PALAEONTOLOGICAL FIELD ASSESSMENT OF THE PROPOSED DEVELOPMENT OF THE WILDEALSKLOOF MIXED USE DEVELOPMENT NEAR BLOEMFONTEIN, FREE STATE PROVINCE

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EXECUTIVE SUMMARY

Ideal Consulting proposes the development of a new mixed use development as well as associated infrastructure on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province. According to the National Heritage Resources Act (Act No 25 of 1999, section 38), a palaeontological impact assessment is key to detect the presence of fossil material within the proposed development area and it is thus necessary to evaluate the impact of the construction and operation of the development site on the palaeontological resources.

The proposed footprint is underlain by sediments of the Volksrust Formation (Ecca Group, Karoo Supergroup) and the Adelaide Formation (Palingkloof Member) of the Beaufort Group (Karoo Supergroup). The Palaeontological sensitivity of the Volksrust Formation is moderate while the palaeontological sensitivity of the Adelaide Formation is very high.

During a field survey of the development footprint, no fossiliferous outcrops were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint. Irrespective of the uncommon occurrence of fossils a solitary fossil may be of scientific value as many fossil taxa are known from a single fossil. The recording of fossils will expand our knowledge of the Palaeontological Heritage of the development area. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Wildealskloof mixed used development and associated infrastructure will be of a low significance in palaeontological terms. It is therefore considered that the construction and operation of the Wildealskloof development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction and operation of the development may be authorised as the whole extent as the development footprint is not considered sensitive in terms of palaeontological resources.

In the event that fossil remains are uncovered during any phase of construction, either on the surface or unearthed by new excavations and vegetation clearance, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (if possible *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carried out by a professional palaeontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies as required by SAHRA.

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1 INTRODUCTION

Envirolution Consulting (Pty) Ltd has been appointed as the independent Environmental Consultants by Ideal Consulting (Pty) Ltd for the undertaking of an Environmental Impact Assessment (EIA) process and compiling an Environmental Management Programme (EMPr) for the proposed Wildealskloof Mixed Use Development, Bloemfontein, Free State Province (Fig. 1 – 3).

Project Description

Information provided by the developer

The Wildealskloof Mixed Use Development consists of the construction of the following:

- Single Residential Units,
- Apartments and "flat" Units (9000 Units in total),
- Retirement facility,
- School Housing (Boarding Houses),
- Offices,
- a Regional Shopping Centre,
- Industrial Land Uses,
- Memorial Park (Cemetery),
- Parks,
- Conservation areas,
- Municipal land uses,
- Hotel and Spa,
- Churches,
- Schools and Crèches.

Based on a pre-feasibility study, site identification and environmental screening process undertaken by Ideal Consulting, a favourable site has been recognized for consideration and evaluation through an Environmental Impact Assessment (EIA) process.

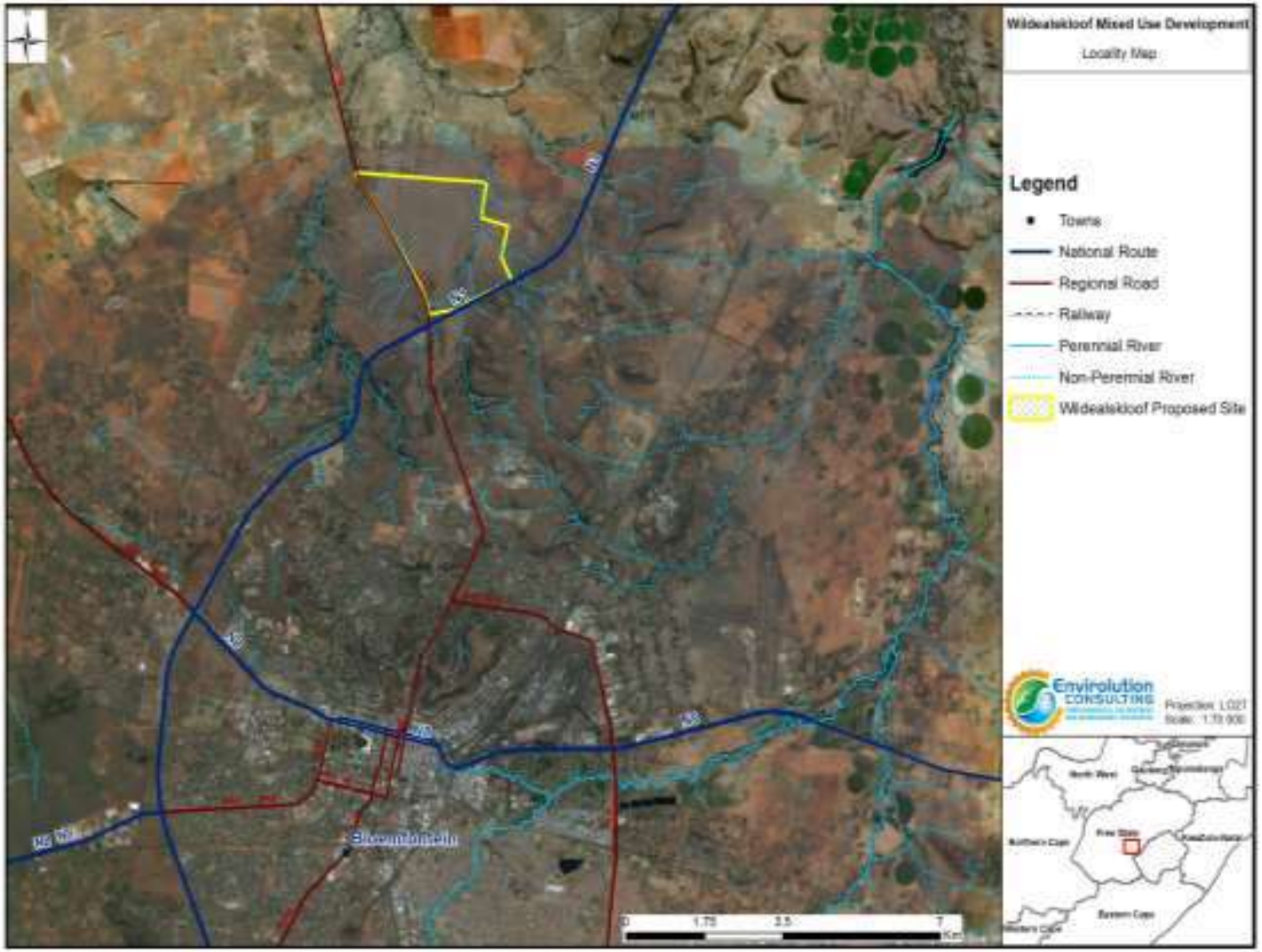

Figure 1: Google Earth Image of the location of the proposed mixed use development as well as associated infrastructure on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province. Map provided by Envirolution Consultants.

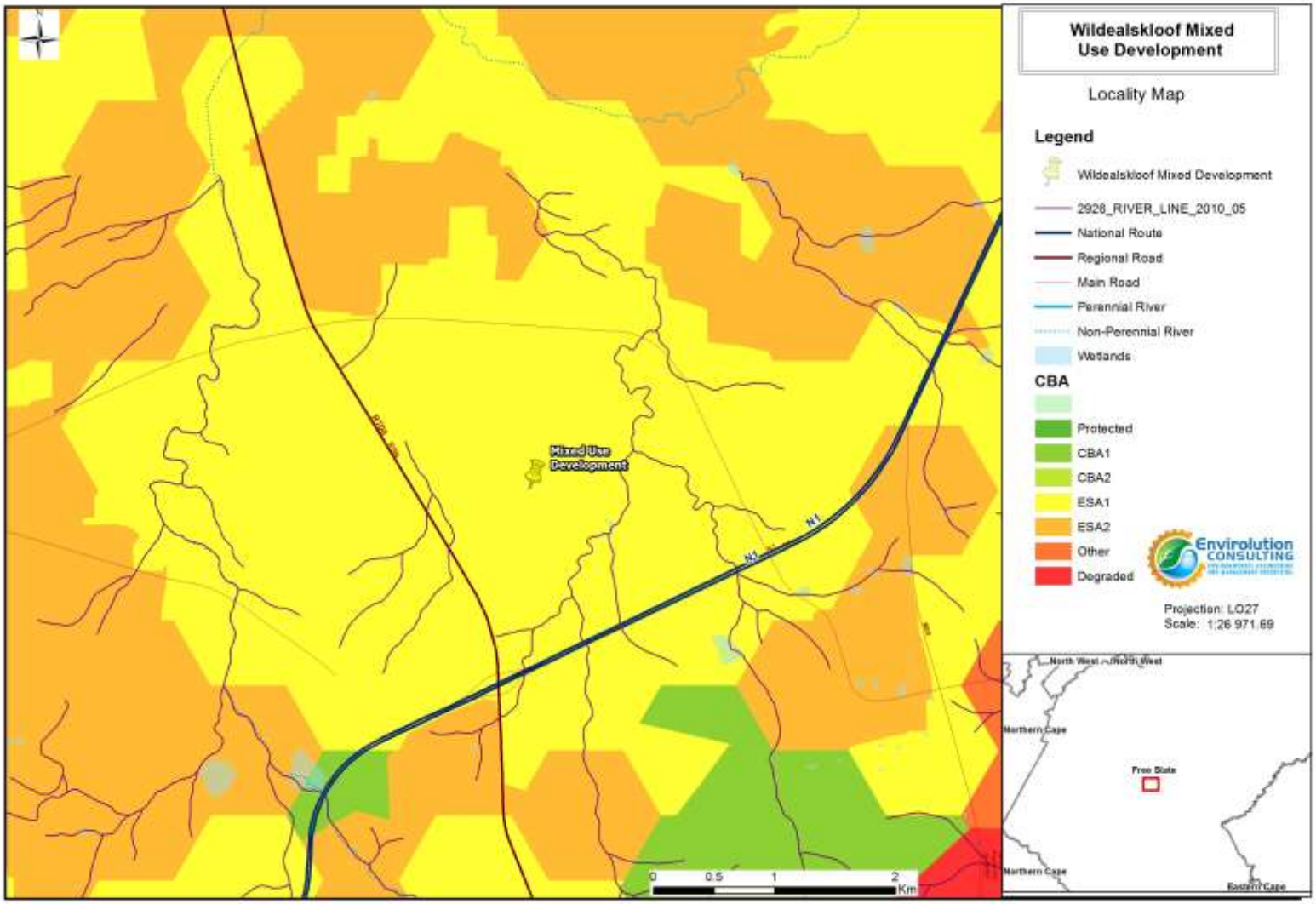

Figure 2: Locality of the proposed mixed use development as well as associated infrastructure on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province. Map provided by Envirolution Consultants.

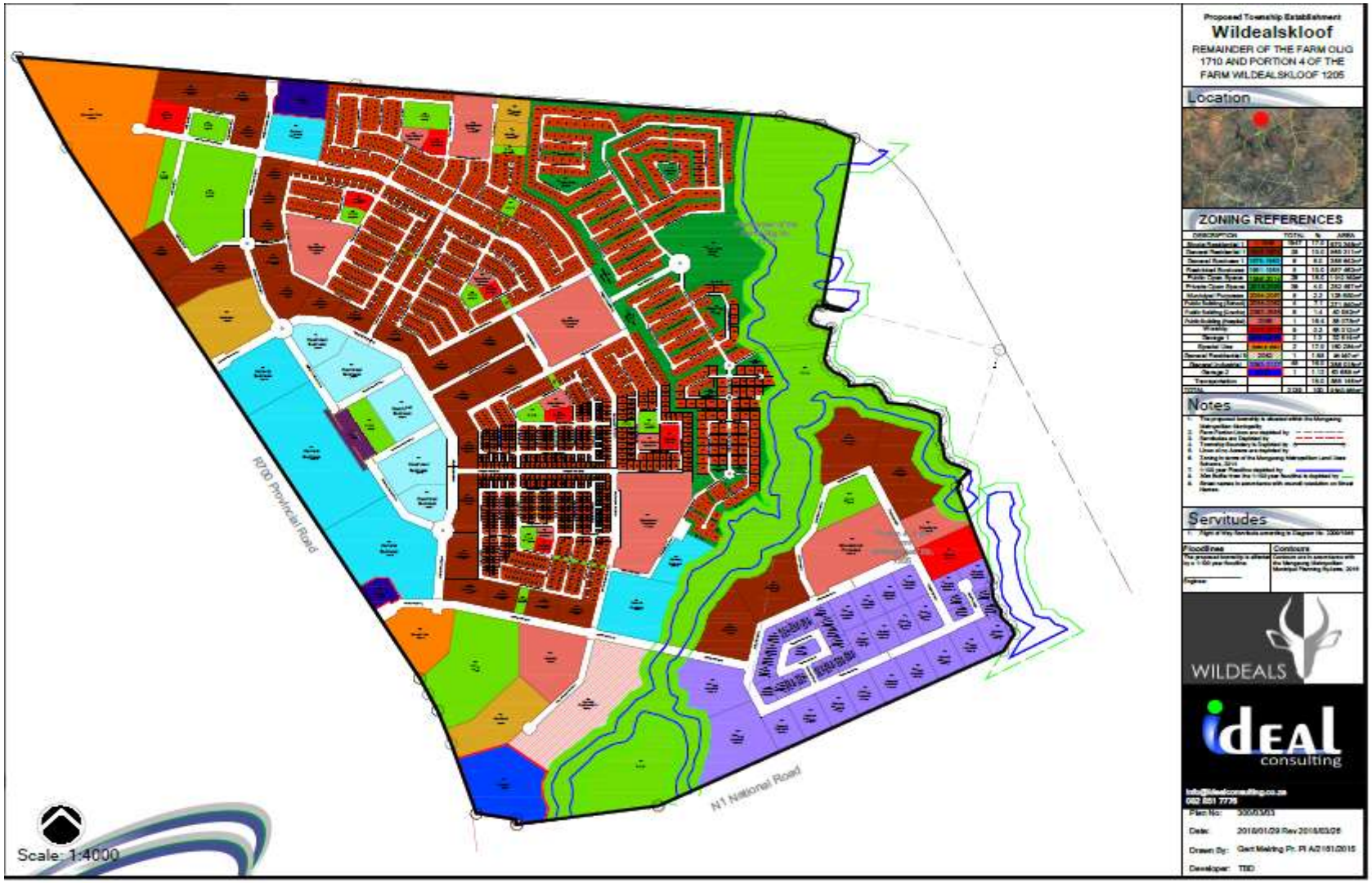

Figure 3: Conceptual Layout of the proposed mixed use development as well as associated infrastructure on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province. Map by Ideal Consulting.

2 LEGISLATION

NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999)

Cultural Heritage in South Africa, includes all heritage resources, and is protected by the National Heritage Resources Act (Act 25 of 1999). Heritage resources as defined in Section 3 of the Act include **"all objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens**". Palaeontological heritage is unique and non-renewable and is protected by the above mentioned Act. Palaeontological resources may not be unearthed, moved, broken or destroyed by any development without prior assessment and without a permit from the relevant heritage resources authority.

This Palaeontological Environmental Impact Assessment forms part of the Heritage Impact Assessment (HIA) and adheres to the conditions of the Act. According to **Section 38**, an HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

ACCORDING TO SECTION 35 OF THE NATIONAL HERITAGE RESOURCES ACT 1999, DEALING WITH ARCHAEOLOGY, PALAEONTOLOGY AND METEORITES:

35. (1) Subject to the provisions of section 8, the protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority: Provided that the protection of any wreck in the territorial waters and the maritime cultural zone shall be the responsibility of SAHRA.

(2) Subject to the provisions of subsection (8) *(a)*, all archaeological objects, palaeontological material and meteorites are the property of the State. The responsible heritage authority must, on behalf of the State, at its discretion ensure that such objects are lodged with a museum or other public institution that has a collection policy acceptable to the heritage resources authority and may in so doing establish such terms and conditions as it sees fit for the conservation of such objects.

(3) 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.

(4) No person may, without a permit issued by the responsible heritage resources authority—

(a) Destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) Destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) 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

(d) Bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—

(a) Serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;

(b) Carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;

(c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection (4); and (d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

(6) The responsible heritage resources authority may, after consultation with the owner of the land on which an archaeological or palaeontological site or a meteorite is situated, serve a notice on the owner or any other controlling authority, to prevent activities within a specified distance from such site or meteorite.

(7) *(a)* Within a period of two years from the commencement of this Act, any person in possession of any archaeological or palaeontological material or object or any meteorite which was acquired other than in terms of a permit issued in terms of this Act, equivalent provincial legislation or the National Monuments Act, 1969 (Act No. 28 of 1969), must lodge with the responsible heritage resources authority lists of such objects and other information prescribed by that authority. Any such object which is not listed within the prescribed period shall be deemed to have been recovered after the date on which this Act came into effect. *(b)* Paragraph *(a)* does not apply to any public museum or university. *(c)* The responsible authority may at its discretion, by notice in the *Gazette* or the *Provincial Gazette*, as the case may be, exempt any institution from the requirements of paragraph *(a)* subject to such conditions as may be specified in the notice, and may by similar notice withdraw or amend such exemption.

(8) An object or collection listed under subsection (7) — *(a)* Remains in the ownership of the possessor for the duration of his or her lifetime, and SAHRA must be notified

who the successor is; and *(b)* must be regularly monitored in accordance with regulations by the responsible heritage authority.

HERITAGE RESOURCES MANAGEMENT

38. (1) Subject on the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as (a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length; (b) the construction of a bridge or similar structure exceeding 50 m in length; (c) any development or other activity which will change the character of a site—(i) exceeding 5 000 m^2 in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; (d) the re-zoning of a site exceeding 10 000 m² in extent; (e) or any other category of development provided for in regulations by SAHRA or a Provincial heritage resources authority.

3 OBJECTIVE

The **objective of a Palaeontological Impact Assessment is to determine the impact of the development on potential palaeontological material** at the site.

According to the "SAHRA APM Guidelines: Minimum Standards for the Archaeological and Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are: 1) to identify the palaeontological importance of the exposed and subsurface rock formations in the development footprint; 2) to evaluate the palaeontological importance of the formations; 3) to determine the impact of the development on fossil heritage; and 4) to recommend how the developer ought to protect or mitigate damage to fossil heritage.

When a palaeontological desktop study is compiled, the potentially fossiliferous rocks (i.e. groups, formations, etc.) present within the study area are established from 1:250 000 geological maps. The topography of the development area is identified using 1:50 000 topography maps as well as Google Earth Images of the development area. Fossil heritage within each rock section is obtained from previous palaeontological impact studies in the same region, the PalaeoMap from SAHRIS; and databases of various institutions (identifying fossils found in locations specifically in areas close to the development area). The palaeontological importance of each rock unit of the development area is then calculated. The possible impact of the proposed development footprint on local fossil heritage is established on the following criteria: 1) the palaeontological importance of the rocks; 2) the type and scale of the development footprint; and 3) quantity of bedrock excavated.

In the event that rocks of moderate to high palaeontological sensitivity are present within the study area, a field-based assessment by a professional palaeontologist is required. Based on both the desktop data and field examination of the sedimentary rock exposures, the impact significance of the planned development is measured with recommendations for any further studies or mitigation. In general destructive impacts on palaeontological heritage only occur during construction. The excavations will transform the current topography and may destruct or permanently seal-in fossils at or below the ground surface. Fossil Heritage will then no longer be accessible for scientific research.

Mitigation comprises the sampling, collection and recording of fossils and may precede construction or, more ideally, occur during construction when potentially fossiliferous bedrock is exposed. Preceding the excavation of any fossil heritage a permit from SAHRA must be obtained and the material will have to be housed in a permitted institution. When mitigation is applied correctly, a positive impact is possible because our knowledge of local palaeontological heritage may be increased.

4 GEOLOGICAL AND PALAEONTOLOGICAL HISTORY

The northern part of the proposed footprint is underlain by sediments of the Volksrust Formation (FM) (Ecca Group, Karoo Supergroup) with the Adelaide Formation (Palingkloof Member) of the Beaufort Group (Karoo Supergroup) underlying the rest of the development footprint (Fig. 4). The Beaufort Group is subdivided into a series of biostratigraphic units on the basis of its faunal content (Fig. 5). Based on available biostratigraphic mapping it is evident that only the upper, Late Permian, portion of the Adelaide Subgroup, Balfour Formation, Palingkloof Member, of the *Daptocephalus* Assemblage Zone (*DAZ*) is present in the development footprint (Fig. 5).

4.1 Palaeontology

The fossil biota of the postglacial mudrocks of the Volksrust include

- temnospondyl amphibian remains
- invertebrates eg. the bivalve *Megadesmus* has been described from this formation. minor coals and other plants, organic microfossils
- trace fossil assemblages

Adelaide Formation (Palingkloof Member)

The *DAZ* expands into the lower Palingkloof Member of the Upper Balfour Formation (Groenewald & Kitching 1995, Rubidge 2005). This biozone is characterized by the occurrence of the two therapsids namely *Dicynodon* and *Theriognathus*. The *DAZ* in the Beaufort Group shows the greatest vertebrate diversity and includes numerous well preserved genera and species of dicynodonts, biarmosuchians, gorgonopsian, therocephalian and cynodont therapsid Synapsida as well as captorhinid Reptilia and less well represented eosuchian Reptilia, Amphibia and Pisces. Fossil plants of the Balfour

Formation are relatively rare compared to the vertebrate fossil assemblages. The presence of the wood genera, *Agathoxylon* and *Australoxylon,* was described by Bamford (2004).

The fossils of the lower Palingkloof are worldwide of palaeontological importance because they document the extinction of terrestrial biotas before the catastrophic end-Permian Mass Extinction event (approximately 251 million years ago). Several late Permian, Balfour Formation, vertebrate fossil localities have already been recorded in close proximity to proposed development footprint and are represented in museum collections (*e.g.* Centre of Evolutionary Studies, School of Geosciences, University of the Witwatersrand Johannesburg; Iziko Museums, Cape Town; National Museum, Bloemfontein).

4.2 GEOLOGY

The **Volksrust formation** is mainly argillaceous which mixes with the underlying Vryheid Formation and overlying Beaufort Group. This formation is about 380 m thick in the Bloemfontein area and thins towards the east. It is characterised by grey to black silty shale with thin siltstone/sandstone lenses and beds, mostly towards the upper and lower boundaries. A fairly common feature is thin phosphate and carbonate beds as well as concretions.

The extensive thickness, fine-grained lithology and lateral extent of this formation suggests that it represented an open "shelve "sequence which comprises mainly mud deposited from suspension. This formations consists of by basinal mudrocks with phosphatic/carbonate/sideritic concentrations and minor coals.

The Permian aged **Adelaide Subgroup** consists of a sequence of coarse-grained sandstone and dark carbonaceous mudstone, with very thin coal seams in some areas. The formation is interpreted as a deltaic deposit of rivers entering 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). The uppermost subunit of the Balfour Formation is characterised by the dominance of red mudrocks and underlies the Katberg Formation.

Palaeontological Sensitivity Almond et al (2008) and Groenewald et al., (2014)	**Group**	**Group/ Formation**	**Lithology**	**Period**	**Fossils /Exposures**
Moderate sensitivity	Ecca Group Karoo Supergroup	Volksrust Formation	Basinal dark mudrocks with concretions, small amounts of coals. Offshore shelf possibly also nearshore or lacustrine or lagoonal deposits	Permian	Rare temnospondyl amphibian remains, invertebrates (bivalves, insects), minor coals with plant remains, petrified wood, organic microfossils (acritarchs), low-diversity marine to non-marine trace fossil assemblages Late Permian = *Cistecephalus* Assemblage Zone biotas

Palaeontological Sensitivity Almond et al (2008) and Groenewald et al., (2014)	**Group**	**Group/ Formation**	**Lithology**	**Period**	**Fossils /Exposures**
High to very high Palaeontological sensitivity/ vulnerability	Beaufort Group Karoo Supergroup	Adelaide Formation	Brilliantly coloured mudstone and siltstone. Playa	Permian-Triassic	Key evidence for evolution of mammalian characters among therapsids Continental record of Late Permian Mass Extinction

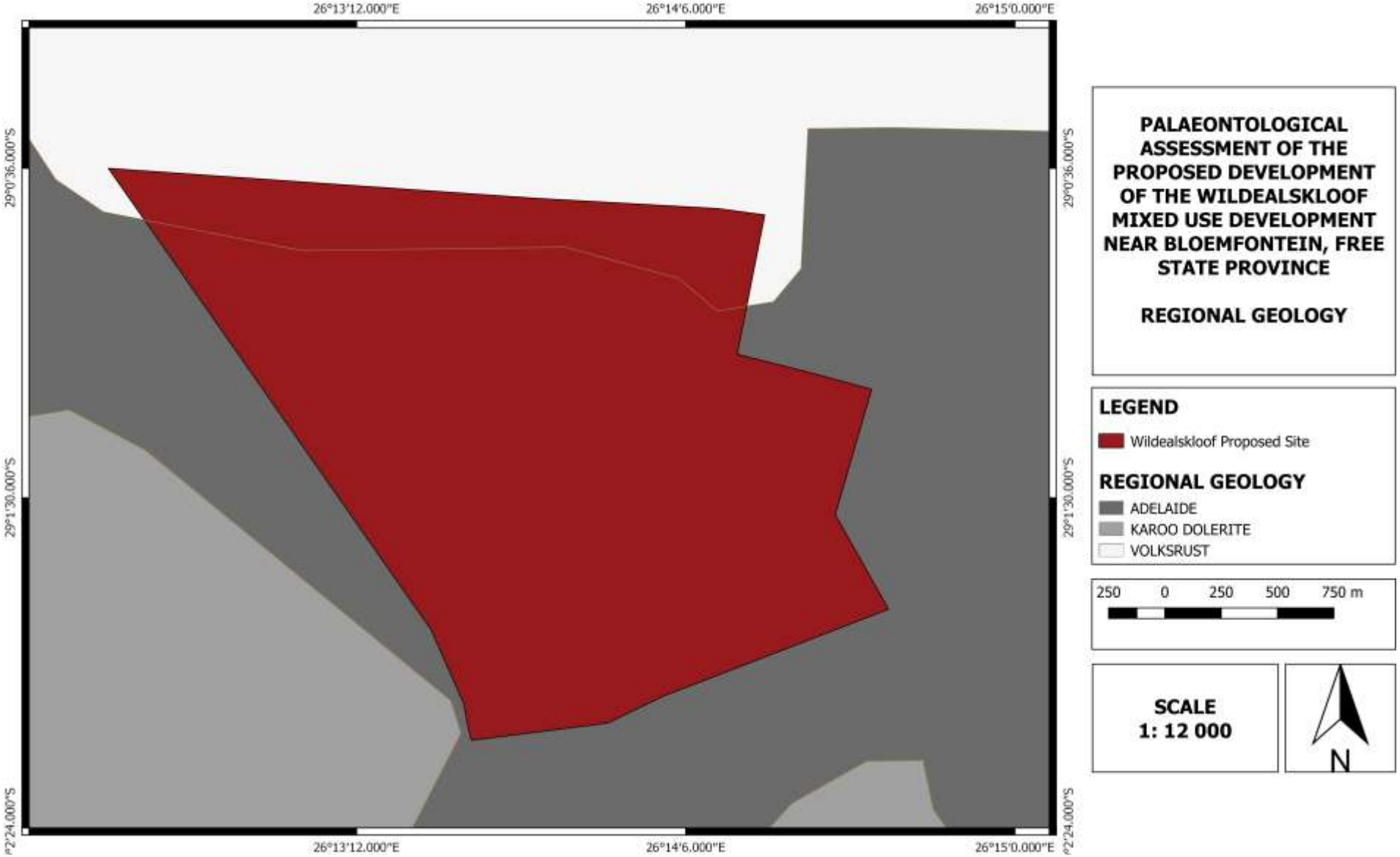

Figure 4: The surface geology of the proposed development of a new mixed use development as well as associated infrastructure on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province. The site is underlain by the Volksrust FM (Ecca Group, Karoo Supergroup) and the Adelaide FM (Beaufort Group, Karoo Supergroup).

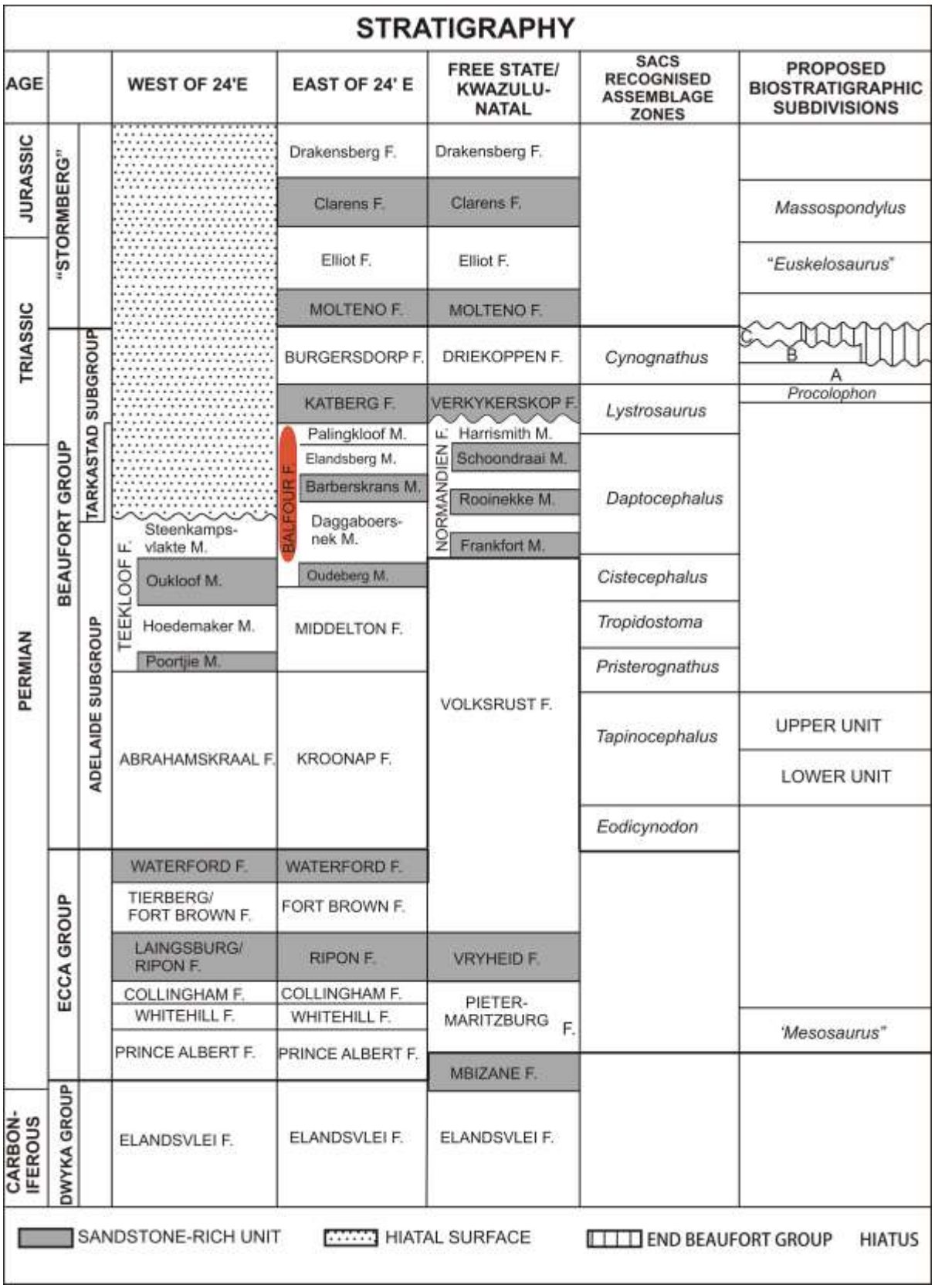

Figure 5: Lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions Beaufort Group of the Karoo Supergroup with rock units and fossil assemblage zones relevant to the present study marked in orange (Modified from Rubidge 1995). Abbreviations: F. = Formation, M. = Member.

5 GEOGRAPHICAL LOCATION OF THE SITE

Site co-ordinates: 29°01'26.76"S and 26°13'48.64"E

The proposed Wildealskloof Mixed Use Development is located on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province. The total extend of the study area is approximately 587 hectares and it falls within the boundary of Mangaung Metropolitan Municipality.

6 METHODS

As part of the Palaeontological Impact Assessment, a field-survey of the development footprint was conducted in January 2018 to assess the potential risk to palaeontological material (fossil and trace fossils) in the proposed footprint of the development. A physical field-survey was conducted on foot and by vehicle within the proposed development footprint. The results of the field-survey, the author's experience, aerial photos (using Google Earth, 2018), topographical and geological maps were used to assess the proposed development footprint. No consultations were undertaken for this Impact Assessment.

6.1 Assumptions and limitations

The accurateness of Palaeontological Desktop Impact Assessments is reduced by old fossil databases that do not always include relevant locality or geological formations. The geology in various remote areas of South Africa may be less accurate because it is based entirely on aerial photographs. The accuracy of the sheet explanations for geological maps is inadequate as the focus was never intended to be on palaeontological material.

South Africa in its entirety has not been studied palaeontologically. Similar Assemblage Zones but in different areas, might provide information on the presence of fossil heritage in an unmapped area. Desktop studies of similar geological formations generally assume that unexposed fossil heritage is present within the development area. Thus, the accuracy of Palaeontological Impact Assessment is improved by a field-survey.

7 FIELD OBSERVATIONS

The following photographs were taken on a site visit to the proposed Wildealskloof Mixed Use Development and associated infrastructure in April 2018.

Figure 6: Notice of proposed Wildealskloof Mixed Use Development and associated infrastructure, on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province.

Figure 7: Lush grassland vegetation and unfossiliferous outcrop in the background on the proposed Wildealskloof Mixed Use Development site on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province.

Figure 7: Grassland vegetation on the proposed Wildealskloof Mixed Use Development site on the remaining extent of the Farm Olrig No. 1710 and Portion 4 of the Farm Wildealskloof No. 1205, Bloemfontein, Free State Province.

8 ASSESSMENT OF IMPACTS

8.1 ASSESSMENT METHODOLOGY

Direct, indirect and cumulative impacts of the issues identified through the scoping study, as well as all other issues identified in the EIA phase must be assessed in terms of the following criteria:

» The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
» The **extent,** wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being site specific, 2 = local (site + immediate surrounds), 3 = regional, 4 = national and a score of 5 being international).

» The **duration**, wherein it will be indicated whether: ☐ the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
☐ the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
☐ medium-term (5–15 years) – assigned a score of 3;
☐ long term (> 15 years) - assigned a score of 4; or
☐ permanent - assigned a score of 5;
» The **consequences (magnitude)**, quantified on a scale from 0-10, where 0 is small and will have no effect on the environment, 2 is minor and will not result in an impact on processes, 4 is low and will cause a slight impact on processes, 6 is moderate and will result in processes continuing but in a modified way, 8 is high (processes are altered to the extent that they temporarily cease), and 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
» The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale of 1–5, where 1 is very improbable (probably will not happen), 2 is improbable (some possibility, but low likelihood), 3 is probable (distinct possibility), 4 is highly probable (most likely) and 5 is definite (impact will occur regardless of any prevention measures).
» the **significance**, which shall be determined through a synthesis of the characteristics described above and can be assessed as low, medium or high; and
» the **status**, which will be described as either positive, negative or neutral.
» the degree to which the impact can be reversed.
» the degree to which the impact may cause irreplaceable loss of resources.
» the *degree* to which the impact can be *mitigated.*
The **significance** is calculated by combining the criteria in the following formula:
S=(E+D+M)P
S = Significance weighting
E = Extent
D = Duration
M = Magnitude
P = Probability
The **significance weightings** for each potential impact are as follows:
» < 30 points: Low (i.e. where this impact would not have a direct influence on

- the decision to develop in the area),

» 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
» > 60 points: High (i.e. where the impact must have an influence on the

- Decision process to develop in the area).

Nature: The excavations and clearing of vegetation during the construction phase will consist of digging into the superficial sediment cover as well as underlying deeper bedrock. These excavations will change the existing topography and may possibly disturb, destroy or permanently close-in fossils at or below the ground surface. These fossils will then be lost for research.

Impacts on Palaeontological Heritage are likely to happen only within the construction phase. No impacts are expected to occur during the operation phase.

	Without mitigation	**With mitigation**
Extent	Local(1)	Local(1)
Duration	Long term/permanent (5)	Long term/permanent (5)
Magnitude	Minor (2)	Minor (1)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (8)**	**Low (7)**
Status (positive or negative)	Negative	Neutral
Reversibility	Irreversible	Irreversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes

Mitigation: Not necessary

The proposed footprint is underlain by sediments of the Volksrust Formation (Ecca Group, Karoo Supergroup) and the Adelaide Formation (Palingkloof Member) of the Beaufort Group (Karoo Supergroup). The Palaeontological sensitivity of the Volksrust Formation is moderate while the palaeontological sensitivity of the Adelaide Formation is very high. The lack of fossils at the proposed development footprint indicates that the impact of the development is of low significance in palaeontological terms.

Chance find Procedure

- When a chance find is made the person must instantly stop all work near the find.
- The site must be secured to protect it from any additional damage
- The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.
- The ECO must appoint a relevant palaeontologist to investigate and access

the chance find and site. • Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings. • These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site • The reports and all other documents will be submitted to SAHRA by the palaeontologist. • The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development. • Once the required approvals have been issued, the Mine/development may carry on with the development. • The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.
Residual Risk: Loss of palaeontological heritage if impacts are not avoided

9 RECOMMENDATIONS CONCERNING FOSSIL HERITAGE MANAGEMENT DURING THE CONSTRUCTION PHASE

OBJECTIVE: Prevent the loss of Palaeontological Heritage	
Project component/s	Damaging impacts on palaeontological heritage occur during the **construction** phase which will modify the existing topography. The Wildealskloof Mixed Use Development consists of the construction of the following: • Single Residential Units, • Apartments and "flat" Units (9000 Units in total), • Retirement facility, • School Housing (Boarding Houses), • Offices, • a Regional Shopping Centre, • Industrial Land Uses, • Memorial Park (Cemetery), • Parks,

	• Conservation areas, • Municipal land uses, • Hotel and Spa, • Churches, • Schools and Crèches. The excavations and site clearance of vegetation will consist of significant excavations into the uppermost sediment cover as well as into the underlying bedrock. These excavations will transform the present topography and may disrupt, destroy or permanently close-in fossils that are then unavailable for research.		
Potential Impact	Destruct, destroy or permanently close-in fossils at or below the ground surface that are then no longer available for research		
Activity/risk source	• Activities associated with the construction of the Wildealskloof Mixes Use development and associated infrastructure		
Mitigation: Target/Objective	Protection of identified fossils uncovered during the construction phase.		
Mitigation: Action/control		**Responsibility**	**Timeframe**
The proposed footprint is underlain by sediments of the Volksrust Formation (Ecca Group, Karoo Supergroup) and the Adelaide Formation (Palingkloof Member) of the Beaufort Group (Karoo Supergroup). The Palaeontological sensitivity of the Volksrust Formation is moderate while the palaeontological sensitivity of the Adelaide Formation is very high. The lack of appropriate exposure at the proposed development footprint indicates that the impact of the development is of low significance in palaeontological terms		EO	Construction phase

10 FINDINGS AND RECOMMENDATIONS

The proposed footprint is underlain by sediments of the Volksrust Formation (Ecca Group, Karoo Supergroup) and the Adelaide Formation (Palingkloof Member) of the Beaufort Group (Karoo Supergroup). The Palaeontological sensitivity of the Volksrust Formation is moderate while the palaeontological sensitivity of the Adelaide Formation is very high.

During a field survey of the development footprint, no fossiliferous outcrops were found. For this reason, a **low palaeontological sensitivity** is allocated to the development footprint. Irrespective of the uncommon occurrence of fossils a solitary fossil may be of scientific value as many fossil taxa are known from a single fossil. The recording of fossils will expand our knowledge of the Palaeontological Heritage of the development area. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Wildealskloof mixed used development and associated infrastructure will be of a low significance in palaeontological terms. It is therefore considered that the construction and operation of the Wildealskloof development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction and operation of the development may be authorised as the whole extent as the development footprint is not considered sensitive in terms of palaeontological resources.

In the event that fossil remains are uncovered during any phase of construction, either on the surface or unearthed by new excavations and vegetation clearance, the ECO in charge of these developments ought to be alerted immediately. These discoveries ought to be protected (if possible *in situ*) and the ECO must report to SAHRA so that appropriate mitigation (*e.g.* recording, collection) can be carried out by a professional palaeontologist.

Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies as required by SAHRA.

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12 QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

The author (Elize Butler) has an MSc in Palaeontology from the University of the Free State, Bloemfontein, South Africa. She has been working in Palaeontology for more than twenty three years. She has been conducting Palaeontological Impact Assessments since 2014.

13 DECLARATION OF INDEPENDENCE

I Elize Butler, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise my objectivity in this work.

14 PROTOCOL FOR FINDS

Chance find Procedure

- When a chance find is made the person must instantly stop all work near the find.
- The site must be secured to protect it from any additional damage
- The finder of the fossil heritage must immediately report the find to his/her direct supervisor, according to the reporting protocols instituted by the Mine/development management. The supervisor must in turn report the find to his/her manager and the ECO. The ECO must report the find to the relevant Authorities and a relevant palaeontologist.
- The ECO must appoint a relevant palaeontologist to investigate and access the chance find and site.
- Both ECO and palaeontologist must ensure that accurate records and documentation are kept. The documentation must start with the initial chance find report, including records of all actions taken, persons involved and contacted, comments received and findings.
- These documents will be necessary to request authorizations and permits from the relevant Authorities to continue with the work on site
- The reports and all other documents will be submitted to SAHRA by the palaeontologist.
- The report will include recommendations for additional specialist work if necessary, or request approval to continue with the development.
- Once the required approvals have been issued, the Mine/development may carry on with the development.
- The ECO will close off the chance find procedure and would be required to implement any requirements issued by the Authority and to add it to the operational management plan.