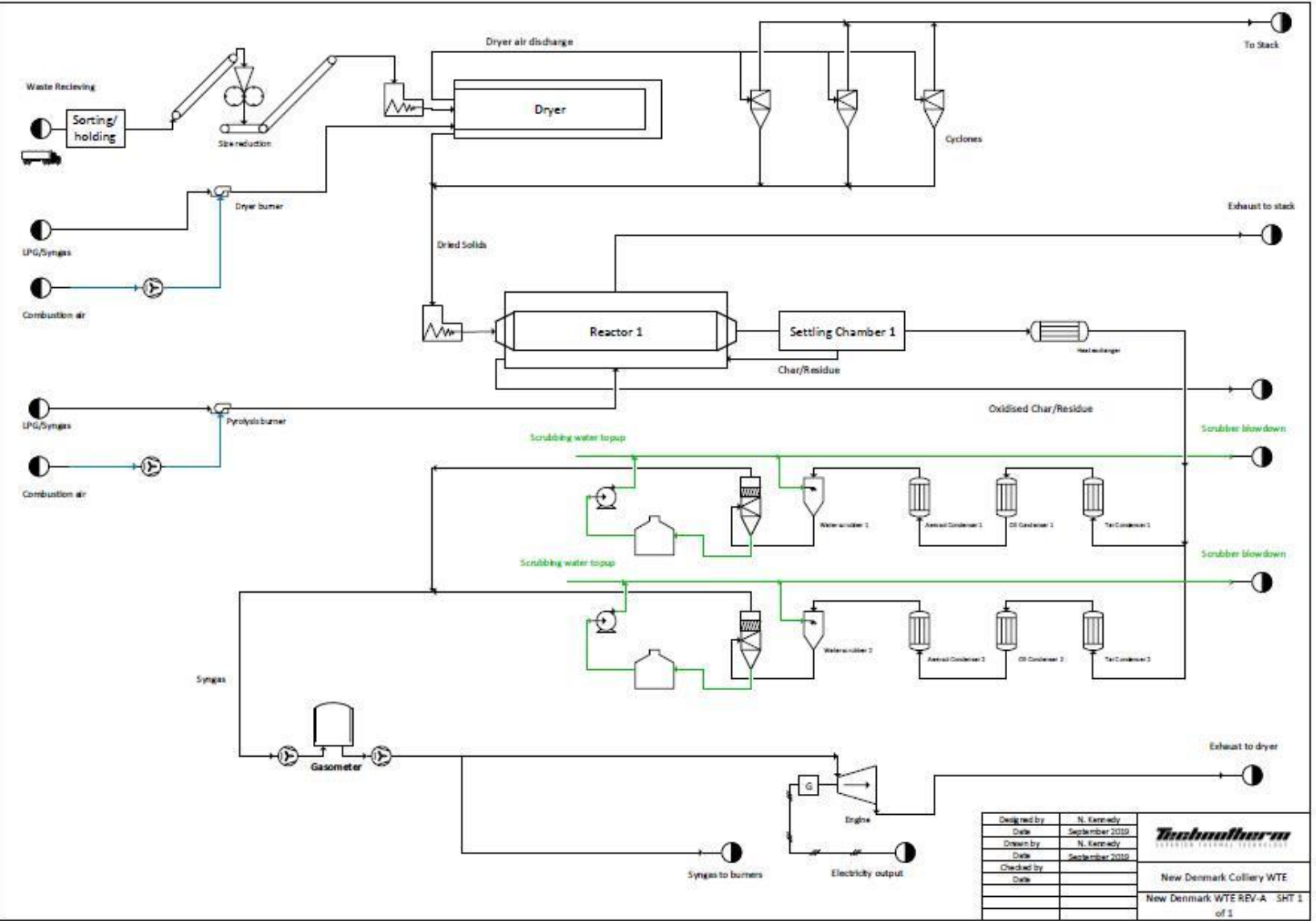


Figure 5: Proposed process flow for the Pyrolysis Plant



5. Policy and legislative context

The following table is a summary of the policy and legislative context applicable to the proposed development.

Table 4: Policy and legislative context

Applicable Legislation and Guidelines used to compile the Report	Reference where applied	Compliance and response of the proposed project
The Constitution of the Republic of South Africa, 1996.	Throughout this Scoping Report.	The Constitution of the Republic of South Africa was considered and applied to throughout the Scoping report as the Constitution states that everyone has the right – (a) to an environment that is not harmful to their health or well-being; and (b) To have the environment protected, for the benefit of present and future generations.
The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002, as amended).		The 2009 approved EMPr will be amended in terms of section 102 of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002), to include for the proposed Pyrolysis Plant. The amendment will be done as part of the Environmental Impact Assessment Report and Environmental Management Programme Report (“EIAR and EMPr”).
The Mineral and Petroleum Resources Development Regulations (GN R527 dated 2004).		The EMPr amendment to be conducted as part of the EIAR and EMPr will comply to the requirements of the Mineral and Petroleum Resources Development Regulations (GN R527 dated 2004).
The National Environmental Management Act (Act No. 107 of 1998 as amended).		The Scoping Report has been compiled in terms of GN R.982, promulgated in terms of Sections 24(5), 24M and 44 of the National Environmental Management Act, Act No. 107 of 1998 (“NEMA”).
The Environmental Impact Assessment Regulations (GN R982 dated 2014, as amended).		The Scoping Report was compiled in terms of the requirements of Appendix 2 of the Environmental Impact Assessment (“EIA”) Regulations (GN R.982 dated 2014, as amended).
The Environmental Impact Assessment Regulation. Listing Notice 1. (GN R983 dated 2014, as amended).	Part 4.1 of this Scoping Report.	Listing notice 2 activities are applied for the proposed Pyrolysis Plant.
The Environmental Impact Assessment Regulation. Listing Notice 2. (GN R984 dated 2014, as amended).		
Integrated Environmental Management Guideline:	Part 6.1 of this Scoping Report.	The need and desirability were assessed for the proposed Pyrolysis Plant . The proposed Pyrolysis



Applicable Legislation and Guidelines used to compile the Report	Reference where applied	Compliance and response of the proposed project
Guideline on Need and Desirability (2017).		Plant will use general and hazardous waste to generate electricity.
Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector.	Chapters E, F and L of Part 8.4.1; and Part 8.4.4 of this Scoping Report.	Biodiversity related to the Pyrolysis Plant was considered when sites were selected, and alternatives considered.
Regulations on use of water for mining and related activities aimed at the protection of water resources published in terms of the National Water Act under Government Notice 704 of 4 June 1999 (GN R704).	Part 9.9 and Chapter G of Part 8.4.1 of this Scoping Report.	Storm water management measures, in compliance to GN R704, will be implemented at the proposed Pyrolysis Plant and associated infrastructure.
The National Environmental Management: Biodiversity (Act 10 of 2004, as amended).	Chapter E, F and L of Part 8.4.1 of this Scoping Report.	Biodiversity related to the Pyrolysis Plant was considered when sites were selected, and alternatives considered. No permits and/or licences in terms of National Environmental Management: Biodiversity (Act 10 of 2004, as amended) will be required for the proposed Pyrolysis Plant .
Alien and Invasive Species Regulations (GN R598 dated 2014).		The occurrence of alien and invasive species will be assessed and mitigated (in accordance to these regulations) during the construction and operational phases of the proposed Pyrolysis Plant .
Conservation of Agricultural Resources (Act 43 of 1983).		Erosion potential will be assessed and mitigated (in accordance to this act) during the construction and operational phases of the proposed Pyrolysis Plant.
The National Environmental Management: Air Quality (Act 39 of 2004, as amended).	Chapter I of Part 8.4.1 of this Scoping Report.	The proposed Pyrolysis Plant require an Atmospheric Emissions Licence ("AEL"); this will be applied for by NDC.
SABS Code of Practice 0103 of 2008: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication. SABS Code of Practice 0328 of 2008:	Chapter J of Part 8.4.1 of this Scoping Report.	The SABS Code of Practice 0103 will be taken into account when the mitigation measures for the proposed Pyrolysis Plant are formulated.



Applicable Legislation and Guidelines used to compile the Report	Reference where applied	Compliance and response of the proposed project
Environmental Noise Impact Assessments.		
National Environmental Management: Waste Act (Act No. 59 of 2008, as amended).	Part 4.1 of this Scoping Report.	Various waste management activities are applied for as part of the proposed Pyrolysis Plant.
National Heritage Resources Act (Act No. 25 of 1999, as amended).	Chapter K of Part 8.4.1 of this Scoping Report.	No archaeological or historical sites are affected by and in close proximity to the proposed Pyrolysis Plant.
DMRE Guideline for Consultation with communities and Interested and Affected Parties. As required in terms of Sections 16(4)(b) or 27(5)(b) of the MPRDA, and in accordance with the standard directive for the compilation thereof as published on the official website of the Department of Mineral Resources.	Part 8.2 and 9.7 of this Scoping Report.	The public participation process was done in accordance to the DMRE guideline for consultation with communities and interested and affected parties. The surface rights are owned by farmers, which are included in the process. However, the communities are critical to the proposed Pyrolysis Plant as the project will be operated by a contractor from the community.
Integrated Environmental Management Information Series. Criteria for determining alternatives in EIA.	Part 8.7 and Part 9.1 of this Scoping Report.	Location, technology and no-go alternatives were assessed for the proposed Pyrolysis Plant .

6. Need and desirability of the proposed activities

6.1. Need and desirability in terms of the guideline on need and desirability, 2017

In 2017, the then Department of Environmental Affairs published an Integrated Environmental Management Guideline, the Guideline on Need and Desirability. The following table indicates on how the guideline requirement were considered in this Scoping Report.



Table 5: Need and Desirability of the proposed activities

Requirement	Part where requirement is addressed/response
1. How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?⁴	
1.1 How were the following ecological integrity considerations taken into account?	
1.1.1 <i>Threatened Ecosystems⁵</i>	
1.1.2 <i>Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure⁶</i>	The project will have a minimal impact on the ecological integrity of the area as the area selected for the Pyrolysis Plant is already disturbed (salvage yard). Refer to Chapters E, F and L of Part 8.4.1 of this Scoping Report and Part 8.5 for potential impacts.
1.1.3 <i>Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs").</i>	
1.1.4 <i>Conservation targets</i>	
1.1.5 <i>Ecological drivers of the ecosystem.</i>	
1.1.6 <i>Environmental Management Framework.</i>	The Lekwa Local Municipality's Integrated Development Plan 2018/19, states that two-thirds of the Lekwa economy is mining, trade, community services and manufacturing. Regionally mining accounts for 11.2% in the Lekwa region.
1.1.7 <i>Spatial Development Framework.</i>	This application relates to the Pyrolysis Plant. The Pyrolysis Plant will have minimal impact on the ecological integrity of the area.
1.1.8 <i>Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)⁷</i>	Anticipated emissions from the Pyrolysis Plant (i.e. carbon dioxide, dioxins and furans) will have an impact on the air quality in the area. The impacts will be further discussed and assessed in greater detail as part of the Environmental Impact Assessment Report and Environmental

⁴ Section 24 of the Constitution and section 2(4)(a)(vi) of NEMA refer.⁵ Must consider the latest information including the notice published on 9 December 2011 (Government Notice No. 1002 in Government Gazette No. 34809 of 9 December 2011 refers) listing threatened ecosystems in terms of Section 52 of National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).⁶ Section 2(4)(r) of NEMA refers.⁷ Section 2(4)(n) of NEMA refers

Requirement	Part where requirement is addressed/response
	Management Programme Report ("EIAR and EMPr").
1.2 How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts? ⁸	The preliminary potential impacts that have been identified and may occur as a result of the proposed activity have been discussed in Part 8.5 of this document. The impacts will be further discussed and assessed in greater detail as part of the EIAR and EMPr.
1.3 How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts? ⁹	
1.4 What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste? ¹⁰	General waste, hazardous waste, duff material, tyres and conveyor belts will be fed into the proposed Pyrolysis Plant to generate electricity. The end product will be ash that will be disposed of in accordance with the results of the waste classification. Scrap metal and glass that cannot be fed into the Pyrolysis Plant will be disposed of according to the Seriti Coal waste management procedure.
1.5 How will this development disturb or enhance landscapes and/or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts? ¹¹	The proposed Pyrolysis Plant will not impact any cultural heritage of the area as the plant will be located at the salvage yard, which is a disturbed area.
1.6 How will this development use and/or impact on non-renewable natural resources? What	The proposed Pyrolysis Plant will reduce the impact on non-renewable natural resource, as

⁸ Section 24 of the Constitution and Sections 2(4)(a)(i) and 2(4)(b) of NEMA refer.⁹ Section 24 of the Constitution and Sections 2(4)(a)(ii) and 2(4)(b) of NEMA refer¹⁰ Section 24 of the Constitution and Sections 2(4)(a)(iv) and 2(4)(b) of NEMA refer¹¹ Section 24 of the Constitution and Sections 2(4)(a)(iii) and 2(4)(b) of NEMA refer.

Requirement	Part where requirement is addressed/response
measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts? ¹²	less electricity will be bought from coal-fired power stations by NDC, and the mine's waste will be used to generate electricity. The potential impacts that may occur as a result of the proposed activities have been preliminarily identified and discussed in Part 8.5. The impacts will be described and assessed in detail as part of the EIAR and EMPr.
1.7 How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? ¹³	
1.7.1 <i>Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? (note sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life)</i>	The 20-year life of mine will maximise the utilisation of coal resources within the NDC's Mining Right.
1.7.2 <i>Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity</i>	

¹² Section 24 of the Constitution and Sections 2(4)(a)(v) and 2(4)(b) of NEMA refer¹³ Section 24 of the Constitution and Sections 2(4)(a)(vi) and 2(4)(b) of NEMA refer

Requirement	Part where requirement is addressed/response
<i>costs of using these resources this the proposed development alternative?)</i>	
<i>1.7.3 Do the proposed location, type and scale of development promote a reduced dependency on resources?</i>	
1.8 How were a risk-averse and cautious approach applied in terms of ecological impacts? ¹⁴	<p>The Pyrolysis Plant will have a minimal impact on the ecological integrity of the area. Refer to Chapters E, F and L of Part 8.4.1 of this Scoping Report and Part 8.5 for potential impacts.</p> <p>A conservative approach will be followed in terms of the identification and assessing of environmental impacts associated with the proposed project during the EIAR and EMPr.</p>
<i>1.8.1 What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?</i>	Refer also to Part 8.6.2 of this Scoping Report.
<i>1.8.2 What is the level of risk associated with the limits of current knowledge?</i>	<p>The level of risk associated with the limits of current knowledge (during the Scoping Phase) can be considered low. The potential risks have been identified in Part 8.5 and will be further assessed in detail as part of the EIAR and EMPr.</p>
<i>1.8.3 Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</i>	
1.9 How will the ecological impacts resulting from this development impact on people's environmental right in terms following: ¹⁵	
<i>1.9.1 Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</i>	<p>All potential negative and positive impacts associated with the proposed activities have been preliminarily identified and discussed in Part 8.5 below. These impacts will be discussed, assessed and the significance determined during the EIAR and EMPr.</p>
<i>1.9.2 Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?</i>	
1.10 Describe the linkages and dependencies between human wellbeing, livelihoods and	

¹⁴ Section 24 of the Constitution and Section 2(4)(a)(vii) of NEMA refer.

¹⁵ Section 24 of the Constitution and Sections 2(4)(a)(viii) and 2(4)(b) of NEMA refer



Requirement	Part where requirement is addressed/response
ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	
1.11 Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	
1.12 Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations? ¹⁶	Refer to Part 8.1 of this report for an assessment of the alternatives identified.
1.13 Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area? ¹⁷	A preliminary determination of the potential impacts associated with the proposed activities has been included in Part 8.5 of this document. These impacts (including the residual and cumulative impacts) will be described and assessed in detail and the significance determined as part of the EIAR and EMP.
2. "Promoting justifiable economic and social development"¹⁸	
2.1 What is the socio-economic context of the area, based on, amongst other considerations, the following considerations?	
2.1.1 <i>The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,</i>	The Lekwa Local Municipality's Integrated Development Plan 2018/19, states that two-thirds of the Lekwa economy is mining, trade, community services and manufacturing. Regionally mining accounts for 11.2% in the Lekwa region.
2.1.2 <i>Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),</i>	This application relates to the proposed Pyrolysis Plant that will assist in waste disposal.

¹⁶ Section 2(4)(b) of NEMA refer¹⁷ Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer¹⁸ Section 24 of the Constitution refers.

Requirement	Part where requirement is addressed/response	is
2.1.3 <i>Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and</i>		
2.1.4 <i>Municipal Economic Development Strategy (“LED Strategy”).</i>		
2.2 Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?		
2.2.1 <i>Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?</i>		
2.3 How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities? ¹⁹		
2.4 Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? ²⁰ Will the impact be socially and economically sustainable in the short- and long-term?		
In terms of location, describe how the placement of the proposed development will: ²¹		
2.4.1 <i>result in the creation of residential and employment opportunities in close proximity to or integrated with each other,</i>	This application relates to the proposed Pyrolysis Plant that will assist in waste disposal and further mining of coal that will continue to contribute to the Socio Economy in the area.	
2.4.2 <i>reduce the need for transport of people and goods,</i>		
2.4.3 <i>result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),</i>		
2.4.4 <i>compliment other uses in the area,</i>		

¹⁹ Section 2(2) of NEMA refers²⁰ Sections 2(2) and 2(4)(c) of NEMA refers.²¹ Section 3 of the Development Facilitation Act, 1995 (Act No. 67 of 1995) ("DFA") and the National Development Plan refer

Requirement	Part where requirement is addressed/response
2.4.5 be in line with the planning for the area,	
2.4.6 for urban related development, make use of underutilised land available with the urban edge,	
2.4.7 optimise the use of existing resources and infrastructure,	
2.4.8 opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),	
2.4.9 discourage “urban sprawl” and contribute to compaction/densification,	
2.4.10 contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,	
2.4.11 encourage environmentally sustainable land development practices and processes,	The proposed Pyrolysis Plant will generate electricity from waste material generated at the mine that would have been disposed of at landfill. Less electricity will be required from Eskom and the mine can become self-sustainable in the long run. Refer to Part 9.9. Detailed management and mitigation measures will be included in the EIAR and EMPr.
2.4.12 take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),	Refer to section 8.1 for details of alternatives.
2.4.13 the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),	This application relates to the proposed Pyrolysis Plant that will assist in minimising waste disposal.
2.4.14 impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and	



Requirement	Part where requirement is addressed/response
2.4.15 <i>in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?</i>	A conservative approach will be followed in terms of the identification and assessing of environmental impacts associated with the proposed project during the EIAR and EMPr
2.5 How were a risk-averse and cautious approach applied in terms of socio-economic impacts? ²²	
2.5.1 <i>What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?²³</i>	Since the project is still in the scoping phase, the level of risk associated with the limits of current knowledge is low.
2.5.2 <i>What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?</i>	
2.5.3 <i>Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?</i>	
2.6 How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following	
2.6.1 <i>Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?</i>	<p>This application relates to the proposed Pyrolysis Plant that will assist in minimising waste disposal.</p> <p>The proposed Pyrolysis Plant will have an impact on the air quality of the surrounding area, however, the plant is designed to comply to the air quality standards and national ambient minimum emission standards.</p>
2.6.2 <i>Positive impacts. What measures were taken to enhance positive impacts?</i>	Refer to Part 8.7 of this report for an identification of the positive impacts.
2.7 Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in	The preliminarily identified impacts of the proposed activities are presented in Part 8.5 of this document.

²² Section 2(4)(a)(vii) of NEMA refers²³ Section 24(4) of NEMA refers

Requirement	Part where requirement is addressed/response
ecological impacts (e.g. over utilisation of natural resources, etc.)?	
2.8 What measures were taken to pursue the selection of the “best practicable environmental option” in terms of socio-economic considerations? ²⁴	
2.9 What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? ²⁵ Considering the need for social equity and justice, do the alternatives identified, allow the “best practicable environmental option” to be selected, or is there a need for other alternatives to be considered?	Refer to Part 8.1 of this report for an assessment of the alternatives identified and their potential impacts on the social environment.
2.10 What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination? ²⁶	Refer to point 2.6 (of this table) above.
2.11 What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development’s life cycle? ²⁷	The identification of the potential impacts has been presented in Part 8.5 below. The potential impacts will be further described and assessed in detail and the significance determined as part of the EIAR / EMPr phase of the project. Mitigation measures will also be provided for each potential impact that may occur.
2.12 What measures were taken to:	
2.12.1 <i>ensure the participation of all interested and affected parties,</i>	Refer to the Public Participation Report attached hereto as Annexure D.

²⁴ Section 2(4)(b) of NEMA refers.²⁵ Section 2(4)(c) of NEMA refers.²⁶ Section 2(4)(d) of NEMA refers.²⁷ Section 2(4)(e) of NEMA refers.

Requirement	Part where requirement is addressed/response
2.12.2 <i>provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation,</i> ²⁸	
2.12.3 <i>ensure participation by vulnerable and disadvantaged persons,</i> ²⁹	
2.12.4 <i>promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means,</i> ³⁰	
2.12.5 <i>ensure openness and transparency, and access to information in terms of the process,</i> ³¹	
2.12.6 <i>ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge</i> ³² , and	
2.12.7 <i>ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein were being promoted?</i> ³³	Refer to the Public Participation Report attached hereto as Annexure D. The Public Participation Report presents the detail of all Interested and Affected Parties (“I&APs”) that were identified, how the I&APs were notified and involved in the process, any issues and concerns raised by the I&APs, and the final results of the Public Participation Process.
2.13 Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)? ³⁴	

²⁸ Section 2(4)(f) of NEMA refers²⁹ Section 2(4)(f) of NEMA refers.³⁰ Section 2(4)(h) of NEMA refers.³¹ Section 2(4)(k) of NEMA refers.³² Section 2(4)(g) of NEMA refers.³³ Section 2(4)(q) of NEMA refers.³⁴ Section 2(4)(g) of NEMA refers.

Requirement	Part where requirement is addressed/response
2.14 What measures have been taken to ensure that current and/or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected? ³⁵	All contractors, sub-contractors and workers will attend compulsory environmental awareness training and inductions. This training will highlight the dangers associated with the workplace. Procedures relating to environmental risks will also be put in place and will be regularly updated.
2.15 Describe how the development will impact on job creation in terms of, amongst other aspects	
2.15.1 <i>the number of temporary versus permanent jobs that will be created,</i>	This application relates to the proposed Pyrolysis Plant that will assist in reducing waste disposal.
2.15.2 <i>whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area),</i>	
2.15.3 <i>the distance from where labourers will have to travel,</i>	
2.15.4 <i>the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits), and</i>	
2.15.5 <i>the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.).</i>	
2.16 What measures were taken to ensure:	
2.16.1 <i>that there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment, and</i>	Refer to the Public Participation Report attached hereto as Annexure D. Other government departments are included on the list of I&APs and stakeholders and received the notifications of the proposed activity as well as notifications on the availability of the report for review. All applicable environmental legislation was considered during the scoping process.
2.16.2 <i>that actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?</i>	
2.17 What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will	During the initial Public Participation Process, all issues and concerns raised by the I&APs, stakeholders and the Organs of State are considered, and responses provided.

³⁵ Section 2(4)(j) of NEMA refers

Requirement	Part where requirement is addressed/response
be protected as the people's common heritage? ³⁶	
2.18 Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left? ³⁷	Mitigation measures for each of the identified impacts will be described in detail in the EIAR and EMPr. The proposed mitigation measures will be realistic to protect both the bio-physical and socio-economic environment in both the short- and long-term.
2.19 What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment? ³⁸	The applicant will be responsible for the costs of any remediation of pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects. The Financial Provisioning for the proposed project will be included and discussed in detail in the EIAR and EMPr.
2.20 Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations? ³⁹	<p>The alternatives for the proposed project are described in Part 8.1 below and assessed in terms of the following four categories:</p> <ul style="list-style-type: none"> • Environmental; • Technical/Engineering; • Economical; and • Social. <p>The alternatives will be further assessed in greater detail in the EIAR and EMPr phase</p>
2.21 Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area? ⁴⁰	The preliminarily identified impacts have been presented in Part 8.5 below. The impacts will be further described and assessed, and the significance determined as part of the EIAR and EMPr. All residual and cumulative impacts will also be described and assessed in the EIAR and EMPr.

³⁶ Section 2(4)(o) of NEMA refers.

³⁷ Section 240(1)(b)(iii) of NEMA and the National Development Plan refer.

³⁸ Section 2(4)(p) of NEMA refers.

³⁹ Section 2(4)(b) of NEMA refers.

⁴⁰ Regulations 22(2)(i)(i), 28(1)(g) and 31(2)(1) in Government Notice No. R. 543 refer.



7. Period for which environmental authorisation is required

New Denmark Colliery's Mining Right is valid until 2039. Therefore, the period for which environmental authorisation is required is at least 20 years (from the date of approval provided by the DMRE).

8. Description of the process followed to reach the proposed preferred site

8.1. Details of alternatives considered

The following alternatives have been identified as part of the proposed project and will be further be assessed in the EIAR and EMPr.

8.1.1 Location alternatives for the Pyrolysis Plant;

Refer to Figure 6 for the preferred and alternative location of the proposed Pyrolysis Plant.

Preferred location:

The preferred location for the Pyrolysis Plant is at the existing salvage yard where there is enough space and the plant will be on an impermeable surface. The salvage yard is near the scrap yard where the waste will be temporarily stored.

Alternative location:

The alternative location for the Pyrolysis Plant is at the scrap yard. The scrap yard is where the waste will be stored and reduces the need for transporting the waste. The area will have to be cleared of the scrap metal to allow for adequate space for the proposed Pyrolysis Plant.

8.1.2 Technological alternatives (waste to energy)

In terms of technological alternatives there are three options; pyrolysis which is the preferred option, gasification and incineration that are the alternatives. Refer to Figure 7 for a comparative illustration.

Preferred option: Pyrolysis Plant

NDC has proposed the Pyrolysis Plant. This technology provides 3 main advantages:

- disposes of waste on site eliminating the carbon footprint caused by transport,
- reduces emissions to a minimum, and
- is the most efficient of the systems available allowing more than 1 Mega Watt export per ton of waste.

NDC has proposed Technotherm as the preferred supplier for the Pyrolysis Plant. Technotherm uses a horizontal reactor complete with charge lock (to preclude oxygen) and a thermal gas clean-up system provides clean engine ready-gas for use in gas engines to provide electricity. Efficiency is increased by using the engine exhaust for drying. Pyrolysis is taking place in the absence of oxygen (a thermo-



chemical reaction), and has the lowest emissions of all. The pyrolysis solution provides output to the emission point well below the regulatory requirements.

Alternative option: Gasification

Gasification is preferred to incineration due to lower emissions and takes place with limited oxygen. Gasification, however, produces gas, ash and tar that will require final disposal.

Alternative option: Incineration

Incineration produces flue gas and ash that require final disposal. However due to the emissions regulations and the incidence of abatement system failures, incineration is not preferred.

8.1.3 No-go option (waste to energy)

The no-go option would be the status quo, with all waste disposed to landfill. This requires no investment, however, the carbon footprint considering the transport to the landfill, creation of methane over an extended period of time, potential leachate and limited landfill space available, render this waste disposal alternative as the least preferred option from an environmental point of view. According to the waste hierarchy, disposal of waste is the last option. Prevention, reuse, recycling and recovery should be considered first and foremost.



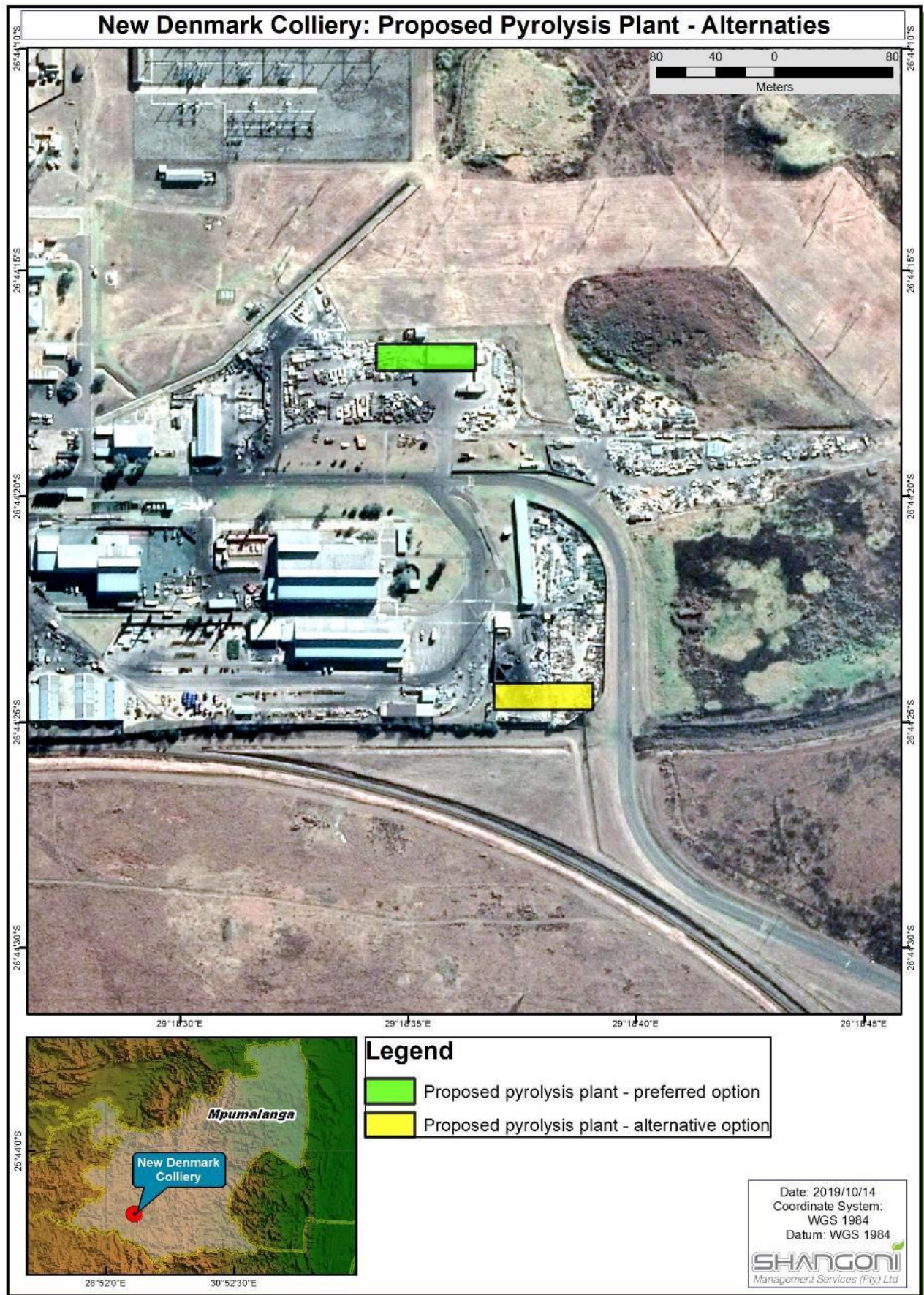


Figure 6: Preferred and alternative locations of the Pyrolysis Plant

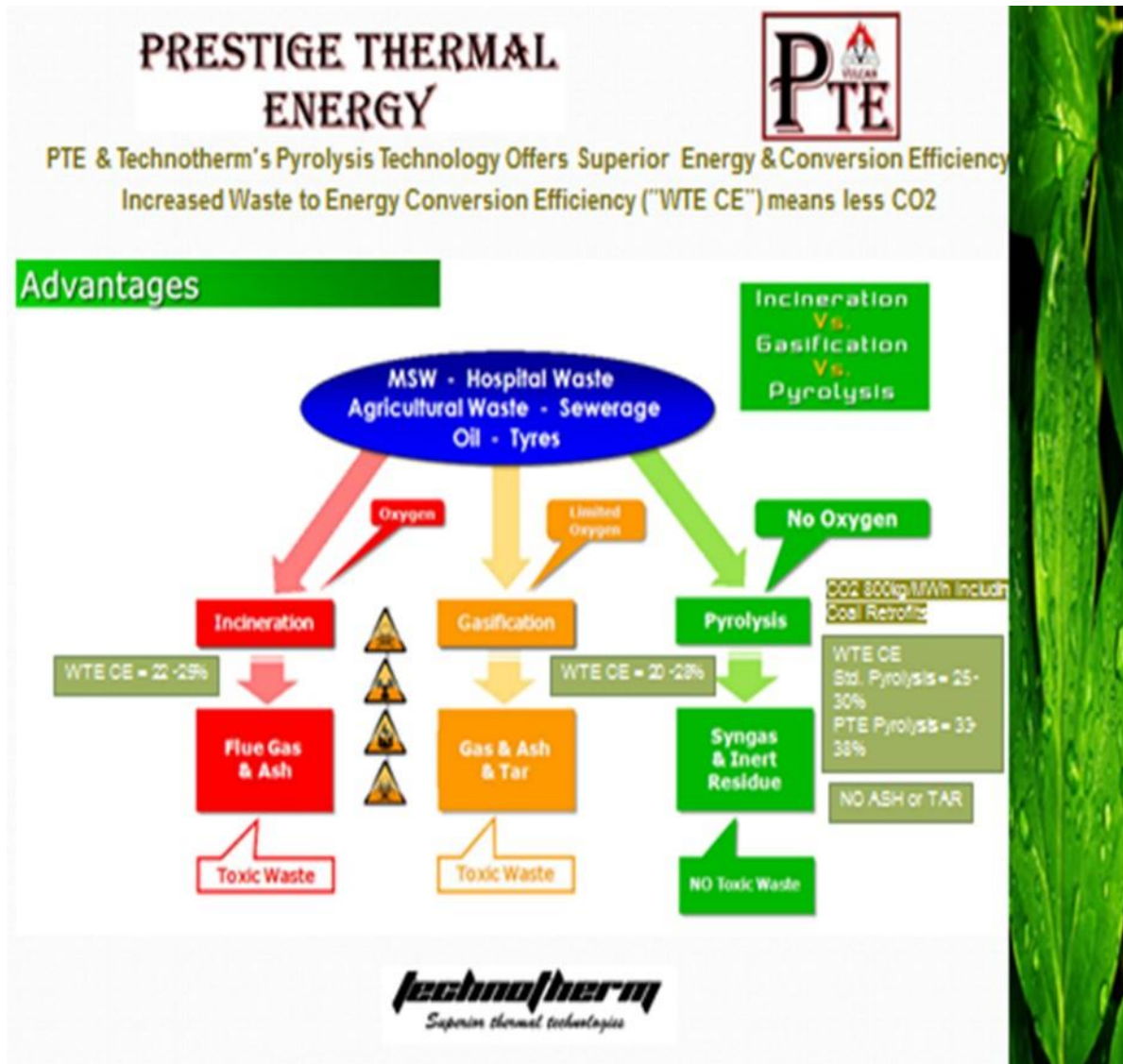


Figure 7: Comparison of pyrolysis, gasification and incineration

8.2. Details of the Public Participation Process followed

A detailed public participation process was undertaken as part of the initial application- and scoping phase for the proposed project. The following has been conducted as part of the Environmental Authorisation Application (proof hereof is included in the Public Participation Report attached as Annexure D to this report):

- Advertisements.
 - A Newspaper advertisement will be placed in the Standerton Advertiser on the 18th of February 2020.
- Site notices.
 - Five (5) site notices were placed around the proposed project site as well as at the existing mine.



- Written notices.
 - Written notices (including Background Information Documents) were distributed to Interested and Affected Parties (“I&APs”).
- Availability of Scoping Report for public review
 - This Scoping Report was made available for public and stakeholder review for a period of 30 days (from 18th of February to 18th March 2020). Notices providing the detail of the public viewing station and review period, were sent to registered I&APs via e-mail. This notification also formed part of the above-mentioned advertisement and site notices.

8.3. Summary of issues raised by I&APs

Table 6 below will be completed when the final Scoping Report is compiled and will provide a summary of the comments and issues raised and responses thereto.



Table 6: Summary of the issues raised by the I&APs

Interested and Affected Parties	Date Received	Comments	Issues Raised	EAPs Response to Issues as Mandated by the Applicant	Section and Paragraph Reference in this Report Where the Issues and Responses Were Incorporated.
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To be completed upon completion of the public participation process.



8.4. Description of baseline environment

8.4.1 The type of environment affected by the proposed activity

A baseline description or “*status quo*” of the of the present environmental situation is provided in this part of the document. The following attributes / aspects have been described in detail, in the following respective chapters:

- Chapter A: Geology;
- Chapter B: Climate;
- Chapter C: Topography;
- Chapter D: Soils, Land Use and Land Capability;
- Chapter E: Vegetation;
- Chapter F: Fauna;
- Chapter G: Surface water;
- Chapter H: Groundwater;
- Chapter I: Air Quality;
- Chapter J: Noise;
- Chapter K: Archaeology and cultural history;
- Chapter L: Sensitive landscapes;
- Chapter M: Visual aspects; and
- Chapter N: Regional socio-economic structure.

Section 8.4.1 provides both a summary of the baseline environment as applicable to the proposed Pyrolysis Plant informed by:

- Anglo Operations Limited. 2005. *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR.*
- Golder Associates. 2015. *Biodiversity Action Plan for New Denmark Colliery's Mining Rights Area, 2015 – 2020*

Chapter A: Geology

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005.

NDC reserves occur within the Vryheid Formation of the Eccu Group within the Karoo Sequence. Sixty boreholes have been drilled by the mine to the base of the Karoo Supergroup in the MRA from which



geological information could be derived. The thickness of the sediments underlying the No. 4 coal seam varies between 50 and 300 m. The coal-bearing Ecca Group ranges in thickness from 125 - 360 m and is comprised of an upper shale-like stage, the Volksrust Shale Formation, the mainly sandy coal measure stage, the Vryheid Formation, and a locally developed lower silt to shale stage, the Pietermaritzburg Shale Formation. The Vryheid Formation sediments developed in the NDC area are similar to those occurring elsewhere in the Highveld and Witbank Coalfields and are comprised mainly of sandstone, with lesser amounts of sandstone / siltstone and mudstone. The Pyrolysis Plant is located on the Karoo Dolerite Mesozoic Era Lithology class dolerite. Refer to figure 8.

Chapter B: Climate

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005.

The NDC is situated within the Mpumalanga Highveld region. The climate is temperate with warm to hot summers and the winter months are cold with moderate to severe frost. The main climatic hazards are thunderstorms and hail in summer, and severe frost that may occur during a period of 150 days between April and September. The mean annual rainfall is approximately 695 mm of which most occurs in the summer months.

Table 7 summarises the mean monthly rainfall data for the weather station at Standerton (No. 0441416A0) with latitude 26°56' and longitude 29°14' for a time period of 29 years from 1961 – 1990. It also indicates the 24-hour maximum rainfall with the year in which it occurred, as well as the number of days with a precipitation greater than 0.1 mm. The mean annual rainfall recorded for the MRA is 695 mm. Table 8 represents maximum rainfall intensities.

Table 7: Mean monthly rainfall data

Month	Mean monthly rainfall	24 hours maximum		
		Rainfall	Year	Number of days
January	122	106	1980	14.5
February	87	95	1970	10.4
March	66	81	1964	9.5
April	44	64	1990	6.6
May	12	45	1976	3.1
June	9	26	1989	1.9
July	7	21	1970	1.3
August	12	38	1979	1.8



Month	Mean monthly rainfall	24 hours maximum		Number of days
		Rainfall	Year	
September	29	45	1987	4.5
October	86	70	1969	9.8
November	117	103	1963	14.0
December	104	66	1977	12.9
Year	695	106	1980	90.3

Table 8: Maximum rainfall intensities

Storm duration (hr)	Return period (years)						
	2	5	10	20	50	100	200
0.25	72	95	117	144	190	234	288
0.5	50	66	81	100	132	162	199
1	32	42	51	63	83	102	126
2	19	25	30	37	49	60	74

The average daily maximum temperature is approximately 31.5 °C in January and 22.4 °C in July. In extreme cases, daily maximum temperatures may rise to 35.6 °C and 25.3 °C in January and July respectively. Average daily minimal temperatures range from roughly 9.4 °C in January to - 6.7 °C in July. Extreme minimal daily temperatures can drop to 4.5 °C in January and - 9.2 °C in July. The mean monthly maximum and minimum temperatures as measured for a period of 29 years from 1961 - 1990 are presented in Table 9.

Table 9: Mean monthly temperatures

Month	Temperatures (°C)		
	Maximum	Minimum	Mean
January	26.8	13.8	20.3
February	26.2	13.2	19.7
March	25.5	11.6	18.6
April	22.3	7.4	14.9
May	20.2	2.4	11.3
June	17.2	- 1.7	7.8
July	17.8	- 1.8	8.0
August	20.7	1.2	11.0
September	24.3	5.9	15.1



Month	Temperatures (°C)		
	Maximum	Minimum	Mean
October	24.9	9.2	17.1
November	25.1	11.5	18.3
December	26.5	13.0	19.8

Wind direction and speed information from the Standerton weather station using wind data collected over a period of 9 years from 1993 - 2002 were utilised. From January through to April the wind blows from the east to the west. In May and June, the predominant wind direction is from west to east. From July to September, there is no specific predominant wind direction and the wind blows equally from both east and west. In October and November, the predominant wind direction is from east to west. In December, the predominant wind direction is from east to west. The yearly average indicates that the predominant wind direction in order of magnitude is from the east followed by east-north-east and then the west. The mean monthly evaporation (in mm) for the period 1960 to 1987 measured at Standerton is given in **Error! Reference source not found..**

Table 10: The mean monthly evaporation (in mm)

Variable	Mean monthly evaporation
January	191.8
February	159.2
March	159.0
April	113.8
May	98.5
June	79.1
July	94.3
August	127.1
September	177.8
October	196.0
November	180.4
December	200.2
Year	1777.2



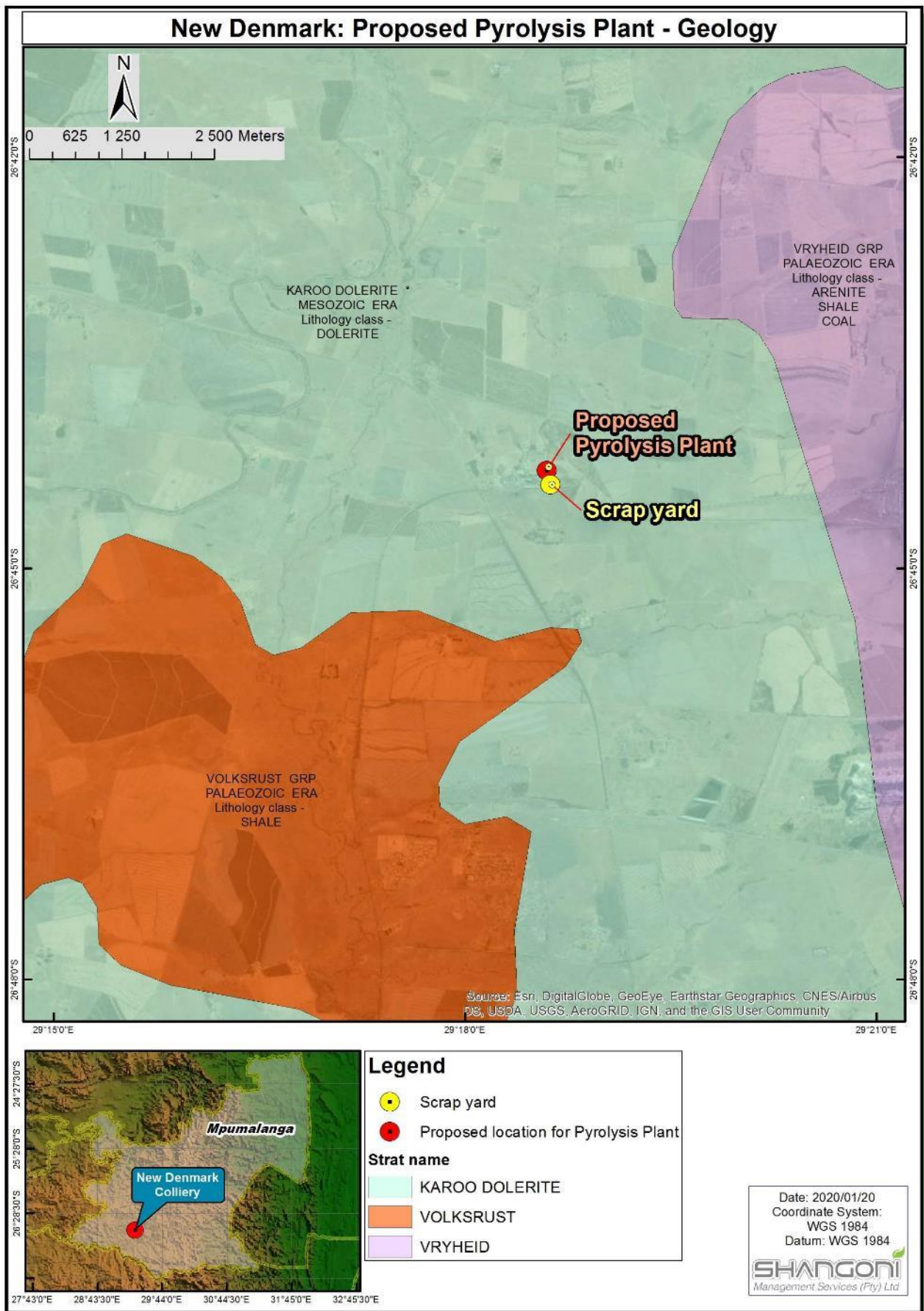


Figure 8: Geology applicable to the Pyrolysis Plant

Chapter C: Topography

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005.

The natural topography and drainage patterns of the area can be described as generally flat with occasional gentle slopes. Settlement of the surface subsidence in areas of flat topography generally results in a temporary reduction in run-off and the creation of temporary ponds on the surface. Alterations to drainage paths have been noted as a result of surface subsidence, but this can be rectified through limited earthworks and other remedial measures. The mine falls within the land type inventory map for 2628 East Rand. The specific land type that the site falls in is Ea17, which stipulates a terrain code for the area as being A2 which is described as:

- A: More than 80 % of the area has a slope of less than 8 %, and
- 2: The relief between the highest and the lowest points in the landscape averages between 30 to 90 m.

Chapter D: Soils, land use and land capability

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005.

Soils

According to Figure 9, the Pyrolysis Plant is associated with S5 swelling clay soils that are high in natural fertility and high swell-shrink potential which are very plastic and are sticky.

Land cover

According to Figure 10 the proposed Pyrolysis Plant will be situated on an urban area.

Land use

The land capable of sustaining arable crop production is suited to intensive sustained dryland and irrigation cropping, provided that the quality of the water is within acceptable sodicity and salinity limits. These soils require skilled management and skilled irrigation design and there are some restrictions on the choice of crops that can be grown successfully.

The areas that classify as grazing land are generally confined to the shallower and transitional zone. The land is subject to such extreme limitations with regard to the effective rooting depth of less than 300 mm or poor drainage that remedial measures are not considered economically practically practical for typical cropping systems. This category is best left undisturbed as veld grazing. There are no rocks



or pedocrete fragments in the upper horizons of any of the soil groups, which will limit the land capability to wilderness land.

Land capability

The wetland areas are defined in terms of the wetland delineation guidelines, which use soil form, topography as well as botanic criteria to define the limits to this domain. The soils in this class of land are predominantly wet bottom land soils of the Rensburg series. This class of land is typically permanently wet and is best left undisturbed under the natural grass cover. The land capabilities of the total surveyed portions are represented in Table 11.

Table 11: Land capability of the total surveyed portions

Land capability	Area (ha)	Total area (%)
Arable	4941.34	78.49
Grazing	1 004.51	15.95
Wetland	290.375	4.61
Wilderness	59.26	0.94
Total	6 295.485	100

The areas that classify as wilderness land are found associated with the shallow, rocky soils. This class of land falls within the damp to wet transition zones. Table 12 indicates the completed studies applicable to the proposed Pyrolysis Plant to be located on the Remaining extent of the farm Slagkraal 353 IS.

Table 12: Land capability studies performed within the NDC MRA applicable to the proposed Pyrolysis Plant

Farm name	Farm no.	Portion	Extent (ha)	Land capability studies
Slagkraal	353	4	174.5	Completed
Slagkraal	353	R	305.6	2006
Slagkraal	353	9	68.1	2006
Slagkraal	353	3	37.7	2006
Slagkraal	353	8	26.3	2006
Slagkraal	353	6	30.8	2011

Chapter E: Vegetation

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE*



Reference No. MP 30/5/1/2/2/ (74) MR, dated 2005 and the Biodiversity Action Plan for New Denmark Colliery's Mining Rights Area, 2015 - 2020 dated September 2015.

The mine falls within the Bankenveld zone, within the grassland biome of the Highveld region. The entire MRA falls within a vegetation type known as 'Themeda Veld'.

The Highveld region is divided into four distinct zones, namely the arid west, the Bankenveld, the Central plateau and the Drakensberg. Each zone has a reasonably uniform altitude, rainfall, climate and geology and, therefore, vegetation. The vegetation of the study area falls within the Bankenveld zone. The three main habitats that can be found in each zone, are:

- Grasslands, which are open and unprotected from fire and frost,
- Rocky areas, which provide increased soil moisture, and more protection from both fire and frost, and
- Rivers and gorges, where there is additional moisture and more protection from fire.

The main habitat that was identified in the MRA of NDC was Grassland. The Grassland Biome of South Africa is considered to have very high levels of biodiversity. Approximately 79 % of the Moist Clay Highveld Grassland (No. 35, Low and Rebelo, 1998) has been transformed. This is mostly through overgrazing by sheep and cattle, and to a lesser degree by ploughing because of the high clay content of the soil. According to figure 11 the area falls within the Soweto Highveld Grassland Gm8.

Flora Species of Conservation Concern

According to the *Biodiversity Action Plan for New Denmark Colliery's Mining Rights Area, 2015 - 2020* dated September 2015, the Central shaft area is transformed and there are no flora species of conservation concern.



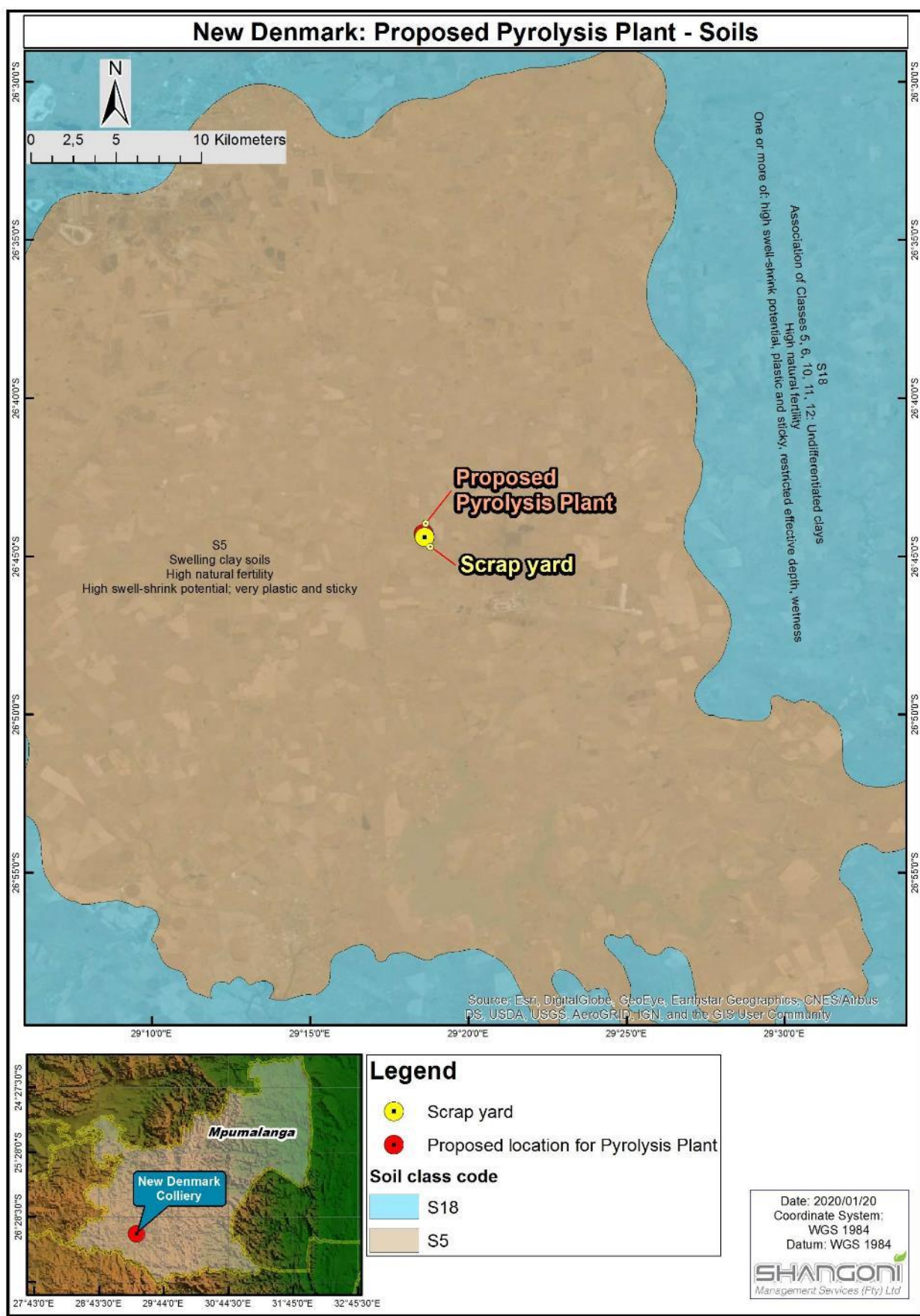


Figure 9: Soils applicable to the Pyrolysis Plant

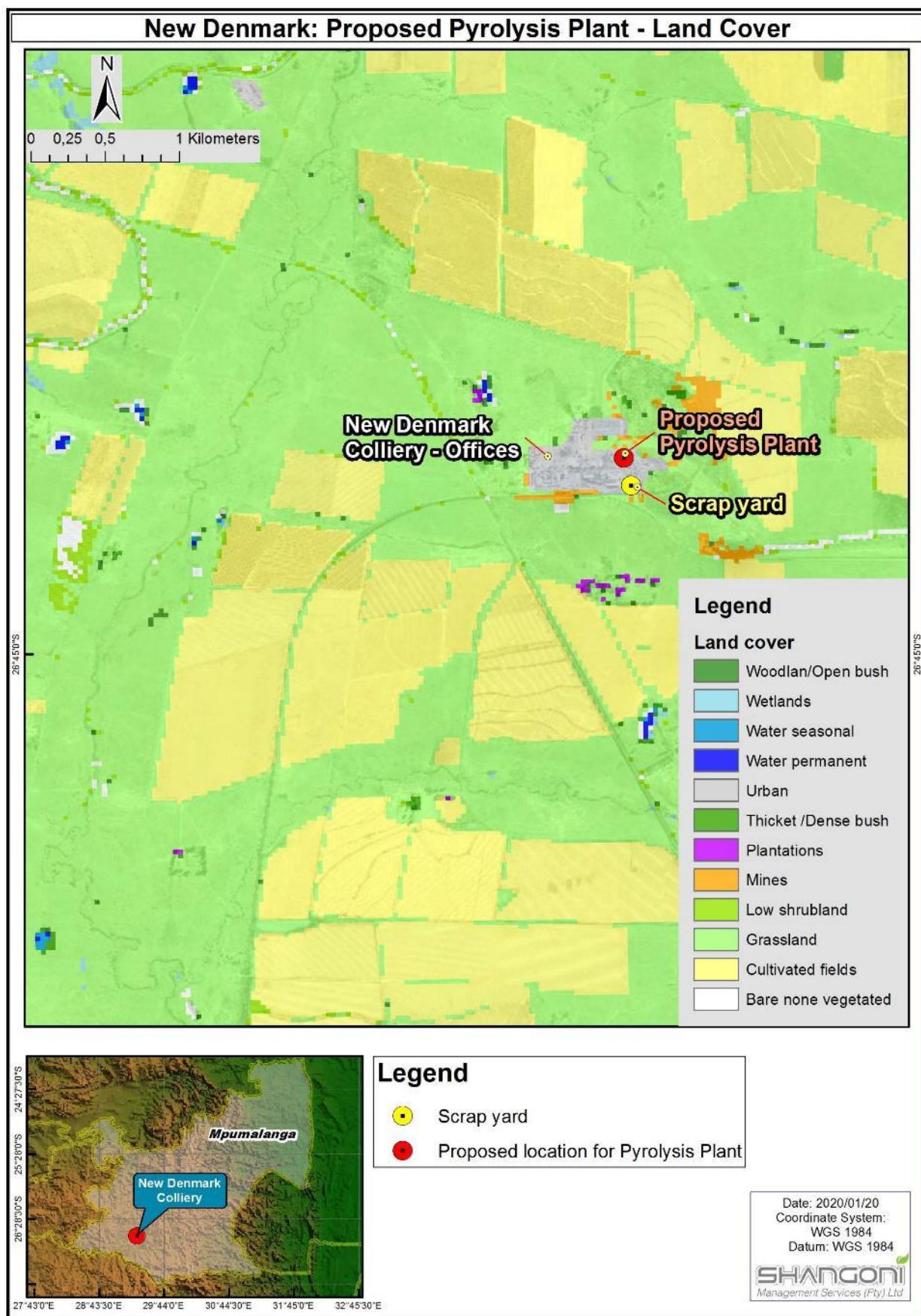


Figure 10: Land cover applicable to the Pyrolysis Plant

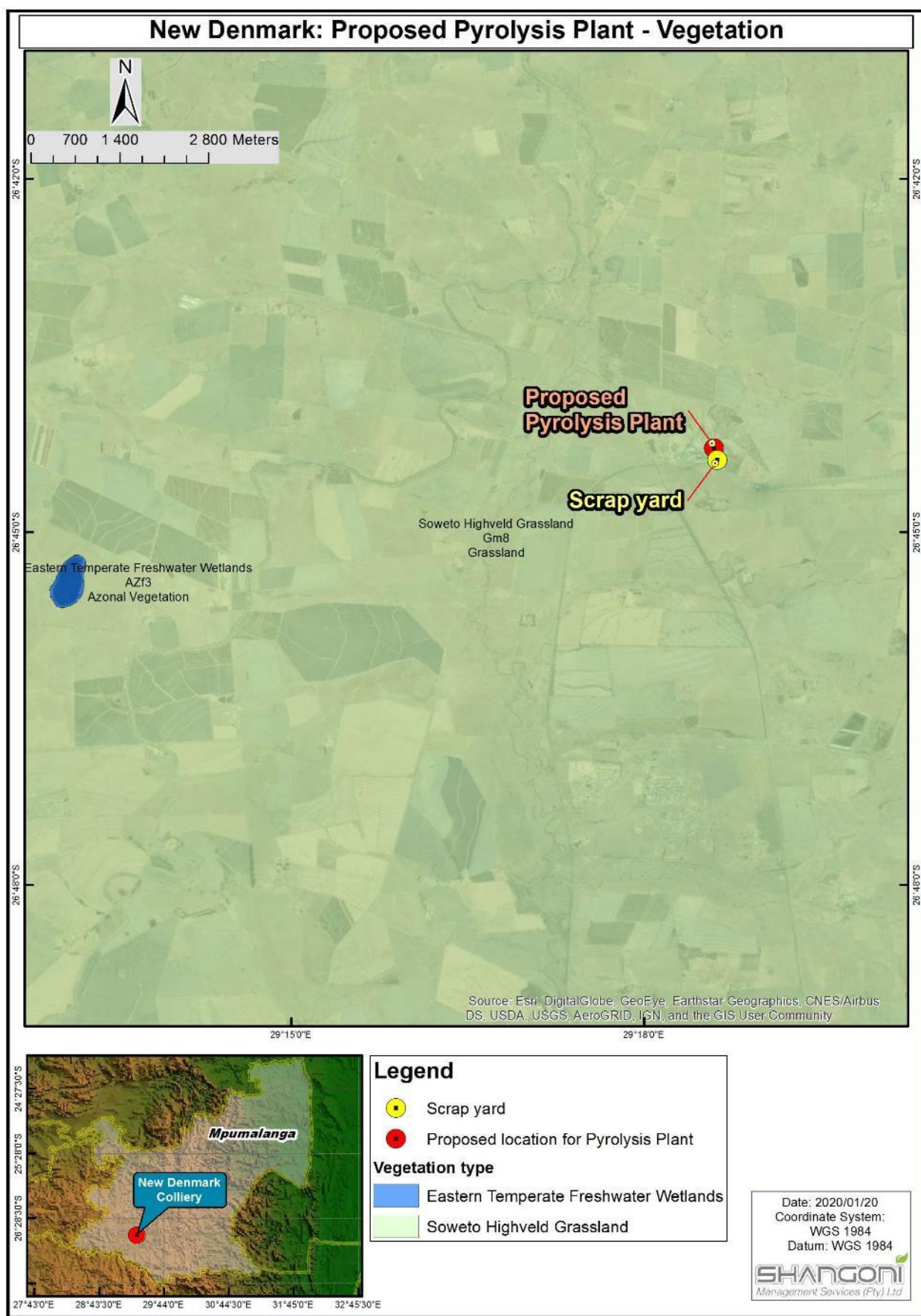


Figure 11: Vegetation applicable to the Pyrolysis Plant

Chapter F: Fauna

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005 and the *Biodiversity Action Plan for New Denmark Colliery's Mining Rights Area, 2015 - 2020* dated September 2015.

Mammals

According to the *Biodiversity Action Plan for New Denmark Colliery's Mining Rights Area, 2015 - 2020* dated September 2015, a number of mammal species of conservation concern have potential to occur within the MRA, based on their current natural distribution. These and their likelihood of occurrence within the MRA are summarised in Table 13. Aardvark is the only mammal species of conservation concern considered likely to be present, as well as those already recorded to date (Cape Clawless Otter, Serval and Steenbok).

Table 13: Mammal species of conservation concern

Scientific Name	Common Name	IUCN Regional Status	NEMBA ToPS List (2013)	Mpumalanga Protected Species	Likelihood of Occurrence within MRA
<i>Amblysomus robustus</i>	Robust Golden Mole	Endangered	-	-	Unlikely - known from the Steenkampsberg mountains in the Belfast and Dullstroom districts
<i>Atelerix frontalis</i>	Southern African Hedgehog	Near Threatened	-	Protected	Possible – habitat preferences are wide
<i>Aonyx capensis</i>	Cape Clawless Otter	-	Protected	Protected	Recorded
<i>Lutra maculicollis</i>	Spottednecked Otter	Near Threatened	-	Protected	Possible – suitable freshwater habitat exists within MRA
<i>Proteles cristatus</i>	Aardwolf	-	-	Protected	Unlikely - distribution is largely determined by the distribution of Trinervitermes termites, which are not recorded from MRA
<i>Felis nigripes</i>	Small spotted Cat	-	Protected	-	Unlikely
<i>Leptailurus serval</i>	Serval	Near Threatened	Protected	-	Recorded
<i>Orycteropus afer</i>	Aardvark	-	Protected	Protected	Likely



Scientific Name	Common Name	IUCN Regional Status	NEMBA ToPS List (2013)	Mpumalanga Protected Species	Likelihood of Occurrence within MRA
<i>Connochaetes gnou</i>	Black Wildebeest	-	Protected	Protected	Unlikely
<i>Raphicerus campestris</i>	Steenbok	-	-	Protected	Recorded
<i>Redunca fulvorufula</i>	Mountain Reedbuck	-	-	Protected	Unlikely
<i>Pelea capreolus</i>	Grey Rhebok	-	Protected	Protected	Unlikely – prefers mountainous terrain

Species Recorded within the MRA

Mammal species that have been recorded over the course of biodiversity surveys conducted within New Denmark Colliery's MRA are summarised in Table 14. The presence of species of conservation concern is indicated, and their presence as stock in the game camps is also specified where relevant.

Table 14: Mammal species recorded within MRA

Scientific Name	Common Name	Species of conservation concern	Game Camp Species
<i>Aonyx capensis</i>	Cape Clawless Otter	√	
<i>Atilax paludinosus</i>	Water Mongoose		
<i>Canis mesomelas</i>	Black-backed Jackal		
<i>Cynictis penicillata</i>	Yellow Mongoose		
<i>Suricata suricatta</i>	Suricate		
<i>Galerella sanguinea</i>	Slender Mongoose		
<i>Ichneumia albicauda</i>	White-tailed Mongoose		
<i>Ionyx striatus</i>	Striped Polecat		
<i>Leptailurus serval</i>	Serval	√	
<i>Lepus saxatilis</i>	Scrub Hare		
<i>Mastomys coucha/natalensis</i>	Multimammate Mouse		
<i>Rhabdomys pumilio</i>	Four-striped Mouse	Grass	
<i>Xerus inauris</i>	Ground Squirrel		
<i>Antidorcas marsupialis</i>	Springbok		
<i>Oryz gazelle</i>	Gemsbok		√
<i>Alcelaphus buselaphus</i>	Red Hartebeest		√



Scientific Name	Common Name	Species of conservation concern	Game Camp Species
<i>Equus quagga</i>	Zebra		√
<i>Kobus ellipsiprymnus</i>	Waterbuck		√
<i>Damaliscus puygargus</i>	Blesbok	√	√
<i>Raphicerus campestris</i>	Steenbok	√	√
<i>Sylvicapra grimmia</i>	Common Duiker		
<i>Tragelaphus oryx</i>	Eland	√	√

Although Gemsbok, Red Hartebeest, Zebra, Waterbuck, Blesbok and Eland are species of conservation concern, it is important to note that their presence within the MRA is due to their stocking in the game camps; the MRA and the wider area no longer lies within the current distribution of these species.

Birds

According to the South African Bird Atlas Project (SABAP), 220 bird's species have been recorded in the region, of which 23 are of conservation importance. Three distinct bird assemblages associated with specific vegetation communities have been recognised within the MRA during bird surveys. Refer to Table 15.

Table 15: Vegetation communities and associated dominant species.

Vegetation Community	Dominant Species
Undisturbed Grassland	Cape Longclaw (<i>Macronyx capensis</i>), Long-tailed Widowbird (<i>Euplectes progne</i>), Greater Striped Swallow (<i>Cecropis cucullata</i>), African Pipit (<i>Anthus cinnamomeus</i>), Cloud Cisticola (<i>Cisticola textrix</i>), Red-capped Lark (<i>Calandrella cinerea</i>), Amur Falcon (<i>Falco amurensis</i>)
West Valley Grassland	Long-tailed Widowbird (<i>Euplectes progne</i>), Greater Striped Swallow (<i>Cecropis cucullata</i>), Barn Swallow (<i>Hirundo rustica</i>), SA Cliff Swallow (<i>Petrochelidon spilodera</i>), African Quailfinch (<i>African Quail-finch</i>), Blackheaded Heron (<i>Ardea melanocephala</i>), Southern Red Bishop (<i>Euplectes orix</i>)
Endoheric Pan	Insufficient Sampling to determine dominance.

Source: Nepid Consultants (2010)

Overall 130 bird species have been recorded within the MRA, including 8 species of conservation concern with Undisturbed Grassland being the most important vegetation community for birds of conservation concern. Refer to Table 16.



Table 16: Bird species of conservation concern recorded within the MRA

Species Name	Common Name	Conservation Status (IUCN Regional Red List)	Undisturbed grassland	Wet Grassland	Pan	Disturbed Grassland	Recorded notes
<i>Anthropoides paradiseus</i>	Blue Crane	Vulnerable	x	x			Three pairs observed on Vlakspruit 301 IS – breeding within MRA likely.
<i>Hydroprogne caspia</i>	Caspian Tern	Vulnerable				x	Observed at pan on Vogelvallei 355 IS – likely an irregular visitor.
<i>Eupodotis caerulescens</i>	Blue Korhaan	Least Concern	x				Although LC regionally, these are considered NT globally and thus are of conservation concern. Observed in Undisturbed grassland in several locations throughout MRA.
<i>Circus macrourus</i>	Pallid Harrier	Near Threatened	x	x			Observed at wet grassland on Vlakefontein, non-breeding summer visitor.
<i>Falco biarmicus</i>	Lanner Falcon	Vulnerable	x			x	Several flocks were seen feeding over disturbed grassland and ploughed lands at several localities, nonbreeding summer visitor.
<i>Glareola nordmanni</i>	Black-winged Pratincole	Near Threatened	x			x	Several flocks were seen feeding over disturbed grassland and ploughed lands at several localities, nonbreeding summer visitor.
<i>Phoenicopiterus roseus</i>	Greater Flamingo	Near Threatened			x		Flocks observed at large pan on Vogelvallei 355 IS, and on smaller pan nearby. Non-breeding winter visitor.
<i>Sagittarius serpentarius</i>	Secretarybird	Vulnerable	x		x	x	Observed within game camp – wide habitat preference.

Based on the information presented in Table 16 above, the MRA is probably of greatest significance for blue crane, given that three separate (probably) breeding pairs have been observed within the wet and undisturbed grasslands of MRA. Conservation and maintenance of breeding habitat for this species should therefore be a priority biodiversity management objective for NDC.

Herpetofauna

To date, four frog species and one snake species have been recorded within the MRA, none of which are of conservation concern Table 17. However, not specifically targeted herpetofauna survey of the MRA has been conducted; therefore, a number of additional species could potentially occur e.g African clawed frog (*Xenopus laevis*). Species of conservation concern that have potential to occur are summarised in the next section. Refer to Table 17.



Table 17: Reptiles and amphibians recorded within the MRA

Reptiles	
<i>Hemachatus haemachatus</i>	Rinkhals
Amphibians	
<i>Afrana fuscigula</i>	Cape River Frog
<i>Bufo rangeri</i>	Raucous Toad
<i>Cacosternum boettgerii</i>	Common Caco
<i>Schismaderma carens</i>	Red Toad

Species of Conservation Concern with Potential to occur within the MRA

Based on species distribution and habitat preferences, herpetofauna species of conservation concern that could potentially occur within the MRA are summarised in Table 18.

Table 18: Herpetofauna Species of Conservation Concern with potential to occur within MRA

Scientific Name	Common Name	IUCN Regional Status	NEMBA ToPS List (2013)	Mpumalanga Protected Species*	Endemic Status	Undisturbed grassland	Disturbed Grassland	Wetland/pan
<i>Pyxicephalus adspersus</i>	Giant Bullfrog	Near Threatened		Protected				x
<i>Acontias gracilicauda</i>	Thin tailed Legless Skink	-	-	Protected	Endemic	x		
<i>Afroablepharus wahlbergii</i>	Wahlberg's Snake-eyed Skink	-	-	Protected	-	x		
<i>Afrotyphlops bibronii</i>	Bibron's Blind Snake	-	-	-	Near endemic	x		x
<i>Agama aculeata distantii</i>	Eastern Ground Agama	-	-	Protected	Endemic	x		
<i>Chamaesaura aenea</i>	Coppery Grass Lizard	Near Threatened	-	Protected	Endemic	x		



Scientific Name	Common Name	IUCN Regional Status	NEMBA ToPS List (2013)	Mpumalanga Protected Species*	Endemic Status	Undisturbed grassland	Disturbed Grassland	Wetland/pan
<i>Cordylus vittifer</i>	Common Girdled Lizard	-	-	Protected	Endemic	x		
<i>Duberria lutrix lutrix</i>	South African Slug-eater	-	-	-	Endemic	x		
<i>Gerrhosaurus flavigularis</i>	Yellow-throated plated Lizard	-	-	Protected	-	x		
<i>Hemachatus haemachatus</i>	Rinkhals	-	-	-	Near endemic	x	x	x
<i>Lamprophis aurora</i>	Aurora Snake	-	-		Endemic	x		x
<i>Lygodactylus capensis</i>	Common Dwarf Gecko	-	-	Protected	-	x	x	
<i>Lygodactylus ocellatus</i>	Spotted Dwarf Gecko	-	-	Protected	Endemic	x		
<i>Pachydactylus affinis</i>	Transvaal gecko	-	Protected	Protected	Endemic	x	x	x
<i>Pachydactylus capensis</i>	Cape Gecko	-	Protected	Protected	-	x	x	
<i>Pachydactylus vansonii</i>	Van Son's Gecko	-	Protected	Protected	Near endemic	x		



Scientific Name	Common Name	IUCN Regional Status	NEMBA ToPS List (2013)	Mpumalanga Protected Species*	Endemic Status	Undisturbed grassland	Disturbed Grassland	Wetland/pan
<i>Psammophis crucifer</i>	Cross-marked Grass Snake	-	-	-	Near endemic	×		
<i>Pseudocordylus melanotus</i>	Common Crag Lizard	-	-	Protected	Endemic	×		
<i>Trachylepis capensis</i>	Cape Skink	-	-	Protected	-	×	×	
<i>Trachylepis punctatissima</i>	Speckled Rock Skink	-	-	Protected	-	×	×	
<i>Trachylepis varia</i>	Variable Skink	-	-	Protected	-	×		

*All reptiles, excluding monitors (*Varanus* spp.) and snakes (*Serpentes*) are protected according to Schedule 2 of the Mpumalanga Nature Conservation Act

Invertebrates

Table 19 shows the invertebrates and numbers found to occur on the MRA.

Table 19: Invertebrates recorded in the MRA

Taxa	Number of species recorded
Ants	25
Cicadellid Leafhoppers	55
Butterflies	14
Carabid and Tenebrionid Beetles	-
Mygalomorph Spiders	2

Source: Nepid Consultants (2010)

Chapter G: Surface water

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002)* as part of a mining right



application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR, dated 2005 and Aquatico Scientific. January 2019 to March 2019. New Denmark Colliery Quarterly Water Quality Assessment Report.

NDC is situated in the Grootdraai Dam sub-catchment of the Upper Vaal River water management area. The receiving water resources are the Leeuspruit and Blesbokspruit that flow into the Grootdraai Dam, as well as the Rietspruit, which joins the Vaal River below the Grootdraai Dam. The relevant quaternary catchment areas are C11K, C11H and C12E. Refer to figure 12.**Error! Reference source not found.**

A portion of the Leeuspruit was undermined during 1997. A dolerite outcrop cracked due to the subsidence, which occurred during total extraction mining. It was evident from visual inspections that the water from the Leeuspruit flowed into the mined-out areas. A number of other watercourses and drainage lines have also been undermined (by bord and pillar, as well as total extraction mining methods). Such undermining may result in a gradual settlement of up to 850 mm. This may result in minor temporary ponding of short sections of a spruit and temporary loss of surface water flow.

Water flows to the underground mining operations from different sources:

- Surface ingress due to disturbed natural drainage lines;
- Fractured aquifer formations draining to the workings; and
- Regional groundwater draining towards the large underground voids created by mining.

The ecological status of the river systems within the MRA is classified as moderately modified, with higher significant impacts present within the direct Grootdraai Dam catchment area. This may be as a result of cumulative impacts occurring upstream from various activities. Few aquatic sites of high ecological significance exist within the MRA, however, the mine is ecologically linked via several watercourses and bordered by important wetlands. Some small wetlands as well as a number of non-perennial and perennial watercourses occur in the MRA.

Surface Water Quantity

The impacts of the existing undermining activities on surface water containing structures such as canals, dams and streams have been minimal in terms of both quality and quantity. The existing impacts on the watercourses such the Leeuspruit have been proven negligible. Flows have been maintained in the watercourses in spite of the existing underground mining activities and associated surface impacts. Some small farm dams have had a temporary loss of water when undermining was in progress. It was indicated that surface water from the watercourses and dams does seep into underground workings (in addition to normal seepage). Fractures occur above the longwall panels that connect the existing underground workings with the surface and seepage of surface water into the mine is thus possible.

A number of existing rock dumps are located within the mine's dirty water management areas. Before the rock dumps are rehabilitated, the exposed surfaces may lead to an increase in the infiltration of rainwater and therefore a minor decrease in the run-off. Once the exposed surfaces associated with the rock dumps are rehabilitated, including the placement of topsoil and vegetated, this impact becomes



negligible. The possible impact from existing surface infrastructure, including the storm water management channels, includes an increase in run-off and thus a decrease in infiltration. The existing overland conveyors disturbed the pre-mining run-off patterns of surface water but do not have an effect on the catchment yield. Direct rainfall on the plant- and stockpile areas reports to a dirty water management system and thus not to the relevant watercourses. Treated domestic wastewater effluent reports to a number of small farm dams.

Settlement due to undermining of the surface in areas of flat topography may result in the creation of temporary ponds on surface and thus a temporary reduction in surface water run-off. However, this can be rectified through the implementation of some earthworks and other remediation measures. Alterations of drainage paths have been noted as a result of surface subsidence at NDC. The affected area is approximately 72 ha in extent and is a minimal portion (0.18 %) of the total catchment area of \pm 40 000 ha.

Mean Annual Run-off (MAR)

The MAR values were calculated using the Pitman model (WRSM-90) simulated for a 79-year rainfall period from 1912 - 1991 and is presented in Table 20.

Table 20: Mean annual run-off (MAR) for the relevant catchment areas

Catchment	MAR (Mm ³ / annum)	Base flow (m ³)
Leeuspruit	14.47	0 – 0.18
Rietspruit	6.10	0 – 0.03
Blesbokspruit (Vlakspruit)	3.51	0 – 0.02
Blesbokspruit (Mooifontein)	1.65	0 – 0.01

Normal dry weather flow

Normal dry weather flow has been measured in the Leeuspruit downstream of the MRA at the DHWS's weir site (C1H005) for the period 1965 to 1977. The flows measured vary from 0 to 0.18 million cubic metres per month. Gauged flow data is not available for the other catchments and the flow in these catchments has been simulated by modelling.

Flood peaks and volumes

Flood peak volumes computed by AAC Civil Engineering Department for 1 in 50 and 1 in 100 year 24-hour event for the main catchment area are 1.94 million m³ per day and 2.09 million m³ per day, respectively. Flood peaks for the minor catchment areas have not been computed. A minor diversion of a non-perennial channel to the Leeuspruit takes clean water around the pollution control dam.

Water quality for the Central Shaft area:

According to the Aquatico Scientific. *January 2019 to March 2019. New Denmark Colliery Quarterly Water Quality Assessment Report*, the Central Shaft area is situated on a west-north-west trending



water divide. Any impacts from the Central Shaft Rock Dump could be picked up at monitoring locality SH. The water seepage from the rock dump occurs in a northwards direction towards the Leeuspruit tributary and joins the Leeuspruit upstream of SH. Seepage from the Central Shaft infrastructure area, salvage yard, workshops and sewage works ("WWTW") migrates to the south-west to another tributary of the Leeuspruit, upstream of LS1.

Central Shaft Area: Monitoring localities SQ (Elandsvlei Dam) at Central Shaft reveals a quarterly average water quality which can be described as alkaline and non-saline. The average pH and concentration of EC exceeded the WUL: 2016 Wastewater Discharge Quality Guidelines. All other variables remained well within these guidelines. Comparing the average concentrations to the General Limit, Section 21f and h, 2013; all measured variables at SQ were within the General Limit guideline.

Final effluent from the central shaft sewage plant is pumped into Dam at Thulani (SU), which is used for recreational purposes. When the dam is full, it overflows into an unnamed tributary of the Leeuspruit. On average, the physical water quality at the Dam at Thulani (SU) was recorded as neutral and very saline. The average pH and concentrations of EC, SS, COD and *E.coli* did not comply with the WUL: 2016 Waste Water Discharge Quality Guidelines.

The average concentrations of EC and SS exceeded the General Limit, Section 21f and h, 2013 hence water from this locality is not suitable for discharge into the environment.

Leeuspruit: All of the localities recorded at least one variable in the unacceptable range mostly which was total alkalinity. Majority of the remaining recorded concentrations (for which a guideline is presented) ranged within the acceptable to tolerable levels per the RWQOs. Refer to Table 21.

Heavy metals Mn, Cu, Ni, Zn and Pb concentrations were mostly below detection limit during the quarterly period.

The overall calculated water quality change (increase) of the Leeuspruit calculated between SX - SA was observed in terms of EC, pH, TDS, hardness, total alkalinity, Ca, Mg, Na, K, F, Cl, SO₄, PO₄-P, Al, Fe, B, Cd, COD and SS.

Table 21: Average water quality results for Leeuspruit Catchment

AVERAGE DATA TABLE: January 2019 to March 2019										
VARIABLE	UNITS	MONITORING LOCALITIES								
		SA	SB	SG	SH	SL	SS2	SX	LS1	SK
pH @ 25°C	pH	8.13	7.9	7.9	8.1	7.2	8.4	7.7	8	8
Electrical conductivity (EC) @ 25°C	mS/m	77.5	41.2	32.4	31.4	35.1	47.7	35	31.5	37.4
Total Dissolved solids @ 180°C	mg/l	573	304	234	239	238	316	284	237	268



AVERAGE DATA TABLE: January 2019 to March 2019

Total hardness	mg/l	250	118	130	112	123	130	128	110	116
Total alkalinity	mg/l	208	106	110	109	128	142	108	101	112
Calcium (Ca)	mg CaCO ₃ /l	37.7	22.5	22	20.7	37	22	24	20.7	22
Magnesium (Mg)	mg CaCO ₃ /l	35.3	15	15	13.7	8	20	17	13.7	15
Sodium (Na)	mg/l	68	34	17.5	17	21	42	19	16.7	28
Potassium (K)	mg/l	7.37	5.9	4.7	4.87	5.5	5.85	5	5.1	5.8
Fluoride (F)	mg/l	0.433	0.35	0.2	0.267	0.2	0.25	0.1	0.3	0.3
Chloride (Cl)	mg/l	50.3	24.5	16.5	15.7	18	35	17	16	21
Sulphate (SO ₄)	mg/l	141	70	41.5	40.7	26	81.5	43	39	49
Nitrate (NO ₃) as N	mg/l	0.05	0.05	0.1	0.05	0.05	0.05	0.05	0.05	0.05
Orthophosphate (PO ₄) as P	mg/l	0.225	0.05	0.05	0.175	1.6	0.05	0.05	0.075	0.1
Boron (B)	mg/l	0.062	0.041	0.02	0.018	0.068	0.035	0.013	0.056	0.03
Aluminium (Al)	mg/l	0.095	0.199	0.086	0.067	0.05	0.05	0.05	0.67	0.05
Iron (Fe)	mg/l	0.078	0.156	0.108	0.052	0.142	0.036	0.049	0.06	0.059
Manganese (Mn)	mg/l	0.013	0.013	0.013	0.013	0.766	0.013	0.013	0.013	0.013
Copper (Cu)	mg/l	0.005	0.005	0.005	0.005	0.008	0.005	0.005	0.005	0.005
Nickel (Ni)	mg/l	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Lead (Pb)	mg/l	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Zinc (Zn)	mg/l	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.025	0.013
Total suspended solids (TSS)	mg/l	40	58	7.9	200	403	51	18	68	29
Chemical oxygen demand (COD)	mg/l	26	16	16	28	341	24	16	22	20



AVERAGE DATA TABLE: January 2019 to March 2019

E.coli	CFU/100ml	1700	290	870	730	-	58	-	250	-
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Surface Water Use

The principal users of the water in the Leeuspruit and Leeuspruit tributaries are the local farming communities. The surface water resources are mainly utilised as drinking water for cattle and sheep. The Eskom Tutuka Power Station provides water to NDC as well as the farmers whose boreholes are affected by mining activities.

Surface water features

The closest surface water features to the proposed Pyrolysis Plant is the Leeuspruit. Refer to Figure 13.



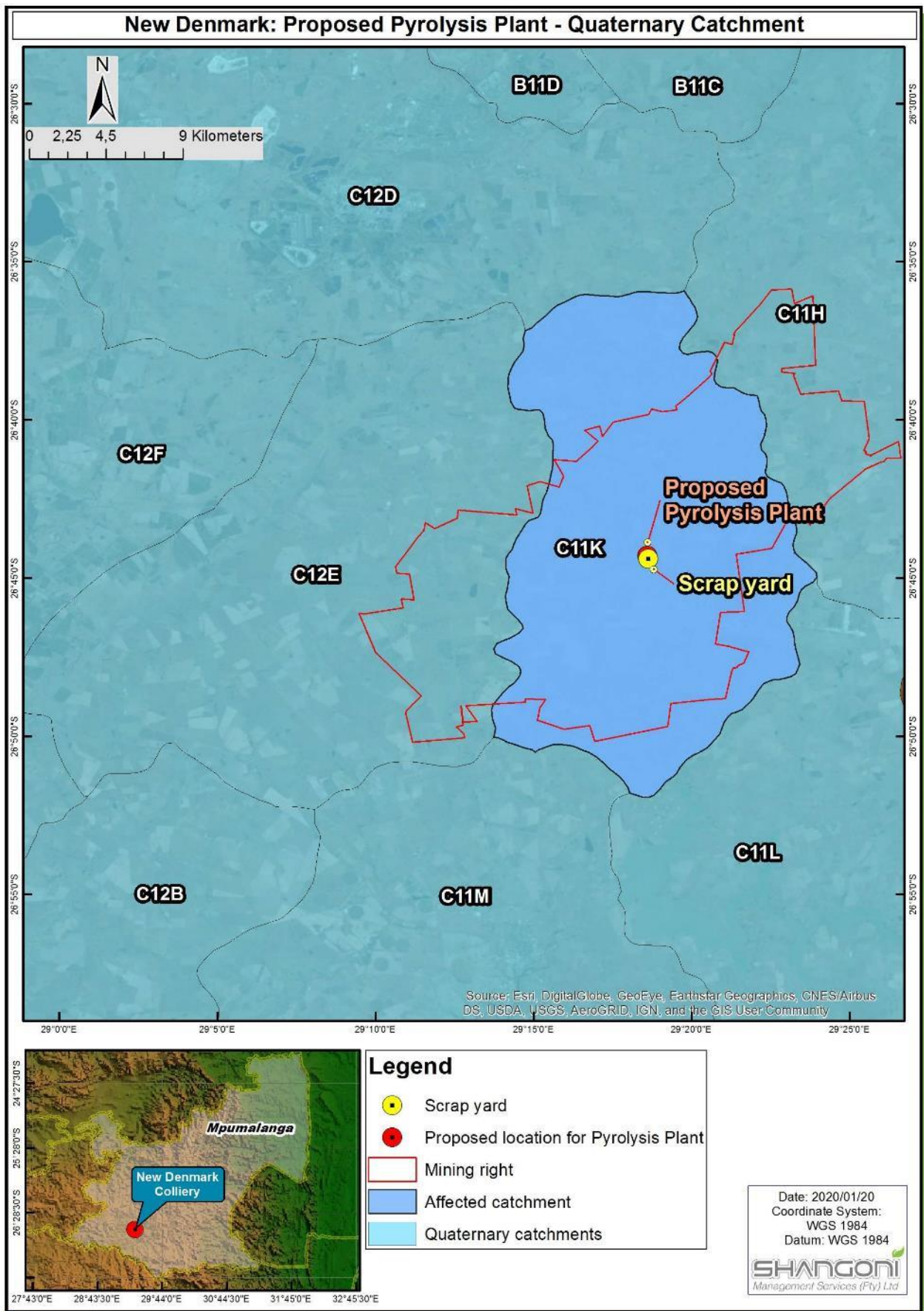


Figure 12: Quaternary catchment applicable to the Pyrolysis Plant

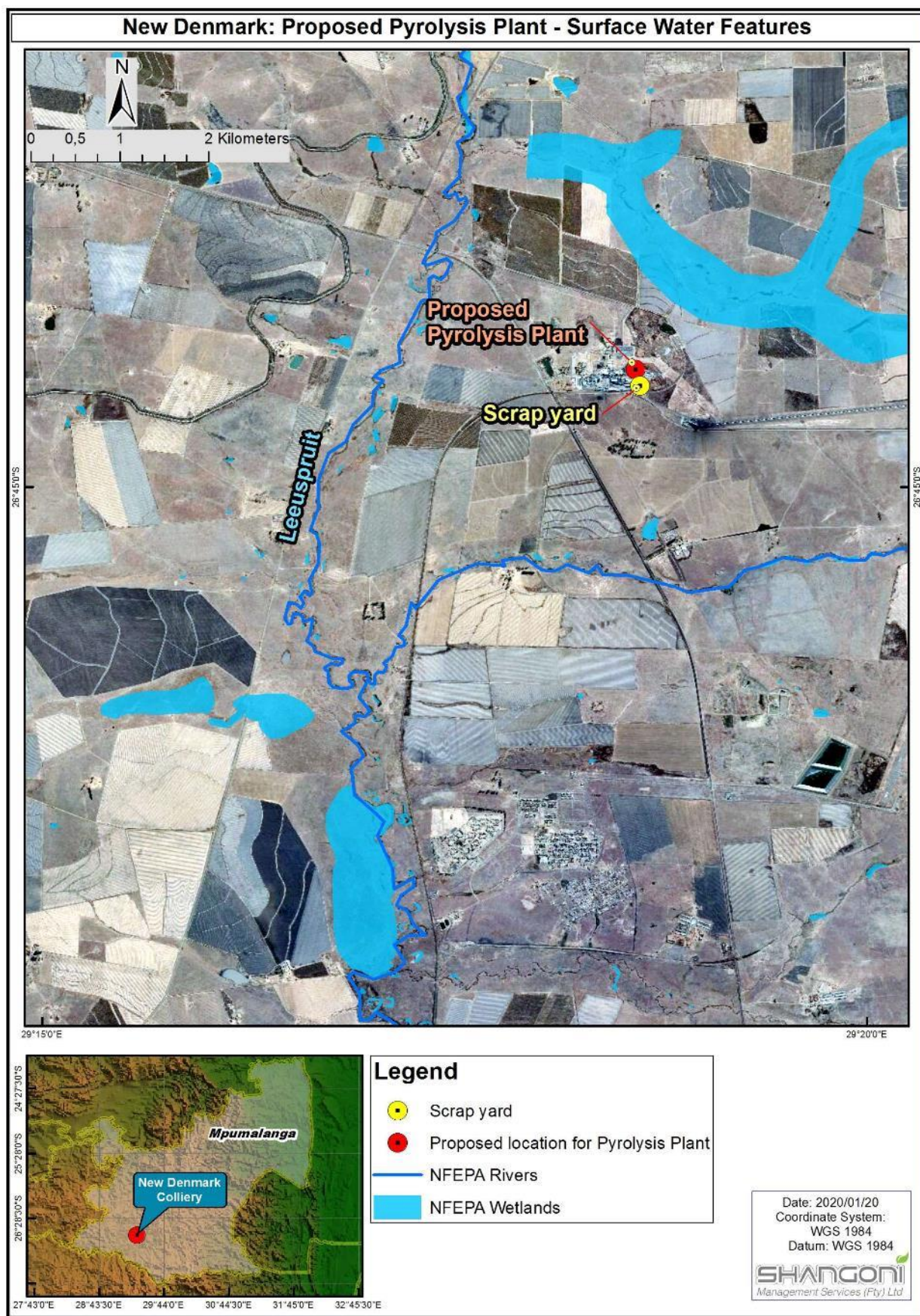


Figure 13: Surface water features applicable to the Pyrolysis Plant

Chapter H: Groundwater

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005 and Aquatico Scientific. January 2019 to March 2019. *New Denmark Colliery Quarterly Water Quality Assessment Report*.

Two groundwater aquifers were identified in the area. The upper aquifer lies within the weathered zone, which extends up to 15 m below the surface. This is normally the aquifer accessed for agricultural use. The shallow depth of this aquifer is partly attributed to the presence of a 60 m thick dolerite sill over large portions of the area. The second aquifer is usually associated with fractures within the arenaceous sediments such as sandstone and grit. Groundwater may be intersected at any level within these sediments, down to the No. 4 coal seam horizon at ± 180 m.

The existing mining operations have a significant impact on groundwater in the study area. The removal of the coal contributes to the fracturing of the overlying strata, allowing the groundwater to seep into the mined-out areas. As indicated in the report attached to the EMP and titled “*Underground compartments, capacities and water volumes for New Denmark Colliery – past and future*” compiled by F. Hodgson, dated June 2001 the NDC has a history of excess water that needs to be pumped to the surface. A compartment storage system was implemented in 1992 for the storage of excess affected water. However, the volume of contaminated water that needs to be stored exceeds the capacity of the compartments available for storage. The above-mentioned report contains a description of the storage capability in these compartments over the life of mine and, statistics and data available for the various compartments and the mine as a whole. The volume of mine water to be managed is ± 18 Mm³ while the total current capacity available in the compartments is 11 Mm³. The compartments, excluding the main development, will total more than 17 000 ha, while the depth of mining ranges between 130 – 260 m below surface. This amounts to at least 180 Mm³ during the life of mine.

Depth of Groundwater Table

Two aquifers are identified in the MRA. An upper water aquifer lies directly above a dolerite sill on average 10 to 15 m below surface. This sill is approximately 60 m thick. Farmers' boreholes are drilled to an average depth of 15 m. A second aquifer occurs below the dolerite sill in the sandstone above the No. 4 coal seam at an average depth of 180 m. According to the Groundwater Resources of South Africa (1995) Sheet 2, the storage coefficient of the underlying aquifer is expected to be less than 0.001. The recommended drilling depth below the groundwater level is 30 - 50 m. Fractures are restricted to a zone directly below the groundwater level. Groundwater drainage patterns in the area are generally related to surface water flow, such that groundwater divides coincide with watersheds.

The upper aquifer contains water of a quality that can be used by farmers for both domestic purposes and for watering cattle and sheep. The extent of the impact on the lower aquifer is not known, although it is assumed that the dewatering cone for this aquifer would be similar to that for the upper aquifer.



Neither of the aquifers are important regional groundwater resources. The lower aquifer is too deep to be economically tapped by local farmers and the water quality is not suitable for irrigation purposes.

As the coal seam is extracted, the aquifers are broken and groundwater flows into the mined area. Not only is the volume of water significant, but also the water quality is poor and characterised by high sulphate, calcium and magnesium concentrations. Total extraction underground mining temporarily destroys the groundwater reserve. The pre-mining groundwater reserve is limited to the top 30 m of the stratigraphic column. Deeper down, almost no groundwater resources have been utilised due to the low permeability of the strata and the increased salinity of the groundwater at depth.

Groundwater Use

Farmers tap the upper aquifer locally for stock watering and minor domestic use. The lower aquifer is too deep to be economically tapped by local farmers and the water quality is not suitable for irrigation purposes.

Groundwater Zone

According to the Groundwater Resources of South Africa (1995) Sheet 2, the storage coefficient of the underlying aquifer is expected to be smaller than 0.001. The recommended drilling depth below the groundwater level is 30 - 50 m. Fractures are restricted to a zone directly below the groundwater level. Groundwater drainage patterns in the area are generally related to surface water flow. For this reason, groundwater divides coincide with watersheds.

Presence of Boreholes and Springs

At the start of mining, there were 223 boreholes and springs within the mine boundary area. The yield per borehole varied between 400 litres and 2 000 litres per hour as measured by NDC. Boreholes are pumped and tested by NDC as required or if an impact is suspected. Further information regarding the quantity and quality of the water extracted from the boreholes is available from the mine.

Groundwater Flow Evaluation

The two main sources of water that contribute to influx into the underground mine workings are from the surrounding groundwater and from the rainfall and run-off that infiltrates into the underground mines. The existing underground mining at NDC has extended over approximately 4 000 ha over the past \pm 18 years. If only bord and pillar mining was applied, the estimated current influx would have been in the order of 1 Ml/day. However, the estimated influx at NDC is significantly greater since both bord and pillar and longwall mining methods are employed. The collapsed structures above the longwall panels connect the underground mining areas with the overlying aquifers. Rainfall run-off can penetrate the ground above the longwall areas more easily through cracks. According to the report: *Underground compartments, capacities and water volumes for New Denmark Colliery – past and future*, compiled by



F. Hodgson, dated June 2001, a moderate to high variability in influx characteristics is evident through the history of the mine.

Groundwater Quality

According to the Aquatico Scientific. January 2019 to March 2019. *New Denmark Colliery Quarterly Water Quality Assessment Report*, four boreholes were monitored during the quarterly period and their positions are indicated in the figure below for the Central Shaft area.



Figure 14: Surface layout map of the Central Shaft area.

The physical groundwater quality for C2 can be described as neutral, very saline and very hard; C3 can be described as neutral, non-saline and hard; C4 can be described as neutral, nonsaline and moderately hard. All the variables measured at all the groundwater localities complied with the WUL: 2016 limits for groundwater except SO₄ at C2 that exceeded the limit. In terms of the WUL: 2016 limits for groundwater, the water quality of these localities remained constant as compared to last quarterly period with a decrease in the SS concentrations and an increase in SO₄ concentration at C2. Refer to Table 22.



Table 22: Quarterly concentrations of the Central Shaft groundwater monitoring localities at NDC

AVERAGE DATA TABLE							
VARIABLE	UNITS	ASSESSMENT 1	ASSESSMENT 2	MONITORING LOCALITIES			
				C1	C2	C3	C4
pH @ 25°C	pH	5.0/9.7	5.0/9.7	-	7.55	7.65	7.85
Electrical conductivity (EC) @ 25°C	mS/m	170	170	-	137	68.5	61.3
Total Dissolved solids @ 180°C	mg/l	1200	1200	-	1105	417	384
Total hardness	mg CaCO ₃ /l	-	-	-	387	252	169
Total alkalinity	mg CaCO ₃ /l	-	-	-	136	244	202
Fluoride (F)	mg/l	1.5	1.5	-	0.35	0.55	0.5
Calcium (Ca)	mg/l	-	-	-	87	51.5	32
Magnesium (Mg)	mg/l	-	-	-	53.5	26.5	19
Sodium (Na)	mg/l	200	200	-	125	54.4	61.5
Potassium (K)	mg/l	-	-	-	7	5	6.05
Chloride (Cl)	mg/l	300	300	-	46	15.5	35
Sulphate (SO ₄)	mg/l	500	500	-	549	125	52.5
Nitrate (NO ₃) as N	mg/l	11	11	-	8.7	0.075	7.4
Orthophosphate (PO ₄) as P	mg/l	-	-	-	0.05	0.05	0.05
Aluminium (Al)	mg/l	0.3	0.3	-	0.05	0.05	0.05
Iron (Fe)	mg/l	0.3	0.3	-	0.03	0.013	0.013
Manganese (Mn)	mg/l	0.1	0.1	-	0.169	0.023	0.013
Copper (Cu)	mg/l	2	2	-	0.005	0.005	0.005
Nickel (Ni)	mg/l	0.07	0.07	-	0.013	0.013	0.013
Lead (Pb)	mg/l	0.01	0.01	-	0.005	0.005	0.005
Zinc (Zn)	mg/l	5	5	-	0.013	0.013	0.013



AVERAGE DATA TABLE							
Boron (B)	mg/l	2.4	2.4	-	0.166	0.11	0.049
Total suspended solids (TSS)	mg/l	-	-	-	8	9.7	0.9
TPH C10 - C40	µg/l	-	-	-	200	200	200

TPH (total petroleum hydrocarbons) concentrations were mostly below detection limit at all the borehole localities. Water quality according to the colour-coded classification system of the WRC (1998) “Quality of Domestic Water Supplies” can be classified as Good water quality (class 1) for C3 and C4 while C2 is classified as Marginal water quality (class 2) due to high SO₄ concentration recorded.

Chapter I: Air Quality

The NDC MRA falls within the Air Quality Priority Area – Highveld priority area. A specialist has been appointed to conduct an air quality impact assessment of the proposed pyrolysis plant.

Chapter J: Noise

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005.

Acoustical problems arising from the mining activities at NDC and its location in regard to the rural environment are currently not a problem. Due to the rural setting of the site, it is not expected that the noise created at the mine will have any effect on the surrounding communities.

Chapter K: Archaeology and Cultural History

There are no known archaeological or historical sites situated in close proximity to the proposed Pyrolysis Plant.

Chapter L: Sensitive Landscapes

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005.

Some small natural wetlands do occur within the mine boundary area. There are no wetlands or sensitive areas located close to the proposed site for the Pyrolysis Plant.



Chapter M: Visual aspects;

The proposed Pyrolysis Plant will be located within the mine area at the salvage yard.

Chapter N: Regional socio-economic structure

The following information was obtained from the *Environmental Impact Assessment and Environmental Management Programme submitted as contemplated in Section 39 (1) and Regulation 50 of the Mineral and Petroleum Resources Development Act, 2002 (Act No.28 of 2002) as part of a mining right application under Section 22(1) of the Act, Mining Right Application New Denmark Colliery DMRE Reference No. MP 30/5/1/2/2/ (74) MR*, dated 2005.

Gert Sibande is one of three districts in the Mpumalanga Province and is located in the south east portion of the province. According to a 2011 census, the Gert Sibande District Municipality has a total population of approximately 1 043 194 individuals, residing in 27 different towns and settlement areas throughout the region. NDC falls within the Lekwa Municipality, which is situated in the southern portion of the district (15% of district area) with the seat being located in Standerton and consisting of 15 wards. Standerton is the key urban node with Morgenzon as a major satellite node. The municipality's population was estimated to be 115 662 people in 2011 of which 25.9% of the potential economically active population are unemployed. The population is highly urbanised with the highest concentration of people living in Thutukani, which is located approximately 6 km south of NDC Central Shaft.

The mine is contributing to the local, regional and national economy by job creation and is currently a significant employer in the district, both of skilled and unskilled labour. The mine has 945 permanent employees and about 692 contractors. Labour is mostly sourced from the town of Standerton, which not only provides housing for the mining personnel, but has also become a hub for a number of guest houses and accommodation businesses that are supported by visitors to the nearby NDC and Tutuka power station.

The area is served by the Gert Sibande District Municipality (Lekwa Local Municipality). The following key economic activities are conducted in the Gert Sibande District Municipality:

- Mining,
- Manufacturing,
- Agriculture,
- Electrification / power generation,
- Construction,
- Trade,
- Transport,
- Finance,
- Community Services, and
- Tourism.



8.5. Impacts and risks identified

Table 23 below contains preliminary potential impacts that have been identified for the activities described in the final site layout plan. A detailed risk assessment will be undertaken as part of the EIAR and EMPr, in which the duration, probability, magnitude and reversibility of the impacts will be determined, and the significance of the impact calculated. Potential cumulative impacts have also been determined and are presented in Table 24.

Table 23: Preliminary determination of potential impacts of the Pyrolysis Plant

Environmental component (Aspects affected)	Activity	Potential Impact
Geology	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on geology as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard.
Topography	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on topography as a result of the construction and operation of the Pyrolysis Plant.
Soils	Construction and operation of the proposed Pyrolysis Plant.	There is a potential for soil pollution from hydrocarbon spillages and storage of general and hazardous waste on soils.
Land use and land capability	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on land use and land capability as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard; a disturbed area that has been concreted.
Fauna and Flora	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on fauna and flora as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard; a disturbed area that has been concreted.
Surface water	Construction and operation of the proposed Pyrolysis Plant.	There is a potential for contamination of surface water from the construction and operation of the Pyrolysis Plant if additional storm water measures are not implemented.
		There is a potential for contamination of surface water from the construction and operation of the Pyrolysis Plant due to incorrect storage of waste.
Groundwater	Construction and operation of the proposed Pyrolysis Plant.	There is a potential for contamination of ground water from hydrocarbon spillages and storage of general and hazardous waste on soils.
		No impact on groundwater resources is anticipated.
Sensitive landscapes	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on the sensitive landscapes (including wetlands) as a result of the Pyrolysis Plant. The Pyrolysis Plant will be



Environmental component (Aspects affected)	Activity	Potential Impact
(including wetlands)		assembled at the salvage yard; a disturbed area that has been concreted.
Air quality	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on the air quality during the construction of the Pyrolysis Plant. However, there is a potential for air pollution from emissions generating from the Pyrolysis Plant during the operational phase.
Noise	Construction and operation of the proposed Pyrolysis Plant.	There is potential for noise to be generated during the construction phase when the Pyrolysis Plant will be assembled on site. Furthermore, the plant will generate noise during the operational phase.
Visual	Construction and operation of the proposed Pyrolysis Plant.	There are no visual impacts identified for the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be located within the Mining Right Area and is located at the existing salvage yard.
Sites of Archaeological and Cultural Importance	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on sites of archaeological and cultural importance as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard; a disturbed area that has been concreted.
Socio-economic	Construction and operation of the proposed Pyrolysis Plant.	There may be positive impacts as a result of the construction and operation of the Pyrolysis Plant. These primarily relate to job creation as well as a reduction in waste generation for disposal to landfill.

Table 24: Preliminary identification of potential cumulative impacts of the Pyrolysis Plant

Environmental component (Aspects affected)	Activity	Potential Impact description
Surface	Construction and operation of the Pyrolysis Plant	Surface water resources may become contaminated if contaminated surface water runoff from affected waste enter the receiving environment, thereby contributing to impacts associated with the existing mining activities. The contribution is, however, considered low.
Groundwater		Groundwater resources may become contaminated from the operation of the Pyrolysis Plant. The contribution as a cumulative impact is, however, considered low.
Noise		Noise created from the Pyrolysis Plant may contribute to the existing noise levels associated with the mine. The cumulative impact is considered low.



Environmental component (Aspects affected)	Activity	Potential Impact description
Air Quality		Emissions from the Pyrolysis Plant may contribute to the existing air quality impacts that will be investigated in the air quality impact assessment.
Socio-Economic		Jobs will be created or maintained, providing income and, therefore, having a further impact on the regional socio-economy aspects of the area, along with other benefits arising from the Social and Labour Plan.

8.6. Methodology used in determining and ranking potential environmental impacts and risks

8.6.1 Methodology to be applied during the EIA and EMP phase

The environmental risk of any aspect is determined by a combination of parameters associated with the impact. Each parameter connects the physical characteristics of an impact to a quantifiable value to rate the environmental risk.

Impact assessments should be conducted based on a methodology that includes the following:

- Clear processes for impact identification, predication and evaluation;
- Specification of the impact identification techniques;
- Criteria to evaluate the significance of impacts;
- Design of mitigation measures to lessen impacts;
- Definition of the different types of impacts (indirect, direct or cumulative); and
- Specification of uncertainties.

After all impacts have been identified, the nature and scale of each impact can be predicted. The impact prediction will take into account physical, biological, socio-economic and cultural information and will then estimate the likely parameters and characteristics of the impacts. The impact prediction will aim to provide a basis from which the significance of each impact can be determined, and appropriate mitigation measures can be developed. The risk assessment methodology is based on defining and understanding the three basic components of the risk, i.e. the source of the risk, the pathway and the target that experiences the risk (receptor). Refer to Figure 15 below for a model representing the above principle (as contained in the DWA's Best Practice Guideline: G4 – Impact Prediction).



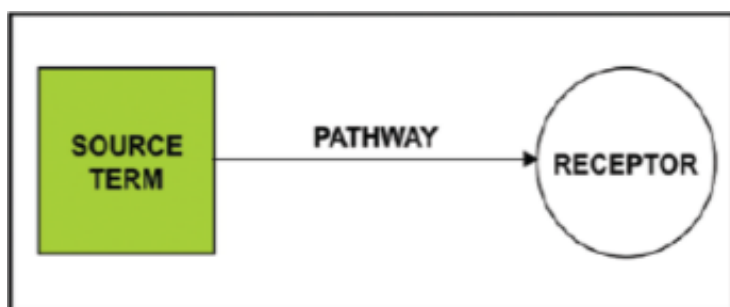


Figure 15: Impact prediction model

Table 25 and Table 26 below indicate the methodology to be used in order to assess the Probability and Magnitude of the impact, respectively, and Table 27 provides the Risk Matrix that will be used to plot the Probability against the Magnitude in order to determine the Severity of the impact.

Table 25: Determination of Probability of impact

Score	Frequency of Aspect / Unwanted Event	Availability of Pathway from the source to the receptor	Availability of Receptor
1	Never known to have happened, but may happen	A pathway to allow for the impact to occur is never available	The receptor is never available
2	Known to happen in industry	A pathway to allow for the impact to occur is almost never available	The receptor is almost never available
3	< once a year	A pathway to allow for the impact to occur is sometimes available	The receptor is sometimes available
4	Once per year to up to once per month	A pathway to allow for the impact to occur is almost always available	The receptor is almost always available
5	Once a month - Continuous	A pathway to allow for the impact to occur is always available	The receptor is always available

Step 1: Determine the PROBABILITY of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor.

Table 26: Determination of Magnitude of impact

Score	Source				Receptor	
	Duration of impact	Extent	Volume / Quantity / Intensity	Toxicity / Destruction Effect	Reversibility	Sensitivity of environmental component
1	Lasting days to a month	Effect limited to the site. (metres);	Very small quantities / volumes / intensity (e.g.	Non-toxic (e.g. water) / Very low potential to create damage or destruction to	Bio-physical and/or social functions and/or processes will	Current environmental component(s) are largely disturbed from



Score	Source			Receptor		
			< 50L or < 1Ha)	the environment	remain unaltered.	the natural state.
2	Lasting 1 month to 1 year	Effect limited to the activity and its immediate surroundings. (tens of metres)	Small quantities / volumes / intensity (e.g. 50L to 210L or 1Ha to 5Ha)	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	Receptor of low significance / sensitivity
3	Lasting 1 – 5 years	Impacts on extended area beyond site boundary (hundreds of metres)	Moderate quantities / volumes / intensity (e.g. > 210 L < 5000L or 5 – 8Ha)	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	Current environmental component(s) are moderately disturbed from the natural state.
4	Lasting 5 years to Life of Organisation	Impact on local scale / adjacent sites (km's)	Very large quantities / volumes / intensity (e.g. 5000 L – 10 000L or 8Ha– 12Ha)	Toxic (e.g. diesel & Sodium Hydroxide)	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	No environmentally sensitive components.
5	Beyond life of Organisation / Permanent impacts	Extends widely (nationally or globally)	Very large quantities / volumes / intensity (e.g. > 10 000 L or > 12Ha)	Highly toxic (e.g. arsenic or TCE)	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	Current environmental component(s) are a mix of disturbed and undisturbed areas.

Step 2: Determine the MAGNITUDE of the impact by calculating the average of the factors above.

Table 27: Determination of Severity of impact

Environmental Impact Rating / Priority	
	MAGNITUDE



Environmental Impact Rating / Priority					
Probability	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Step 3: Determine the SEVERITY of the impact by plotting the averages that were obtained above for Probability and Magnitude.

8.6.2 Knowledge gaps, assumptions and limitations

- New Denmark Colliery is to collect a waste sample for testing. Technotherm will assist in supplying a shredding machine that can be collected and brought to site on a truck. The waste will be shredded, and a sample is taken to Technotherm for testing.
- An air emissions license is required for the proposed Pyrolysis Plant.

8.7. Positive and negatives that the proposed activity and alternatives will have on the environment and community affected

The positive and negative implication of the proposed activity and the alternative identified have been provided below and assessed in terms of the following four categories:

- Environmental.
- Technical/Engineering.
- Economical.
- Social.

The positive and negative impacts of both the proposed activities and the preliminary identified alternatives will be further assessed as part of the EIAR and EMPr.

Table 28: Advantage and disadvantages of the proposed activities and preliminary identified alternatives

Alternative	Advantages	Disadvantages
Location		



Alternative	Advantages	Disadvantages
Location (preferred)	<p>Environmental: The salvage yard is located on an impermeable surface that will prevent soil and water pollution.</p> <p>Technical/Engineer: Not applicable.</p> <p>Economical: The salvage yard is near the scrap yard, therefore, less transport costs to transport the waste to the Pyrolysis Plant.</p> <p>Social: The salvage yard is located close to the entrance gate of the mine and the contractor will not have to travel far distances to access the site.</p>	<p>Environmental: The salvage yard is full, and the space needs to be cleared for the construction of the Pyrolysis Plant.</p> <p>Technical/Engineer: The existing roof will have to be extended to provide shelter for the Pyrolysis Plant.</p> <p>Economical: The scrap metal stored at the salvage yard will have to be cleared from site and can cause a delay in the project.</p> <p>Social: The contractor will have to use the mine's entrance and comply to the Mine Health and Safety Act No. 29 of 1996 and the Occupational Health & Safety Act (85 OF 1993).</p>
Location (alternative)	<p>Environmental: The scrap yard is located on an impermeable surface that will prevent soil and water pollution.</p> <p>Technical/Engineer: Not applicable.</p> <p>Economical: No transport of waste is required if the Pyrolysis Plant is situated at the scrap yard where the waste is stored.</p> <p>Social: The scrap yard is located close the entrance gate of the mine and the contractor will not have to travel far distances to access the site.</p>	<p>Environmental: The scrap yard is full, and the space needs to be cleared for the construction of the Pyrolysis Plant.</p> <p>Technical/Engineer: The existing roof at the hazardous waste site is not sufficient and will have to be extended to provide shelter for the Pyrolysis Plant.</p> <p>Economical: Currently there is no space for the Pyrolysis Plant and all scrap metal will have to be removed and sold.</p> <p>Social: The contractor will have to use the mines entrance and comply to the Mine Health and Safety Act No. 29 of 1996 and the Occupational Health & Safety Act (85 OF 1993).</p>
Technological		
Pyrolysis Plant (preferred)	<p>Environmental:</p> <ul style="list-style-type: none"> Disposes of waste on site eliminating the carbon footprint caused by transport, Alternative electricity supply through waste-to-energy, Avoids disposal to landfill, Is the most efficient of the systems available allowing more than 1 Mega Watt export per ton of waste. <p>Technical/Engineer: All waste except glass and scrap metal can be processed by the Pyrolysis Plant.</p> <p>Economical: Costs savings will be realised through both savings on waste disposal and electricity generation.</p> <p>Social: Creation of additional employment opportunities during the construction and operational phases of the project as this project will be done</p>	<p>Environmental: Requires 1000 liters of water per day to operate the plant. Emissions will be generated from the plant.</p> <p>Technical/Engineer: The Pyrolysis Plant has specific operating requirements and requires a skilled operator.</p> <p>Economical: Expensive technology and operating costs.</p> <p>Social: None identified</p>



Alternative	Advantages	Disadvantages
	by a contractor from the local community.	
Gasification (alternative)	<p>Environmental: Gasification has lower emissions than incineration.</p> <p>Refer similar advantages as for Pyrolysis Plant.</p> <p>Technical/Engineer Refer similar advantages as for Pyrolysis Plant</p> <p>Economical: This process can effectively compete in high-price energy environments to provide both power and products. Gasification can be utilised to turn lower-priced feedstock, such as pet coke and coal, into valuable products, like electricity, fuels and fertilizers.</p> <p>Social: Creation of additional employment opportunities during the construction and operational phases of the project as this project will be done by a contractor from the local community.</p>	<p>Environmental: Gasification produces gas, ash and tar that will require final disposal.</p> <p>Technical/Engineer: Gasification is a complex and sensitive process.</p> <p>Economical: Not energy efficient.</p> <p>Social: None identified</p>
Incineration (alternative)	<p>Environmental: Refer similar advantages as for Pyrolysis Plant.</p> <p>Technical/Engineer: Refer similar advantages as for Pyrolysis Plant.</p> <p>Economical: Cheaper than Pyrolysis and gasification process.</p> <p>Social: Creation of additional employment opportunities during the construction and operational phases of the project as this project will be done by a contractor from the local community.</p>	<p>Environmental: Incineration produces flue gas and ash that requires final disposal and produces emissions.</p> <p>Technical/Engineer: Combustion of waste produces more toxic waste.</p> <p>Economical: The installation of an incineration plant is an expensive process.</p> <p>Social: None identified.</p>

9. Plan of study for the Environmental Impact Assessment Process

9.1. Description of alternatives

Refer to Sections 8.1 and 8.7 above for a description of the alternatives that have been identified.

9.2. Description of the aspects to be assessed as part of the environmental impact assessment process

As part of the proposed Pyrolysis Plant project, the following aspects of the environment will be considered and include:

- Geology.



- Topography.
- Soil, Land use and land capability.
- Fauna and Flora.
- Surface water.
- Groundwater.
- Sensitive landscapes (including wetlands).
- Air quality.
- Noise.
- Visual aspects.
- Sites of cultural and archaeological importance.
- Socio-economic aspects.

9.3. Description of aspects to be assessed by specialists

The following specialist studies were identified:

- Pyrolysis Plant: Air quality impact study.

9.4. Proposed method of assessing the environmental aspects including the proposed method of assessing alternatives

9.4.1 Proposed method of assessing environmental aspects

The method for assessing the environmental aspects have been described in Part 8.6.2 above.

9.4.2 Proposed method of assessing alternatives

Refer to Parts 8.1 and 8.7 above for the description of alternatives identified and for the advantages and disadvantages of the identified alternatives.

9.5. The proposed method of assessing duration and significance

The method used in determining the significance and the duration of the impact is described in Table 29. Duration is divided into five (5) periods. A score of between 1 and 5 is assigned to the impact based on the characteristics of the impact and the period for which the impact will occur and have an impact on the socio-economic, cultural and biophysical environment. The score assigned to the specific impact for duration is then used in determining the magnitude of the impact.

Table 29: Determination of the duration of the impact

Duration of impact	Score
Lasting days to a month	1
Lasting 1 month to 1 year	2
Lasting 1 – 5 years	3
Lasting 5 years to Life of Organisation	4



Duration of impact	Score
Beyond life of Organisation / Permanent impacts	5

9.6. The stages at which the Competent Authority will be consulted

The Competent Authority, in this case the Mpumalanga Department of Mineral Resources and Energy (“DMRE”) will be consulted throughout the application process.

This Scoping Report is compiled and will be made available for public and stakeholder review for a period of thirty (30) days. This Scoping Report will be submitted to the DMRE, where after the DMRE will have 44 days to either refuse environmental authorisation or accept the Scoping Report and inform the applicant to proceed with the tasks contemplated in the plan of study for the EIA.

The Competent Authority (the DMRE) will further be involved during the EIA phase of the project. The EIAR and EMPr will also be made available for a public and stakeholder review period of thirty (30) days. Upon completion of the review period, the EIAR and EMPr will be finalised and submitted to the DMRE, where after the DMRE will have a period of 107 days to consider the application and, in writing, notify the applicant of the decision to grant or refuse environmental authorisation.

9.7. Particulars of the public participation process with regard to the Impact Assessment process that will be conducted

9.7.1 Steps to be taken to notify interested and affected parties

A detailed public participation process was undertaken as part of the initial application- and scoping phase for the proposed project. The following has been conducted as part of the Environmental Authorisation Application (proof hereof is included in the Public Participation Report attached as Annexure D to this report):

- Advertisements.
 - A Newspaper advertisement will be placed in the Standerton Advertiser on the 18th of February 2020.
- Site notices.
 - Five (5) site notices were placed around the proposed project site as well as at the existing mine.
- Written notices.
 - Written notices (including BIDs) were distributed to Interested and Affected Parties (I&APs).
- Availability of Scoping Report for public review
 - This Scoping Report was made available for public and stakeholder review for a period of 30 days (18th of February to 18th March 2020). Notices providing the detail of the public viewing



station and review period, were sent to registered I&APs via e-mail. This notification also formed part of the above-mentioned advertisement and site notices.

9.8. Description of the tasks that will be undertaken as part of the environmental impact assessment process

The Environmental Impact Assessment Report (“EIAR”) and Environmental Management Programme Report (“EMPr”) will be submitted, once the Scoping Report has been accepted by the Competent Authority. The EIAR will be compiled in accordance to Appendix 3 of the EIA Regulations 2014, as amended and the Environmental Management Programme Report (EMPr) will be compiled in accordance to Appendix 4 of the EIA Regulations 2014, as amended.

Required content of Environmental Impact Assessment Report

An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-

- (a) Details of-
 - (i) The EAP who prepared the report; and
 - (ii) The expertise of the EAP, including a curriculum vitae;
- (b) The location of the activity, including:
 - (i) The 21-digit Surveyor General code of each cadastral land parcel;
 - (ii) Where available, the physical address and farm name; and
 - (iii) Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.
- (c) A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-
 - (i) A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; and
 - (ii) On land where the property has not been defined, the coordinates within which the activity is to be undertaken.
- (d) A description of the scope of the proposed activity, including-
 - (i) All listed and specified activities triggered and being applied for; and
 - (ii) A description of the associated structures and infrastructure related to the development.
- (e) A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;



- (f) A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location;
- (g) A motivation for the preferred development footprint within the approved site;
- (h) A full description of the process followed to reach the proposed development footprint within the approved site, including:
 - (i) Details of the development footprint alternatives considered;
 - (ii) Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;
 - (iii) A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;
 - (iv) The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
 - (v) The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-
 - (aa) Can be reversed;
 - (bb) May cause irreplaceable loss of resources; and
 - (cc) Can be avoided, managed or mitigated;
 - (vi) The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;
 - (vii) Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community, that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;
 - (viii) The possible mitigation measures that could be applied and level of residual risk;
 - (ix) If no alternative development locations for the activity were investigated, the motivation for not considering such; and
 - (x) A concluding statement indicating the preferred alternative development location within the approved site;
- (i) A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-



- (i) A description of all environmental issues and risks that were identified during the environmental impact assessment process; and
 - (ii) An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;
- (j) An assessment of each identified potentially significant impact and risk, including-
 - (i) Cumulative impacts;
 - (ii) The nature, significance and consequences of the impact and risk;
 - (iii) The extent and duration of the impact and risk;
 - (iv) The probability of the impact and risk occurring;
 - (v) The degree to which the impact and risk can be reversed;
 - (vi) The degree to which the impact and risk may cause irreplaceable loss of resources;
 - (vii) The degree to which the impact and risk can be mitigated;
- (k) Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;
- (l) An environmental impact statement which contains-
 - (i) a summary of the key findings of the environmental impact assessment;
 - (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and
 - (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives; based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;
- (m) Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;
- (n) The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;
- (o) Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation



- (p) A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;
- (q) A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;
- (r) Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised;
- (s) An undertaking under oath or affirmation by the EAP in relation to:
 - (i) The correctness of the information provided in the reports;
 - (ii) The inclusion of comments and inputs from stakeholders and I&APs;
 - (iii) The inclusion of inputs and recommendations from the specialist reports where relevant; and
 - (iv) Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;
- (t) Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;
- (u) An indication of any deviation from the approved scoping report, including the plan of study, including-
 - (i) Any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and
 - (ii) A motivation for the deviation;
- (v) Any specific information that may be required by the competent authority; and
- (w) Any other matters required in terms of section 24(4) (a) and (b) of the Act.

Required content of EMPr

An EMPr must comply with section 24N of the Act and include-

- (a) Details of
 - (i) The EAP who prepared the EMPR; and
 - (ii) The expertise of that EAP to prepare an EMPR, including a curriculum vitae;
- (b) A detailed description of the aspects of the activity that are covered by the EMPR as identified by the project description;



- (c) A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;
- (d) A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-
 - (i) Planning and design;
 - (ii) Pre-construction activities;
 - (iii) Construction activities;
 - (iv) Rehabilitation of the environment after construction and where applicable post closure;
 - (v) Where relevant, operation activities;
- (e) A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);
- (f) A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to –
 - (i) Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - (ii) Comply with any prescribed environmental management standards or practices;
 - (iii) Comply with any applicable provisions of the Act regarding closure, where applicable;
 - (iv) Comply with any provisions of the Act regarding financial provisions for rehabilitation;
- (g) The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
- (h) The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);
- (i) An indication of the persons who will be responsible for the implementation of the impact management actions;
- (j) The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;
- (k) The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);
- (l) A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;



- (m) An environmental awareness plan describing the manner in which-
 - (i) The applicant intends to inform his or her employees of any environmental risk which may result from their work; and
 - (ii) Risks must be dealt with in order to avoid pollution or the degradation of the environment;
- (n) Any specific information that may be required by the competent authority.

9.9. Measures to avoid, reverse, mitigate, or manage identified impacts

Table 30 below is the Risk assessment table in which preliminarily identified impacts have been identified. Mitigations measures (to avoid , reverse, mitigate, or manage identified impacts) as well as the extent to which these impacts are anticipated to result in residual risks are also provided in Table 30 below.



Table 30: Risk assessment table for the proposed Pyrolysis Plant

Environmental component (Aspects affected)	Activity	Potential Impact	Mitigation type Modify/Remedy/ Control/Stop	Potential for residual risk
Geology	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on geology as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard.	No mitigation measures required.	No potential for residual risk.
Topography	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on topography as a result of the construction and operation of the Pyrolysis Plant.	No mitigation measures required.	No potential for residual risk.
Soils	Construction and operation of the proposed Pyrolysis Plant.	There is a potential for soil pollution from hydrocarbon spillages and storage of general and hazardous waste on soils.	Control: <ul style="list-style-type: none"> Any oil spillage due to leakages and blockages will be cleaned up with an oil clean-up kit (saw dust/wood shavings/chemical adsorbent) and either pyrolyzed or sent for correct disposal. In the interest of operational health and safety, any oil will be treated as hazardous prior to full material safety data sheets being established. All waste storage containers must comply with the conditions as stipulated in GNR. 926 of 29 November 2013. 	Low to medium potential for residual risk, if not mitigated appropriately.
Land use and land capability	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on land use and land capability as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at	No mitigation measures proposed.	No potential for residual risk.



Environmental component (Aspects affected)	Activity	Potential Impact	Mitigation type Modify/Remedy/ Control/Stop	Potential for residual risk
		the salvage yard; a disturbed area that has been concreted.		
Fauna and Flora	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on fauna and flora as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard; a disturbed area that has been concreted.	No mitigation measures proposed.	No potential for residual risk.
Surface water	Construction and operation of the proposed Pyrolysis Plant.	There is a potential for contamination of surface water from the construction and operation of the Pyrolysis Plant if additional storm water measures are not implemented.	Control: <ul style="list-style-type: none"> Implementation of storm water management measures in compliance to GN R704. 	Low to medium potential for residual risk, if not mitigated appropriately.
		There is a potential for contamination of surface water from the construction and operation of the Pyrolysis Plant due to incorrect storage of waste.	Control: <ul style="list-style-type: none"> All waste storage containers must comply with the conditions as stipulated in GNR. 926 of 29 November 2013. 	Low to medium potential for residual risk, if not mitigated appropriately.
Groundwater	Construction and operation of the proposed Pyrolysis Plant.	There is a potential for contamination of ground water from hydrocarbon spillages and storage of general and hazardous waste on soils.	Control: <ul style="list-style-type: none"> All waste storage containers must comply with the conditions as stipulated in GNR. 926 of 29 November 2013. Any oil spillage due to leakages and blockages will be cleaned up with an oil clean-up kit (saw dust/wood shavings/chemical adsorbent) and either pyrolyzed or sent for correct disposal. In the 	Low to medium potential for residual risk, if not mitigated appropriately.



Environmental component (Aspects affected)	Activity	Potential Impact	Mitigation type Modify/Remedy/ Control/Stop	Potential for residual risk
			interest of operational health and safety, any oil will be treated as hazardous prior to full material safety data sheets being established.	
		No impact on groundwater resources is anticipated.	Control: <ul style="list-style-type: none"> Cleaning the tyres and conveyor belts using compressed air instead of water should be considered. Re-use of water in the process. 	Low to medium potential for residual risk, if not mitigated appropriately.
Sensitive landscapes (including wetlands)	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on the sensitive landscapes (including wetlands) as a result of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard; a disturbed area that has been concreted.	No mitigation measures proposed.	No potential for residual risk.
Air quality	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on the air quality during the construction of the Pyrolysis Plant. However, there is a potential for air pollution from emissions generating from the Pyrolysis Plant during the operational phase.	Control: <ul style="list-style-type: none"> Compliance to the air quality standards and national ambient minimum emission standards. Further measures as per the specialist assessment during the EIAR phase. 	As per specialist assessment, to be undertaken during the EIAR phase.
Noise	Construction and operation of the proposed Pyrolysis Plant.	There is potential for noise to be generated during the construction phase when the Pyrolysis Plant will be assembled on site and the	Control: <ul style="list-style-type: none"> The Pyrolysis Plant will be under roof. The Pyrolysis Plant will not exceed 89 dB at 1 m from all internal equipment. Truck movements outside of the facility may be up 	Low to medium potential for residual risk, if not mitigated appropriately.



Environmental component (Aspects affected)	Activity	Potential Impact	Mitigation type Modify/Remedy/ Control/Stop	Potential for residual risk
		operation of the Pyrolysis Plant will generate noise.	to 106 dB. The noise levels will not disturb any interested and affected parties as the Pyrolysis Plant will be situated within the mine at the salvage yard.	
Visual	Construction and operation of the proposed Pyrolysis Plant.	There are no visual impacts identified for the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be located within the Mining Right Area and is to be located at the existing salvage yard.	No mitigation measures proposed.	No potential for residual risk.
Sites of Archaeological and Cultural Importance	Construction and operation of the proposed Pyrolysis Plant.	There are no impacts identified on sites of archaeological and cultural importance as a result of the construction and operation of the Pyrolysis Plant. The Pyrolysis Plant will be assembled at the salvage yard; a disturbed area that has been concreted.	No mitigation measures proposed.	No potential for residual risk.
Socio-economic	Construction and operation of the proposed Pyrolysis Plant.	There may be positive impacts as a result of the construction and operation of the Pyrolysis Plant. These primarily relate to job creation.	Control: <ul style="list-style-type: none"> Local companies and labour should be utilized where possible. The site workers and contractors will adhere to the requirements of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and Mine Health and Safety Act, Act 29 of 1996. 	Low to medium potential for residual risk, if not mitigated appropriately.



10. Other information required by the Competent Authority

10.1. Compliance with the provisions of section 24(4)(a) and (b): - read with section 24(3)(a) and (7) of the National Environmental Management Act 107 of 1998. The EIA report must include the:

10.1.1 Impact on the socio-economic conditions of any directly affected person

Table 31: Impact on the socio-economic conditions of any directly affected person

Results of investigation, assessment and evaluation of impact on any directly affected person	Reference to where mitigation is reflected
New Denmark indicates that it strives to maintain a positive impact on the socio-economic environment during the life of mine. The mine indicates that it is actively involved in the community whereby funds are made available for the development of local infrastructure and social upliftment.	Part 8.7

10.1.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act 25 of 1999.

Table 32: Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act 25 of 1999.

Results of investigation, assessment and evaluation of impact on any national estate	Reference to where mitigation is reflected
Pyrolysis Plant	
No impact on national estate (heritage resources) in terms of the Heritage Resources Act (Act 25 of 1999), are identified as part of the project, as the project is on brownfields areas.	Refer to Chapter K of Part 8.4.1.

11. Other matters required in terms of section 24(4)(a) and (b) of the Act

Section 24(4)(b) of the NEMA (1998), as amended, states that the following:

“24(4) Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment -

(b) must include, with respect to every application for an environmental authorisation and where applicable-



- (i) *investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity;”*

The positive and negative implication of the proposed activity and the alternative identified have been provided above under Section 8.7. The positive and negative implications of both the proposed activities and the preliminary identified alternatives will be further assessed as part of the EIAR and EMPr.

12. Undertaking

The EAP herewith confirms

- the correctness of the information provided in the reports ☒
- the inclusion of comments and inputs from stakeholders and I&APs ; ☐
- the inclusion of inputs and recommendations from the specialist reports where relevant; ☐ and
- the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

Signature of EAP

Date

13. Declaration of independence

Shangoni hereby declares that it is an independent EAP has no business, financial, personal or other interest in this project in respect of which Shangoni is appointed. Furthermore, no circumstances exist that may compromise the objectivity of Shangoni, excluding fair remuneration for work performed in connection with this project.

Report compiled **DRAFT FOR REVIEW**
by:

Report reviewed by: **DRAFT FOR REVIEW**

Lee-Anne Fellows
(Pr.Sci.Nat)

Brian Hayes (Pr Eng)

EAPSA EAP

