

**PHASE 1 PALAEOLOGICAL
HERITAGE IMPACT ASSESSMENT
REPORT ON THE SITE OF THE
CONSTRUCTION OF A PROPOSE
HAUL ROAD, PROPOSED
EXTENSION OF MINING
ACTIVITIES BENEATH 2A
POLLUTION CONTROL DAM AND
THE SITE OF A NEW POLLUTION
CONTROLL DAM ON KLEINKOPJE
COLLIERY, MPUMALANGA
PROVINCE**

22 September 2016

Prepared for:
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**PHASE 1 PALAEOLOGICAL HERITAGE IMPACT ASSESSMENT REPORT ON THE
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Prepared for:

Shangoni Management Consultants (Pty) Ltd.

On behalf of:

Anglo Operations (Pty) Ltd

Prepared By:

Prof B.D. Millstead

EXECUTIVE SUMMARY

Anglo Operations (Pty) Ltd proposes to expand their coal mining operations within the Kleinkopje Colliery. As a result of this aim the company plans to put a new haul road in place, to mine in an area currently occupied by the existing 2A Pollution Control Dam and to construct a new pollution control dam develop to replace the 2A Dam. The three proposed components of the planned development are all located within the boundary of the Kleinkopje Colliery Mining Right area. The mine is located approximately 15 km south of 15km south of Emalahleni, Nkangala District Municipality, Witbank Magisterial District, in the Mpumalanga Province. The proposed infrastructure elements are located approximately 3 km SE of the N12, 5 km west of the R544 and 6 km east of the R547 roads and are located within portions of the farms Klippan 332 REM and Portions 5, 6 and 12, Landau 349 Rem and Kleinkopje 15 Ptn 1 (Figure 2). The aerial extent of the proposed 2A Dam component is project is approximately 101 ha while the area contemplated for the proposed pollution control dam is approximately 21 ha. The proposed haul road is approximately 4 km in length.

Anglo Operations (Pty) Ltd has appointed Shangoni Management Consultants (Pty) Ltd to compile an Environmental Impact Assessment Report (EIAR) for the proposed project. Shangoni Management Consultants (Pty) Ltd has appointed BM Geological Services to provide a Phase 1 Palaeontological Heritage Impact Assessment Report in respect of the proposed project area.

A site investigation was conducted, as part of a Phase 1 Palaeontological Heritage Impact Assessment Study, on the 2nd of September 2016 by Prof B.D. Millstead. Prof Millstead was accompanied, and assisted by, Mr Jerome Ncina of Kleinkopje Colliery. The 2A Dam and proposed Pollution Control Dam project areas were traversed by foot. However, due to time constraints the proposed haul road area was inspected by vehicle.

The construction of the proposed Bronkhorspruit Rail Siding redevelopment will directly affect the Early Permian coal-bearing sediments of the Vryheid Formation (Ecca Group, Karoo Supergroup). Any negative impacts to the palaeontological heritage of the region will be limited to the footprint area of the construction activities and, as such, the extent of any impact is accordingly characterised as local. The Vryheid Formation strata underlying the 2A Dam area will be completely destroyed by the mining operation. It is anticipated that only the regolith horizon underlying the proposed haul road will be negatively impacted and the underlying Vryheid Formation will not be directly impacted by the road's construction. The proposed pollution control dam will overly an area where the Vryheid Formation has previously been removed by coal mining activities and which has subsequently been rehabilitated with mine waste rock land fill.

Vryheid Formation sediments are known to contain rare plant macrofossil assemblages belonging to the scientifically significant *Glossopteris* Flora. The formation is also known

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to contain trace fossil assemblages belonging to two forms (*Helminthiopsis* and *Taphrelminthopsis*) within horizontally laminated siltstones and mudstones that represent part of the deep water *Nerites* community. These trace fossil assemblages provide valuable scientific insight into the sedimentary environments of the rocks that contain them. No in situ fossil materials were identified during the conduct of the site investigation. However, fragmentary plant macrofossils were identified in the waste rock material that forms the rehabilitated land surface of the proposed pollution control dam area. While these fossils are of no scientific value they indicate the presence of potentially significant plant macrofossils within the Vryheid Formation strata that are being economically exploited at the Kleinkopje Colliery.

The following damage mitigation protocols are recommended.

2A Dam: A member of staff (e.g., the Environment Officer) of the Kleinkopje Colliery be trained to recognise the types of fossils that may be exposed via the mining operations and how to excavate and curate them. This officer should:

- Make regular inspections of newly exposed rock material following blasting to identify if scientifically significant fossils have been exposed.
- An experience Karoo palaeobotanist must be mandated by the colliery to inspect the fossils, ascertain their significance and to make any necessary recommendations concerning their preservation.
- Should scientifically significant macrofossil materials be unearthed during the excavations associated with the project the excavations in that area should be halted in that location and SAHRA informed of the discovery (see Section 3.3 above) and a palaeontologist contracted to evaluate their importance. A significant potential benefit of the examination of the excavations associated with the construction of the project is that currently unobservable fossils may be uncovered and that potentially significant fossil material may be made available for scientific study.

It is further recommended that:

- Six monthly examinations of the colliery pit by an experience Karoo palaeobotanist should be undertaken once mining has commenced.
- The six monthly periodicity of these inspections should be subject to later review, based on the results of those inspections.
- Should scientifically significant macrofossil materials be unearthed during the excavations associated with the project the excavations in that area should be halted in that location and SAHRA informed of the discovery (see Section 3.3 above) and a palaeontologist contracted to evaluate their importance.
- Should scientifically or culturally significant fossil material exist within the project area any negative impact upon it could be mitigated by its excavation (under

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permit from SAHRA) by a palaeontologist and the resultant material being lodged with an appropriately permitted institution. In the event that an excavation is impossible or inappropriate the fossil or fossil locality should be protected and the fossil site excluded from any further construction activities.

Pollution Control Dam: No damage mitigation procedures are required in the proposed PCD construction area.

Proposed Haul Route: No damage mitigation procedures are required in the proposed haul route area.

This study has not identified any palaeontological reason to prejudice the redevelopment of the 2A Dam as an open pit mine or the construction of the proposed pollution control dam or haul road at Kleinkopje Colliery subject to the proposed damage mitigation procedures being enacted.

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1 INTRODUCTION

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Anglo Operations (Pty) Ltd has appointed Shangoni Management Consultants (Pty) Ltd to compile an Environmental Impact Assessment Report (EIAR) for the proposed project. Shangoni Management Consultants (Pty) Ltd has appointed BM Geological Services to provide a Phase 1 Palaeontological Heritage Impact Assessment Report in respect of the proposed project area.

2 TERMS OF REFERENCE AND SCOPE OF THE STUDY

The terms of reference for this study were as follows:-

- Conduct a desktop assessment of the potential impact of the proposed project on the palaeontological heritage of the project area.
- Describe the possible impact of the proposed development on the palaeontological heritage of the site, according to a standard set of conventions.
- Quantify the possible impact of the proposed development on the palaeontological heritage of the site, according to a standard set of conventions, these being:
 - The standard BM Geological Services assessment terminology.
 - The standard Shangoni Management Consultants assessment matrices.
- Provide an overview of the applicable legislative framework.
- Make recommendations concerning future work programs as, and if, necessary.

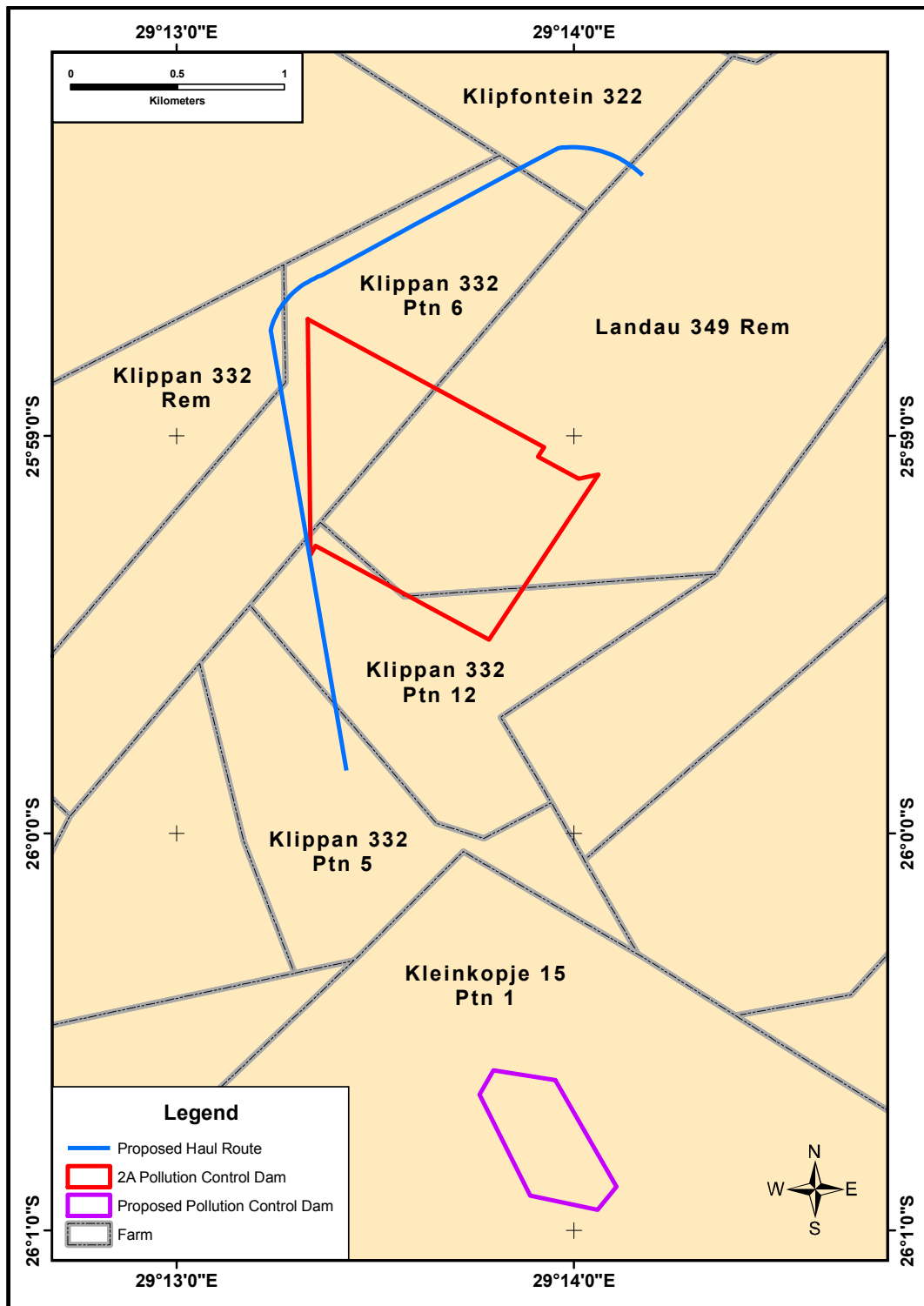


Figure 1: Map showing the spatial relationships of the 2A Dam area, the proposed new pollution control dam and the proposed new haul Road relative to each other. Shown

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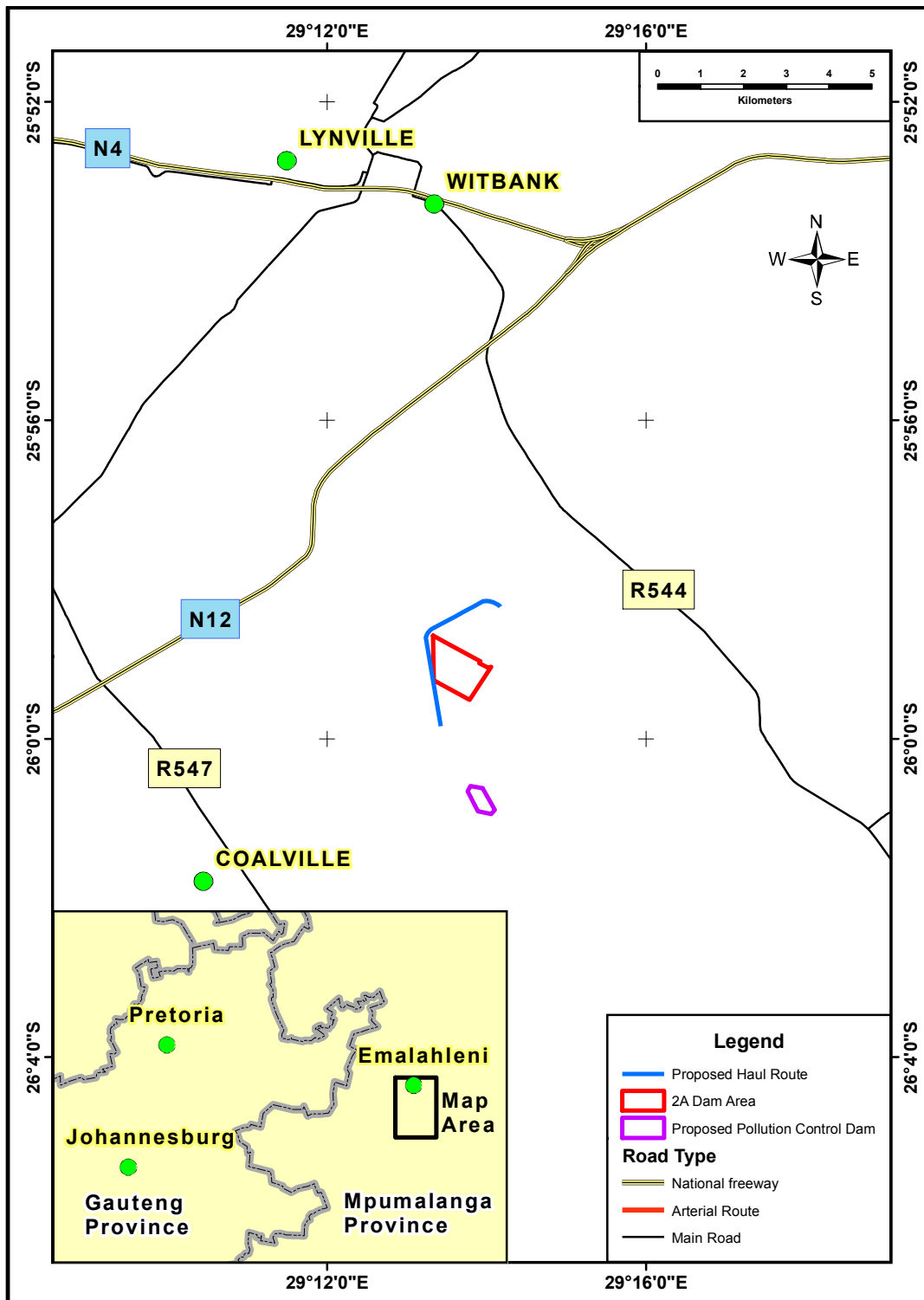


Figure 2: Map showing the location of the 2A Dam area as well as the proposed new pollution control dam and the proposed haul road.

3 LEGISLATIVE REQUIREMENTS

South Africa's cultural resources are primarily dealt with in two Acts. These are the National Heritage Resources Act (Act 25 of 1999) and the National Environmental Management Act (Act 107 of 1998).

3.1 The National Heritage Resources Act

The following are protected as cultural heritage resources by the National Heritage Resources Act:

- Archaeological artefacts, structures and sites older than 100 years,
- Ethnographic art objects (e.g. prehistoric rock art) and ethnography,
- Objects of decorative and visual arts,
- Military objects, structures and sites older than 75 years,
- Historical objects, structures and sites older than 60 years,
- Proclaimed heritage sites,
- Grave yards and graves older than 60 years,
- Meteorites and fossils,
- Objects, structures and sites of scientific or technological value.

The Act also states that those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities. The national estate includes the following:

- Places, buildings, structures and equipment of cultural significance,
- Places to which oral traditions are attached or which are associated with living heritage,
- Historical settlements and townscapes,
- Landscapes and features of cultural significance,
- Geological sites of scientific or cultural importance,
- Sites of Archaeological and palaeontological importance,
- Graves and burial grounds,
- Sites of significance relating to the history of slavery,
- Movable objects (e.g., archaeological, palaeontological, meteorites, geological specimens, military, ethnographic, books etc.).

3.2 Need for Impact Assessment Reports

Section 38 of the Act stipulates that any person who intends to undertake an activity that falls within the following:

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- The construction of a linear development (road, wall, power line, canal etc.) exceeding 300 m in length,
- The construction of a bridge or similar structure exceeding 50 m in length,
- Any development or other activity that will change the character of a site and exceed 5 000 m² or involve three or more existing erven or subdivisions thereof,
- Re-zoning of a site exceeding 10 000 m²,
- Any other category provided for in the regulations of SAHRA or a provincial heritage authority,

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. If there is reason to believe that heritage resources will be affected by such development, the developer may be notified to submit an impact assessment report. A Palaeontological Impact Assessment (PIA) only looks at the potential impact of the development palaeontological resources of the proposed area to be affected.

3.3 Legislation Specifically Pertinent to Palaeontology*

***Note:** Section 2 of the Act defines “palaeontological” material as “any fossilised remains or fossil trace of animals or plants which lived in the geological past, other than fossil fuels or fossiliferous rock intended for industrial use, and any site which contains such fossilised remains”.

Section 35(4) of this Act specifically deals with archaeology, palaeontology and meteorites. The Act states that no person may, without a permit issued by the responsible heritage resources authority (national or provincial):

- Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite,
- Destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite,
- Trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or
- Bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment that assists in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites,

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- Alter or demolish any structure or part of a structure which is older than 60 years as protected.

The above mentioned palaeontological objects may only be disturbed or moved by a palaeontologist, after receiving a permit from the South African Heritage Resources Agency (SAHRA). In order to demolish such a site or structure, a destruction permit from SAHRA will also be needed.

Further to the above point, Section 35(3) of this Act indicates that “any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority”. Thus, regardless of the granting of any official clearance to proceed with any development based on an earlier assessment of its impact on the Palaeontological Heritage of an area, the development should be halted and the relevant authorities informed should fossil objects be uncovered during the progress of the development.

3.4 The National Environmental Management Act [as amended]

This Act does not provide the detailed protections and administrative procedures for the protection and management of the nation’s Palaeontological Heritage as are detailed in the National Heritage Resources Act, but is more general in its application. In particular Section 2(2) of the Act states that environmental management must place people and their needs at the forefront of its concerns and, amongst other issues, serve their cultural interests equitably. Further to this point section 2(4)(a)(iii) states that disturbances of sites that constitute the nation’s cultural heritage should be avoided, and where it cannot be avoided should be minimised and remedied.

Section 23(1) indicates that a general objective of integrated environmental management is to identify, predict and evaluate the actual and potential impact of activities upon the cultural heritage. This section also highlights the need to identify options for mitigating of negative effects of activities with a view to minimising negative impacts.

In order to give effect to the general objectives of integrated environmental management outlined in the Act the potential impact on cultural heritage of activities that require authorisation or permission by law must be investigated and assessed prior to their implementation and reported to the relevant organ of state. Thus, a survey and evaluation of cultural resources must be done in areas where development projects that will potentially negatively affect the cultural heritage will be performed. During this process the impact on the cultural heritage will be determined and proposals for the mitigation of the negative effects made.

4 METHODOLOGY

The most effective methodology for determining the fossiliferous potential of the project area was to traverse the area by foot. The study area was visited on the 2nd of September 2016 by Prof B.D. Millstead. Prof Millstead was accompanied, and assisted by, Mr Jerome Ncina of Kleinkopje Colliery.

Given the extensive aerial extent of the proposed development it was impossible to extensively visit the entire site within an acceptable timeframe. However, a large proportion of the land surface covered by each of the three areas to be studied was physically inspected. It is also important to note that much of the remainder of the area could be observed during the conduct of the foot transects. Had bedrock outcrops been observed these would have been inspected. The path of the foot- and vehicle-based traverses was recorded as a track on a hand-held GPS and is indicated in Figures 3-5. Photographs were taken and observations made were taken at a number of locations (see data waypoint locations in Figure 4-5). The location of the photographs and observation points was recorded using a hand-held GPS.

It is evident from Figure 5 that Prof Millstead was forced to traverse the *Phragmites* swamp in the centre of the 2A Dam area and this caused a considerable amount of the available time allocated to the field investigation to be lost. As a result, there was only sufficient time left to traverse the southern portion of the proposed haul road, as well as the area immediately adjacent to the northern section of the road by vehicle. However, any potentially fossiliferous outcrops that may have been present would have been visible. It is, accordingly believed that study was not adversely affected by the area being traversed by vehicle.

5 RELEVANT EXPERIENCE

Prof Millstead holds a PhD in palaeontology and has previously been employed as a professional palaeontologist with the Council for Geoscience in South Africa. He is currently the principle of BM Geological Services and has sufficient knowledge of palaeontology and the relevant legislation required to produce this Palaeontological Impact Assessment Report. Prof Millstead is registered with the South African Council for Natural Scientific Professions (SACNASP), and is a member of the Palaeontological Society of South African and a Fellow the Geological Society of South Africa.

6 ACCESS AND INDEPENDENCE

The area to be impacted by the proposed mine expansion was supplied to BM Geological Services as a series of .kml files. The research was conducted completely free of any hindrance. Access was freely available to all portions of the study area and Kleinkopje Colliery allowed access wherever it was deemed necessary for the satisfactory

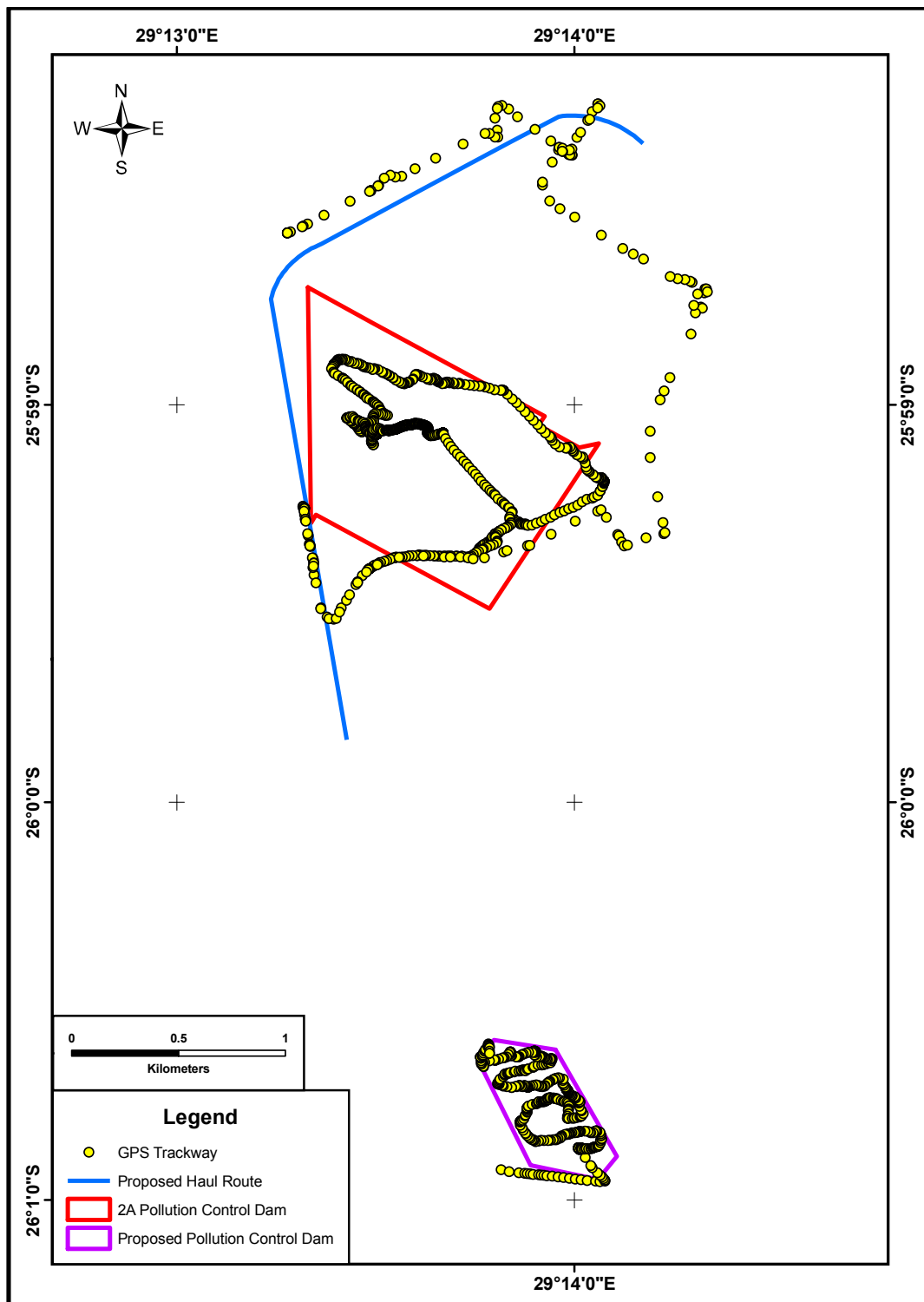


Figure 3: Map showing the location of the areas traversed during the conduct of the site investigation. The lines of yellow circles indicate the GPS trackway that was collected during the survey. Close-up views of the southern and northern areas are provided in Figures 4 and 4 below..

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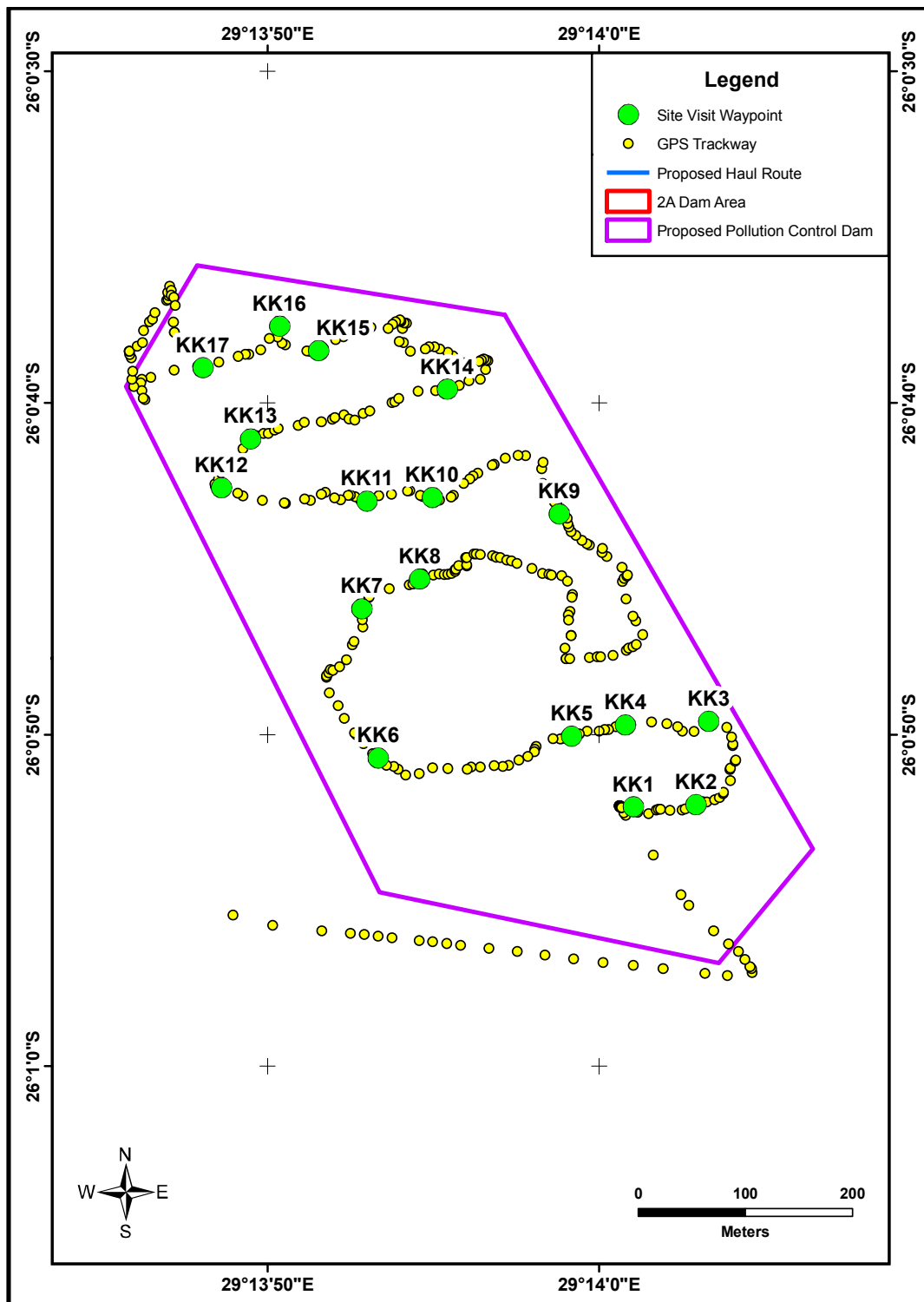


Figure 4: Map of the proposed new pollution control dam area showing the GPS trackway collected during site investigation and, thus, where the traverse was undertaken. The green circles indicate the location of waypoints where detailed observations were made.

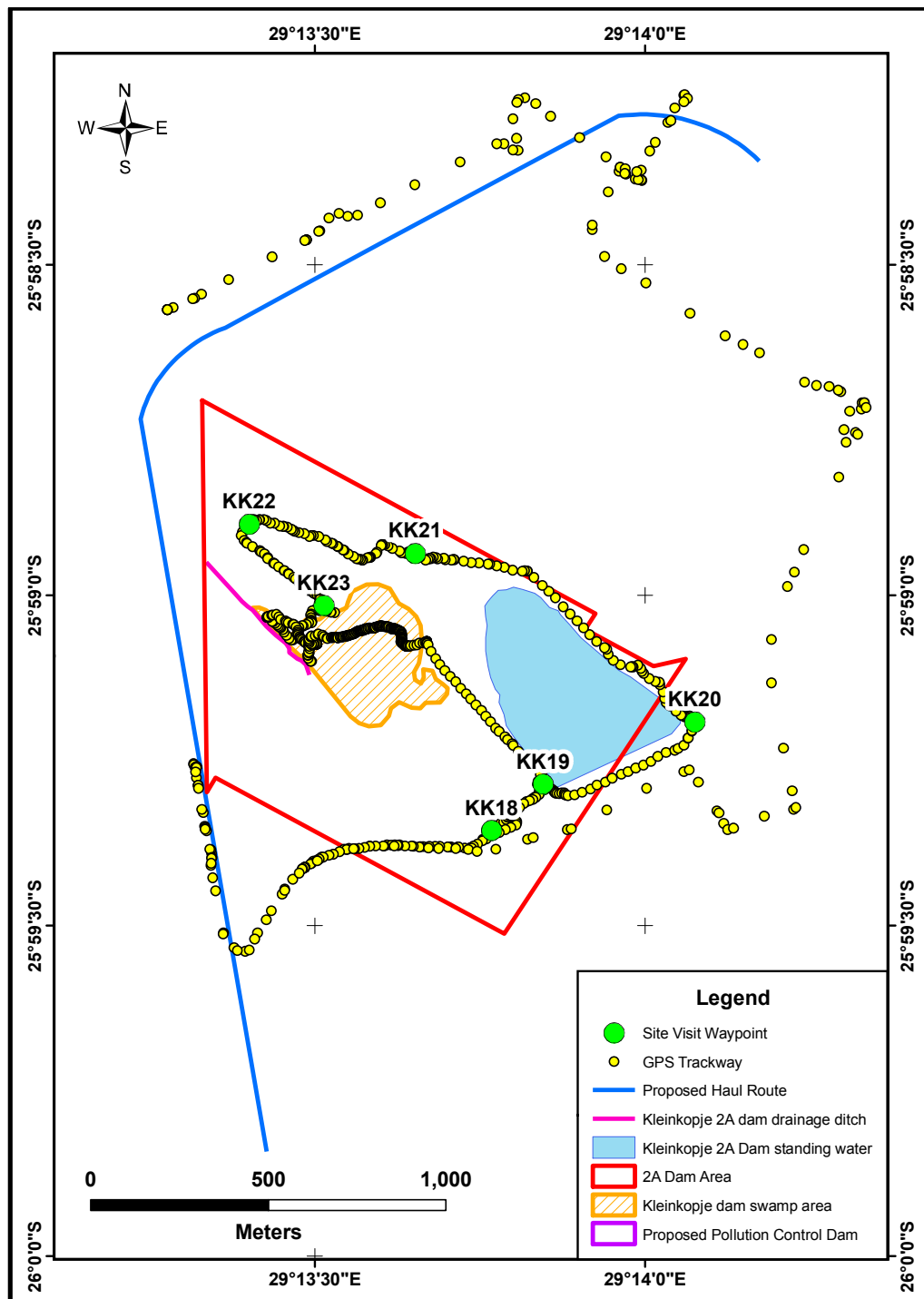


Figure 5: Map of the 2A Dam area and the proposed new haul road showing the GPS trackway collected during site investigation and, thus, where the traverse was undertaken. The green circles indicate the location of waypoints where detailed observations were made. Shown also are the location of the existing aerial extent of the waters of the 2A dam, the *Phragmites* swamp and the drainage channel referred to in the text.

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completion of the study. The area to be investigated is topographically flat and easily accessible for the majority of its extent. The exception to this easy physical access is provided by an extensive, densely vegetated *Phragmites* swamp located in the centre of the 2A Dam area (Figure 5). Similarly, a deep, water-filled drainage ditch extends from the swamp to the north-western corner of the 2A Dam area; it proved impossible to cross this ditch. A high razor wire fence was located on the western margin of the ditch. Collectively the fence, ditch and swamp made movement in the central and northeastern portions of the 2A Dam area very difficult. Almost the entire eastern extent of the 2A Dam area was under water at the time of the field visit (Figure 5).

Prof Millstead was appointed to conduct this Palaeontological Heritage Impact Assessment study as an independent consultant and shall receive fair remuneration for these professional services. Neither Prof Millstead nor BM Geological Services has any financial interest in the proposed developments, Kleinkopje Colliery or any associated persons or companies.

7 GEOLOGY AND FOSSIL POTENTIAL

Figure 6 shows that the project area is completely underlain by rocks of the Early Permian Vryheid Formation. A summary of the characteristics of the Vryheid Formation and its fossiliferous potential follows.

7.1 Vryheid Formation

7.1.1 Geology

The Main Karoo Basin consists of a retro-arc foreland basin filled with a lithological succession ranging in age from the Late Carboniferous to the Middle Jurassic (Johnson *et al.*, 2006). The basin-fill sequence wedges out northwards over the adjacent Kaapvaal Craton.

In the Main Karoo Basin of South Africa the Vryheid Formation is a sandstone and coal-rich stratigraphic unit that interfingers with (i.e., is transitional with and partially time equivalent to) the overlying Volkrust and underlying Pietermaritzburg Formations; both of which are both are predominantly argillaceous (Figure 7). Genetically the formation can be divided into lower fluvial-dominated deltaic interval, a middle fluvial interval (the coal-bearing zone) and an upper fluvial-dominated deltaic interval (Johnson *et al.*, 2006). The thickness and frequency of the sandstone units increases from the base of the formation, reaching their maximum in the middle fluvial interval and then decrease again towards the overlying Volkrust Formation. To the south and south-east the

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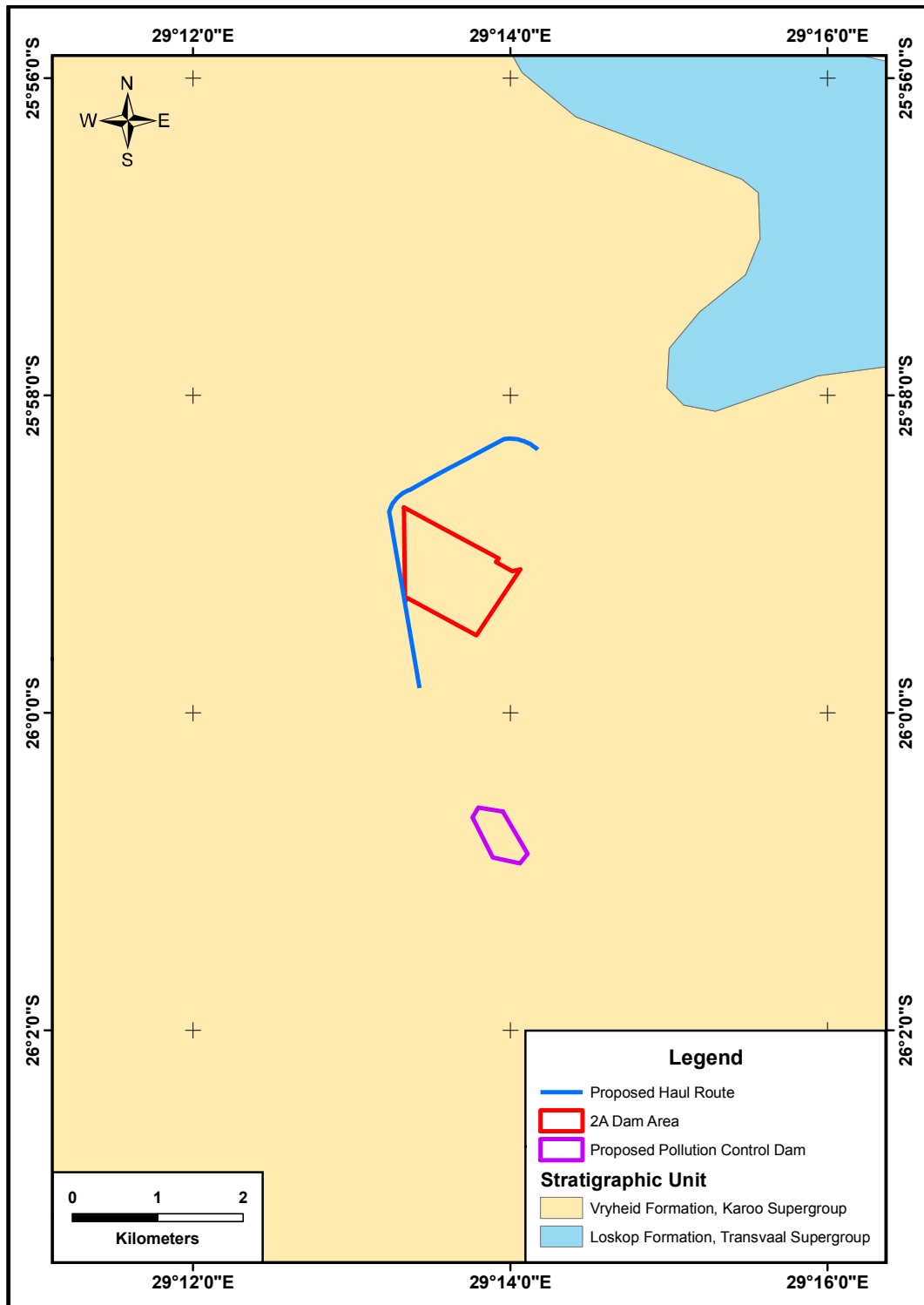


Figure 6: Geological map of the area underlying the three project infrastructure components and their immediate environs.

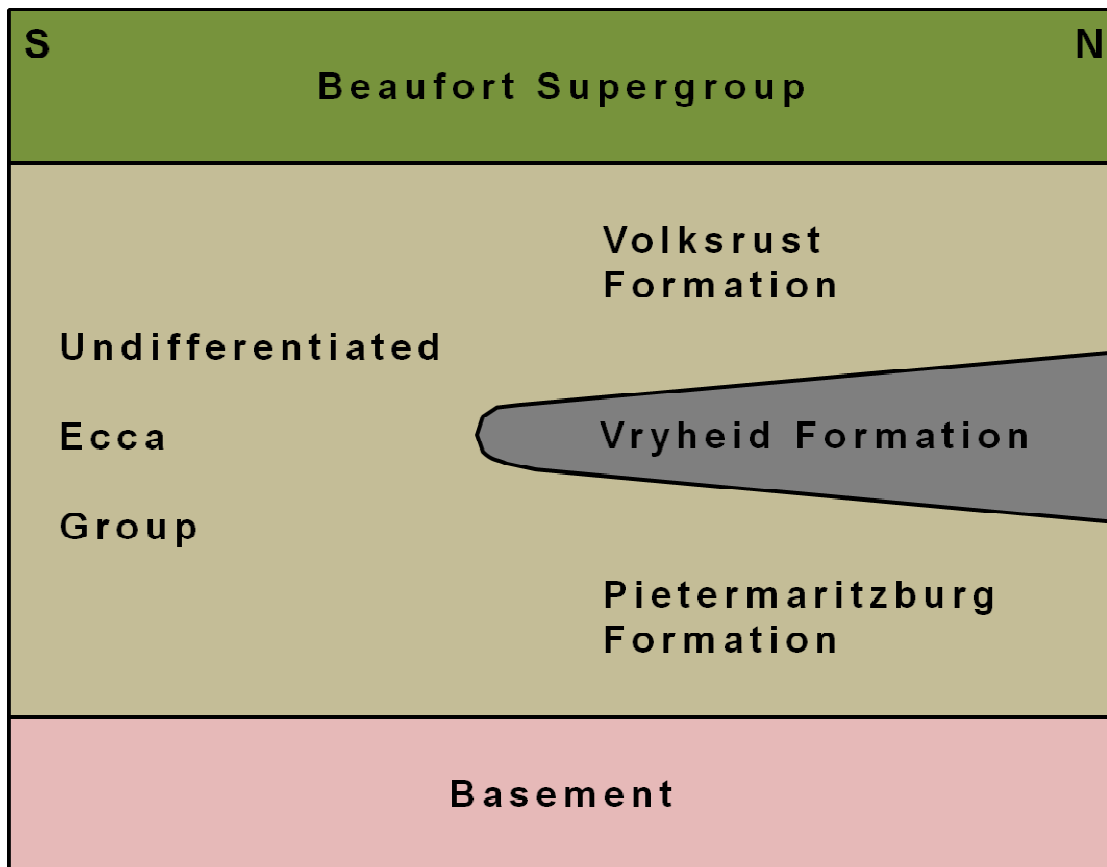


Figure 7: Schematic north-south oriented stratigraphic section of the Ecca Group in the north-east corner of the Karoo Basin. The Volksrust and Pietermaritzburg Formations can only be recognised when the Vryheid Formation forms part of the vertical sequence. In the north and north-western portions of the basin the Pietermaritzburg Formation was not deposited and the coal-bearing strata of the Vryheid Formation rest directly upon the basement.

Vryheid Formation grades laterally into undifferentiated, deep-water argillites of the Ecca Group (Figure 4).

The Vryheid Formation is one of sixteen (16) recognised stratigraphic units that constitute the Permian Ecca Group. During the deposition of the Ecca Group the basin was dominated by a large sea (the salinity levels of this water body remain unresolved). The exception to this model was the deposition of the coal-bearing strata of the Vryheid Formation along the northern margin during an episode of deltaic progradation into the basin.

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Deposition of the Vryheid Formation was terminated by a basin-wide transgression that drowned the Vryheid deltas and their coal swamps resulting in the deposition of the deep water sediments of the Volksrust Formation.

7.1.2 Palaeontological potential

The most conspicuous and common components of the palaeontological record of the Ecca Group in general are the plant macrofossils of the *Glossopteris* flora. Two large and conspicuous leaf form taxa dominate the *Glossopteris* flora; these being *Glossopteris* and *Gangamopteris*. Within the upper Ecca (containing the Vryheid Formation) *Gangamopteris* has ceased to occur with only *Glossopteris* present (Anderson and McLauchlan, 1976). The palaeobotanical record of the Ecca Group is diverse and the literature describing it is voluminous (numerous papers having been published by E. Plumstead, H. Anderson, J. Anderson, E. Kovaks-Endrődy and M. Bamford amongst others). A comprehensive review of the flora in the Karoo Basin literature is, accordingly, beyond the scope of this study, but a thorough review of the palaeobotanical content of the Ecca Group in general and the Vryheid Formation in particular is presented in Bamford (2004). In that summary it is indicated that the Vryheid Formation can be expected to contain the plant macrofossils *Buthelezia*, *Sphenophyllum*, *Rangia*, *Phyllothea*, *Schizoneura*, *Sphenopteris*, *Noeggerathiopsis*, *Taeniopteris*, *Pagiophyllum* and *Benlightfootia* and the wood taxa *Australoxylon* and *Prototaxoxylon*. In addition to the above records can be added the observations of Tavener-Smith *et al.*, (1988) where it was noted that both *Glossopteris* and *Vertebraria* occur within the palaeontological record of the formation.

In portions of the formation that are typified by low thermal alteration abundant assemblages of palynomorph plant microfossils (including acritarchs) can be expected (Anderson, 1977).

Jubb and Gardiner (1975) report the presence of fragmentary fish fossils within the Ecca sequence of southern Africa; these being *Coelacanthus dendrites* from the Somkele coal-field of northern Natal and *Namaichthys digitata* from correlative strata in the Senge Coal-fields of Zimbabwe. While fish faunas are obviously rare and none have been reported from the Vryheid Formation the possibility remains that they may be present.

Animal body fossils are rare within the Ecca Group in general (excepting the time equivalent faunas of the Whitehill Formation). However, no reptile fossils have been identified within the Vryheid Formation.

Hobday and Tavener-Smith (1975) reviewed trace fossil assemblages identified within the Vryheid Formation. Within that fossil assemblage they identified two forms (*Helminthiopsis* and *Taphrelminthopsis*) within horizontally laminated siltstones and mudstones that represent part of the deep water *Nerites* community.

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No *in situ* fossil materials were located during the conduct of the survey. However, at Waypoints KK3 and KK4 (see Figure 4) scattered carbonaceous stem compressions and fragmentary *Glossopteris* leaves were identified in loose blocks of rock that were not *in situ* (Figures 8-9). The material is highly fragmentary, unidentifiable to species level and is not *in situ*, thus, has little scientific significance. However, Mr Ncima (of Kleinkopje Colliery) informed Prof Millstead that the site underlying the proposed PCD had previously been Ramp 1 of the initial colliery pit void and had been subsequently rehabilitated. The rock material that had been used for the infilling of the void had been sourced from later excavations of the mine pit void. Thus, while the fossil materials are not *in situ* they indicate that **the Vryheid Formations rocks that are being mine in the colliery are indeed fossiliferous.**

8 ENVIRONMENT OF THE PROPOSED PROJECT SITE

The proposed three new mining activities and infrastructure elements proposed for the Kleinkopje Colliery collectively cover a large aerial extent. The 2A Dam area is approximately 101 ha in aerial extent while the area contemplated for the proposed pollution control dam (PCD) is approximately 21 ha. The proposed haul road is approximately 4 km in length.

Figure 10 shows that the entire project area consists of flat, gently undulating topography. No significant natural drainage lines exist in any of the three project segment. However, a man-made dam is located in the eastern margin of the 2A Dam. This dam is located upon a pre-existing ephemeral tributary of the Oliphants River. It is also evident from Figure 10 that a number of made-made drainage trenches traverse the western half of the 2A Dam as well as its southern margin.

The area underlying all three project infrastructure segments is vegetated with the eastern Highveld Grassland vegetation type (Figure 11). Mucina and Rutherford (2006) categorise this vegetation type as endangered. However, the fact that the area underlying the proposed PCD is a rehabilitated mining void means that none of the vegetation there is undisturbed, natural vegetation. Similarly, portions of the northern (east-west oriented) extent of the proposed haul road are located within an ESKOM servitude and have historically been disturbed.

Site-specific discussion of each of the three project infrastructure element area follows below.

8.1 Proposed PCD

Examination of Google earth imagery (Figure 12) indicates that the new PCD area lies approximately 300 m to the east of the Kleinkopje Colliery offices. The area occupied by the PCD is topographically flat and featureless (Figure 13), save for the presence of a number of graded dirt roads that traverse the site.

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Figure 8: Photograph of pale, micaceous sandstone bearing carbonaceous compressions of plant stem segments (Waypoint KK3, Figure 4). The stem segments are up to 10 cm in length.

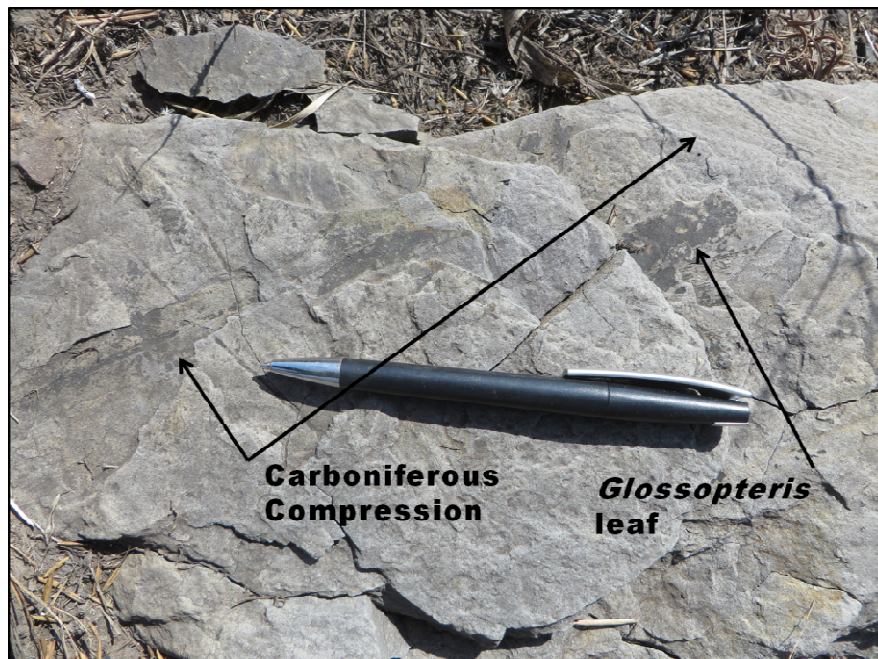


Figure 9: Photograph of pale, micaceous sandstone bearing carbonaceous compressions of plant stem segments (Waypoint KK4, Figure 4). The stem segments are up to 15 cm in length and 2 cm.

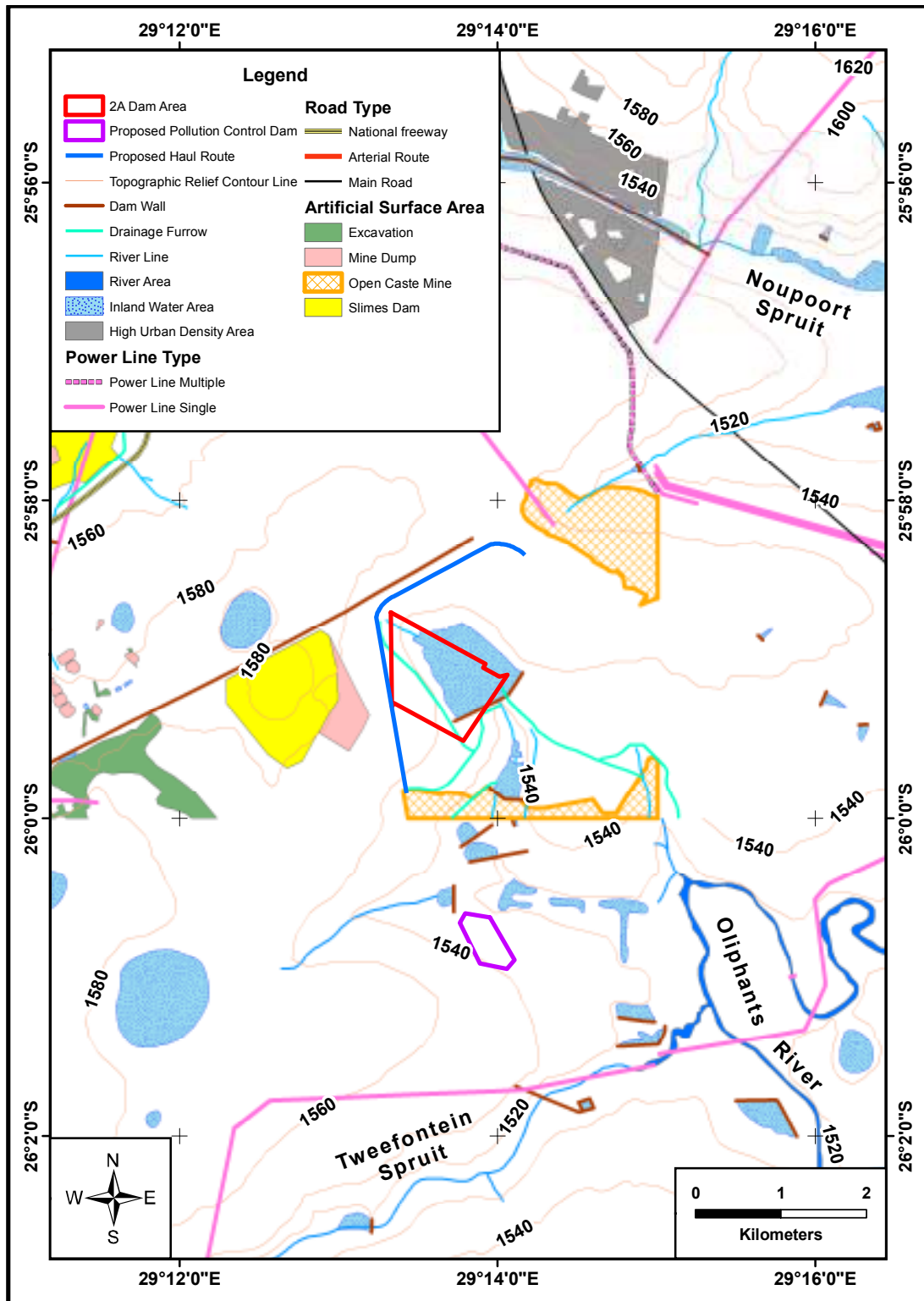


Figure 10: Map showing the environment of the three project infrastructure segments and their immediate environs. The topographic relief contour interval is 20 m.

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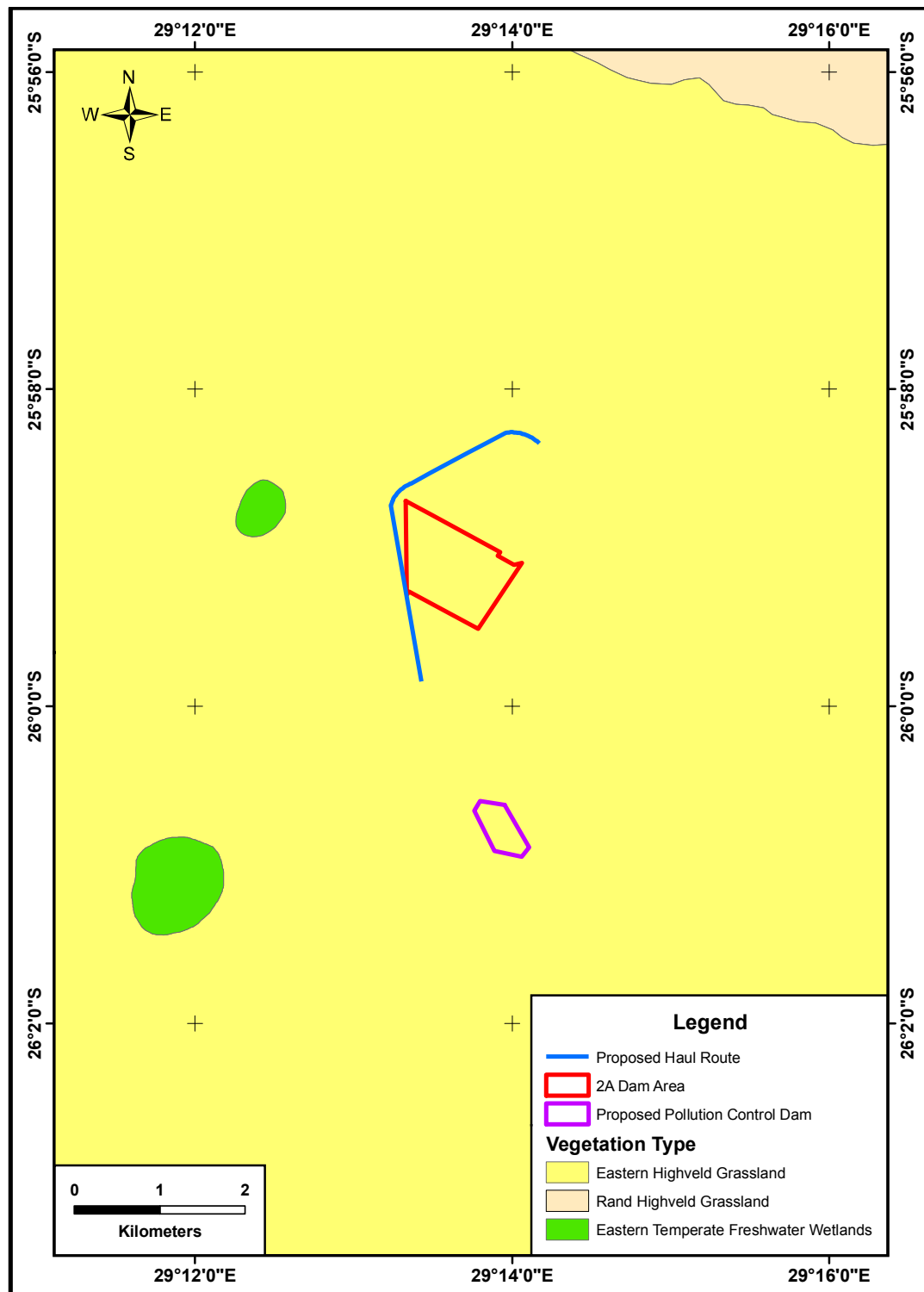


Figure 11: Map of the vegetation cover types for each of the three project infrastructure elements and their immediate environs (after Mucina and Rutherford, 2006).

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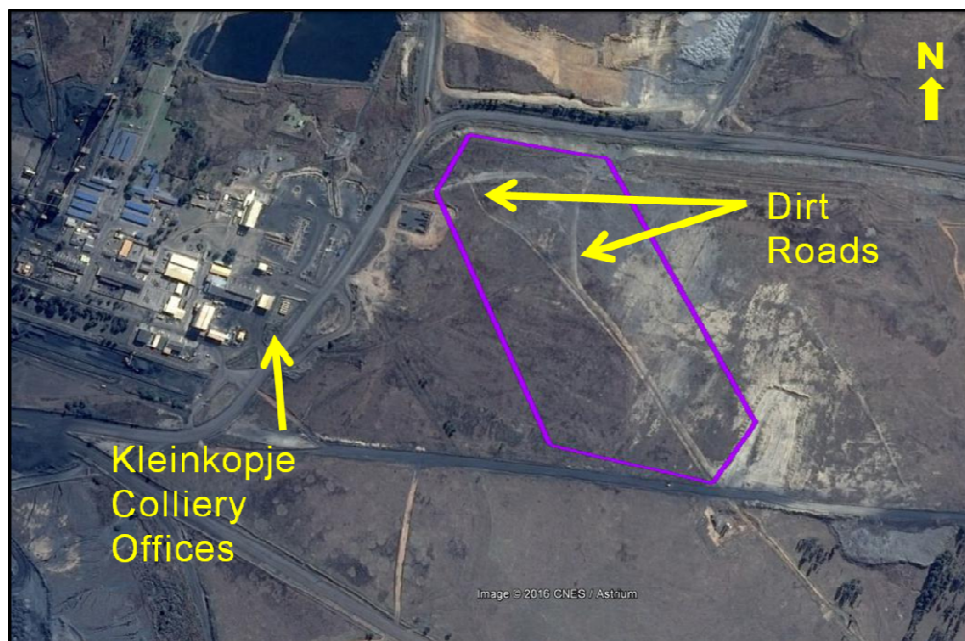


Figure 12: Google earth image of the area underlying the proposed pollution control dam and its immediate environs. Note: the darker colouration of the vegetation evident on the western side of the dirt roads is the thickly vegetated grassland, while the much lighter coloured area lying to the east of the dirt roads is the sparsely grassed area.



Figure 13: General view to the north of the PCD area taken from waypoint KK1 (see Figure 4). The flat featureless, sparsely grassed nature of the area is evident.

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During the examination of the area no *in situ* rock outcrops were observed. The rock material that was identified consisted of chaotically oriented blocks and boulders of Karoo mudstone, sandstone and grits (Figures 14-15). As indicated above in Section 7.1.2 However, Mr Ncima (of Kleinkopje Colliery) informed Prof Millsted that the site underlying the proposed PCD had previously been Ramp 1 of the initial colliery pit void and had been subsequently rehabilitated. The rock material that had been used for the infilling of the void had been sourced from later excavations of the mine pit void. The rehabilitated surface bore a vegetation cover of sparse grass on the eastern side of the dirt roads and dense grass and sedges on the western side of the dirt roads (Figure 10).

8.2 2A Dam

The 2A Dam area lies approximately 2.3 km north-northeast of the Kleinkopje Colliery offices. The 2A Dam area is bordered on its immediate southern and approximately 1.3 km from its eastern border by the mines open pit voids (Figure 16). It is evident from Figure 17 that a large body of standing water (a man-made dam) is located on the eastern margin of the area and that an extensive *Phragmites* swamp is located in the area's centre. A deep drainage ditch is located in the western corner of the area (Figure 5) and the presence of this feature makes traversing that part of the project area impossible. It is also evident from Figure 10 that a more extensive set of drainage trenches is located in the southern portion of the 2A Dam area.

8.3 Proposed Haul Road

The route of the proposed haul road is approximately 4 km in length and is located immediately proximally to the northern and western margin of the 2A Dam area (Figure 1). The exact nature of this development is not known to the author at the time of writing, but all other haul roads observed on the mining property are unpaved, dirt roads of sufficient width to comfortably accommodate large haul trucks (i.e., ± 20 m). It is assumed that this will be the same road configuration in the new road. The northern (east-west oriented) section of the road commences at the existing mine pit ramp and closely parallels an existing grassland vegetated ESKOM servitude and high voltage power line. The topography slopes gently from north to south. The north-south oriented western section of the route will be located in flat, featureless landscape vegetated with thick grassland. This portion of the route runs parallel to an existing bitumen road and a coal conveyer system. No outcrops of bedrock were observed along the entire extent of the haul route.

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Figure 14: View of the unconsolidated, chaotically oriented blocks of Karoo sandstone and mudstone that indicate that the PCD area has been subject to landfill and rehabilitation.



Figure 15: View of the unconsolidated, chaotically oriented polymict boulders of Karoo lithologies that indicate that the PCD area has been subject to landfill and rehabilitation (Waypoint KK9; see Figure 4).

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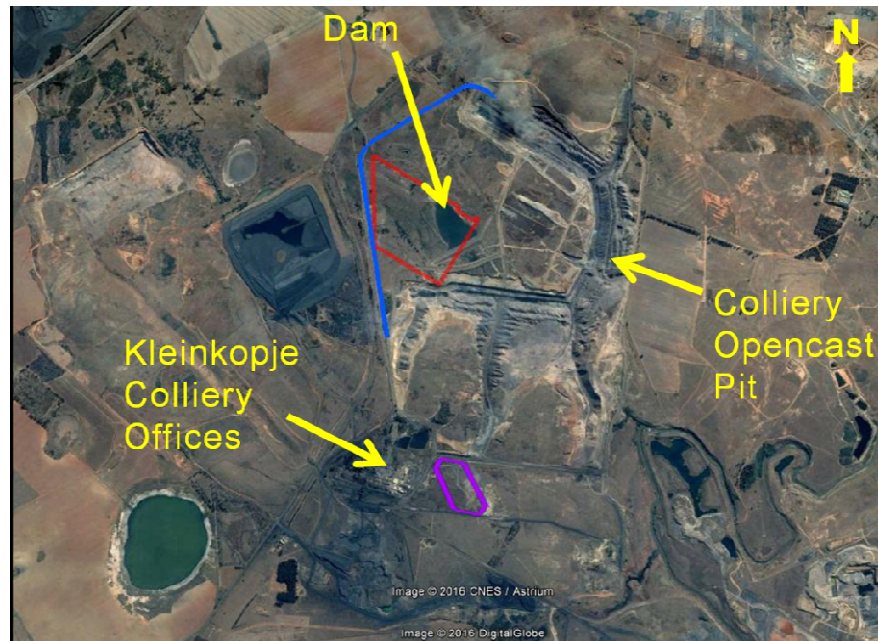


Figure 16: Google earth Image showing the location of the 2A Dam area (red polygon) relative to the Kleinkopje Colliery offices. It is evident that the operating open pit void is located immediately to the south of the 2A Dam site as well as running parallel to the eastern margin of the project area.

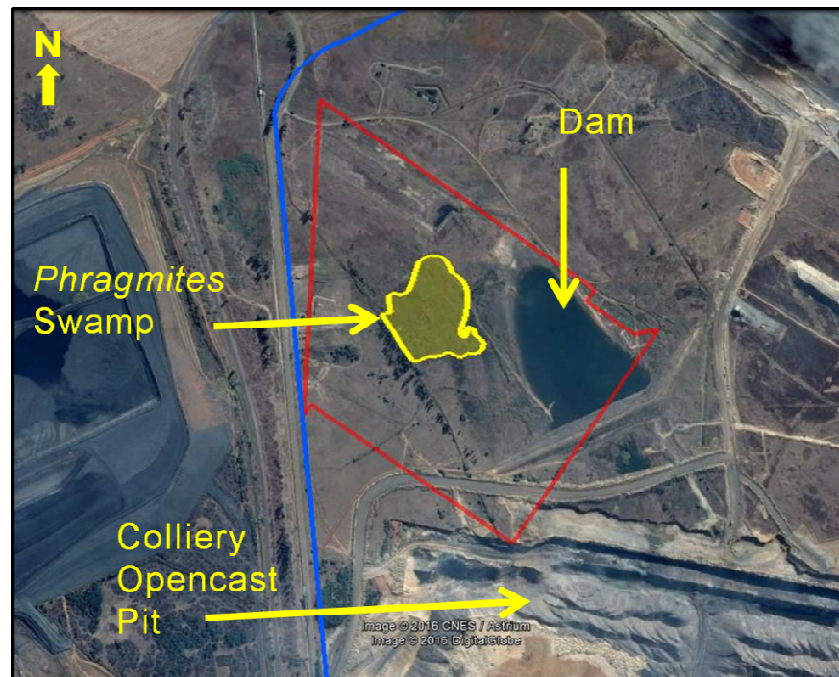


Figure 17: Google earth image of the 2A dam area. It is evident that the eastern portion of the area is covered by standing water and the central portion is covered by a thickly vegetated *Phragmites* swamp.

9 OVERVIEW OF SCOPE OF THE PROJECT

The proposed mining related activities at the Kleinkopje Colliery will consist of the following activities and infrastructure elements (Figure 1).

- An open pit colliery mine void
- A Pollution control dam
- A ±20 m wide dirt haul road

9.1 Effect upon the bedrock geology

It is evident from Section 9 that the required infrastructure elements will impact upon the subsurface geology to differing degrees.

9.1.1 2A Dam

The mine will utilise all coal seams present in the stratigraphy, down to and including the No. 1 Seam. This means that the entire remaining thickness of the Vryheid Formation will be impacted by the mining activities, with the glacial rocks of the Dwyka Formation (which underlie the Vryheid Formation) being left relatively undisturbed. The entire vertical and aerial extent of the rocks of the Vryheid Formation within the planned mine void will be permanently and irredeemably impacted by the mining activities.

9.1.2 Pollution Control Dam

The PCD will be constructed upon land that has previously been subjected to mining activities. Consequently, the entire extent of the Vryheid Formation has been removed as part of the process of exploiting the coal seams it contained. The void was subsequently in-filled with mine waste rock and rehabilitated. As a direct result, the construction of the PCD will not impact directly upon any *in situ* bedrock material.

9.1.3 Proposed Haul Road

It is expected, herein, that the proposed haul road will emulate the existing haul roads in the mine area and will accordingly be graded dirt roads. The direct effect of the construction of the road will be restricted to the upper-most >1 m of the land surface. In all portions of the haul road route examined during the site investigation the land surface bore an well-developed, apparently thick regolith cover. This is evinced by the ubiquitous presence of the regolith cover in all areas examined as well as the presence of numerous graves in the northern sector of the route and the thick, rank nature of the grassland in the western portion of the route. It is unlikely that the construction of the haul road would directly impact upon the bedrock.

10 IMPACT ASSESSMENT

The potential impact of the proposed mining area is categorised below according to the following criteria.

10.1 Nature of Impact

The potential negative impacts of the proposed project on the palaeontological heritage of the area are:

- Damage or destruction of fossil materials during the construction of project infrastructural elements to a maximum depth of those excavations. Many fossil taxa (particularly vertebrate taxa) are known from only a single fossil and, thus, any fossil material is potentially highly significant. Accordingly, the loss or damage to any single fossil can be potentially significant to the understanding of the fossil heritage of South Africa and to the understanding of the evolution of life on Earth in general. Where fossil material is present and will be directly affected by the building or construction of the projects infrastructural elements the result will potentially be the irreversible damage or destruction of the fossil(s).
- Movement of fossil materials during the construction phase, such that they are no longer *in situ* when discovered. The fact that the fossils are not *in situ* would either significantly reduce or completely destroy their scientific significance.
- The loss of access for scientific study to any fossil materials present beneath infrastructural elements for the life span of the existence of those constructions and facilities.

10.2 Extent of impact

The possible extent of the permanent impact of the proposed project on the palaeontological heritage of South Africa is restricted to the damage, destruction or accidental relocation of fossil material caused by the excavations and construction of the necessary infrastructure elements forming part of the project. The possible source of a less permanent negative impact on the palaeontological heritage is the loss of access for scientific research to any fossil materials that become covered by the various infrastructural elements that comprise the project. The **extent of the area of potential impact is, accordingly, categorised as local** (i.e., restricted to the project site).

The extent of any negative impact resulting from the 2A Dam, the Proposed PCD and the proposed haul road have been independently assessed, and all three are assessed as being **2** using the Shangoni Management Consultants (Pty) Ltd assessment matrix and this is presented in Table 1.

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Extent	score
Effect limited to the site (meters)	1
Effect limited to the activity and its immediate surrounding (tens of meters)	2
Impacts on extended area beyond site boundary (hundreds of metres)	3
Impact on local scale / adjacent sites (kilometres)	4

Table 1: Shangoni Management Consultants (Pty) Ltd assessment matrix to determine the extent of an impact.

10.3 Duration of impact

The anticipated duration of the identified impact is assessed as potentially **permanent to long term**. This assessment is based on the fact that, in the absence of mitigation procedures (should fossil material be present within the area to be affected) the damage or destruction of any palaeontological materials will be permanent. Similarly, any fossil materials that exist below any new infrastructural elements, but which are not uncovered during the necessary excavations, will be unavailable for scientific study for the life of the existence of those features.

The duration of any negative impact resulting from the 2A Dam, the Proposed PCD and the proposed haul road have been independently assessed, and all three are assessed as being **4** using the Shangoni Management Consultants (Pty) Ltd assessment matrix and this is presented in Table 2.

Duration of Impact	score
Lasting days to a month	1
Lasting 1 month to 1 year	2
Lasting 1 to 5 years	3
Lasting 5 years to life of organisation	4

Table 2: Shangoni Management Consultants (Pty) Ltd assessment matrix to determine the duration of an impact.

10.4 Probability of impact

The Cenozoic sandy regolith is considered to be unfossiliferous within the three project areas. The probability of any negative impact upon the regolith is assessed as being **nil**.

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The sediments of the Vryheid Formation are noted for containing an important palaeontological heritage particularly in respect of plant macrofossils of the *Glossopteris* flora. In general, the occurrence of fossils within the geological record is erratic in general and the chance of impacting upon most macrofossil types at any particular point within the Vryheid Formation is low. However the presence of plant macrofossils being present within the Vryheid Formation strata being mines in Kleinkopje Colliery was confirmed in Section 7.1.2 below.

Each of the three project infrastructure elements will affect the Vryheid Formation to differing degrees and, as such the probability of them negatively affecting the palaeontological heritage of the Vryheid Formation will be assessed separately.

10.4.1 2A Dam

The volume of potentially fossiliferous rock to be mined is large. Similarly, it must be noted that where plant macrofossils or trace fossils are present within a sequence (as they are in the Vryheid Formation) they are often in dense accumulations and the probability of a negative impact upon the palaeontological heritage of the Vryheid Formation strata underlying the 2A Dam area is accordingly assessed as being **probable**.

The probability of the palaeontological heritage of the 2A Dam area being negatively impacted has been assessed as being **5** using the Shangani Management Consultants (Pty) Ltd assessment matrix and this is presented in Table 3.

Frequency of unwanted event	Score
Never known to happen, but may happen	1
Known to happen in industry	2
< Once a year	3
Once per month to up to once a month	4
Once a month - continuous	5

Table 3: Shangani Management Consultants (Pty) Ltd assessment matrix to determine the probability of an impact.

10.4.2 Proposed PCD

The potentially fossiliferous Vryheid Formation strata underlying the proposed PCD area have been completely removed by prior mining activities that specifically targeted those strata. Thus, the probability of a negative impact upon the palaeontological heritage of the Vryheid Formation strata underlying the PCD area is accordingly assessed as being **nil**.

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The probability of the palaeontological heritage of the proposed PCD area being negatively impacted has been assessed as being **1** using the Shangoni Management Consultants (Pty) Ltd assessment matrix and this is presented in Table 3.

10.4.3 Proposed Haul Road

It is anticipated, herein, that the construction of the proposed haul road will only affect the unfossiliferous regolith horizon. The probability of a direct negative impact upon the palaeontological heritage of the Vryheid Formation strata underlying the proposed haul road is, accordingly, assessed as being **low**. The route of the haul road will, however, overlie potentially fossiliferous Vryheid Formation strata. However, these fossils would only be sterilised from scientific study for the duration of the active life of the road, and in any case they are probably too deeply buried to be accessed by paleontologists unless exposed by mining activities.

The probability of the palaeontological heritage of the proposed haul road area being negatively impacted has been assessed as being **1** using the Shangoni Management Consultants (Pty) Ltd assessment matrix and this is presented in Table 3.

10.5 Significance of the impact

Should the project progress without due care to the possibility of fossils being present within the Vryheid Formation the resultant damage, destruction or inadvertent relocation any affected fossils will be permanent and irreversible. This potential for negative impact is accentuated by the fact that often the plant macrofossils and trace fossils that are known to be present in this formation often occur in dense accumulations, and as such, if any negative impact occurs it may well affect many fossils simultaneously. The delta top/fluvial/coal swamp environments that existed during the deposition of the Vryheid Formation provide an important window into the evolution of plant life of the famous *Glossopteris* flora during the Early Permian within the Main Karoo Basin. Their significance is due to the uniqueness of their terrestrial environments within the basin fill of the Main Karoo Basin at that time. Thus, any fossil materials occurring within the project area are potentially extremely scientifically and culturally significant and any negative impact on them would be of **high significance**.

The scientific and cultural significance of fossil materials is underscored by the fact that many fossil taxa (particularly vertebrate taxa) are known from only a single fossil and, thus, any fossil material is potentially highly significant. Accordingly, the loss or damage to any single fossil can be potentially significant to the understanding of the fossil heritage of South Africa and to the understanding of the evolution of life on Earth in general. Where fossil materials are present and will be directly affected by the building or construction of project infrastructural elements the result will potentially be the irreversible damage or destruction of the fossil(s).

10.6 Magnitude of the impact

The magnitude of possible negative impacts upon the palaeontological heritage of the three infrastructure elements has been independently assessed according to the Shangoni Management Consultants (Pty) Ltd assessment matrix. The magnitude of the effects upon the 2A Dam area is assessed as being **3.5**, that of the proposed haul road and haul road are assessed as being **1.5**. These values represent the average of the values calculated for impact and extent of the negative impact for each of the three areas.

10.7 Severity of the impact

The severity of any potential negative impacts upon the palaeontological heritage of the 2A dam area, the proposed PCD area and the proposed haul road area have been using the Shangoni Management Consultants (Pty) Ltd assessment matrix and this is presented in Table 4. The severity of the possible negative impacts upon the palaeontological heritage of the 2A Dam area is assessed as being **high** and as being **low** for both the proposed PCD area and the proposed haul road area.

ENVIRONMENTAL IMPACT RATING / PRIORITY					
PROBABILITY	MAGNITUDE				
	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

Table 4: Shangoni Management Consultants (Pty) Ltd assessment matrix to determine the severity of an impact.

11 DAMAGE MITIGATION, REVERSAL AND POTENTIAL IRREVERSABLE LOSS

The degree to which the possible negative effects of the proposed project can be mitigated, reversed or will result in irreversible loss of the palaeontological heritage can be determined as discussed below.

11.1 Mitigation

11.1.1 2A Dam

No fossiliferous bedrock materials were observed to outcrop in the 2A Dam area and, as such, there are no mitigation procedures required prior to the commencement of mining. However, it is evident from the discussion above (Section 10.4) that there is a **high probability** of scientifically and culturally significant plant macrofossil assemblages being present within the Vryheid Formation rocks that Kleinkopje Colliery intends to exploit for their contained coal seams.

It is recommended that a member of staff (e.g., the Environment Officer) of the Kleinkopje Colliery be trained to recognise the types of fossils that may be exposed via the mining operations and how to excavate and curate them. This officer should:

- Make regular inspections of newly exposed rock material following blasting to identify if scientifically significant fossils have been exposed.
- An experience Karoo palaeobotanist must be mandated by the colliery to inspect the fossils, ascertain their significance and to make any necessary recommendations concerning their preservation.
- Should scientifically significant macrofossil materials be unearthed during the excavations associated with the project the excavations in that area should be halted in that location and SAHRA informed of the discovery (see Section 3.3 above) and a palaeontologist contracted to evaluate their importance. A significant potential benefit of the examination of the excavations associated with the construction of the project is that currently unobservable fossils may be uncovered and that potentially significant fossil material may be made available for scientific study.

It is further recommended that:

- Six monthly examinations of the colliery pit by an experience Karoo palaeobotanist should be undertaken once mining has commenced.
- The six monthly periodicity of these inspections should be subject to later review, based on the results of those inspections.
- Should scientifically significant macrofossil materials be unearthed during the excavations associated with the project the excavations in that area should be halted in that location and SAHRA informed of the discovery (see Section 3.3 above) and a palaeontologist contracted to evaluate their importance.
- Should scientifically or culturally significant fossil material exist within the project area any negative impact upon it could be mitigated by its excavation (under permit from SAHRA) by a palaeontologist and the resultant material being lodged with an appropriately permitted institution. In the event that an excavation is

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impossible or inappropriate the fossil or fossil locality should be protected and the fossil site excluded from any further construction activities.

11.1.2 Pollution Control Dam

The potentially fossiliferous rocks (i.e., the Vryheid Formation) that had previously underlain this area have previously been removed and destroyed by mining and replaced with mine waste rock. This material is fossiliferous (see Section 7.1.2) but this material is not *in situ*, is completely out of its original context and consequently has no scientific value. Accordingly, no damage mitigation procedures are required in the proposed PCD construction area.

11.1.3 Proposed Haul Route

No potentially fossiliferous bed rock outcrops were observed in the area of the proposed haul route. It is also anticipated that the construction of the haul route will probably only impact upon the pervasive regolith cover which is unfossiliferous. Accordingly, no damage mitigation procedures are required in the proposed haul route area.

11.2 Reversal of damage

Any damage to, or the destruction of, palaeontological materials or reduction of scientific value due to a loss of the original location is **irreversible**.

11.3 Degree of irreversible loss

Once a fossil is damaged, destroyed or moved from its original position without its geographical position and stratigraphic location being recorded the **damage is irreversible**.

Fossils are usually scarce and sporadic in their occurrence and the chances of negatively impacting on a fossil in any particular area are low. However, any fossil material that may be contained within the strata underlying the project area is potentially of the greatest scientific and cultural importance. Thus, the potential always exists during the conduct of the construction of the project within potentially fossiliferous rocks for the permanent and irreversible loss of extremely significant or irreplaceable fossil material. This said, many fossils are incomplete in their state of preservation or are examples of relatively common taxa. As such, just because a fossil is present it is not necessarily of great scientific value. Accordingly, not all fossils are necessary significant culturally or scientifically significant and the potential degree of irreversible loss will vary from case to case. The judgement on the significance of the fossil must be made by an experienced palaeontologist.

12 ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

The information provided within this report was derived from a detailed site investigation conducted on foot. No fossil materials were observed during the conduct of that survey. However, it was impossible, within the time constraints possible, to inspect all portions of the three project infrastructure areas. It is possible, but unlikely that fossiliferous outcrops may have not been observed. Additionally, the geological occurrence of fossils within fossiliferous geological units is sporadic and cannot be interpreted with precision or certainty.

In order to assess the potential impacts of the project upon the palaeontological heritage of the area assumptions were made concerning both the scope of impact that will result from the construction of the identified infrastructure elements.

13 ENVIRONMENTAL IMPACT STATEMENT

Anglo Operations (Pty) Ltd proposes to expand their coal mining operations within the Kleinkopje Colliery. As a result of this aim the company plans to put a new haul road in place, to mine in an area currently occupied by the existing 2A Pollution Control Dam and to construct a new pollution control dam develop to replace the 2A Dam. The three proposed components of the planned development are all located within the boundary of the Kleinkopje Colliery Mining Right area. The mine is located approximately 15 km south of 15km south of Emalahleni, Nkangala District Municipality, Witbank Magisterial District, in the Mpumalanga Province. The proposed infrastructure elements are located approximately 3 km SE of the N12, 5 km west of the R544 and 6 km east of the R547 roads and are located within portions of the farms Klippan 332 REM and Portions 5, 6 and 12, Landau 349 Rem and Kleinkopje 15 Ptn 1 (Figure 2). The aerial extent of the proposed 2A Dam component is project is approximately 101 ha while the area contemplated for the proposed pollution control dam is approximately 21 ha. The proposed haul road is approximately 4 km in length. Any negative impacts to the palaeontological heritage of the region will be limited to the footprint area of the three infrastructure elements and, as such, the extent of any impact is accordingly characterised as local. The extent of the project impacts is categorised as being level **2** using the Shangoni Assessment matrix.

The entire area of the three infrastructure elements is underlain by the Early Permian strata of the Vryheid Formation and the overlying regolith; only the Vryheid Formation is potentially fossiliferous. The degree to which the Vryheid Formation will be impacted by the proposed activities differs for each of the three.

2A Dam: The entire remaining thickness of the Vryheid Formation will be impacted by the mining activities. The entire vertical and aerial extent of the rocks of the Vryheid

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Formation within the planned mine void will be permanently and irredeemably impacted by the mining activities.

Pollution Control Dam: The PCD will be constructed upon land that has previously been subjected to mining activities and the void subsequently in-filled with mine waste rock and rehabilitated. As a direct result, the construction of the PCD will not impact directly upon any *in situ* Vryheid Formation rocks.

Proposed Haul Road: It is expected that the proposed haul road will emulate the existing haul roads in the mine area and will accordingly be graded dirt roads. The direct effect of the construction of the road will be restricted to the upper-most >1 m of the land surface. In all portions of the haul road route the site investigation the land surface bore an well-developed, apparently thick regolith cover. It is unlikely that the construction of the haul road would directly impact upon the Vryheid Formation.

The plant macrofossils that are known to be present in the Vryheid Formation provide an important window into the evolution of plant life of the famous *Glossopteris* flora during the Early Permian within the Main Karoo Basin. Their significance is due to the uniqueness of their terrestrial environments within the basin fill of the Main Karoo Basin at that time. Thus, any fossil materials occurring within the project area are potentially extremely scientifically and culturally significant and any negative impact on them would be of **high significance**. Similarly, the trace fossils that may be present provide important palaeoenvironmental information essential to the understanding of the development of the Karoo Basin. However, they tend to be taxonomically restricted and abundant where they occur, they are considered to be of **moderate significance**. However, as the occurrence of either fossil type cannot be predicted, and they may co-occur within the same vertical sequence it is considered appropriate to classify the potential significance of the collective fossil assemblage as **high** for the purposes of this report. Shangoni Management Consultants prefers to have this element of risk quantified as the severity of the risk. According to that assessment criteria the severity of the possible negative impacts upon the palaeontological heritage of the 2A Dam area is assessed as being **high** and as being **low** for both the proposed PCD area and the proposed haul rod area.

The magnitude of the effects upon the 2A Dam area is assessed as being **3.5**, that of the proposed haul road and haul road are assessed as being **1.5** using the Shangoni assessment matrix.

Each of the three project infrastructure elements will affect the Vryheid Formation to differing degrees and, as such, the probability of them negatively affecting the palaeontological heritage of the Vryheid Formation has been assessed separately.

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2A Dam: The probability of a negative impact upon the palaeontological heritage of the Vryheid Formation strata underlying the 2A Dam area is assessed as being **probable**. Using the Shangoni Management Consultants assessment matrix the probability is characterised as being level **5**.

Proposed PCD: The probability of a negative impact upon the palaeontological heritage of the Vryheid Formation strata underlying the PCD area is assessed as being **nil**. Using the Shangoni Management Consultants assessment matrix the probability is characterised as being level **1**.

Proposed Haul Road: The probability of a direct negative impact upon the palaeontological heritage of the Vryheid Formation strata underlying the proposed haul road is assessed as being **low**. Using the Shangoni Management Consultants assessment matrix the probability is characterised as being level **1**. The route of the haul road will, however, overlie potentially fossiliferous Vryheid Formation strata. However, these fossils would only be sterilised from scientific study for the duration of the active life of the road, and in any case they are probably too deeply buried to be accessed by paleontologists unless exposed by mining activities.

The mitigation requirements of the three project infrastructure areas have been individually assessed and are outlined below.

13.1 2A Dam

It is recommended that a member of staff (e.g., the Environment Officer) of the Kleinkopje Colliery be trained to recognise the types of fossils that may be exposed via the mining operations and how to excavate and curate them. This officer should:

- Make regular inspections of newly exposed rock material following blasting to identify if scientifically significant fossils have been exposed.
- An experience Karoo palaeobotanist must be mandated by the colliery to inspect the fossils, ascertain their significance and to make any necessary recommendations concerning their preservation.
- Should scientifically significant macrofossil materials be unearthed during the excavations associated with the project the excavations in that area should be halted in that location and SAHRA informed of the discovery (see Section 3.3 above) and a palaeontologist contracted to evaluate their importance. A significant potential benefit of the examination of the excavations associated with the construction of the project is that currently unobservable fossils may be uncovered and that potentially significant fossil material may be made available for scientific study.

It is further recommended that:

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- Six monthly examinations of the colliery pit by an experience Karoo palaeobotaist should be undertaken once mining has commenced.
- The six monthly periodicity of these inspections should be subject to later review, based on the results of those inspections.
- Should scientifically significant macrofossil materials be unearthed during the excavations associated with the project the excavations in that area should be halted in that location and SAHRA informed of the discovery (see Section 3.3 above) and a palaeontologist contracted to evaluate their importance.
- Should scientifically or culturally significant fossil material exist within the project area any negative impact upon it could be mitigated by its excavation (under permit from SAHRA) by a palaeontologist and the resultant material being lodged with an appropriately permitted institution. In the event that an excavation is impossible or inappropriate the fossil or fossil locality should be protected and the fossil site excluded from any further construction activities.

13.2 Pollution Control Dam

The potentially fossiliferous rocks (i.e., the Vryheid Formation) that had previously underlain this area have previously been removed and destroyed by mining and replaced with mine waste rock. This material is fossiliferous (see Section 7.1.2) but this material is not *in situ*, is completely out of its original context and consequently has no scientific value. Accordingly, no damage mitigation procedures are required in the proposed PCD construction area.

13.3 Proposed Haul Route

No potentially fossiliferous bed rock outcrops were observed in the area of the proposed haul route. It is also anticipated that the construction of the haul route will probably only impact upon the pervasive regolith cover which is unfossiliferous. Accordingly, no damage mitigation procedures are required in the proposed haul route area.

13.4 Recommendation

This study has not identified any palaeontological reason to prejudice the redevelopment of the 2A Dam as an open pit mine or the construction of the proposed pollution control dam or haul road at Kleinkopje Colliery subject to the proposed damage mitigation procedures being enacted.

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