Phase 1 Heritage Impact Assessment of the Remainder of the farm Cecilia 2352, Remainder of the farm Bloemfontein 654 and a portion of the farm Kwaggafontein 9300, Bloemfontein, FS Province.

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Executive Summary

A Phase 1 Heritage Impact Assessment was carried out as part of a proposed new residential development on the remainder of farms Cecilia 2352, Bloemfontein 654, and a portion of the farm Kwaggafontein 2300 outside Bloemfontein in the Free State Province. The study area is capped by relatively thick deposits of geologically recent aeolian sands and residual soils that thin out towards the southeast, occasionally exposing dolerite bedrock. The natural terrain has been altered by previous activities (quarry and gum tree plantation) and subsequent human impact resulting from various recreational activities (a drive–in, quad-biking and 4x4 trails). The northern and northwestern part of the Kwaggafontein and Cecilia portions as well as the southern part of the Bloemfontein portion is underlain by intrusive igneous dolerites which are considered to be of low paleontological significance. Contact metamorphic zones are generally not conducive to the preservation of fossil plant material vertebrate fossils. Potentially fossil-bearing outcrop is generally concealed as a result of low topographic relief within the study area and the subsequent capping of the landscape by a relatively thick mantle of geologically recent and palaeontologically sterile, superficial deposits. Potential impact on fossil remains by the proposed project is regarded as low, but it is advised that if *fresh* sedimentary bedrock is exposed during the construction phase of the project, inspection of fresh exposures by a qualified palaeontologist should be allowed at the appropriate time. The sedimentary bedrock component within the study area is rated Generally Protected B (GP.B).

A foot survey of the terrain revealed no evidence for the accumulation of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape. There are also no indications of rock art, prehistoric structures or buildings older than 60 years within the boundaries of the study area. The archaeological component of the remainder of farms Cecilia 2352, Bloemfontein 654, and a portion of the farm Kwaggafontein 2300 is rated Generally Protected C (GP.C).

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Introduction

A Phase 1 Heritage Impact Assessment was carried out as part of a proposed new residential development on the remainder of farms Cecilia 2352, Bloemfontein 654, and a portion of the farm Kwaggafontein 2300 outside Bloemfontein in the Free State Province (**Fig. 1**). The proposed residential development (Cecilia Park) will cover an area of approximately 166 ha. The assessment is required as a prerequisite for new development in terms of the National Environmental Management Act and is also called for in terms of the National Heritage Resources Act 25 of 1999. A site visit and subsequent assessment took place during November 2014. The task involved identification of possible paleontological sites or occurrences in the proposed zone, an assessment of their significance, possible impact by the proposed development and recommendations for mitigation where relevant.

Terms of Reference

- Identify and map possible heritage sites and occurrences using available resources.
- Determine and assess the potential impacts of the proposed development on potential heritage resources;
- Recommend mitigation measures to minimize potential impacts associated with the proposed development.

Methodology

The heritage significance of the affected area was evaluated through a desktop study and carried out on the basis of existing field data, database information and published literature. This was followed by a field assessment by means of a pedestrian survey. A Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. Relevant publications, aerial photographs (incl. Google Earth) and site records were consulted and integrated with data acquired during the on-site inspection.

Field Rating

Site significance classification standards prescribed by SAHRA (2005) were used for the purpose of this report (**Table 1**).

Description of the Affected Area

Locality data

1 : 50 000 scale topographic map: 2926 AA Bloemfontein

1: 250 000 scale geological map 2926 Bloemfontein

General site coordinates (**Fig. 2**):

A) 29° 7'1.05"S 26° 8'37.37"E

B) 29° 6'57.60"S 26° 9'5.05"E

C) 29° 7'8.63"S 26° 9'7.18"E

D) 29° 7'10.35"S 26° 9'44.60"E

E) 29° 7'33.36"S 26° 9'44.32"E

F) 29° 7'36.26"S 26° 9'37.99"E

G) 29° 7'37.91"S 26° 9'30.55"E

H) 29° 7'27.56"S 26° 9'31.66"E

I) 29° 7'26.42"S 26° 9'21.83"E

J) 29° 7'35.03"S 26° 9'20.68"E

K) 29° 7'38.66"S 26° 9'11.69"E

L) 29° 7'43.72"S 26° 8'39.96"E

The site is located at the corner of Haldon Road (N8) and the N1 national road (**Fig. 2**). It is made up of open veld and mainly disturbed terrain, informally used by off-road and quad-bike enthusiasts for recreational purposes (**Fig. 3 & 4).** Old topographic maps of the area indicate that the affected area has already been subjected to commercial farming practices (tree plantations) by 1953 (**Fig. 5**).

Geology

The geology of the region has been described by Theron (1963) and Johnson (2006). It is situated within the Beaufort Group, Adelaide Subgroup (Karoo Supergroup), and is primarily represented by late Permian, Balfour Formation sedimentary rocks, which are made up of alternating sandstone and mudstone layers (*Pa*) (**Fig. 6**). Dykes and sills of resistant Jurassic dolerites (*Jd***)** determine the relief in the region. The igneous Jurassic dolerites are not fossiliferous and can be excluded from further consideration in the present palaeontological assessment. The site is capped by younger, superficial deposits of Quaternary age. Superficial deposits in the region consist mainly of and shallow to well-developed, windblown sand and residual soils of varying depth.

Background

The site is located within an area considered to be of high palaeontological sensitivity (SAHRIS Palaeo-sensitivity map, 2015, **Fig. 7**). The local palaeontological footprint is primarily represented by Late Permian Karoo vertebrate fauna and Late Cenozoic (Quaternary) macrofossils (Broom 1909 a; Broom 1909 b; Goodwin & van Riet Lowe 1929; Kitching 1977; Churchill *et al* 2000; Rossouw 1999, 2000, 2006). The succession of Beaufort Group sedimentary rocks is subdivided into eight biostratigraphic units, called assemblage zones (Rubidge 1995) and the sedimentary strata underlying the affected area are assigned to the *Dicynodon* Assemblage Zone (AZ) (Kitching 1995) (**Fig. 8**). This biozone is characterized by the presence of a

distinctive and fairly common dicynodont genus. Therapsids and other vertebrate fossils from this biozone are usually found as dispersed and isolated specimens in mudrock horizons, associated with an abundance of calcareous nodules. Plant fossils (*Dadoxylon, Glossopteris*) and trace fossils (arthropod trails, worm burrows) are also present. The sediments assigned to the *Dicynodon* AZ are associated with stream deposits consisting of floodplain mudstones and subordinate, lenticular channel sandstones. In more recent times the central interior and what is now the Free State Province, was once a vast and highly productive grassland ecosystem. Numerous mammal fossils stretching as far back as the Middle Pleistocene are regularly discovered in the Free State Province, especially in fluvial sediments along river courses like the nearby Modder River and the Renosterspruit. Quaternary palaeontological sites, often associated with Stone Age artefacts, are found eroding out of Pleistocene alluvial terraces and dongas along the Modder River and its tributaries near Maselspoort and Mockesdam and further east along the Honingspruit near Sannaspos. Fossils discovered at various fossil sites along the Modder River and its tributaries revealed the existence of a number of open grassland adapted herbivores (*Equus capensis, Megalotragus priscus, Pelorovis antiquus, Antidorcas bondi* and *Equus lylei*).

The Stone Age archaeological record of Modder River catchment east of Bloemfontein spans back to the early Middle Stone Age. Prehistoric archaeological remains previously recorded in the region include stone tools and mammal fossil remains from sealed and or exposed contexts. Along much of the course of Modder River and its tributaries north of Bloemfontein, alluvial deposits contain numerous occurrences of *in situ* Middle and Later Stone Age material eroding out of the overbank sediments where they are often found in association large mammal fossil remains (Churchill *et al*. 2000; Rossouw 1999, 2000, 2006). The incidence of surface scatters usually decreases away from localized areas such as alluvial contexts and dolerite-shale contact zones when stone tools largely occur as contextually derived individual finds in the open veld.

There is no record of Later Iron Age settlements in the immediate area around Bloemfontein (Maggs 1976)..

The cultural significance of the landscape west of Bloemfontein is primarily represented by the historical footprint left behind by early colonial settlers, when

several farms, including Bains Vlei and Kwaggafontein was owned by Andrew Hudson Bain who settled in the Free State in 1847 (Collins 1965). In 1860 and 1862 two hunts, organized for the second son of Queen Elizabeth and for the Barolong tribe respectively, took place at Bains Vlei which led to the mass killing of thousands of antelope and a subsequent dwindling of large antelope herds in the Bloemfontein area.

Field Assessment

Results from the field assessment are summarized in **Table 2**. The study area is capped by relatively thick deposits of geologically recent aeolian sands and residual soils that thin out towards the southeast at Bloemfontein 654, exposing dolerite bedrock (**Fig. 10**). A foot survey of the terrain revealed extensive alteration to the natural terrain at Bloemfontein 654 and Cecilia 2352, with no evidence for the accumulation and preservation of intact fossil material within the superficial Quaternary sediments (**Fig. 11 - 13**). The Kwaggafontein portion consists of about 50 ha of mainly open grassland (**Fig. 14).** A disused quarry located within dolerite outcrop is located at the northern border between the Kwaggafontein and Cecilia portions (**Fig. 15**). Aside from relatively recent modern developments and activities, including a substation at Bloemfontein 654, a drive-in theater and pub at Cecilia 2352, the survey revealed no evidence of *in situ* Stone Age archaeological material, capped or distributed as surface scatters on the landscape (**Fig. 16**). There are also no indications of rock art, prehistoric structures or buildings older than 60 years within the boundaries of the study area. A grove made up of two distinct lines of young gum trees (*Eucalyptus spp*.) is situated along the eastern border of Cecilia 654 and are not considered to be older than 60 years of age (**Fig. 17**).

Impact Statement and Recommendation

Significance of impacts is summarized in **Table 3**. The natural terrain has been altered by previous agricultural activities (quarry and gum tree grove) and subsequent human impact resulting from various recreational activities (drive – in, quad-biking and 4x4 trails) (**Fig. 18**).

Sedimentary bedrock

The palaeontological significance of the sedimentary bedrock in the region is considered high. However, the northern and northwestern part of the Kwaggafontein

and Cecilia portions as well as the southern part of the Bloemfontein portion is underlain by intrusive igneous dolerites which are considered to be of low paleontological significance. Contact metamorphic zones are generally not conducive to the preservation of fossil plant material vertebrate fossils. Potentially fossil-bearing outcrop is generally concealed as a result of low topographic relief within the study area and the subsequent capping of the landscape by a relatively thick mantle of geologically recent and palaeontologically sterile, superficial deposits. Potential impact on fossil remains by the proposed project is regarded as low, but it is advised that if *fresh* sedimentary bedrock is exposed during the construction phase of the project, inspection of fresh exposures by a qualified palaeontologist should be allowed at the appropriate time. The sedimentary bedrock component within the study area is rated Generally Protected B (GP.B).

Superficial deposits

It is unlikely that the proposed development will affect palaeontological heritage resources within the overlying Quaternary soils due to the disturbed condition of the substrate and the absence of suitable Quaternary-aged alluvial contexts at the site. The palaeontological significance of the unconsolidated Quaternary soils is therefore considered as low. The superficial sediment component within the study area is rated Generally Protected C (GP.C).

Impact on potential historical structures older than 60 years, Stone Age archaeological remains or rock art localities within the study area is considered unlikely. The archaeological component of the remainder of farms Cecilia 2352, Bloemfontein 654, and a portion of the farm Kwaggafontein 2300 as indicated in Figure 2 is rated Generally Protected C (GP.C).

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Tables and Figures

Table 1. Field rating categories for heritage sites as prescribed by SAHRA.

Field Rating	**Grade**	**Significance**	**Mitigation**
National Significance (NS)	Grade 1	-	Conservation; national site nomination
Provincial Significance (PS)	Grade 2	-	Conservation; provincial site nomination
Local Significance (LS)	Grade 3A	High significance	Conservation; mitigation not advised
Local Significance (LS)	Grade 3B	High significance	Mitigation (part of site should be retained)
Generally Protected A (GP.A)	-	High/medium significance	Mitigation before destruction
Generally Protected B (GP.B)	-	Medium significance	Recording before destruction
Generally Protected C (GP.C)	-	Low significance	Destruction

Table 2. Features recorded during the foot survey.

Feature	Coordinates		Comment
Substation	29° 7'27.08"S	26° 9'35.81"E	Modern
Drive-in	29° 7'26.48"S	26° 9'26.01"E	Modern
Industrial buildings	29° 7'36.83"S	26° 9'6.37"E	Modern
Commercial plot	29° 7'39.64"S	26° 8'56.90"E	Modern
Quad-bike trails	29° 7'24.55"S	26° 9'0.68"E	Modern
Quad-bike trails	29° 7'12.84"S	26° 9'7.70"E	Modern
Quad-bike trails	29° 7'2.40"S	26° 9'0.80"E	Modern
Building (Pub)	29° 7'10.52"S	26° 8'55.76"E	Modern
Quarry	29° 7'6.94"S	26° 8'50.85"E	Modern
Gum tree grove	29° 7'19.79"S	26° 9'29.10"E	Modern

Table 3. Summary of impacts at the remainder of Cecilia 2352, remainder of Bloemfontein 654 and a portion of Kwaggafontein 9300.

Zone	Rock types and Age	Potential heritage / Biostratigraphy	Palaeontological Significance before site visit	Archaeological Significance before site visit	Potential Impact (after site visit)
Remainder of Cecilia 2352	Superficial deposits, soils Quaternary to Recent	Stone Age, pre-colonial, colonial remains. mammal fossil remains; microfossils	High	High	Low
	Dolerite (*Jd*) Intrusive igneous bedrock. Jurassic	Stone tool raw material (dolerite-shale contact zone). Rock engravings No fossils	Low	Low-Moderate	Low
	Adelaide Subgroup *Pa*) Balfour Formation. Fluvial and lacustrine mudstones and sandstones. Late Permian	*Dicynodon* Assemblage Zone Therapsids, amphibians, fish, amniotes, invertebrates, plant fossils, trace fossils	High	Low	Low
Remainder of Bloemfontein 654	Superficial deposits, soils Quaternary to Recent	Stone Age, pre-colonial, colonial remains. mammal fossil remains; microfossils	High	High	Low
	Dolerite (*Jd*) Intrusive igneous bedrock. Jurassic	Stone tool raw material (dolerite-shale contact zone). Rock engravings No fossils	Low	Low-Moderate	Low
Portion of Kwaggafontein 9300	Superficial deposits, soils Quaternary to Recent	Stone Age, pre-colonial, colonial remains. mammal fossil remains; microfossils	High	High	Low
	Dolerite (*Jd*) Intrusive igneous bedrock. Jurassic	Stone tool raw material (dolerite-shale contact zone). Rock engravings No fossils	Low	Low-Moderate	Low
	Adelaide Subgroup (*Pa*) Balfour Formation. Fluvial and lacustrine mudstones and sandstones. Late Permian	*Dicynodon* Assemblage Zone Therapsids, amphibians, fish, amniotes, invertebrates, plant fossils, trace fossils	High	Low	Low

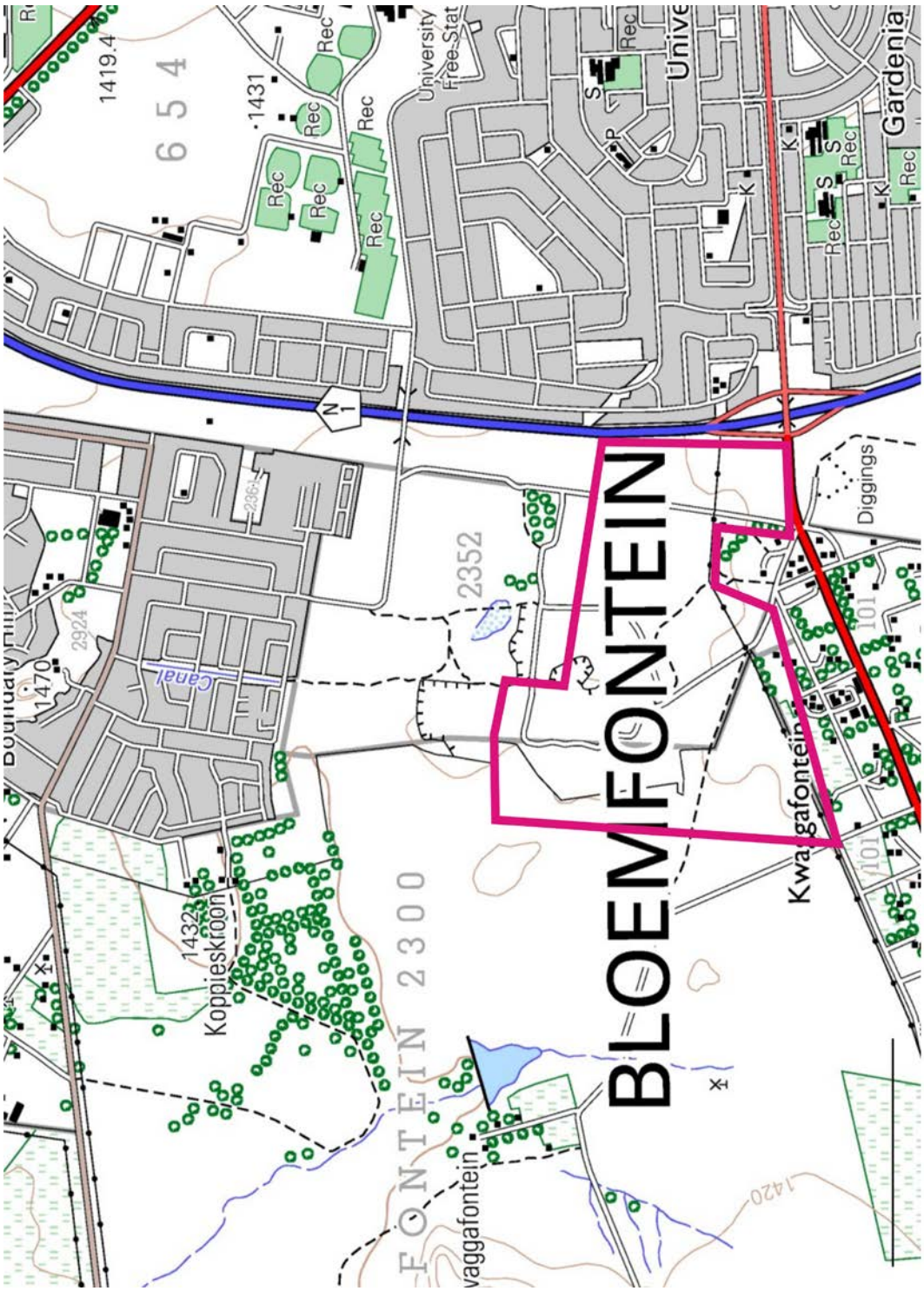

Figure 1. Map of the study area (portion of 1:50 000 scale topographic map 2926 AA Bloemfontein).

Figure 2. Aerial view of the study area.

Figure 3. The study area at Bloemfontein 654, looking southeast (above) and south (below).

Figure 4. The study area at Cecilia 2352, looking west.

Figure 5. 1:18000 topographic map of Cecilia ca. 1953 indicate that the affected area has been used as a tree plantation during the 1940's and 1950's.

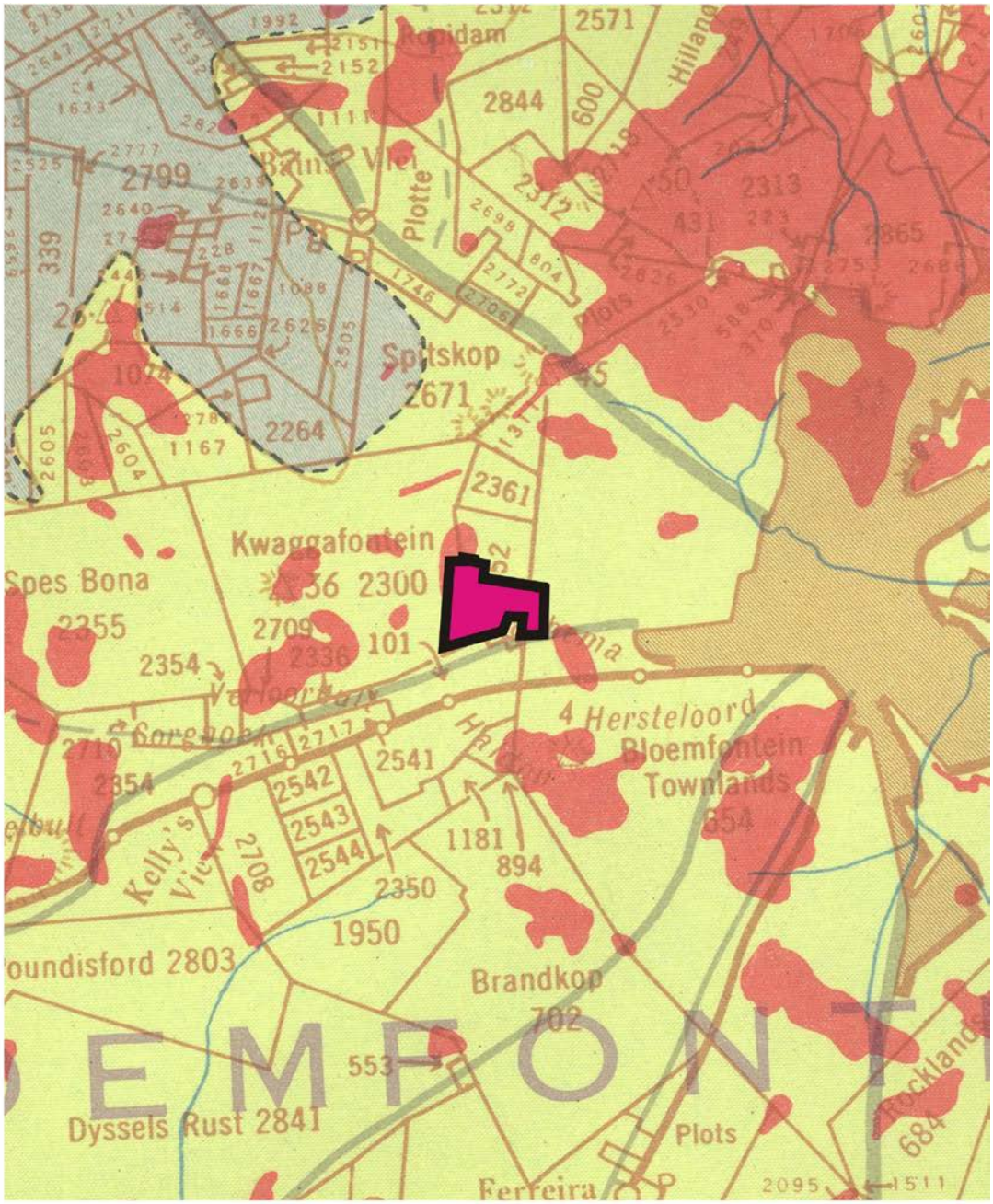

Figure 6. Portion of the 1:250 000 scale geological map Bloemfontein 2926. The site (rectangle) is situated within the Beaufort Group, Adelaide Subgroup, which is represented by Late Permian, Balfour Formation sedimentary rocks, made up of alternating sandstone and mudstone layers (green area). The sedimentary rocks are intruded by resistant Jurassic dolerites (Karoo Dolerite Suite, red area). Surface (superficial) sediments are primarily made up of alluvium, aeolian sands and residual soils.

Figure 7. According to the SAHRIS Palaeo-sensitivity map (2014), the site is located within an area considered to be of high palaeontological sensitivity. Red = high sensitivity; field assessment and protocol for finds is required. Grey = low sensitivity; no palaeontological studies are required.

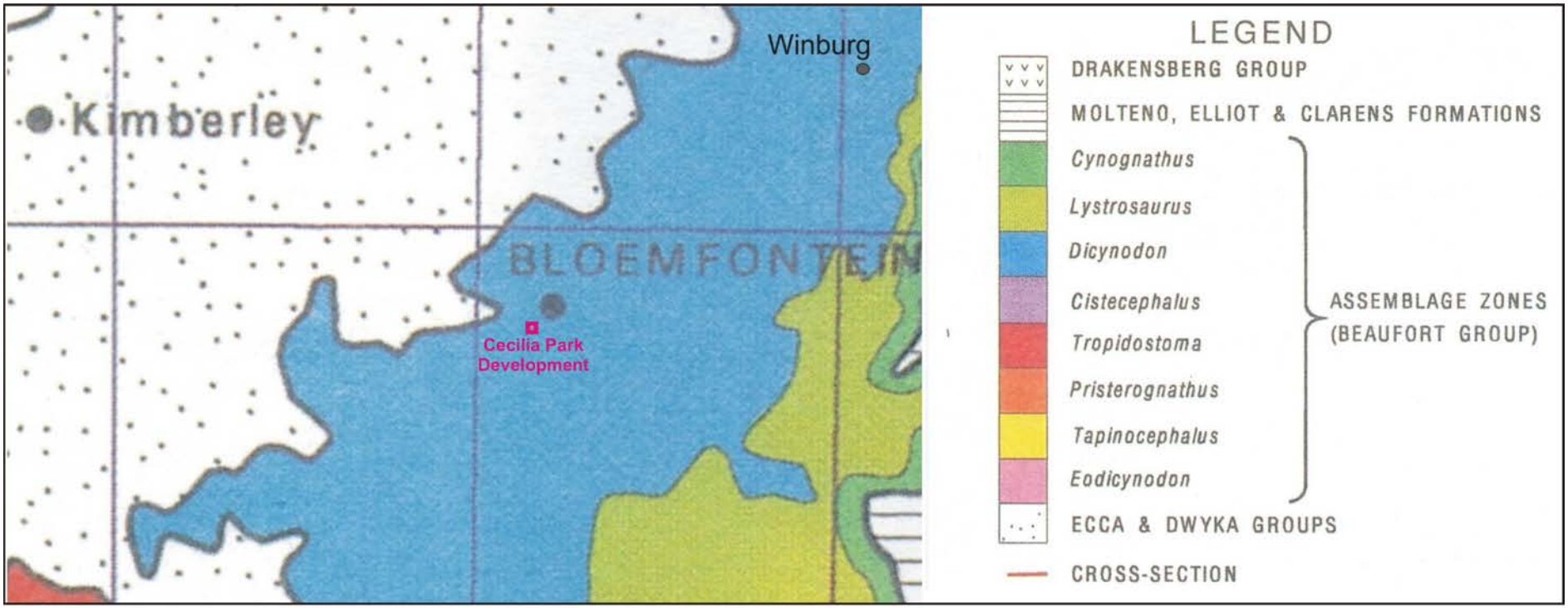

Figure 8. Geographical distribution of vertebrate biozones of the Beaufort Group around Bloemfontein (Rubidge 1995).

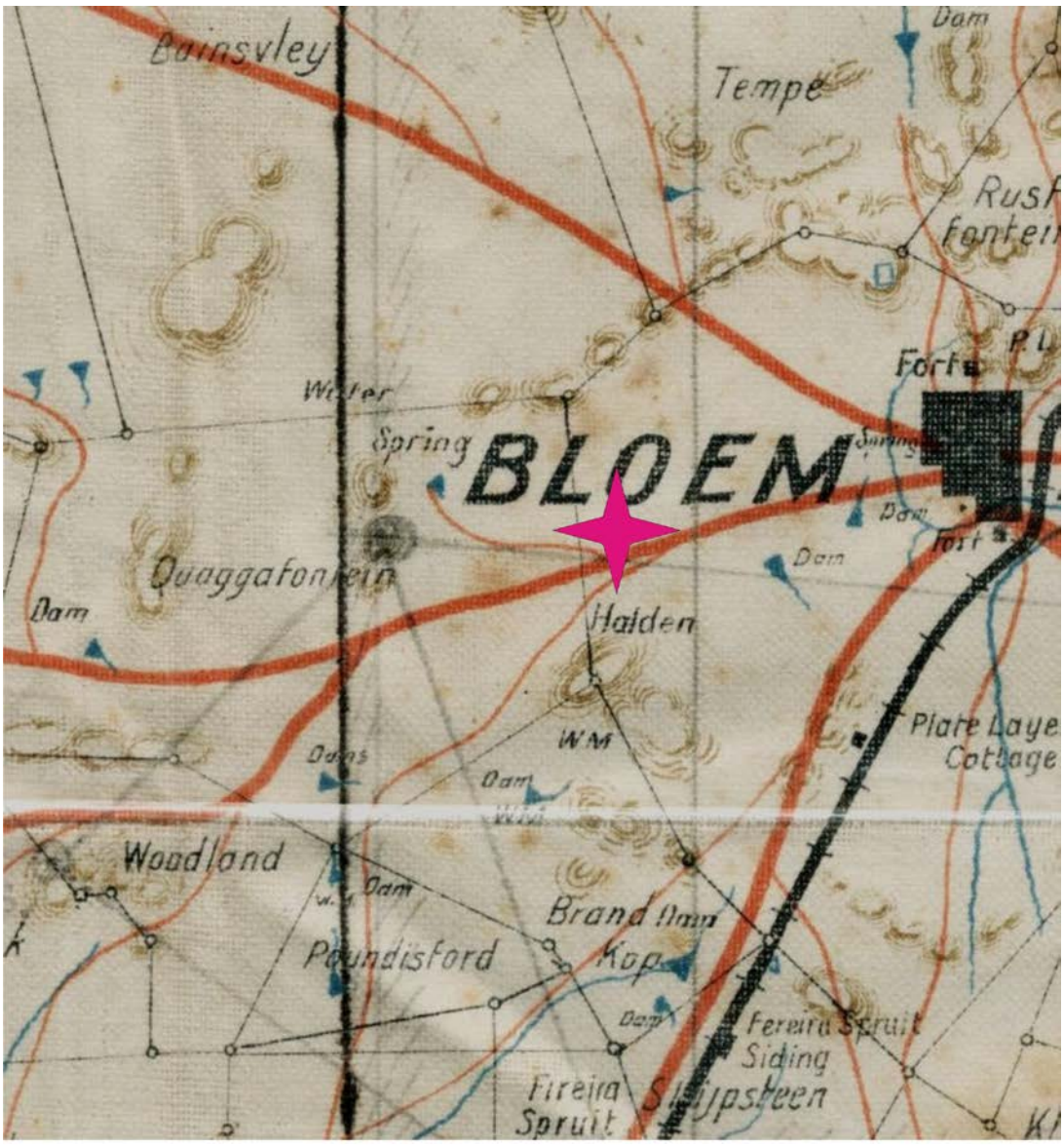

Figure 9. British military map ca. 1900 of the area between Bains Vlei and Brandkop in the south. The study area is indicated by a star.

Figure 10 The Bloemfontein 654 portion is capped by relatively thick deposits of geologically recent aeolian sands and residual soils that thins out towards the southeast, exposing dolerite bedrock. Scale: 1 = 10 cm.

Figure 11. The superficial sediments near the southeastern boundary of the Bloemfontein 654 portion is extensively disturbed by previous construction activities. Scale: 1 = 10 cm.

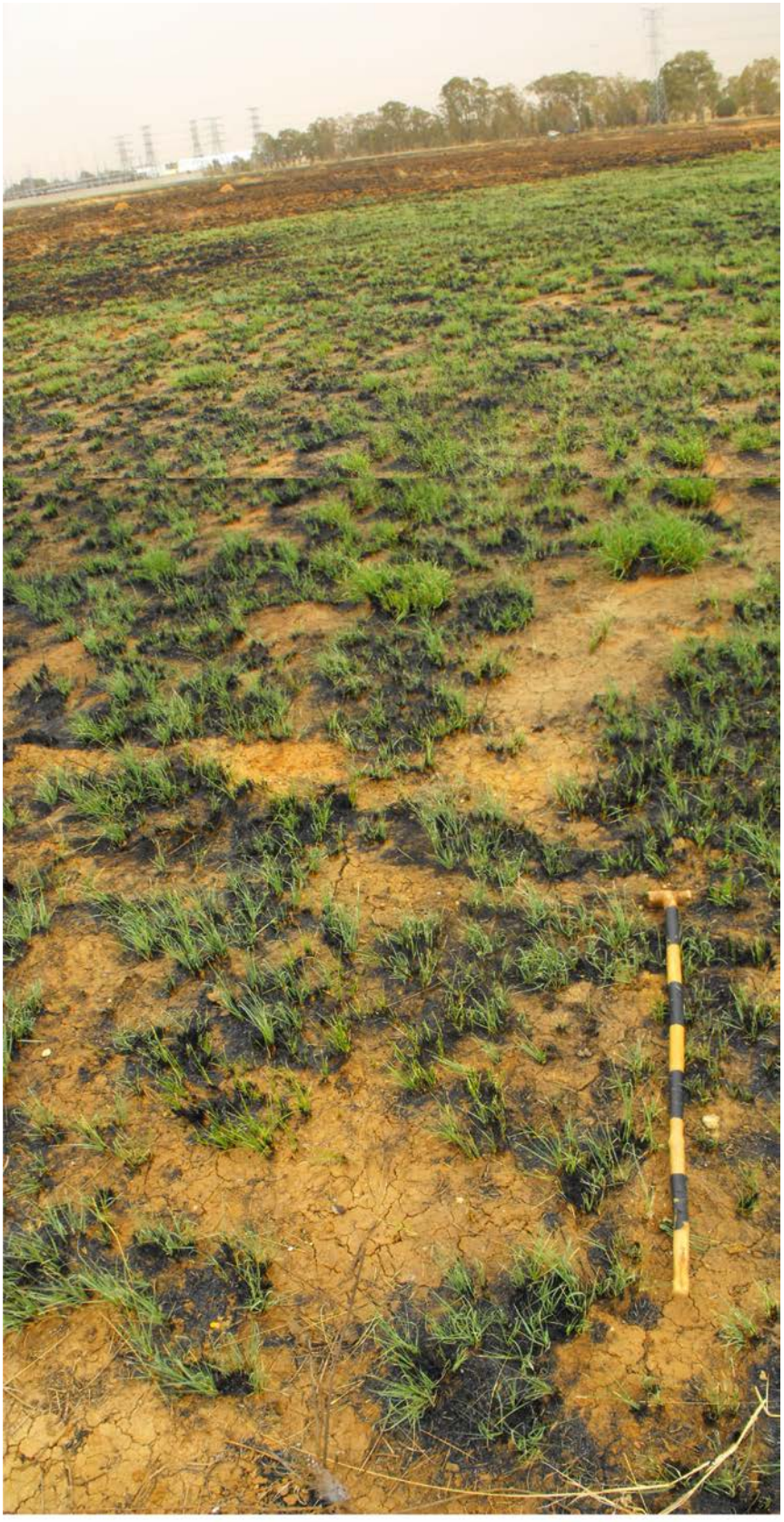

Figure 12. Open veld underlain by geologically recent superficial sediments, looking southwest. Scale: 1 = 10 cm.

Figure 13. Open veld in the Cecilia 2352 portion is covered by geologically recent superficial sediments, looking east (above, left) and west (right). The terrain is frequently used for illegal rubbish dumping (below, left). Scale: 1 = 10 cm.

Figure 14. The Kwaggafontein portion, looking north (top), west (middle) and south (bottom).

Figure 15. A disused quarry at the Kwaggafontein portion, looking northeast. The area is filled with building rubble.

Figure 16. The survey area, looking southwest (Bloemfontein portion, above), west-northwest (Cecilia portion, below) and north (Kwaggafontein portion, right).

Figure 17. A stand of gum trees situated on remainder of Cecilia 654, looking west.

Figure 18. Aerial view of the study area showing results from the survey.