



BARRY MILLSTEED
GEOLOGICAL SERVICES

**ANNUAL PALAEOONTOLOGICAL
MONITORING REPORT
(SEPTEMBER 2022) ON VAALBULT
COLLIERY LOCATED ON
PORTIONS 1, 9 AND 10 OF THE
FARM VAALBULT 3 IT,
MPUMALANGA PROVINCE**

Prepared for:
Vaalbult Mining Company (Pty) Ltd

Prepared by:
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9 September 2022

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EXECUTIVE SUMMARY

Vaalbult Mining Company (Pty) Ltd owns and operates a colliery on Portions 1, 9 and 10 of the farm Vaalbult 3 IT, Gert Sibande District Municipality, located west of Carolina, Mpumalanga Province. The South African Heritage Resources Agency (SAHRA) has instructed Vaalbult Mining Company (Pty) Ltd [SAHRA document Ref: 16/5/1 Vaalbult Mining Project; dated 14 February 2014] that on-site checks for the occurrence of any fossils of the excavated pit and stockpiled material are required every six months by an experienced Karoo palaeobotanist. The Karoo palaeobotanist must submit a monitoring report to SAHRA on this work. SAHRA also indicated that the frequency of these checks should be assessed after six months, this assessment being based on the findings and the planned mining programme. In July 2016 BM Geological Services recommended that these monitoring reports should be conducted on an annual basis. Following on from those recommendations SAHRA has instructed Vaalbult Mining Company (Pty) Ltd [SAHRA document Ref: 16/5/1 Vaalbult Mining Project; dated 18 April 2017] that on-site checks for the occurrence of any fossils of the excavated pit and stockpiled material are required every twelve months.

In compliance with the SAHRA instruction discussed above, and subsequent recommendations, this report documents the results of a palaeontological monitoring program site visit conducted by Dr B Millstead on the 1st of September 2021. Dr Millstead [representing Barry Millstead Geological Services (Pty) Ltd] was accompanied by Ms Phangisile Mthimunya [representing Vaalbult Mining Company (Pty) Ltd] who facilitated the access to all those areas that were required. Vaalbult Mining Company made no restrictions concerning the location of areas to be investigated and access was freely available to Dr Millstead to inspect wherever he desired. Given that freedom, it proved impossible to visit the western half of the northern highwall, as well as the western highwalls of the area of Cuts 2,5 and 3,5 because of floor of the mine void and its highwalls due to the active mining taking place there during the site visit. The present investigation was conducted within the mine's Cuts 2,5 and 3,5, as well as upon waste rock piles that emanated from the Cut as well as the erstwhile Box Cut. Cuts 2,5 and 3,5 being the only working open caste pit void at the time of inspection. In 2021 the mine was in the process of transitioning to underground mining, and it is expected that no further open pit mining conducted within the mine lease. However, early in 2022 the underground mining operations were permanently halted and, after a short cessation in all mining activities, open pit mining recommenced.

The present palaeontological monitoring study revealed that the Vaalbult Colliery mining operations impact directly upon strata of the Early Permian Vryheid Formation, Karoo Supergroup. This unit is known to be richly fossiliferous elsewhere in its extent; common fossils known to occur within the unit include plant macrofossils and trace fossils. The stratigraphic succession within in the Vaalbult Colliery consists of eight distinct lithofacies, named units A-H herein. This stratigraphic sequence is dominated by two coal seams that are being economically exploited by the colliery. These seams are

the upper-most D seam (unit E) and the underlying E seam (unit A). The E seam constitutes the base of the colliery pit in all areas observed and appears to be uniformly distributed throughout the pit.

A revised understanding of the stratigraphic relationship between units C and D was developed and presented in the 2019 site visit report. In that it was recognised that unit D is not uniformly thick, and may occur contained in the upper half of unit C. Unit D may pinch out in some regions of the study area.

The strata examined within the Cut in 2009 were poorly exposed. During the present site visit an unidentifiable plant compressions of a woody stem segments and several blocks containing abundant specimens of *Skolithus* sp. ichnofossils were located within rock fall at the base of highwalls comprised of unit F. The fossils identified were of minimal scientific importance and, thus, even if their provenance was known no damage mitigation protocols would have been required. None of the fossils (plant macrofossil or trace fossils) identified are palaeontologically significant and require special preservation or excavation. No fossil materials were identified that would necessitate damage mitigation procedures to be enacted.

Overall, the lithological succession of the Vaalbult Colliery is known to be fossiliferous (albeit poorly so) and low in taxonomic diversity. Thus, due care needs to be exercised to ensure that the mining activities do not diminish the palaeontological heritage of the area. That said the Vryheid Formation strata occur beneath a uniformly thick regolith horizon and do not crop out. The absence of bedrock outcrop means that no fossils are observable at surface. Thus, it is only due to the ongoing mining activities that the fossiliferous strata are exposed and made available for scientific study. No fossils were located within them during this site visit. None of the fossils located during the preceding studies conducted by Dr Millstead are of sufficient palaeontological significance that their excavation by a palaeontologist or their preservation is required. This situation is subject to future change but this may not always be the case. However, comparison of the stratigraphic successions studied in this and the preceding palaeontological monitoring reports indicates that several of the geological units present within the mine show significant sedimentological variation across the small area mined to date. Significant facies variations may be possible across the extent of the Mining Right area. Changes within the abundance and type of fossil assemblages may be possible and that palaeontologically significant fossil assemblages may be present. The possibility of the presence of palaeontologically significant fossils within the rocks of the colliery therefore remains a strong possibility.

The 2021 palaeontological audit report prepared by Dr Millstead indicted that the mine was in the final stages of transition to an underground mining operation. It is common practice in the industry that all rock surfaces not being actively mined are coated with lime powder to prevent methane combustion. This activity hides the rock surface and makes observation of the rock and its content impossible. Similarly, the preponderance of Mine Health and Safety protocols that are part of the fabric of underground mining

usually make access to the freshly mined surface impossible for individuals who are not appropriately trained and qualified.

It is was accordingly recommended by Dr Millsteed in 2021 that:

- The annual palaeontological audit of the mine workings should be placed into a state of suspension indefinitely (subject to later review should open cast mining recommence at Vaalbult Mine at any time in the future).
- Should opencast mining be planned at any time in the future of the life of mine, the mine must contact SAHRA and inform them of this possible intention, and potentially trigger a resumption of annual palaeontological impact assessment audit (at the request of SAHRA).

However, while the planned underground mining did commence, this was permanently halted earlier in 2022 and the mine has reverted to open pit mining methods, following a short cessation in all mining activities. Thus, is accordingly recommended, herein, that:

- No palaeontological reason was found during this site visit to impede the ongoing mining operations.
- The process of conducting an annual palaeontological audit of the mine's open pit highwalls and waste rock piles continue to be performed.

1 INTRODUCTION

Vaalbult Mining Company (Pty) Ltd owns and operates a colliery on Portions 1, 9 and 10 of the farm Vaalbult 3 IT, Gert Sibande District Municipality, located west of Carolina, Mpumalanga Province. The South African Heritage Resources Agency (SAHRA) has instructed Vaalbult Mining Company (Pty) Ltd [SAHRA document Ref: 16/5/1 Vaalbult Mining Project; dated 13 February 2014] that on-site checks for the occurrence of any fossils of the excavated pit and stockpiled material are required every six months by an experienced Karoo palaeobotanist. The Karoo palaeobotanist must submit a monitoring report to SAHRA on this work. SAHRA indicated that the frequency of these checks should be assessed after six months, based on the findings and the planned mining programme. In July 2016 BM Geological Services recommended that these monitoring reports should be conducted on an annual basis. Following on from those recommendations SAHRA has instructed Vaalbult Mining Company (Pty) Ltd [SAHRA document Ref: 16/5/1 Vaalbult Mining Project; dated 18 April 2017] that on-site checks for the occurrence of any fossils within the excavated pits and stockpiled materials are required every twelve months. In compliance with the SAHRA instruction and subsequent recommendations, this report documents the results of a palaeontological monitoring program site visit conducted by Dr B. Millsteed [representing Barry Millsteed Geological Service (Pty) Ltd] on the 1st of September 2022. Dr Millsteed was accompanied by Ms Phangisile Mthimunya [of Geovicon Environmental (Pty) Ltd and representing Vaalbult Mining Company (Pty) Ltd] who facilitated the access to all those areas that were required. Vaalbult Mining Company (Pty) Ltd made no restrictions concerning the location of areas to be investigated and access was freely available to Dr Millsteed to inspect wherever he desired. The only remaining open pit void being actively mined was visited (containing both Cuts 2,5 and 3,5), and all observations and data were obtained from that void.

2 LOCATION

The Vaalbult Colliery mining lease lies approximately 10 km west of the town of Carolina and 28 km northeast of Hendrina, Gert Sibande District Municipality, located west of Carolina, Mpumalanga Province (Figure 1). The approximate corner points (Figure 1) of the Mining Right area are provided in Table 1. Vaalbult Colliery is located on Portions 1, 9 and 10 of the farm Vaalbult 3 IT (Figure 2). All work conducted during the present study took place on Portion 9 of the farm.

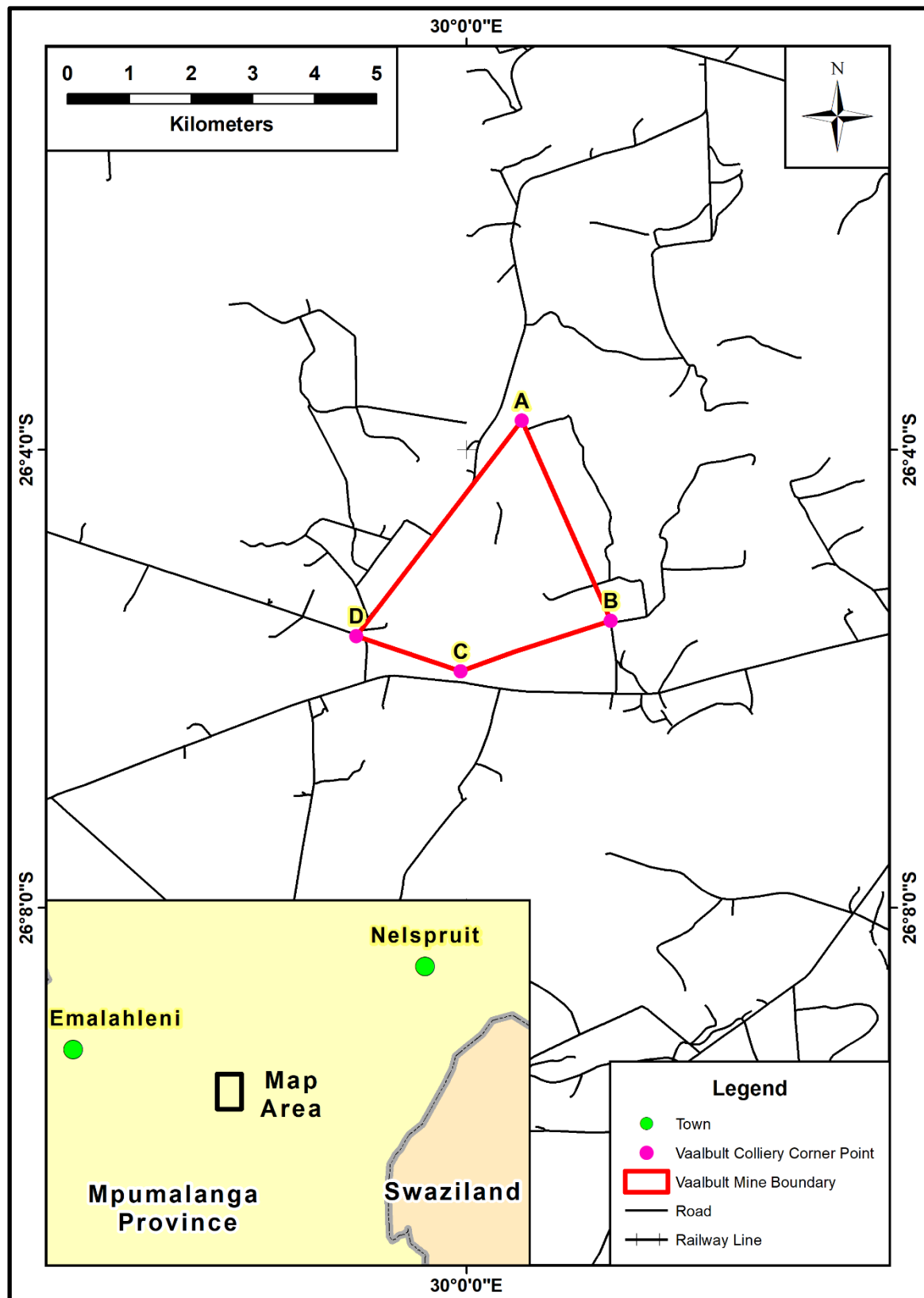


Figure 1: Location map of the Vaalbult Colliery. Shown, as the purple circles are the approximate corner points of the Mining Right area, the co-ordinates for the corner points are provided in Table 1.

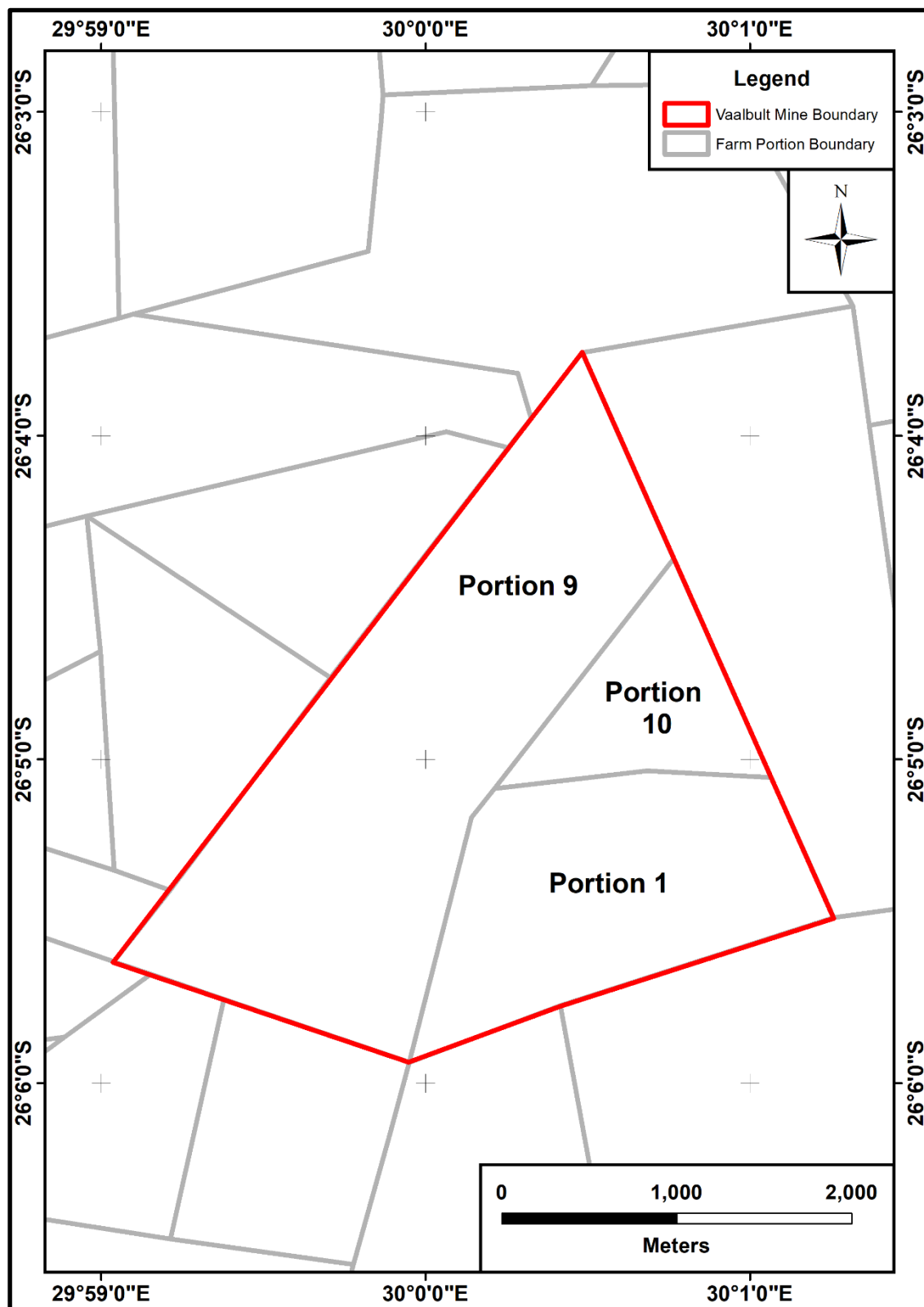


Figure 2: Map showing the location of the various portions Vaalbult 3 IT that constitute the Mining Right area.

CORNER POINT	LATITUDE	LONGITUDE
A	-26.062385	30.008051
B	-26.091515	30.020978
C	-26.098911	30.999122
D	-26.093777	30.983943

Table 1: Approximate latitude and longitude of corner points of the Vaalbult Colliery Mining Right boundary. The coordinates are provided in geographic format (WGS84 datum).

3 RELEVANT EXPERIENCE

Dr B 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 the principle of BM Geological Services and has sufficient knowledge of palaeontology and the relevant legislation required to produce this Palaeontological Monitoring Report. Dr Millstead is registered with the South African Council for Natural Scientific Professions (SACNASP; Reg. No. 400332/07), is a member of the Palaeontological Society of South African, a member of the Association of Australasian Palaeontologists, and is a fellow of the Geological Society of South Africa.

4 ACCESS AND INDEPENDENCE

Dr Millstead was retained, as an independent consultant to conduct this palaeontological monitoring study and compile the present report, and shall receive fair remuneration for these professional services. Neither Dr Millstead nor BM Geological Services has any financial interest in the Vaalbult Colliery, the Vaalbult Mining Company (Pty) Ltd nor any companies or individuals associated with the project.

No restrictions concerning the location of areas to be investigated were made by Vaalbult Mining Company and access was freely available to Dr Millstead to inspect wherever he desired. Vaalbult Mining Company (Pty) Ltd made all safety and access arrangements required to inspect the areas selected by Dr Millstead. That said, it proved impossible to visit the western and north-western portions of the highwalls that constitute Cuts 2,5 and 3,5 as the area was in the process of being actively mined and was unsafe at the time of the site visit.

5 METHODOLOGY

The Vaalbult Colliery was visited and inspected by Dr Millstead on the 1st of September 2022. Dr Millstead was accompanied during the investigation by Ms Phangisile Mthimunye representing Vaalbult Mining Company (Pty) Ltd. All sites were

inspected on foot and extensive observation was made of all accessible portions of Cuts 2,5 and 3,5 high-walls as well as waste rock piles that emanated from the mine's open pit excavations that were produced since the previous palaeontological audit in 2021. As part of this process all sedimentary facies present in the high-walls were identified and investigated for their palaeontological content. The identified facies were described and are documented herein. The locations where detailed observations were recorded and/or photographs taken were made as waypoints using a hand-held GPS (Figure 3). The present investigation was conducted within the mine's void containing Cuts 2,5 and 3,5 (Figure 3) as well as a series of waste rock piles that originated from mining of both the Box Cut, and Cuts 2,5 and 3,5. Cuts 2,5 and 3,5 being the only working areas within the open cast pit void at the time of inspection, and as such the location of the Box Cut is unknown to the author.

6 GEOLOGY

Figure 4 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 in general, the strata present within the Vaalbult Colliery open pit, and their fossiliferous content and potential follows.

6.1 Vryheid Formation

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 Volksrust and underlying Pietermaritzburg Formations; both of which are both predominantly argillaceous (Figure 5). In terms of environment of deposition, the formation can be divided into a 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 Volksrust Formation. To the south and southeast, the Vryheid Formation grades laterally into undifferentiated, deep-water argillites of the Ecca Group (Figure 5).

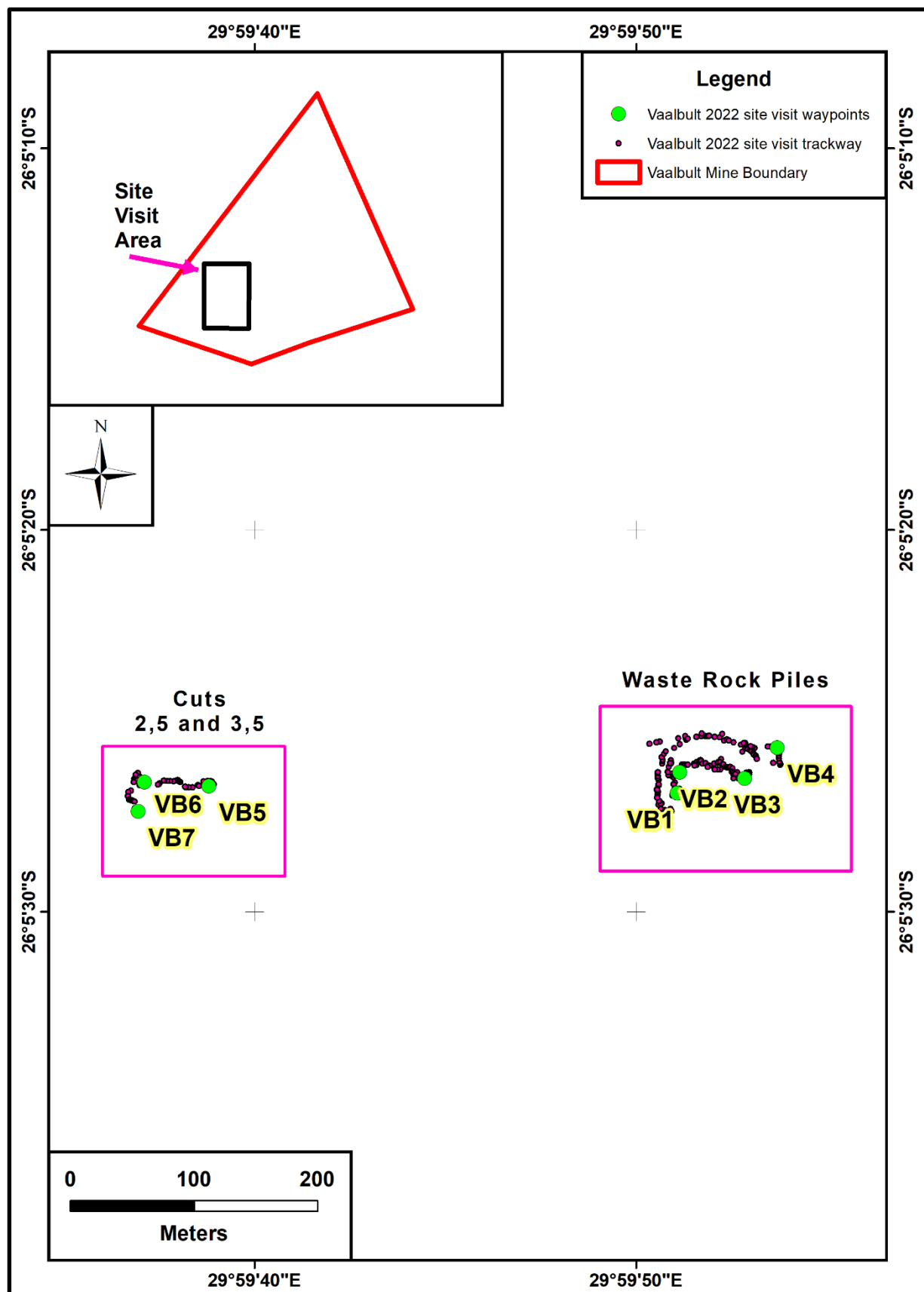


Figure 3: Map showing the location of the GPS waypoints, and site visit trackway that define the areas examined during the site visit on the 1st of September 2022.

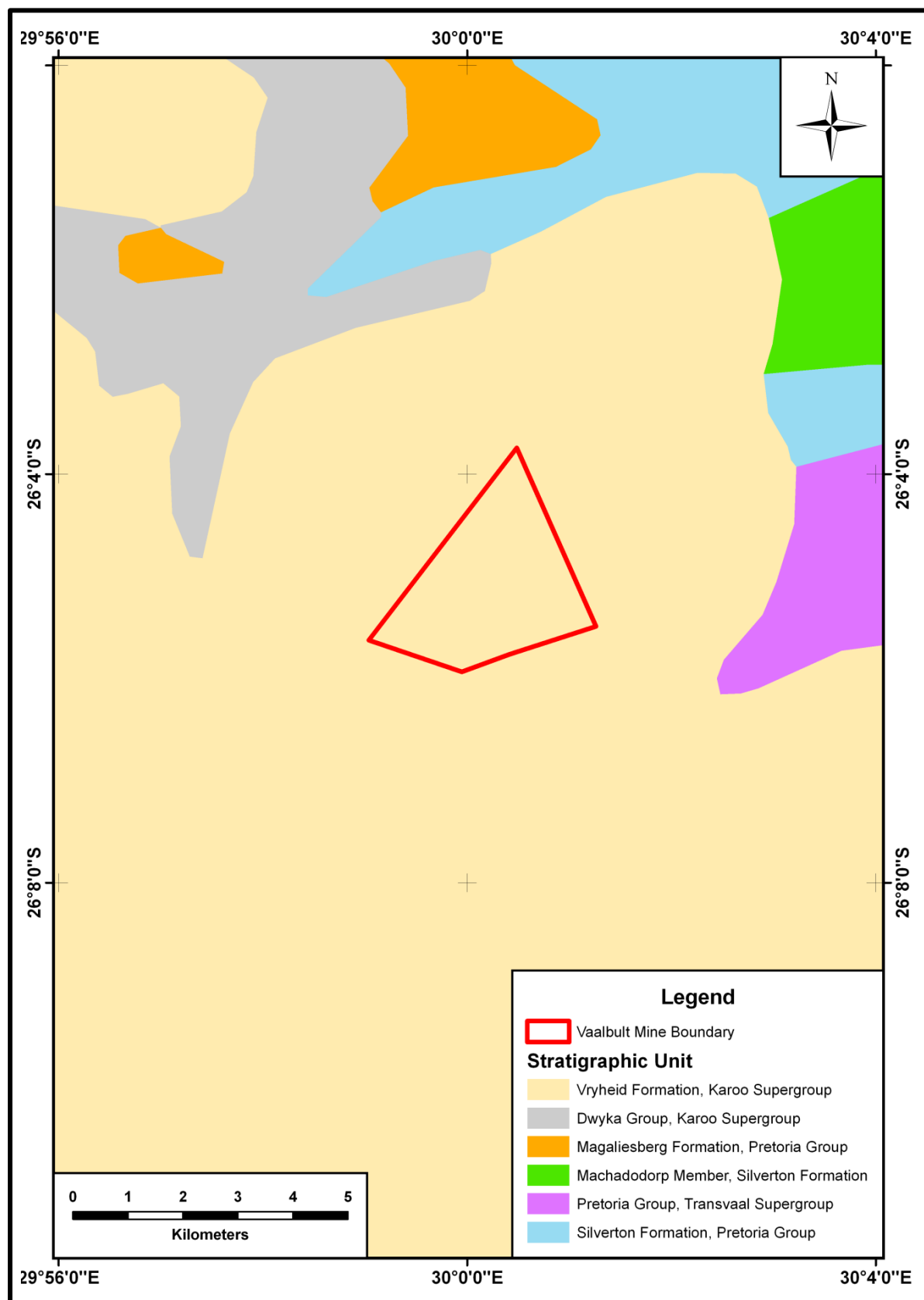


Figure 4: Geological map of the area underlying the Vaalbult Colliery Mining Right area and its immediate environs.

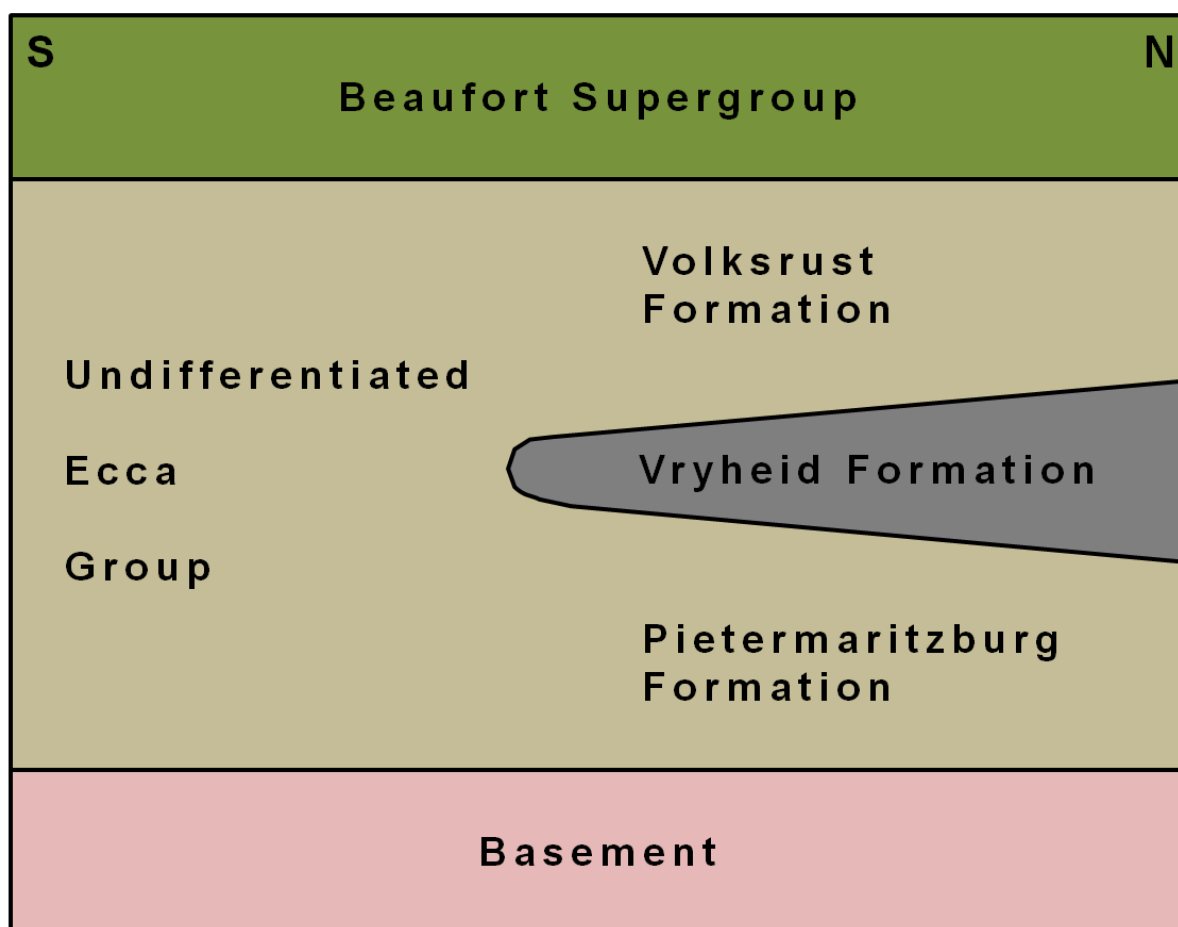


Figure 5: Schematic north-south oriented stratigraphic section of the Ecca Group in the northeast corner of the Karoo Basin. The Volksrust and Pietermaritzburg Formations can only be recognised when the Vryheid Formation forms part of the vertical sequence. In the north and north-western portions of the basin the Pietermaritzburg Formation was not deposited. In these areas the coal-bearing strata of the Vryheid Formation rest directly upon the basement.

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.

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

the project area did not identify any outcrops of bedrock, the entire area being covered by Cainozoic Regolith.

6.2 Geology of the Vaalbult Colliery

6.2.1 Historical overview

The major lithological succession described by BM Geological Services in previous reports from the colliery is outlined in Table 2. This stratigraphic sequence is dominated by the two coal seams that are being economically exploited by Vaalbult Colliery (Figures 8 and 9). These coal seams are the stratigraphically younger D seam (unit E) and the underlying E seam (unit A). The E seam constitutes the base of the colliery pit in all area observed and appears to be uniformly distributed throughout the colliery. The E seam has been observed to be up to ca. 1.5 m thick. Unit E has been observed to be present as a predominantly mudstone-rich horizon containing numerous thin, discontinuous coaly stringers; it has also observed as a well-developed coal seam > 40 cm and < 1.5 m in thickness. In this thicker part of the unit E a ±15-20 cm thick, grey coloured granulestone has previously been identified approximately half-way up the coal seam.

Lithological Unit	Unit Code
Regolith	H
Brown sandstone	G
Carbonaceous mudstone	F
D seam	E
Buff sandstone	D
Carbonaceous mudstone	C
Buff sandstone	B
E seam	A

Table 2: Lithological succession previously described from within the Vaalbult Colliery pit. The code indicated is the letter code used to identify the individual major lithological units in this report. Coal horizons are highlighted in bold text.

The sedimentary sequence separating the two seams varies between 11.5 m and 12.5 m in thickness (the thickness decreases towards the west; Figure 8). The inter-seam lithostratigraphic succession within the colliery is as follows. Immediately overlying the E seam is a highly variable sandstone unit (unit B) which is termed “the parting” in the mine’s terminology. Unit B has been observed to be a 30 cm thick, buff coloured

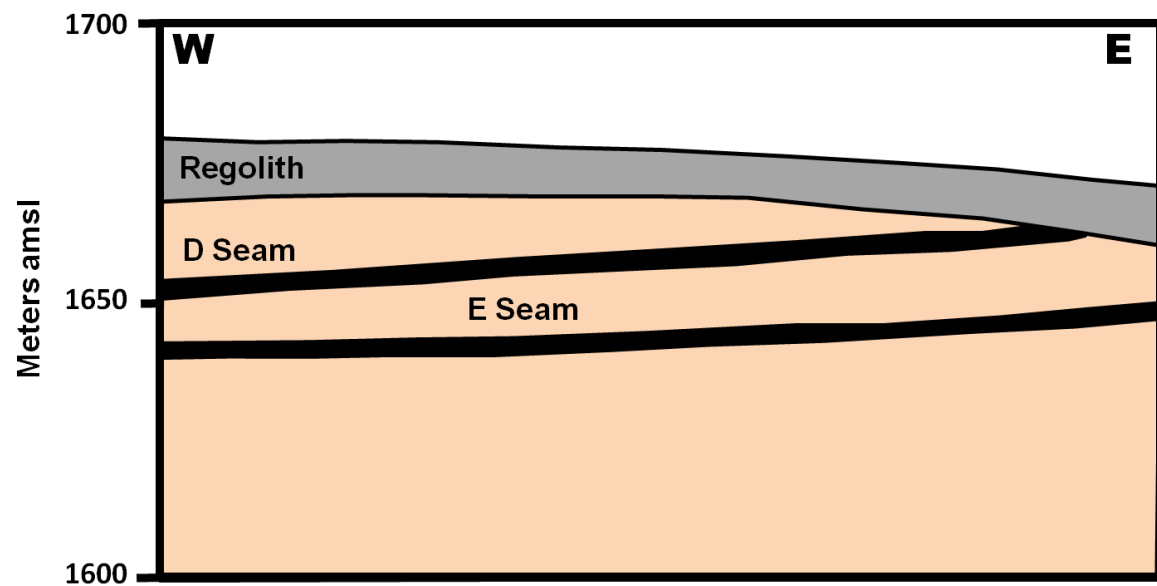


Figure 6: Schematic E-W oriented geological cross section across the central western section of the Mining Right area, and approximately in the same location as the mine pit (data obtained from the client). The location of this cross-section is provided in Figure 9.

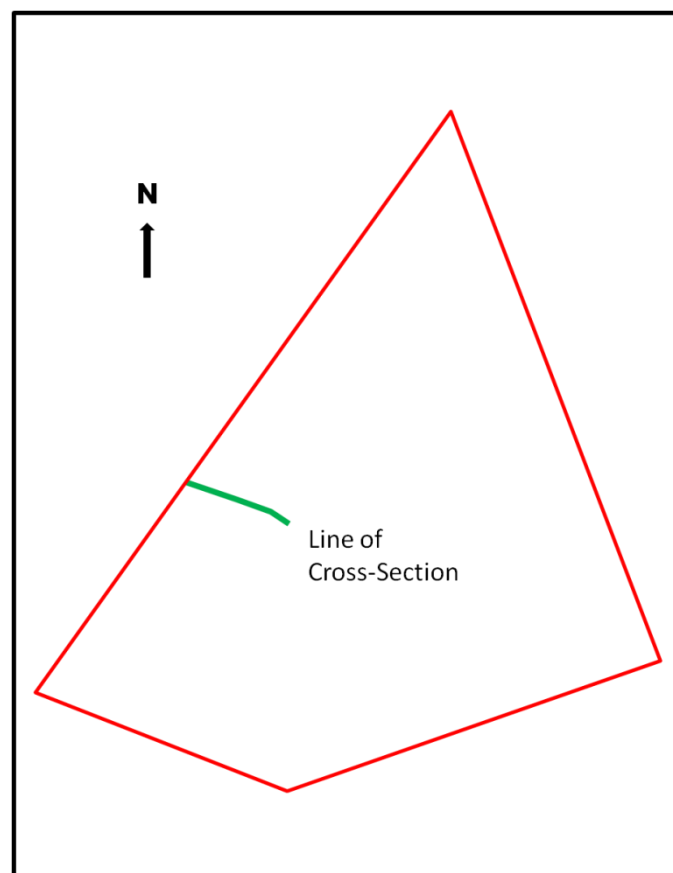


Figure 7: Map showing the location of the geological cross-section shown in Figure 8.

uniform, massively bedded unit. However, in some areas the sandstone forms a 50 cm thick fining-upward sequence with granulestone at the base, grading upward into a flaser-bedded portion and an upper-most massive to planar-bedded sandstone portion. A carbonaceous, very-coarse grained, highly irregularly thick, undulatory and lenticular, sandstone horizon up to ca. 30 cm thick occurs in some areas occurring between the top of the E seam and the base of Unit B. Elsewhere, unit B is present as a <2 m thick laminated, micaceous sandstone (the individual mica flakes exceed several millimetres in size). Overlying unit B is approximately 6 m of black, thinly laminated, carbonaceous mudstone and fine-sandstones. Unit C overlies unit B and consists of ca. 9-10 m of buff coloured sandstone. Overlying unit C is approximately 5-6 m of brown coloured, sandstones of unit D. The sandstone is variable in appearance, being parallel bedded in and exhibiting well developed point bar cross-beds. Unit C has been observed as being extremely variable in appearance. It sporadically occurs as a discontinuous 30-40 cm thick, buff coloured sandstone (maximum thickness) that occurs approx. 40-50 cm above the top of unit B. In some areas the sandstone is a distinct tabular member. Elsewhere along strike the sandstone lenses out to become a discontinuous non-connected series of lenses distributed over a 30-40 cm vertical stratigraphic thickness. Occurring above this sandstone, but still within unit C in the present site investigation is a ca. 30-40 cm thick buff coloured, tabular sandstone is present throughout all the sections identified and occurs ca. 2 m above the top of unit B.

Unit D has been observed to consist of approximately 5 m of tabular sandstones which are lighter in colour (buff) than in the underlying unit C. The unit is mostly composed of thin, well delineated tabular sandstones, but that distributed throughout the succession are a number (four were observed) of much thicker, laterally continuous buff sandstones.

The coals of Unit E (D seam) overly unit D and the maximum exposed thickness in the colliery is ca. 40 cm. In the previous biannual site visit the unit overlying unit E was ca. 8 m of thinly laminated, black carbonaceous mudstones (termed unit F). The rocks comprising unit F was subdivided in a previous palaeontological audit report into three distinct lithological subunits (termed F1-F3). Rock sequence F1 consists of ca. 2 m of massive and laminated dark grey mudstones, F2 consists of ca. 1 m of light grey, laminated mudstones and the upper part of unit F consists of ca. 3 m of black, carbonaceous mudstone (subunit F3). Overlying unit F is a light brown sandstone unit several meters in thickness termed unit G. The light brown sandstones of unit G have not been observed closely anywhere in the colliery and, as such, little detail can be provided of it. Approximately 2 m of regolith (unit H) tops the sequence.

6.2.2 Observations from the current study

The sites observed in the site visit (i.e., Cuts 2,5 and 3,5) reported herein all lie stratigraphically above the E seam and below the D seam. Spatially the waypoints VB5-

VB7, see Figure 3) Lie along the highwalls of associated with Cuts 2,5 and 3,5. Waypoints VB1-VB4 are all located within the waste rock piles.

The strata cropping out at waypoints VB5-VB7 are the finely laminated, dark grey unit C, which are stratigraphically overlain by buff sandstones of unit D (Figures 10-12).

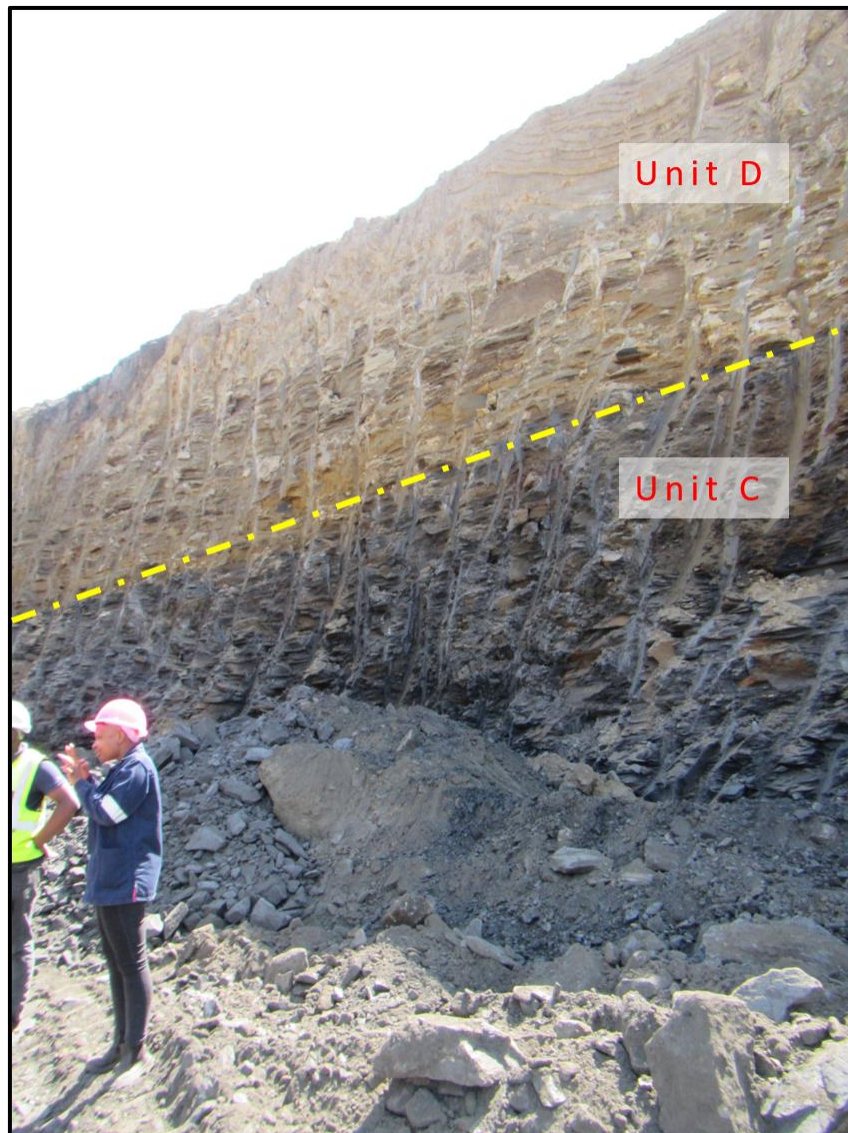


Figure 8: View of the eastern end of the northern highwall in the mine void containing both Cuts 2,5 and 3,5 (waypoint VB5; see Figure 3). Visible in the photograph is that the lowermost unit C is ca. 6 m thick. It is stratigraphically overlain by the ca. 6m thick succession of unit D. A sharp, seemingly conformable contact separates the two units. Unit B lies just below the floor of the open pit.



Figure 9: Rocks of unit C located at waypoint VB5. The finely laminated, dark grey, carbonaceous mudstones of the unit occasionally exhibit thin (mm scale) calcareous laminations.



Figure 10: Thinly bedded to massive, buff-coloured sandstones of unit D (waypoint VB5, see Figure 3).

6.3 Palaeontological potential

6.3.1 Palaeontology of the Vryheid Formation

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, R. Prevec, 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 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 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 *Namaicthys 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.

6.3.2 Palaeontology of the Vaalbult Colliery

Two distinct groups of fossils have been identified during the preceding palaeontological audit site visits conducted by Dr B. Millstead within the sedimentary strata that comprise the Vaalbult Colliery highwalls and the waste rock stockpiles. The fossil assemblages consist of plant macrofossils and a trace fossil assemblage. All fossils located during the conduct of the site visit reported herein were in finer-grained, lower energy sediments of unit F. The higher energy environment of deposition suggested for Unit G (based on the coarser grain size of the sediment as well as the tabular cross-bedding and rip up clasts) suggests a lower potential for fossil preservation.

6.3.2.1 Plant macrofossils

No plant macrofossil material was identified during the conduct of this site visit.

6.3.2.1 Trace fossils

During the conduct of earlier site visits conducted in the period 2016-2021 trace fossils representing burrows of two types were identified within the sedimentary rocks of the mine sequence. These fossils are a) closely spaced, unbranching, vertical, tubular burrows identified as the ichnogenus *Skolithus* and b) branching or bifurcating horizontal burrows tentatively identified as the ichnogenus cf. *Scolicia*. The fossils identified as the ichnogenus *Skolithus* were overwhelmingly the dominant ichnogenus recognised at the colliery.

Hobday and Tavener-Smith (1975) report the presence of this fossil type elsewhere in the Ecca Subgroup where they occur in sandstones associated with upward-coarsening regressive facies cycles attributed to delta progradation.

As with the plant macrofossils materials identified during preceding palaeontological audits of the mine conducted by Dr B. Millstead the ichnofossil assemblages are not uniformly distributed within the rocks of the coalmine sequence, but are instead markedly patchy in their occurrence. These specimens were present in extensive accumulations of evenly spaced burrows. The lithology containing these fossils is micaceous, carbonaceous sandstones similar to those observed in “the parting” and otherwise known as unit B.

No trace fossil material was identified during the conduct of this site visit.

7 SUMMARY

Dr B. Millstead, in the presence of Ms Phangisile Mthimunye [representing Vaalbult Mining Company (Pty) Ltd], conducted a site investigation of the only mine void being actively mined at the time of the visit on the 1st of September 2022. The present investigation was conducted within the immediate environs of the mine's Cuts 2,5 and 3,5. Due to active mining in Cuts 2,5 and 3,5 at the time of the visit it was deemed unsafe to examine western portion of the northern highwall, or the western-highwalls of the pit. However, it was obvious that these portions of the cut's high wall exposed the same geological units that were able to be examined elsewhere in the cut and, given the close proximity, this was not considered a serious impediment to the site investigation. The site investigation confirmed the presence informal stratigraphic units C and D in the cut's highwall exposures. The ongoing mining operations were in the process of exposing the sandstones of unit B. Waste rock piles emanating from the erstwhile Box Cut, and Cuts 2,5 and 3,5 were also examined. However, the location of the rehabilitated Box Cut is unknown to the author, and it was not evident which material in the rock piles came from the Box Cut, and which came from Cuts 2,5 and 3,5.

The strata examined to date within the mine are generally poorly fossiliferous. During the present site visit an unidentifiable, carbonaceous stem compression of a woody stem segment and a small number of blocks containing numerous *Skolithus* sp. ichnofossils were located within rocks attributed in the rock fall underlying remnant high wall sections. The fossils themselves were of minimal scientific importance and, thus, even if the provenance was known with more precise detail damage mitigation protocols would not have been required.

No fossil materials (either plant macrofossil nor trace fossils) were located during the conduct of the site investigation.

8 RECOMMENDATIONS AND CONSIDERED OPINION

The lithological succession of the Vaalbult Colliery is fossiliferous (although not abundantly so) and so due care needs to be exercised to ensure that the palaeontological heritage of the area is not diminished by the mining activities. That said, the strata being mined by the colliery occur beneath a uniformly thick regolith horizon and do not crop out. The absence of bedrock outcrop means that no fossils are observable at surface. As a result, it is only due to the ongoing mining activities that the fossiliferous strata are exposed and made available for scientific study. No fossils material was identified during this study, but previous palaeontological audit site investigations conducted by Dr Millstead at the mine have palaeontological materials. None of these previously identified fossil materials were of sufficient palaeontological significance that their excavation by a palaeontologist or their preservation is required, but this may not always be the case. However, the area planned to be mined is large and only a small proportion of it has been exploited to date. In addition, several of the

geological units present within the mine show significant sedimentological variation across the small area mined to date. It is interpreted, herein, that significant facies variations may be possible across the full extent of the Mining Right area. Changes within the abundance and type of fossil assemblages may be possible and that palaeontologically significant fossil assemblages may be present. The possibility of the presence of palaeontologically significant fossils within the rocks of the colliery therefore remains a strong possibility.

In the 2021 annual palaeontological report submitted by Dr Millsteed it was reported that the mine is in the final stages of transition to an underground mining operation. It is common practice in the industry that all rock surfaces not being actively mined are coated with lime powder to prevent methane combustion. This activity hides the rock surface and makes observation of the rock and its content impossible. Similarly, the preponderance of Mine health and safety protocols that are part of the fabric of underground mining usually make access to the freshly mined surface impossible for individuals who are not appropriately trained and qualified.

It was accordingly recommended, by Dr Millsteed in 2021, that:

- The annual palaeontological audit of the mine workings should be placed into a state of suspension indefinitely (subject to later review should open cast mining recommence at Vaalbult Mine at any time in the future).
- Should opencast mining be planned at any time in the future of the life of mine, the mine must contact SAHRA and inform them of this possible intention, and potentially trigger a resumption of annual palaeontological impact assessment audit (at the request of SAHRA).

However, while the planned underground mining did commence, this was permanently halted earlier in 2022 and the mine has reverted to open pit mining methods, following a short cessation in all mining activities. Thus, is accordingly recommended, herein, that:

- No palaeontological reason was found during this site visit to impede the ongoing mining operations.
- The process of conducting an annual palaeontological audit of the mine's open pit highwalls and waste rock piles continue to be performed.

9 REFERENCES

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Dr B. Millstead

A handwritten signature in black ink, appearing to read 'B. Millstead', with a stylized flourish at the end.

9 September 2022