

Report for the new housing development at Clayville X50

Farms: Portion 183, Olifantsfontein 410 JR

Erkurhuleni Metropolitan Municipality, Gauteng Province

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Palaeontological Desktop Impact Assessment

Commissioned by: LEAP Landscape Architect and Environmental Planner

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2014/07/18



## **B. Executive summary**

Outline of the development project: LEAP has appointed Dr H. Fourie, a palaeontologist, to undertake a Desktop Paleontological Impact Assessment as part of the Heritage Impact Assessment of –

The new housing development of Clayville X50 and associated infrastructure which will be situated near the town of Tembisa, on the farm Olifantsfontein 410 JR, Portion 183, Ekurhuleni Metropolitan Municipality, Gauteng Province.

Option 1: The construction of a new housing development, Clayville X50, a roughly square block with Dale Road to the south and the R 562 to the north.

The **National Heritage Resources Act 25 of 1999** requires that all heritage resources, that is, all places or objects of aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technological value or significance are protected. The Republic of South Africa (RSA) has a remarkably rich fossil record that stretches back in time for some 3.5 billion years and must be protected for its scientific value. Fossil heritage of national and international significance is found within all provinces of the RSA. South Africa's unique and non-renewable palaeontological heritage is protected in terms of the National Heritage Resources Act. According to this act, palaeontological resources may not be excavated, damaged, destroyed or otherwise impacted by any development without prior assessment and without a permit from the relevant heritage resources authority.

The main aim of the assessment process is to document resources in the development area and identify both the negative and positive impacts that the development brings to the receiving environment. The PIA therefore identifies palaeontological resources in the area to be developed and makes recommendations for protection or mitigation of these resources.

This report prescribes to the Heritage Impact Assessment of Section 38 of the National Heritage Resources Act 25 of 1999.

For this study, resources such as geological maps, scientific literature, institutional fossil collections, satellite images, aerial maps and topographical maps were used. It provides an assessment of the observed or inferred palaeontological heritage within the study area, with recommendations (if any) for further specialist palaeontological input where this is considered necessary.

A Palaeontological Impact Assessment is generally warranted where rock units of LOW to VERY HIGH palaeontological sensitivity are concerned, levels of bedrock exposure within the study area are adequate; large scale projects with high potential heritage impact are planned; and where the distribution and nature of fossil remains in the proposed area is unknown. The specialist will inform whether further monitoring and mitigation are necessary.

Types and ranges of heritage resources as outlined in Section 3 of the National Heritage Resources Act, 1999 (No 25 of 1999):

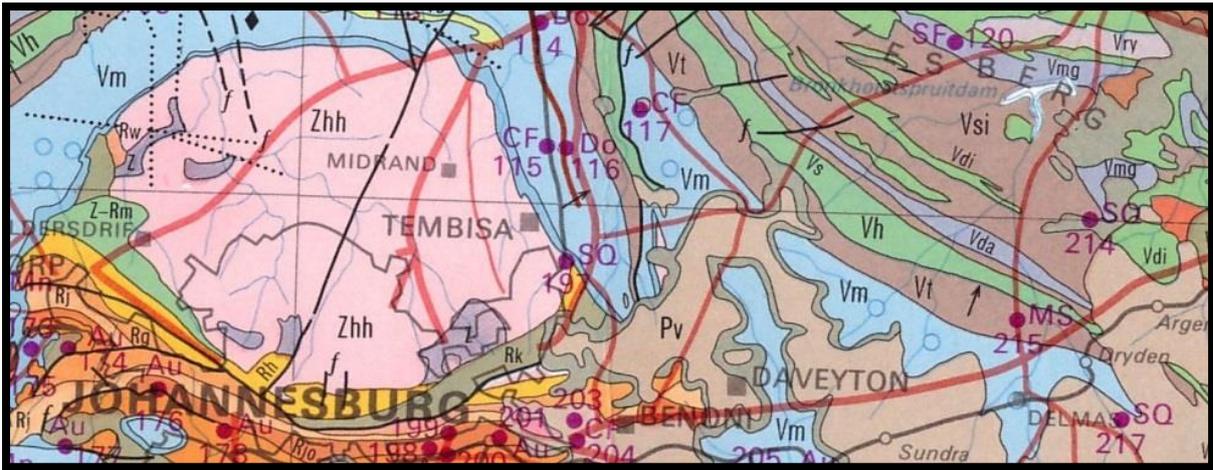
(i) (i) objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens.

Section 38, 1(b) requires the details of the construction of a bridge or similar structure exceeding 50m in length.

It is proposed to comment and recommend on the impact of the development on fossil heritage mitigation or conservation necessary.

Outline of the geology and the palaeontology:

The geology was obtained from map 1:250 000 (Visser 1984) and 2528 Pretoria (Walraven 1978) 1:250 000.



Legend to Map (Visser 1984) and short explanation

- Zhh – (pink) Gneiss, migmatite, granodiorite. Halfway House granite. Swazian.
- Vbr – (blue) Quartzite, conglomerate, shale, basalt. Black Reef Formation, Transvaal Supergroup. Vaalian.
- Vm – (light blue) Dolomite, chert. Malmani Subgroup, Chuniespoort Group, Transvaal Supergroup. Vaalian.
- = S – Syenite dyke. Vaalian.
- f-- - Fault.
- ⊥ 18 – Strike and dip of bed.

Mining activities:  
 SB – Building Sand.

Summary of findings: The desktop palaeontological impact assessment was undertaken during July 2014 and the following is reported:

Rock formations in close proximity mainly fall within the Transvaal Supergroup, the Chuniespoort Group, Malmani Subgroup is known to contain 'algal microfossils' diagenetic in origin in its carbonaceous black shales. Stromatolites are also preserved in the subordinate carbonate rocks in the group, accepted to be the fossil remnants of the simplest single-celled organisms. Caves are usually present. The Black Reef Formation is an auriferous dark-coloured arenite and conglomerate rich formation. Both the Transvaal Supergroup Formations are Vaalian (2600 – 2100 Ma) in age.

The development is taking place in an area covered by the granite from the Halfway House Granite (3 200 Ma) dome or pluton. Information on this and other Swazian intrusives (3 500 – 3 200 Ma) are sparse. It is a dome structure comprising of tonalitic gneisses, migmatites, gneisses, and porphyritic granodiorites. It is named after Halfway House between Pretoria and Johannesburg (Kent 1980). They appear as circular or oval-shaped plutons.

Some 15 km to the southwest of central Pretoria lays the Granite Dome, from which all the Transvaal Supergroup formations dip shallowly to the north and northeast. Malmani dolomite, underlain by thin Black Reef Formation, forms a belt up to some 10km wide around the Dome (Norman and Whitfield 2006).

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. Therefore, if there is the presence of Karoo Supergroup strata the palaeontological sensitivity is generally LOW to VERY HIGH, but here locally INSIGNIFICANT or ZERO for the Halfway House dome.

Recommendation: The impact of the development on fossil heritage is INSIGNIFICANT or ZERO and therefore mitigation or conservation measures are not necessary for this development. A Phase 1 Palaeontological Assessment will not be recommended. The rocky outcrops, overburden and inter-burden need not be surveyed for fossiliferous outcrops. Special care must be taken during the excavation of foundations, footings and channels, only if the presence of the Transvaal Supergroup is suspected.

Option 1: The construction of a new housing development, Clayville X50, a roughly square block with Dale Road to the south and the R 562 to the north. If the development footprint stays as planned then the rocks of the Transvaal Supergroup falls outside the scope of the project and therefore the development can go ahead.

Stakeholders: Developer – Valumax Midrand (Pty) Ltd, H. Slabbert, P.O. Box 78772, Sandton, 2146. Tel: 011 463 8862.

Environmental – LEAP, G. Theron, P.O. Box 13185, Hatfield, 0028. Tel: 012 343 2751.

Landowner – Summer Symphony Properties 264CC, B. Strydom, P.O. Box 15, Olifantsfontein, 1065. Tel: 011 463 8862.

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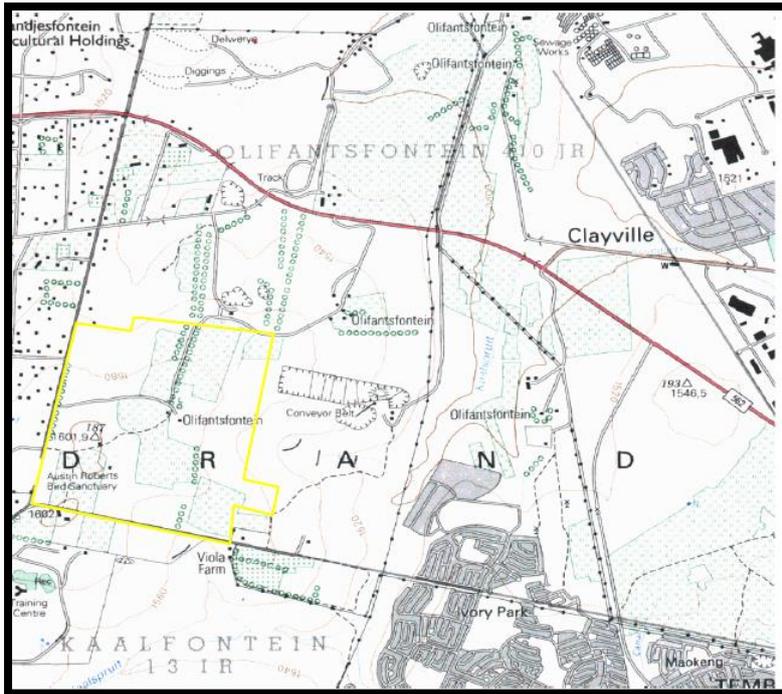
## **D. Background information on the project**

Report This report is part of the environmental impact assessment process under the NEMA (National Environmental Management Act) and forms part of the Heritage Impact Assessment (HIA).

### Outline of development

Valumax intends to construct a new housing development, Clayville X50, a roughly square block with Dale Road to the south and the R 562 to the north. The new housing development of Clayville X50 and associated infrastructure will be situated near the town of Tembisa, on the farm Olifantsfontein 410 JR, Portion 183, Ekurhuleni Metropolitan Municipality, Gauteng Province.

Map provided by LEAP (outline in yellow).



Option 1: The construction of a new housing development, Clayville X50, a roughly square block with Dale Road to the south and the R 562 to the north.

Rezoning/ and or subdivision of land: Developer needs to apply for a housing development. Currently Agriculture.

Name of developer and consultant: Valumax Midrand (Pty) Ltd and Landscape Architect and Environmental Planner.

Terms of reference: Dr H. Fourie is a palaeontologist commissioned to do a desktop palaeontological impact assessment to ascertain if any palaeontological sensitive material is present in the development area. This study will advise on the impact on fossil heritage mitigation or conservation necessary, if any.

Dr Fourie obtained a Ph.D from the Bernard Price Institute for Palaeontological Research, University of the Witwatersrand. Her undergraduate degree is in Geology and Zoology. She specialises in vertebrate morphology and function concentrating on the Therapsid Terocephalia. For the past nine years she carried out field work in the Eastern Cape Province. Dr Fourie has been employed at the Ditsong: National Museum of Natural History in Pretoria (formerly Transvaal Museum) for 20 years.

Legislative requirements: South African Heritage Resources Agency (SAHRA) for issue of permits if necessary. National Heritage Resources Act no: 25 of 1999. An electronic copy of this report must be supplied to SAHRA/PRHA.

### **E. Description of property or affected environment**

#### Location and depth:

The new housing development of Clayville X50 and associated infrastructure will be situated near the town of Tembisa, on the farm Olifantsfontein 410 JR, Portion 183, Ekurhuleni Metropolitan Municipality, Gauteng Province.

Depth: To be determined by foundations, footings and channels.

Location Map: Showing portion 183 (Provided by LEAP).

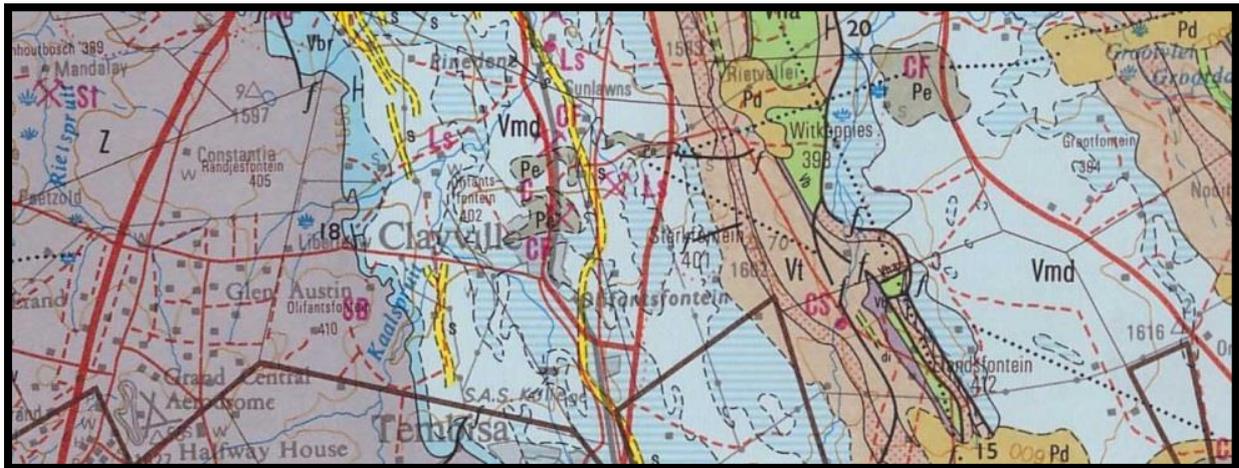


Location map for the proposed Portion 183 of the Farm Olifantsfontein

## F. Description of the Geological Setting

### Description of the rock units:

The development is taking place in an area covered by mostly the Halfway House Granite. The site is situated just below Glen Austin, with the Kaalspruit to the right, not including the mine.



Legend to Map 2528 Pretoria and short explanation.

Z – (grey) Granite-gneiss, granite in places. Halfway House granite. Swazian.

Vbr – (blue) Quartzite, conglomerate, shale. Black Reef Formation, Transvaal Supergroup. Vaalian.

Vmd – (light blue) Dolomite, chert (=). Malmani Subgroup, Chuniespoort Group, Transvaal Supergroup. Vaalian.

== S – Syenite dyke. Vaalian.

--f-- - Fault.

⊥ 18 – Strike and dip of bed.

Mining activities:

SB – Building Sand.

The development is taking place in an area covered by the granite from the Halfway House Granite (3 200 Ma) dome or pluton. Information on this and other Swazian intrusives (3 500 – 3 200 Ma) are sparse. It is a dome structure comprising of

tonalitic gneisses, migmatites, gneisses, and porphyritic granodiorites. It is named after Halfway House between Pretoria and Johannesburg (Kent 1980).

The Swazian is the oldest erratum in South Africa. Other geological events belonging to this time period are the Limpopo, Baberton and Pongola Supergroups. Partial melting of the older sediments, lavas and crust made the intrusion of granitic magmas possible. These domes occur mainly on the Limpopo plateau, lowveld and between Pretoria and Johannesburg (Snyman 1996).

These plutons have characteristically high sodium contents. They appear as circular or oval-shaped plutons, which invaded the greenstone belts from below like rising hot-air balloons, probably while partly solid. This upward emplacement style caused considerable structural disturbance to all the rocks in the region immediately surrounding them (McCarthy and Rubidge 2005).

Some 15 km to the southwest of central Pretoria lies the Granite Dome, from which all the Transvaal Supergroup formations dip shallowly to the north and northeast. Malmani dolomite, underlain by thin Black Reef Formation, forms a belt up to some 10km wide around the Dome (Norman and Whitfield 2006).

The Transvaal Supergroup fills an east-west elongated basin in the south-central part of the old Transvaal (now North – West, Gauteng and Mpumalanga) as far south as Potchefstroom (Kent 1980). It is Vaalian in age, approximately 2600 Ma to 2100 Ma. A maximum thickness of the Transvaal Supergroup reaches 2000m in the north-eastern section. An east-west elongated basin is filled with clastic, volcanic and chemical sedimentary rocks. Three main groups based on lithological differences have been established: they are the Rooiberg, Chuniespoort, and Pretoria Groups (Kent 1980). It is the Bushveld Complex that is responsible for the tilting of the Transvaal sediments and the heat of its intrusion having created andalusite crystals. The diabase sills are shown by reddish, rounded boulders (Norman and Whitfield 2006) (See Appendix 1).

The Groblersdal Group is present at the bottom of the Transvaal basin and is made up of two formations that form an arcuate belt in which the dip of the sedimentary layers is generally to the south. This small group is overlain with apparent conformity by the Black Reef Formation. Also overlain by the Black Reef Formation is the Buffelsfontein Group. It consists of a heterogeneous pile of acid and basic volcanics and sediments and has a lateral extent of some 90 km (Kent 1980).

The Black Reef Formation is an auriferous dark-coloured arenite and conglomerate present in the Gauteng Province. A north-eastern occurring Wolkberg Group is marginalised. It houses the Abel Erasmus Basalt. The Rooiberg Group is a 3000-6000m thick succession of feldspathic quartzites, arkoses and shales, with interbedded volcanics and felsites. It consists of two formations, the lower Damwal and the upper Selons River, restricted in its distribution (Kent 1980, Snyman 1996).

The Chuniespoort Group is made up of chemical and biochemical sediments such as dolomite, chert, limestone and banded iron formation, carbonaceous shale is also present. At the top of the Malmani Subgroup is the Duitschland formation underlain by the Penge and Monte Christo Formations. Sandstone is mostly absent. It is this formation that has great economic value for its lead, zinc, dolomite, and manganese (Kent 1980, Snyman 1996). Cave formation in the dolomite is a major concern in developing areas, especially in the 1500m thick dolomite of the Malmani Subgroup.

The Pretoria Group consists predominantly of quartzitic sandstones, mudstones and shale together with a prominent volcanic unit, minor conglomerate, chemical, and volcanic members. It comprises the, Time Ball Hill, Silverton and Magaliesberg Formations as well as several smaller Formations and overlies the Chuniespoort Group. Both the shale and quartzite of the Pretoria Group are utilised in the building industry. The Time Ball Hill shale formation is known to contain 'algal microfossils' diagenetic in origin. Stromatolites as they are known are preserved in the subordinate carbonate rocks in the Pretoria Group (Eriksson 1999, Kent 1980). This Supergroup is underlain by the Ventersdorp, Witwatersrand and Pongola Supergroups, and the Dominion Group.

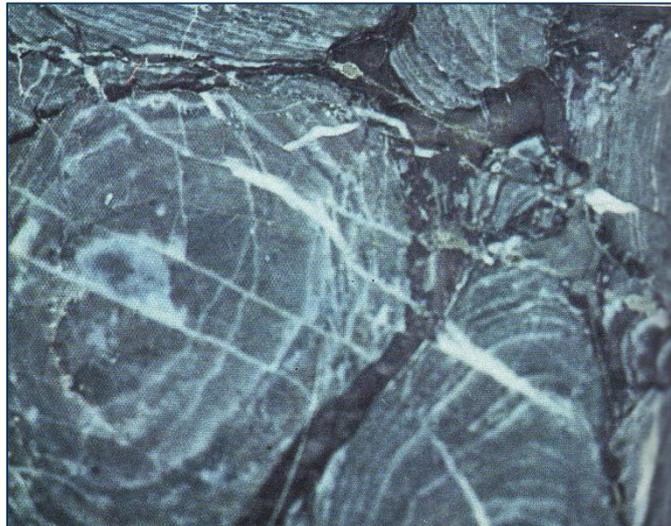
Option 1: The construction of a new housing development, Clayville X50, a roughly square block with Dale Road to the south and the R 562 to the north.

## G. Background to Palaeontology of the area

Summary: When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a desktop and or field scoping (survey) study by a professional palaeontologist is usually warranted. The main purpose of a field scoping (survey) study would be to identify any areas within the development footprint where specialist palaeontological mitigation during the construction phase might be required.

Chemical sediments such as fine grained limestone and dolomite is made up of deposits of organically derived carbonate shells, particles or precipitate. Dolomite is magnesium-rich limestone formed from algal beds and stromatolites. These Early Proterozoic Transvaal stromatolitic dolomites formed and released free oxygen at around 2900-2400Ma. Stromatolites are common in the Malmani dolomites, accepted to be the fossil remnants of the simplest single-celled organisms. They are finely layered, concentric, mound-like structures formed by microscopic algal organisms (Norman and Whitfield 2006). In the rocks overlying the Black Reef Formation there is evidence for life on an abundant scale as cyanobacteria came to dominate the shallow sea forming stromatolites of varying shapes. Large, elongated stromatolite domes can be seen at Boetsap in the North West Province (McCarthy and Rubidge 2005). Algal microfossils reported from the Timeball Hill Formation, Pretoria Group shales are probably of diagenetic origin (Eriksson 1999).

Stromatolites in thin section (De Zanche and Mietto 1979):



The Malmani dolomites, Chuniespoort Group, are home to most of the cave systems that has yielded hominin fossils such as those at Mokopane's cave. It was also home to Middle and Late Stone Age cultures. This cave and the caves in the Cradle of Humankind, near Johannesburg, provided a refuge for man's distant ancestors. The breccia yielded internationally renowned hominins such as *Australopithecus africanus*, *Paranthropus robustus*, extinct mammals, and other fauna. The caves are actively being excavated and researched and this has led to several international collaborations and funding.

Criteria used from the Fossil Heritage Layer Browser (SAHRA):

Rock unit	Significance/vulnerability	Recommended action
Malmani Subgroup	High	Desktop and possible field study
Black Reef Formation	High	Desktop and possible field study
Halfway-House Granite	Insignificant or Zero	No palaeontological studies required

Databases and collections: Ditsong: National Museum of Natural History.

Impact: INSIGNIFICANT or ZERO.

## H. Description of the Methodology

The desktop palaeontological impact assessment scope was undertaken during July 2014.

Assumptions and Limitations:-

The accuracy and reliability of the report is limited by the following constraints:

1. Most development areas have never been surveyed by a palaeontologist or geophysicist.
2. Variable accuracy of geological maps and associated information.
3. Poor locality information on sheet explanations for geological maps.
4. Lack of published data.
5. A site visit was not conducted.
6. Lack of information from Developer.

#### **I. Description of significant fossil occurrences (Heritage value)**

All Karoo Supergroup geological formations are ranked LOW to VERY HIGH, but here the impact is potentially INSIGNIFICANT or ZERO for the Halfway House dome.

#### **J. Recommendation**

- a. There is no objection to the development of the housing, and it is not necessary to request a Phase 1 Palaeontological Impact Assessment: Field study to determine whether the development will affect fossiliferous outcrops as the palaeontological sensitivity is INSIGNIFICANT or ZERO. A Phase 2 Palaeontological Mitigation will only be required if the Phase 1 Palaeontological Assessment finds fossiliferous outcrops.
- b. This project will benefit the economy, the growth of the community and social development in general.
- c. Preferred choice: Option 1.
- d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling, or blasting SAHRA/PRHA must be notified. All construction activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures.

#### Sampling and collecting:

Wherefore a permit is need from the South African Heritage Resources Agency (SAHRA).

- a. Objections: See heritage value and recommendation.
- b. Conditions of development: See Recommendation.
- c. Areas that may need a permit: No.
- d. Permits for mitigation: Not needed from SAHRA / PRHA.

#### **K. Conclusions**

- a. All the land involved in the development was assessed and none of the property is unsuitable for development.
- b. All information needed for the Desktop Palaeontological Impact Assessment scope was provided by LEAP.
- c. Areas that would involve mitigation and may need a permit from the South African Heritage Resources Agency are discussed.
- d. The following should be conserved: if any palaeontological material is exposed during digging, excavating, drilling or blasting, SAHRA must be notified. All development activities must be stopped and a palaeontologist should be called in to determine proper mitigation measures. Especially shallow caves.
- e. Condition in which development may proceed: It is further suggested that a Section 37(2) agreement of the Occupational, Health and Safety Act 85 of 1993 is signed with the relevant contractors to protect the environment and adjacent areas as well as for safety and security reasons.

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### **Declaration**

I, Heidi Fourie, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project for which I was appointed to do a palaeontological scope. There are no circumstances that compromise the objectivity of me performing such work.

Heidi Fourie accepts no liability, and the client, by receiving this document, indemnifies Heidi Fourie against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by the use of the information contained in this document.

This report may not be altered in any way and any parts drawn from this report must make reference to this report.

Hfourie

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Heidi Fourie  
2014/07/18