

PALAEONTOLOGICAL IMPACT ASSESSMENT REPORT

MooiMgeni Transfer Scheme - Phase 2 (MMTS-2)

FOR

WBHO Construction Pty (Ltd)

by

Gideon Groenewald

04 July 2014

EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a Phase 1 Palaeontological Impact Assessment, assessing the potential palaeontological impact of, and to record the location of any fossils found along the pipeline route connecting Spring Grove Dam with the Mpopana Outfall in the KwaZulu-Natal Midlands. The purpose of this Palaeontological Impact Assessment is to identify exposed and potential palaeontological heritage on the site of the proposed development, to assess the impact the development may have on this resource, and to make recommendations as to how this impact might be mitigated.

The project entails the construction of the pipeline and related infrastructure for the Mooi Mgeni Transfer Scheme – Phase two (MMTS-2) Water Transfer System from the Spring Grove Dam to the Mpopana discharge point.

Gideon Groenewald, Sue Groenewald and David Groenewald, experienced fieldworkers, visited the site from Monday 30 June 2014 to Wednesday 2 July 2014. Construction had begun on the section between Gowrie Farm and the Mpopana Outfall and this allowed for the exposed underlying rock to be observed and inspected. For some sections, the pipeline had already been laid and the excavations back-filled. Where this was the case, the rocks on the surface were inspected for any fossil remains. From Gowrie Farm to the Spring Grove Dam, the servitude had just started being cleared. It was not possible to inspect the bedrock along these areas for most of this part of the pipeline due to the rocks being covered by soil and vegetation.

The spoil dump of the excavations done for the Pump station at Spring Grove Dam were inspected in detail and a number of very well preserved vertebrate fossil remains, as well as some plant fossils were recorded. The fossiliferous rocks were indicated to the responsible environmental officers on site and appropriate protocols need to be put in place to collect and store these rocks. An inspection was done of the exposed walls of the pump station excavation site. Mainly plant fossils and fossil bone fragments were observed.

The pipeline route for the MMTS-2 project is underlain by palaeontologically moderately sensitive sedimentary rocks of the Volksrust Formation and highly sensitive sedimentary rocks of the Adelaide Subgroup/Estcourt Formation. Field investigation confirmed that these sediments are generally very deeply weathered and fossil remains are difficult to identify. Deep excavations into fresh, unweathered bedrock of the Adelaide Subgroup yielded rich, well preserved fossil remains of plants and vertebrates.

Recommendations:

- The ECO and environmental personnel of the project must inform all the relevant managers of the fact that the pipeline route is underlain by rocks with a high palaeontological sensitivity.
- The appointed palaeontologist must apply for the necessary permits to collect and remove fossils for curation at a relevant institution.
- The ECO and environmental personnel of the project must keep the palaeontologist informed about the planning for future excavation into

weathered or unweathered bedrock of the Adelaide Subgroup/Estcourt Formation. This includes trenching into virtually all of the presently unexcavated sections of the pipeline from Spring Grove Dam to Nottingham Road. The procedure will entail notification of the results of the geotechnical surveys along the route of the pipeline with photographic evidence of the nature of the bedrock. If fossil remains are expected, arrangements will be made for the palaeontologist to inspect the trenches and excavated material on a weekly basis to collect and rescue exposed fossils.

- All existing spoil material from the Pump Station excavation site must be regarded as Highly Sensitive for palaeontological heritage. All the identified rocks with fossil remains must be removed to a secure holding area, awaiting recommendations by SAHRA with regards to the curation of the material. All future removal of material from the spoil sites must be done under supervision of the palaeontologist to ensure proper management of these highly fossiliferous rocks.

TABLE OF CONTENT

1. INTRODUCTION	1
1.1. Legal Requirements.....	1
2. AIMS AND METHODOLOGY	1
2.1. Scope and Limitations of the Phase 1 Investigation.....	2
3. PROPOSED DEVELOPMENT DESCRIPTION.....	3
4. GEOLOGY OF THE AREA.....	3
4.1. Ecca Group	4
4.1.1. Volksrust Formation (Pvo)	4
4.2. Beaufort Group	4
4.2.2. Adelaide Subgroup (Pa) and Estcourt Formation (Pes)	4
4.3. Dolerite (Jd).....	4
5. PALAEOONTOLOGY OF THE AREA	5
5.1. Volksrust Formation.....	5
5.2. Adelaide Subgroup and Estcourt Formation.....	5
5.3. Dolerite.....	6
6. PRELIMINARY ASSESSMENT RESULTS	6
7. FIELD INVESTIGATION.....	7
7.1. Field Observations.....	8
7.1.1. D2477 to Mpofana Outfall.....	8
7.1.2. Gowry Farm to D2477	9
7.1.3. Nottingham Road to Springrove Dam	10
7.1.4. Spoil Dump and Pump Station excavation site.....	12
8. PALAEOONTOLOGICAL SIGNIFICANCE AND RATING	15
9. PALAEOONTOLOGICAL IMPACT AND MITIGATION.....	16
10. CONCLUSION	16
11. REFERENCES.....	17
12. QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR	18
13. DECLARATION OF INDEPENDENCE	18

LIST OF FIGURES

Figure 3.1 Proposed route of the Mooi-Mgeni transfer pipeline	3
Figure 4.1 Geology of the study area.	5
Figure 6.1 Palaeontological sensitivity of the study area.....	7

LIST OF TABLES

Table 2.1 Palaeontological sensitivity analysis outcome classification	2
Table 5.1 Palaeontological Significance of Geological Units on Site	6
Table 7.1 Field Observations D2477 to Mpofana Outfall.....	8
Table 7.2 Field Observations from Gowry Farm to D2477 District Road.....	9
Table 7.3 Field observations from Nottingham Road to Springrove Dam.....	11
Table 7.4 Field observations at the spoil dump and pump station excavation	13

1. INTRODUCTION

Gideon Groenewald was appointed to undertake a Phase 1 Palaeontological Impact Assessment, assessing the potential palaeontological impact of, and to record the location of any fossils found along the pipeline route connecting Spring Grove Dam with the Mpfana Outfall in the KwaZulu-Natal (KZN) Midlands. The purpose of this Palaeontological Impact Assessment (PIA) is to identify exposed and potential palaeontological heritage on the site of the proposed development, to assess the impact the development may have on this resource, and to make recommendations as to how this impact might be mitigated.

1.1. Legal Requirements

This report is a requirement of the Environmental Authorisation issued for the construction of the MMTS-2 Water Transfer System in August 2013 (and subsequently amended in November 2013), which requires that a Phase 1 Paleontological Impact Assessment must be done for the areas underlain by rocks of the Adelaide Subgroup. This report complies with the requirements for the South African National Heritage Resource Act No 25 of 1999.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens; and
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

2. AIMS AND METHODOLOGY

A Phase 1 investigation is often the last opportunity to record the fossil heritage within the development footprint. These records are very important to understand the past and form an important part of South Africa's National Estate.

Following the "SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment were:

- to identifying exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assessing the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources; and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

Prior to the field investigation a preliminary assessment (desktop study) of the topography and geology of the study area was made using appropriate 1:250 000 geological maps in conjunction with Google Earth (See Appendix 1). Potential fossiliferous rock units (groups, formations etc) were identified within the study area and the known fossil heritage within each rock unit was inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

Priority palaeontological areas were identified within the development footprint to focus the field investigator's time and resources. The aim of the fieldwork was to document any exposed fossil material and to assess the palaeontological potential of the region in terms of the type and extent of rock outcrop in the area.

The likely impact of the proposed development on local fossil heritage was determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 2.1 below.

Table 2.1 Palaeontological sensitivity analysis outcome classification

Sensitivity	Description
Low Sensitivity	Areas where there is likely to be a negligible impact on the fossil heritage. This category is reserved largely for areas underlain by igneous rocks. However, development in fossil bearing strata with shallow excavations or with deep soils or weathered bedrock can also form part of this category.
Moderate Sensitivity	Areas where fossil bearing rock units are present but fossil finds are localised or within thin or scattered sub-units. Pending the nature and scale of the proposed development the chances of finding fossils are moderate. The developer should be made aware of the potential for finding fossils. If fossil material is later discovered it must be appropriately protected and the discovery reported to the appropriate Heritage Authority so that any appropriate mitigation by a palaeontological specialist can be considered and implemented, at the developer's expense.
High Sensitivity	Areas where fossil bearing rock units are present with a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in outcrops and exposed bedrock. The chances of finding fossils during excavations by a professional palaeontologist are high. Palaeontological mitigation measures need to be incorporated into the Environmental Management Plan. The mitigation should involve the comprehensive recording and collection of surface and embedded fossils along and close to the development footprint by a professional palaeontologist.

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, palaeontological mitigation measures should be incorporated into the Environmental Management Programme (EMPr).

2.1. Scope and Limitations of the Phase 1 Investigation

The scope of a phase 1 Investigation includes:

- an analysis of the area's stratigraphy, age and depositional setting of fossil-bearing units;
- a review of all relevant palaeontological and geological literature, including geological maps, and previous palaeontological impact reports;

- data on the proposed development provided by the developer (e.g. location of footprint, depth and volume of bedrock excavation envisaged);
- where feasible, location and examination of any fossil collections from the study area (e.g. museums); and
- do an on-site investigation to assess the identified palaeontological sensitive areas within the development footprint/study area rather than formal palaeontological collection. The investigation should focus on the sites where bedrock excavations would definitely require palaeontological monitoring.

The results of the field investigation are then used to predict the potential of buried fossil heritage within the development footprint. In some investigations this involves the examination of similar accessible bedrock exposures, such as road cuttings and quarries, along roads that run parallel to or across the development footprint.

3. PROPOSED DEVELOPMENT DESCRIPTION

The project entails the construction of the pipeline and related infrastructure for the MMTS-2 from the Spring Grove Dam to the Mpofana discharge point (Figure 3.1).

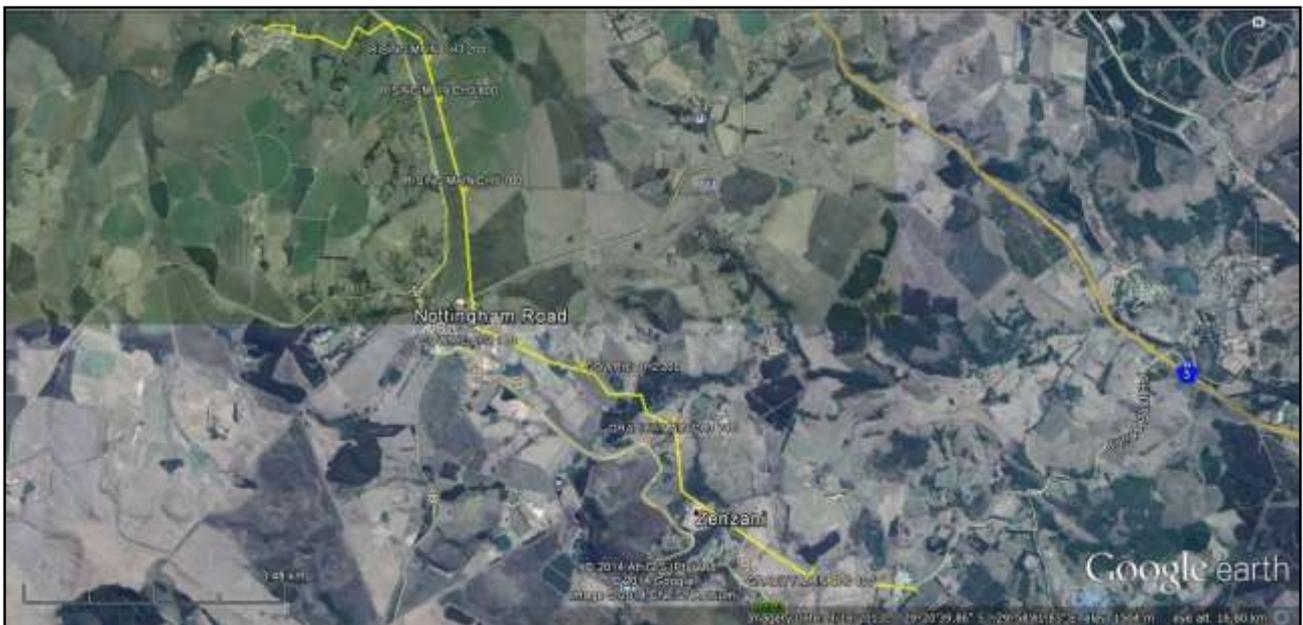


Figure 3.1 Proposed route of the MMTS-2 pipeline

4. GEOLOGY OF THE AREA

The study area is underlain by Permian aged sediments of the Volksrust Formation, Ecca Group and Permian to Triassic aged rocks of the Estcourt Formation, Adelaide Subgroup of the Beaufort Group of the Karoo Supergroup as well as Jurassic aged dolerite. The majority of the route is underlain by sedimentary rocks of the Adelaide Subgroup/Estcourt Formation with the final section towards Templeton underlain by sediments of the Volksrust Formation (Figure 4.1).

4.1. Eccca Group

4.1.1. Volksrust Formation (Pvo)

The most southern part of the pipeline cuts the Permian Volksrust Formation (Pvo) of the Eccca Group. This unit of dark greenish-grey siltstone or shale, weathering into a light yellow to khaki colour is interpreted as a deep water deposit that accumulated in an off-shore marine environment (Johnson *et al.*, 2006).

4.2. Beaufort Group

4.2.2. Adelaide Subgroup (Pa) and Estcourt Formation (Pes)

The Permian to Triassic aged Adelaide Subgroup underlies most of the study area and is mapped out as the Estcourt Formation of the Beaufort Group, Karoo Supergroup in the eastern part of the study area. The Adelaide Subgroup and Estcourt Formation consists of a sequence of coarse-grained sandstone and dark carbonaceous mudstone, with very thin (cm scale) coal seams in places. The formation is interpreted as deltaic deposit of rivers that entered the Karoo Basin from the east, with extensive flood plains where small coal swamps could develop in meandering river as well as deltaic environments (Johnson *et al.*, 2006). The upper part of the Adelaide Subgroup is interpreted as a fluvial sequence of sandstone and siltstone, grading upwards into a lacustrine environment (Groenewald, 1996).

4.3. Dolerite (Jd)

Jurassic aged dolerite intruded the sedimentary sequence during the breakup of Gondwana.

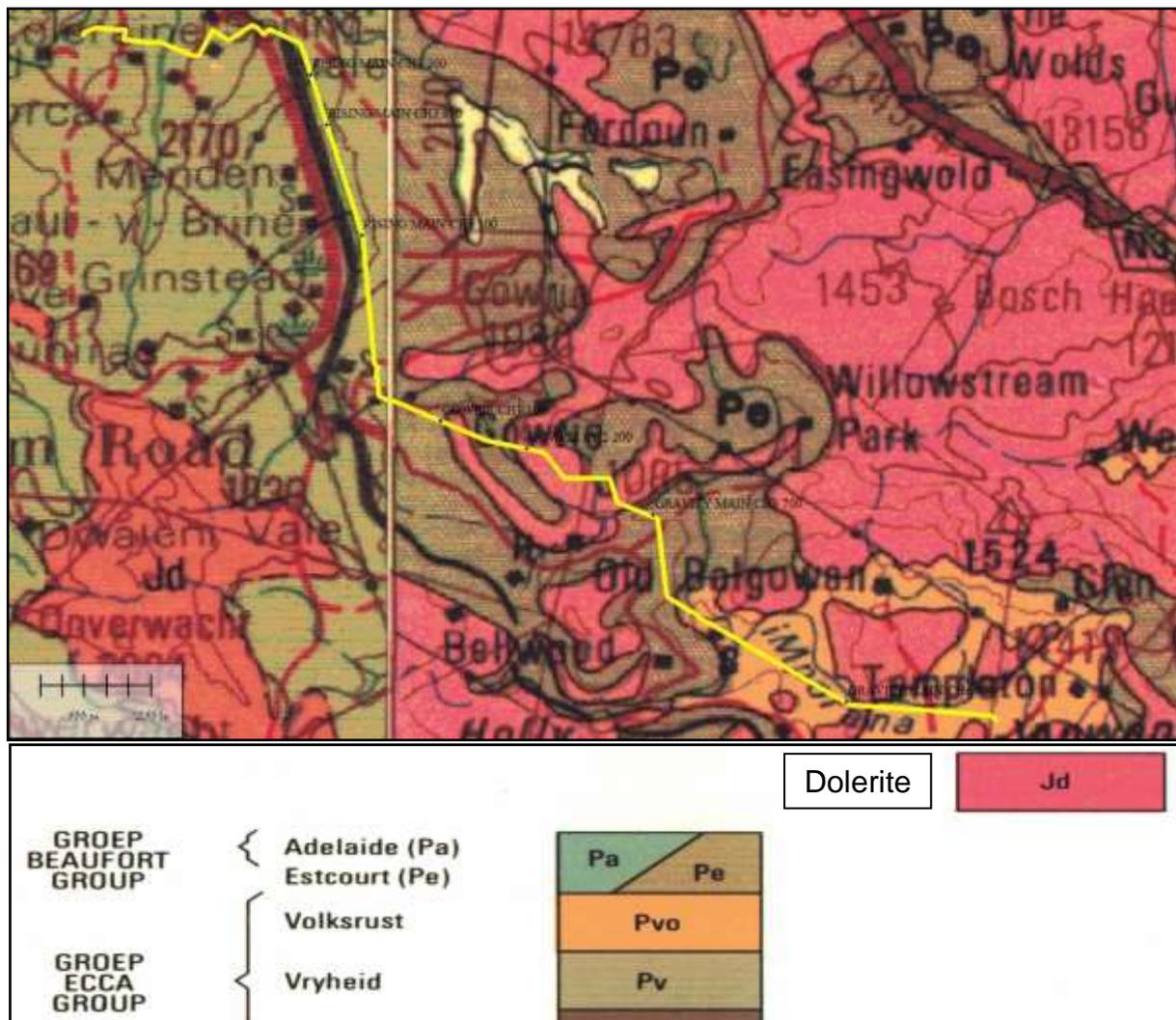


Figure 4.1 Geology of the study area.

5. PALAEOONTOLOGY OF THE AREA

5.1. Volksrust Formation

The Volksrust Formation contains assemblages of trace fossils and the bivalve *Megadesmus* has been described from the Formation (Bamford 2011).

5.2. Adelaide Subgroup and Estcourt Formation

The Adelaide Subgroup and Estcourt Formation is well known for rich assemblages of plant fossils, mainly *Glossopteris*, *Phyllothea* and other flora including ferns, club mosses, liverworts and true mosses (McCarthy and Rubidge, 2005). Vertebrate fossils from the *Dicynodont* and *Lystrosaurus* Assemblage Zones have also been described from the Adelaide Subgroup in this part of KZN (Groenewald, 1996), whilst insect remains have been recorded from several localities (Groenewald, 2012).

5.3. Dolerite

Due to its igneous character dolerite will not contain fossils.

Table 5.1 Palaeontological Significance of Geological Units on Site

Geological Unit	Rock Type and Age	Fossil Heritage	Vertebrate Biozone	Palaeontological Sensitivity
Volkstrust Formation	Deep water shale PERMIAN	Trace fossils and fossils of the bivalve <i>Megadesmus</i>	None	Medium sensitivity
Adelaide Subgroup and Estcourt Formation	Fluvial and deltaic sandstone and mudstone PERMIAN TO TRIASSIC	<i>Glossopteris</i> plant fossils, trace fossils and Dicynodont and <i>Lystrosaurus</i> vertebrate remains as well as insect wings	Dicynodont and Lystrosaurus Assemblage Zones	High sensitivity
Dolerite	Dolerite JURASSIC	None		Not applicable

6. PRELIMINARY ASSESSMENT RESULTS

The Permian aged Volkstrust Formation are known to contain good examples of trace fossils and fossils of the bivalve *Megadesmus* have been described. The Formation is normally deeply weathered in this part of KZN and a Moderate Palaeontological sensitivity is allocated to parts of the pipeline underlain by this Formation.

The Adelaide Subgroup and Estcourt Formation contain significant fossils of plants belonging to the *Glossopteris* assemblage as well as vertebrate fossils from the *Dicynodont* and *Lystrosaurus* Assemblage Zones. It is therefore likely that fossils will be present in all outcrops, as well as in deep excavations (>1m) on the sites of the development. Plant fossils will most likely also be present in mudstone and shale layers exposed during excavation of foundations and in all excavations for the pipeline.

Due to the fact that the areas of the development will be disturbed, fossils might be exposed on the site. Vertebrate fossils of the *Lystrosaurus* and *Dicynodon* Assemblage zones will most probably be exposed during excavations for installation of the pipeline and the presence of concretions containing bone fragments will be of high scientific importance. A High Palaeontological Sensitivity is allocated to areas underlain by the Adelaide Subgroup and Estcourt Formation.

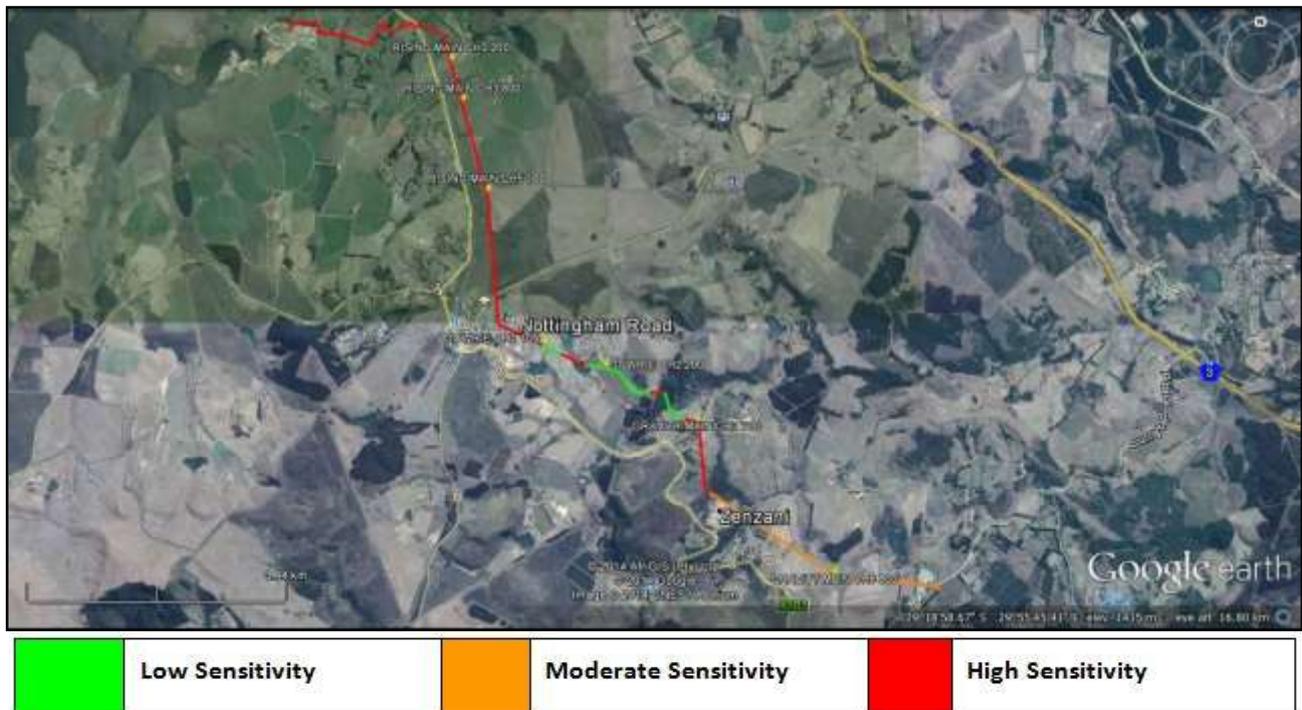


Figure 6.1 Palaeontological sensitivity of the study area

7. FIELD INVESTIGATION

Gideon Groenewald, Sue Groenewald and David Groenewald, experienced fieldworkers, visited the site from Monday 30 June 2014 to Wednesday 2 July 2014. Construction had begun on the section between Gowrie Farm and the Mpofana Outfall and this allowed for the exposed underlying rock to be observed and inspected. For some sections, the pipeline had already been laid and the excavations back-filled. Where this was the case, the rocks on the surface were inspected for any fossil remains. From Gowrie Farm to the Spring Grove Dam, the servitude had just started being cleared. It was not possible to inspect the bedrock along these areas for most of this part of the pipeline due to the rocks being covered by soil and vegetation.

It was confirmed during the field investigation, that the pipeline route is underlain by sedimentary rocks of the Volksrust Formation and the Adelaide Subgroup/Estcourt Formation with intermittent dolerite dykes and sills cutting the sedimentary sequences. Trace fossils were recorded in the sediments of both the Volksrust Formation and the Adelaide Subgroup. These sediments were, however, highly weathered, making it very difficult to identify and collect suitable fossils for curation purposes.

7.1. Field Observations

7.1.1. D2477 to Mpofana Outfall

Construction on this section of the pipeline is in an advanced stage and observations included the inspection of freshly broken, highly weathered shale and siltstone of the Volksrust Formation. Observations are summarised in table 7.1.

Table 7.1 Field Observations D2477 to Mpofana Outfall

GPS Coordinates	Photo	Comments
<p>S29° 22' 05.7" E30° 01' 38.2"</p>		<p>Excavation into deeply weathered sediments of the Volksrust Formation.</p>
<p>S29° 22' 34.5" E30° 01' 42.1"</p>		<p>Excavation into deeply weathered dolerite.</p>
<p>S29° 22' 38.7" E30° 02' 05.3"</p>		<p>Deeply weathered nature of the Volksrust Formation along the pipeline. No fossils observed. Backfilling of the trench is visible.</p>

<p>S29° 23' 15.2" E30° 03' 04.5"</p>		<p>Trace fossils on the bedding planes of the Volksrust Formation shales.</p>
<p>S29° 23' 18.7" E30° 03' 41.4"</p>		<p>Alluvium and deeply weathered shale of the Volksrust Formation at the excavation site for the Mpofana Outfall. No fossils were observed.</p>

7.1.2. Gowrie Farm to D2477

From Gowrie Farm to the D2477 district road the servitude for the pipeline has been cleared, but excavation was only done for part of the section. Test pits for geotechnical investigations were completed for part of the route and the excavated mudstone of the Volksrust Formation were inspected for fossils. Results of the investigation are summarized in Table 7.2.

Table 7.2 Field Observations from Gowrie Farm to D2477 District Road

GPS Coordinates	Photo	Comments
<p>S29° 21' 40.4" E30° 00' 51.4"</p>		<p>The cleared servitude at Gowrie Farm. No outcrop at surface.</p>

<p>S29° 21' 42.6" E30° 00' 57.4"</p>		<p>Sites of the test pits along the pipeline route identified from excavated, highly weathered shale of the Adelaide Subgroup.</p>
<p>S29° 21' 43.4" E30° 00' 58.3"</p>		<p>Plant fossils associated with shales of the Adelaide Subgroup. Fossils are mostly fragmentary.</p>
<p>S29° 22' 00.6" E30° 01' 25.7"</p>		<p>Long sections of this part of the pipeline route are underlain by deeply weathered dolerite.</p>

7.1.3. Nottingham Road to Spring Grove Dam

Clearing of the servitude along this section had very recently commenced from Nottingham Road and very few outcrops were observed. This section of the route has a number of dolerite outcrops that form ridges where no fossils are expected. It was observed during field investigation that the mudstones of the Adelaide Subgroup will probably be deeply weathered. This observation will have to be confirmed during excavation of geotechnical test pits. General field observations are summarized in Table 7.3.

Table 7.3 Field observations from Nottingham Road to Spring Grove Dam

GPS Coordinates	Photo	Comments
<p>S29° 21' 07.2" E29° 59' 53.5"</p>		<p>Clearing of servitude had recently commenced. Very few outcrops are present.</p>
<p>S29° 20' 26.0" E29° 59' 52.6"</p>		<p>Deeply Weathered mudstone of the Adelaide Subgroup. No fossils observed.</p>
		<p>Deeply weathered mudstone of the Adelaide Subgroup in pits dug for powerline pylon anchors.</p>

<p>S29° 19' 06.3" E29° 59' 07.6"</p>		<p>Servitude after crossing R103. No outcrop, no fossils observed.</p>
<p>S29° 19' 15.8" E29° 58' 51.3"</p>		<p>Clearing of vegetation along servitude. No outcrop, no fossils observed. Expect deeply weathered mudstone of the Adelaide Subgroup, to be confirmed during geotechnical investigation.</p>
<p>S29° 19' 08.4" E29° 58' 19.7"</p>		<p>Spring Grove site, with view of the Spring Grove Dam wall in the background.</p>

7.1.4. Spoil Dump and Pump Station excavation site

The spoil dump of the excavations done for the Pump station at Spring Grove Dam were inspected in detail and a number of very well preserved vertebrate fossil remains as well as some plant fossils were recorded. The fossiliferous rocks were indicated to the responsible environmental officers on site and appropriate protocols need to be put in place to collect and store these rocks.

An inspection was done of the exposed walls of the pump station excavation site. Mainly plant fossils and fossil bone fragments were observed.

Field observations are summarized in Table 7.4.

Table 7.4 Field observations at the spoil dump and pump station excavation

GPS Coordinates	Photo	Comments
<p>S29° 19' 08.9" E29° 58' 15.4"</p>		<p>Concretion with fossilized bone remains of a vertebrate, possibly a Dicynodon skull.</p>
<p>S29° 19' 08.7" E29° 58' 15.0"</p>		<p>Fossilized remains of a large vertebrate.</p>
<p>S29° 19' 08.5" E29° 58' 15.4"</p>		<p>Fossilized remains of an articulated skeleton of a large vertebrate.</p>

<p>S29° 19' 08.4" E29° 58' 15.6"</p>		<p>Fossilized bone of a vertebrate.</p>
<p>S29° 19' 08.4" E29° 58' 15.6"</p>		<p>Fossilized rib bones of a smaller vertebrate.</p>
		<p>Fragments of shale containing fossilized remains of plants, mainly associated with the <i>Glossopteris</i> Assemblage, were found throughout the spoil site.</p>
		<p>Impressions of plant stems associated with fine-grained sediments of the Adelaide Subgroup.</p>

<p>S29° 19' 07.3" E29° 58' 06.5"</p>		<p>Calcium concretion, very likely an example of the cast of a vertebrate burrow from the Adelaide Subgroup in the wall of the Pump Station excavation.</p>
<p>S29° 19' 07.9" E29° 58' 07.6"</p>		<p>Rock fragment containing leaf imprint of <i>Glossopteris</i>.</p>
<p>S29° 19' 04.9" E29° 58' 06.9"</p>		<p>Trace fossils (Sinuous, bifurcating), possibly <i>Thallasinoides</i>, a unique find for the Adelaide Subgroup. Unfortunately it was found out of situ in spoil material.</p>

8. PALAEOLOGICAL SIGNIFICANCE AND RATING

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews as well as information gathered during the field investigation.

The palaeontological sensitivity rating of the development site, as predicted during the desktop survey (Figure 6.1), was confirmed during this field investigation and it was also confirmed that most of the sediments of the Adelaide Subgroup, if freshly exposed, contain abundant remains of plants and vertebrates. Any future

excavations that will expose fresh bedrock (to be confirmed during geotechnical investigation) must be regarded as highly sensitive for palaeontological heritage.

9. PALAEOLOGICAL IMPACT AND MITIGATION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews as well as information gathered during the field investigation. The field investigation confirms that the pipeline route is underlain by rocks with a very high palaeontological sensitivity and all deep excavations must be regarded as highly significant in terms the palaeontological heritage of the region.

The following mitigation measures are recommended:

- The ECO and environmental personnel of the project must inform the palaeontologist of the timing for any future excavation into weathered or unweathered bedrock of the Adelaide Subgroup/Estcourt Formation. This includes virtually all of the presently unexcavated sections of the pipeline from Spring Grove Dam to Nottingham Road. The procedure will entail notification of the results of the geotechnical surveys along the route of the pipeline with photographic evidence of the nature of the bedrock. If fossil remains are expected, arrangements will be made for the palaeontologist to inspect the trenches and excavated material on a weekly basis to collect and rescue exposed fossils.
- All existing spoil material from the Pump Station excavation site must be regarded as Highly Sensitive for palaeontological heritage. All the identified rocks with fossil remains must be removed to a secure holding area, awaiting recommendations by SAHRA with regards to the curation of the material. All future removal of material from the spoil sites must be done under supervision of the palaeontologist to ensure proper management of these highly fossiliferous rocks.

10. CONCLUSION

The pipeline route for the MMTS-2 project is underlain by palaeontologically moderately sensitive sedimentary rocks of the Volksrust Formation and highly sensitive sedimentary rocks of the Adelaide Subgroup/Estcourt Formation. Field investigation confirmed that these sediments are generally very deeply weathered and fossil remains are difficult to identify. Deep excavations into fresh, unweathered bedrock of the Adelaide Subgroup yielded rich, well preserved fossil remains of plants and vertebrates.

Recommendations:

- The ECO and environmental personnel of the project must inform all the relevant managers of the fact that the pipeline route is underlain by rocks with a high palaeontological sensitivity.
- The appointed palaeontologist must apply for the necessary permits to collect and remove fossils for curation at a relevant institution.
- The ECO and environmental personnel of the project must keep the palaeontologist informed about the planning for future excavation into weathered or unweathered bedrock of the Adelaide Subgroup/Estcourt Formation. This includes trenching into virtually all of the presently unexcavated sections of the pipeline from Spring Grove Dam to Nottingham Road. The procedure will entail notification of the results of the geotechnical surveys along the route of the pipeline with photographic evidence of the nature of the bedrock. If fossil remains are expected, arrangements will be made for the palaeontologist to inspect the trenches and excavated material on a weekly basis to collect and rescue exposed fossils.
- All existing spoil material from the Pump Station excavation site must be regarded as Highly Sensitive for palaeontological heritage. All the identified rocks with fossil remains must be removed to a secure holding area, awaiting recommendations by SAHRA with regards to the curation of the material. All future removal of material from the spoil sites must be done under supervision of the palaeontologist to ensure proper management of these highly fossiliferous rocks

11. REFERENCES

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12. QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeoecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

13. DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.



Dr Gideon Groenewald
Geologist