

Phase 1 Heritage Impact Assessment of a proposed new bulk water gravity pipeline in Ladybrand, FS Province.

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Summary

A Phase 1 Heritage Impact Assessment was conducted for the proposed installation of a new 1.4 km long bulk water gravity pipeline in Ladybrand, Free State Province. The linear footprint is located on low relief terrain, underlain by potentially fossil-rich Elliot Formation bedrock strata, that is mantled by a well-developed residual soil and alluvial overburden, all considered to be of low palaeontological significance. No aboveground signs of graves or graveyards were observed within the proposed footprint area. Historical buildings or structures older than 60 years are absent from the study area. Impact on potential *in situ* archaeological material, prehistoric structures, historical structures, rock engravings or graves in the affected area is considered unlikely. If construction of the pipeline is restricted to the well-developed residual soil and alluvial overburden, probability of impact on vertebrate fossil remains (or ichnofossils) from the underlying sandstone beds and subordinate mudstones of the Elliot Formation is considered low. The project may proceed, provided that linear excavations exceeding 1 m in depth into intact (previously undisturbed) Elliot Formation strata, or the mechanical exposure of unweathered sandstone surfaces exceeding 4 m² in size, shall require monitoring by a professional palaeontologist during the construction phase of the project. The proposed development footprint is not located within close proximity of well-known prehistoric repositories Leliehoek Shelter and Rose Cottage Cave, the cultural landscape of Platberg or declared heritage sites in town. It is recommended that the archaeological component of the footprint is assigned a site rating of Generally Protected C.

INTRODUCTION

A Phase 1 Heritage Impact Assessment was conducted for the proposed installation of a new 1.4 km long bulk water gravity pipeline in Ladybrand in the Free State Province (**Fig. 1 & 2**). The extent of the affected areas (> 300 m long linear development) falls within the requirements for a Heritage Impact Assessment (HIA) as required by Section 38 (Heritage Resources Management) of the South African National Heritage Resources Act (Act No. 25 of 1999). The site visit and subsequent assessment took place during May 2016. The task involved identification of possible archaeological 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 published and database 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.

Approach and Methodology

The heritage significance of the affected area was based on existing field data, database information, published literature, geological maps and aerial photographs. A field assessment, using a Garmin Etrex Vista GPS hand model (set to the WGS 84 map datum) and a digital camera were used for recording purposes. The study area is rated according to field rating categories as prescribed by SAHRA (**Table 1**).

LOCALITY DATA

Maps: 1:50 000 scale topographical map 2927 AB Ladybrand

1:250 scale geological map 2926 Bloemfontein

Site coordinates (**Fig. 2**):

- A) 29°11'17.42"S 27°28'2.52"E
- B) 29°11'15.47"S 27°28'3.92"E
- C) 29°11'17.42"S 27°28'7.74"E
- D) 29°11'11.32"S 27°28'12.01"E
- E) 29°11'9.57"S 27°28'9.83"E
- F) 29°11'3.10"S 27°27'57.91"E
- G) 29°10'51.47"S 27°28'9.99"E

The proposed footprint is situated on the northern outskirts of Ladybrand and south of Manyatseng township (Dorp Gronden Ladybrand 451) (**Fig. 3**).

Geology

The footprint is located within the outcrop area of the Late Triassic – Early Jurassic Elliot Formation of the Karoo Supergroup (Theron 1963; Johnson *et al.* 2006) (**Fig. 4**). The Elliot Formation represents the penultimate phase of Karoo sedimentation (Stormberg Group) and is characterized by its fluvially derived red bed deposits that respectively overlies and underlies the Molteno and Clarens Formations. Sedimentation processes were ended with the advent of extensive volcanic eruptions when basaltic lavas of the Drakensberg Formation and the Lebombo Group were deposited during the Jurassic Period (Duncan *et al.* 2006). The dykes and sills of resistant Jurassic dolerites (*Jd*) are not fossiliferous. It is generally accepted that the red bed deposits of the Elliot Formation are indicative of laterally continuous floodplain mudstones and associated fluvial sandstones (Visser and Botha, 1980; Smith *et al.* 1993; Johnson *et al.*, 1996, 2006). Kitching and Raath (1984) subdivided the Elliot Formation

into three lithostratigraphic units (Lower, Middle and Upper Elliot formations), but Bordy *et al.* (2004) recently suggested that the formation can be subdivided into two informal units, namely the Lower Elliot Formation (LEF) and Upper Elliot Formation (UEF), which have distinct lithologies, resulting from two different sedimentological regimes.

BACKGROUND

Palaeontology

The proposed pipeline is located in an outcrop area of the Early Jurassic *Massospondylus* Range Zone (Kitching and Raath 1984) of the Late Triassic – Early Jurassic Elliot Formation (Visser & Botha 1980; Johnson *et al.* 2006) (**Fig. 5**). The LEF correlates with Kitching and Raath's Lower Elliot Formation, while the new UEF incorporates both the Middle and Upper Elliot formations of these authors. The division also show reasonable correspondence with the biostratigraphic units defined by Kitching and Raath (1984) as the *Euskelosaurus* and *Massospondylus* Range Zones, respectively. The Elliot Formation contains one of richest Late Triassic to Early Jurassic dinosaur faunas of international importance, which include early dinosaurs (*Massospondylus* and *Euskelosaurus*) ornithischians, rare theropods and crocodylomorphs as well as rare amphibians, turtles, fish, advanced mammal-like reptiles and early mammals (Kitching 1979; Kitching & Raath 1984; MacRae, 1999; McCarthy & Rubidge 2005; Reisz *et al.* 2012). Several early dinosaur localities have been found in the vicinity of Ladybrand in the past so the likelihood is high that vertebrate remains and ichnofossils could be encountered during excavation activities in the area (Bordy *et al.* 2004) (**Fig. 6**).

Archaeology

Dolerite (*Jd*), in the form of dykes and sills are not palaeontologically significant and can be excluded from further consideration in the present palaeontological evaluation. It is however moderately significant from an archaeological point of view as many Stone Age quarry sites ("factory" sites) are found at the foot of dolerite hills where hornfels or other metasedimentary outcrop occur as a result of contact metamorphism following the intrusion of dykes and sills where mudstone occurs. In addition, sandstone caves, hollows and overhangs in the region could also be significant as it may preserve Stone Age archaeological remains in the form of stratified deposits. Stone tools found in the region are mostly made of opalines, but also hornfels, a dark, fine-grained isotropic rock found in the hot-contact zone between the dolerites and shales in the area (Cochrane 2008). Stone Age artefacts are generally common as surface material on the South African central plateau. However, away from localized areas such as cave or riverine sites, the incidence of surface scatters in the region is expected to be low with Stone Age artifacts, usually occurring as contextually derived individual finds.

The archaeological footprint in the area are primarily represented by Stone Age archaeological localities open and cave sites including rock art) and an extensive footprint related to the distribution of Iron Age settlements and early history of Sotho-speaking communities along the Caledon River Valley. Previously recorded Stone Age sites in the region are found at Bokpoort, Orange Springs, Leliehoek and Rose Cottage Cave (Thorp and De Ruyter 1997 (**Fig. 7**). In addition to Later Stone Age levels with European and Iron Age artifacts and rock art, Rose Cottage Cave also has a long cultural sequence incorporating several MSA and LSA industries ranging from ca. 70 ka to around 10 ka ago (Wadley 1992). Rock shelters associated with more recent hunter – gatherer activities are found at Rooikrans, Mauermanshoek, Westbury and Tienfontein. Numerous rock art sites have been recorded in the region, with over 30 farms listed in the Ladybrand district including the famous Tandjiesberg site near Modderpoort (Van Riet Low 1941) (**Fig. 8**).

A number of Iron Age settlements, which resemble Maggs's Type V settlement pattern in many aspects of their material culture, are found in the Caledon Valley (Maggs 1976) (**Fig. 9**). They appear to date from the 18th century onwards. According to historical accounts, the southward migration of early Sotho-speaking communities led to at least one group reaching the Caledon Valley about the mid-seventeenth century and occupying most of the upper and middle parts of the valley by 1800 AD. A major event to take place among the indigenous tribes of the interior highveld of South Africa before the coming of European settlers was the Difaqane raids and wars. Precipitated by the rise of Shaka's Zulu empire among the coastal Nguni-speaking peoples, territorial expansion resulted in the creation of large-scale refugee communities that were continued and

extended over the whole interior by resident Southern Sotho-speaking peoples who could not resist the advanced military and political system of the Nguni invaders. This led to the the segmentation of the Southern Sotho into numerous antagonistic communities scattered along the Caledon River Valley (Lye 1967, 1972). One group was the Leghoya who in 1810 or 1812, were finally conquered and completely absorbed by the Taung under their chief, Moletsane, with whom they settled at Mequatling (Viervoetberg), to the north west west of Ladybrand, in 1837. Although the Leghoya were subjects of Moletsane they lived as separate pockets among the Taung and actually retained their own chief. In 1869, by the Treaty of Aliwal North, Moletsane's territory, which had previously been part of Basutoland, was ceded to the Orange Free State, and Moletsane with his Taung and Leghoya followers moved into south Basutoland, between Mafeteng and Mohale's Hoek, where he was granted land by Moshesh.

Nineteenth century developments in the region also centers around Carolus Baatjes, a name first mentioned in the Wesleyan missionary accounts of 1833 when he formed part of the group of Rolong, Griqua, Korana and missionaries from the Boetsap and Platberg on the Vaal mission stations, who set off on an expedition to find a new, safe area in which to settle. Later in 1833 roughly 12000 people, moved from Platberg on the Vaal and Boetsap to the Caledon River Valley area (Schoeman 1989, 1991) and were settled between four Wesleyan Mission station, Thaba Nchu, Platberg, Lishuane and Umpukane. Platberg was the second most important Wesleyan Mission station in what the Missionaries referred to as the Bechuana District, after Thaba Nchu (Schoeman 2003). Historical accounts of the middle Caledon Valley indicate that hunter-gatherers survived as communities until the end of the Basuto Wars and the establishment of European farms in 1869. Stow (1905) recorded traditions about the last "Bushmen" inhabitants of the Korannaberg (Mequatling) and the Platberg (Ladybrand).

Lying at the foot of the Platberg, Ladybrand was founded in 1867 on the farm Mauershoek and attained municipal status in 1904 (**Fig. 10**). It was named after Lady Catharina Frederica Brand, wife of Sir Christoffel Brand (1797-1875), first Speaker of the Cape Legislative Assembly (Raper 1984).

FIELD ASSESSMENT

The linear footprint is located on low relief terrain, underlain by potentially fossil-rich Elliot Formation bedrock strata, that is mantled by a well-developed residual soil (**Fig 2, A-F**) and alluvial overburden (**Fig. 2, F-G**), all considered to be of low palaeontological significance (**Fig. 11 - 12**). No aboveground signs of graves or graveyards were observed within the proposed footprint area. Historical buildings or structures older than 60 years are absent from the study area. Impact on potential *in situ* archaeological material, prehistoric structures, historical structures, rock engravings or graves in the affected area is considered unlikely.

IMPACT STATEMENT & RECOMMENDATIONS

If construction of the pipeline is restricted to the well-developed residual soil and alluvial overburden (**Fig. 13**), probability of impact on vertebrate fossil remains (or ichnofossils) from the underlying sandstone beds and subordinate mudstones of the Elliot Formation is considered low. The project may proceed, provided that:

- A) linear excavations exceeding 1 m in depth into intact (previously undisturbed) Elliot Formation strata,
- B) or the mechanical exposure of unweathered sandstone surfaces exceeding 4 m² in size,

shall require monitoring by a professional palaeontologist during the construction phase of the project.

The proposed development footprint is not located within close proximity of well-known prehistoric repositories Leliehoek Shelter and Rose Cottage Cave, the cultural landscape of Platberg or declared heritage sites in town. It is recommended that the archaeological component of the footprint is assigned a site rating of Generally Protected C (**Table 1**).

References

- Bordy, E.M., Hancox, P.J. and Rubidge, B.S. 2004. Fluvial style variations in the Late Triassic–Early Jurassic Elliot formation, main Karoo Basin, South Africa *Journal of African Earth Sciences* 38: 383–400.
- Cochrane, G.W.G. 2008. A Comparison of Middle Stone Age and Later Stone Age Blades from South Africa. *Journal of Field Archaeology* 33 (4) 429-448.
- Humphreys, A.J.B. 1991. On the Distribution and Dating of Bifacial Tanged and Barbed Arrowheads in the Interior of South Africa. *South African Archaeological Bulletin* 46 (153)
- Johnson, M.R., Van Vuuren, C.J., Hegenberger, W.F., Key, R., Shoko, U., 1996. Stratigraphy of the Karoo Supergroup in southern Africa: an overview. *Journal of African Earth Sciences* 23(1): 3–15.
- Johnson *et al.* 2006. Sedimentary rocks of the Karoo Supergroup. In: M.R. Johnson, *et. al.* (eds). *The Geology of South Africa*. Geological Society of South Africa.
- MacRae, C. 1999. *Life Etched in Stone*. Fossils of South Africa. The Geological Society of South Africa, Johannesburg.
- McCarthy, T. and Rubidge, B.S. 2005. *The Story of Earth and Life*. Struik Publishers, Cape Town.
- Maggs, T O’C 1976. Iron Age Patterns and Sotho History on the Southern Highveld, South Africa. *World Archaeology* 7(3) 318-332.
- Kitching, J.W and Raath, M.A. 1984. Fossils from the Elliot and Clarens Formations of the Northeastern Cape, Orange Free State and Lesotho, and a suggested biozonation based on tetrapods. *Palaeontologia africana* 25: 111 – 125.
- Kitching, J.W. 1979. Preliminary report on a clutch of six dinosaurian eggs from the Upper Triassic Elliot Formation, Northern Orange Free State. *Palaeontologia Africana* 125: 41 – 45.
- Lye, W.F. 1967. The Difaqane – the Mfecane in the Southern Sotho area, 1822 – 1824. *Journal of African History* 8 (1): 107-131.
- Lye, W.F. 1972. *The distribution of the Sotho Peoples after the Difaqane*. In: L. Thompson (ed.) *African Societies in Southern Africa*. Heinemann. London. 191 – 206.
- Maggs, T. O’C. 1976. Iron Age Patterns and Sotho History on the Southern Highveld: South Africa. *World Archaeology* 7: 18-332.
- Raper 1984. *Dictionary of South African Place Names*. Onomastic Research Centre, HSRC. Pretoria.
- Reisz, R. R, Evans, D. C., Roberts, E. M., Sues, H.-D. and Yates, A. M. 2012. Oldest known dinosaurian nesting site and reproductive biology of the Early Jurassic sauropodomorph *Massospondylus*. *Proceedings of the National Academy of Sciences* 109: 2428 – 2433.
- Schoeman, K. 1989 *The Early Days of the Orange Free State*. Human & Rousseau. Cape Town.
- Schoeman, K. 1991 *The Wesleyan Mission in the Orange Free State*. Cape Town. Human and Rousseau.
- Schoeman, K. 2003 *Early White Travellers in the Transgariiep 1819 – 1840*. Protea Book House. Pretoria.

Smith, R.H.M., Eriksson, P.G., Botha, W.J., 1993. A review of the stratigraphy and sedimentary environments of the Karoo-aged basins of Southern Africa. *Journal of African Earth Sciences* 16: 143–169.

Stow, G.W. 1905. *The Native Races of South Africa*. London.

Thorp, C. and De Ruiter, D. 1997. Evidence for Interaction from Recent Hunter-Gatherer Sites in the Caledon Valley. *African Archaeological Review* 14 (4): 231-256.

Van Riet Lowe, C. 1941. *Prehistoric Art in South Africa*. Archaeological Series No. V. Bureau of Archaeology, Dept. of the Interior. Pretoria.

Wadley, L. 1992. Rose Cottage Cave: The Later Stone Age levels with European and Iron Age artefacts. *South African Archaeological Bulletin* 47:8-12.

Walton, J 1981. The South African kapstylhuis and some European counterparts *Restorica*, no. 10.

Walton, J. 1965. Early Ghoya settlement in the Orange Free State. *Researches of the National Museum, Bloemfontein Memoir* 2.

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DECLARATION OF INDEPENDENCE

I, Lloyd Rossouw, declare that I act as an independent specialist consultant. I do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work as stipulated in the terms of reference and have no interest in secondary or downstream developments resulting from the authorization of this project.

Tables and Figures

Table 1. Field rating categories 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

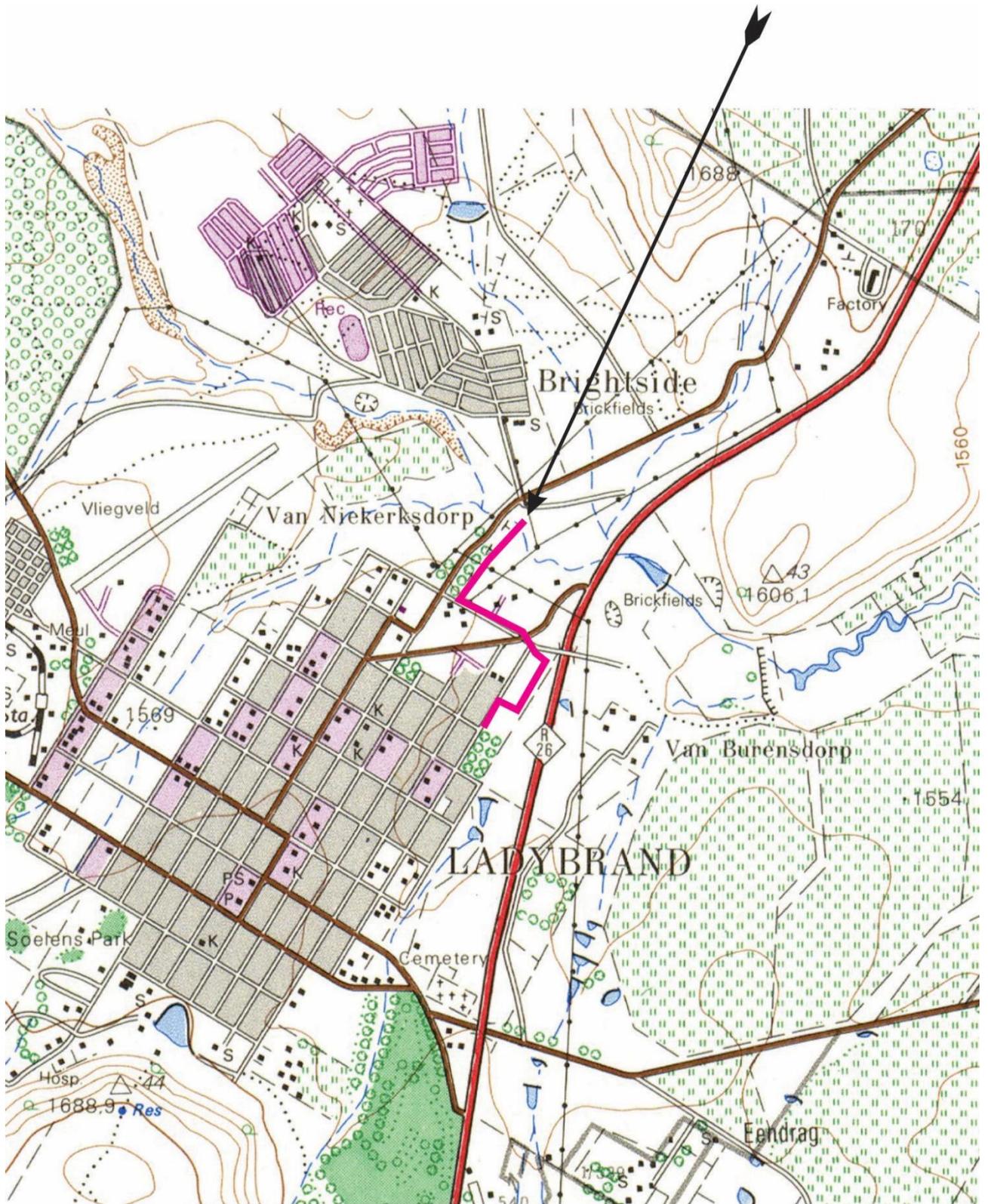


Figure 1. Map of the proposed development footprint (portion of 1:50 000 scale topographic map 2927AB Ladybrand).



Figure 2. Aerial view and layout of the site.



Figure 3. Layout of proposed development in relation to position of Ladybrand.

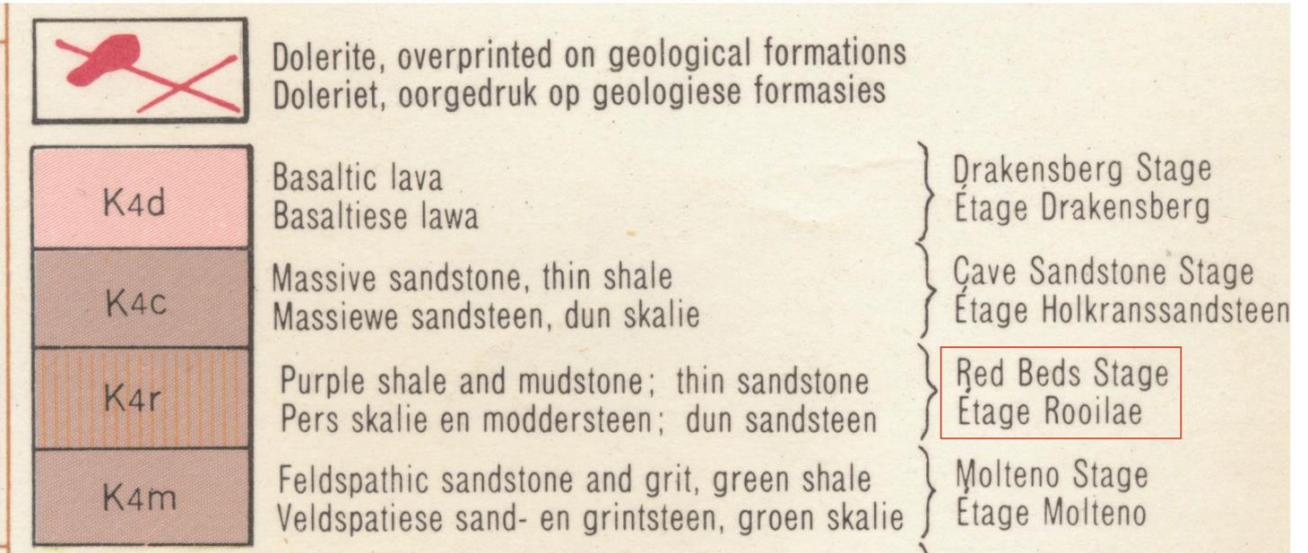


Figure 4. Study area (white polygon) marked on portion of 1:250 000 scale 2926 Bloemfontein. The footprint is located within the outcrop area of the Late Triassic – Early Jurassic Elliot Formation of the Stormberg Group (upper Karoo Supergroup).

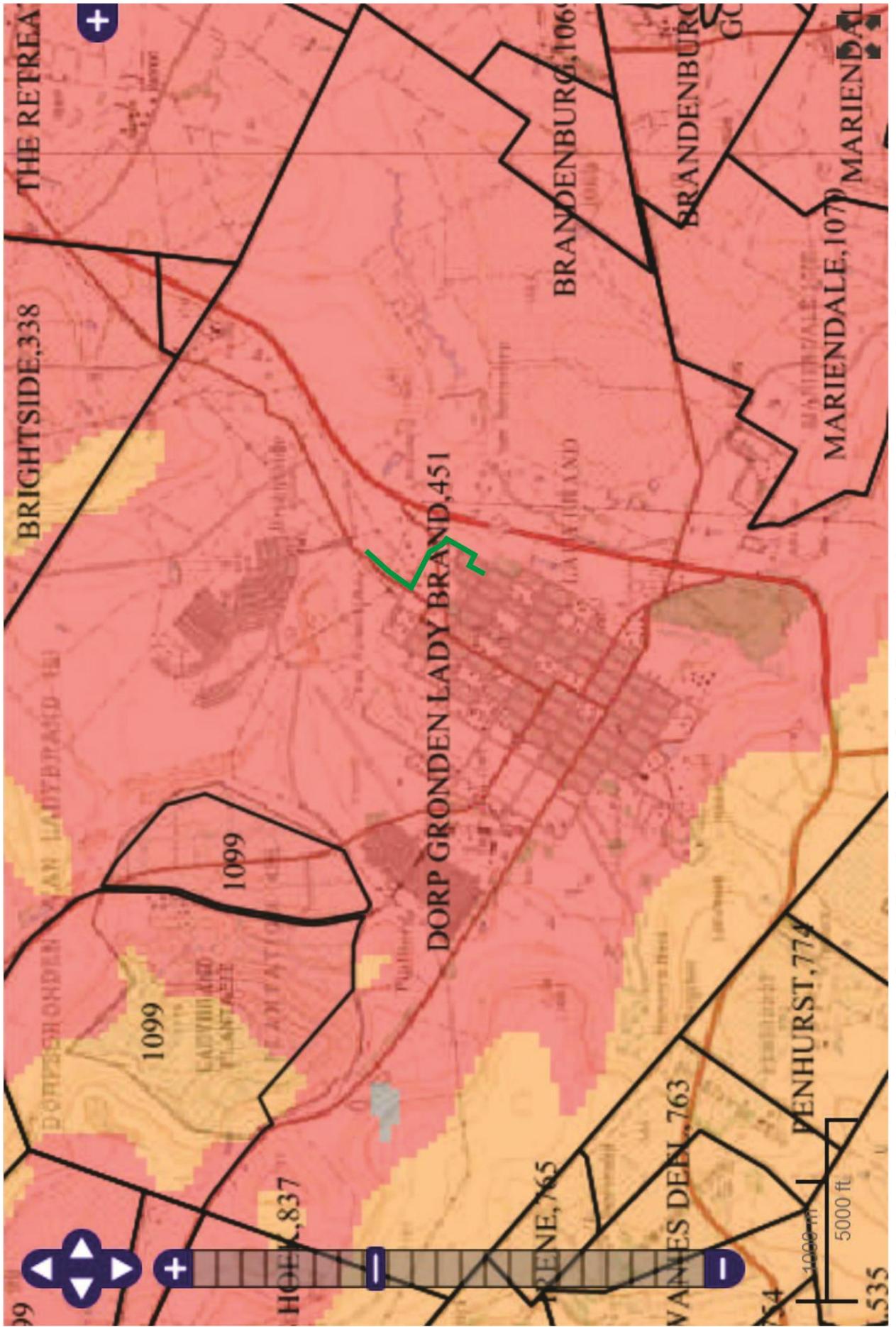


Figure 5. Aerial view of study area (green line) with SAHRIS palaeosensitivity map overlay (c. 2021)

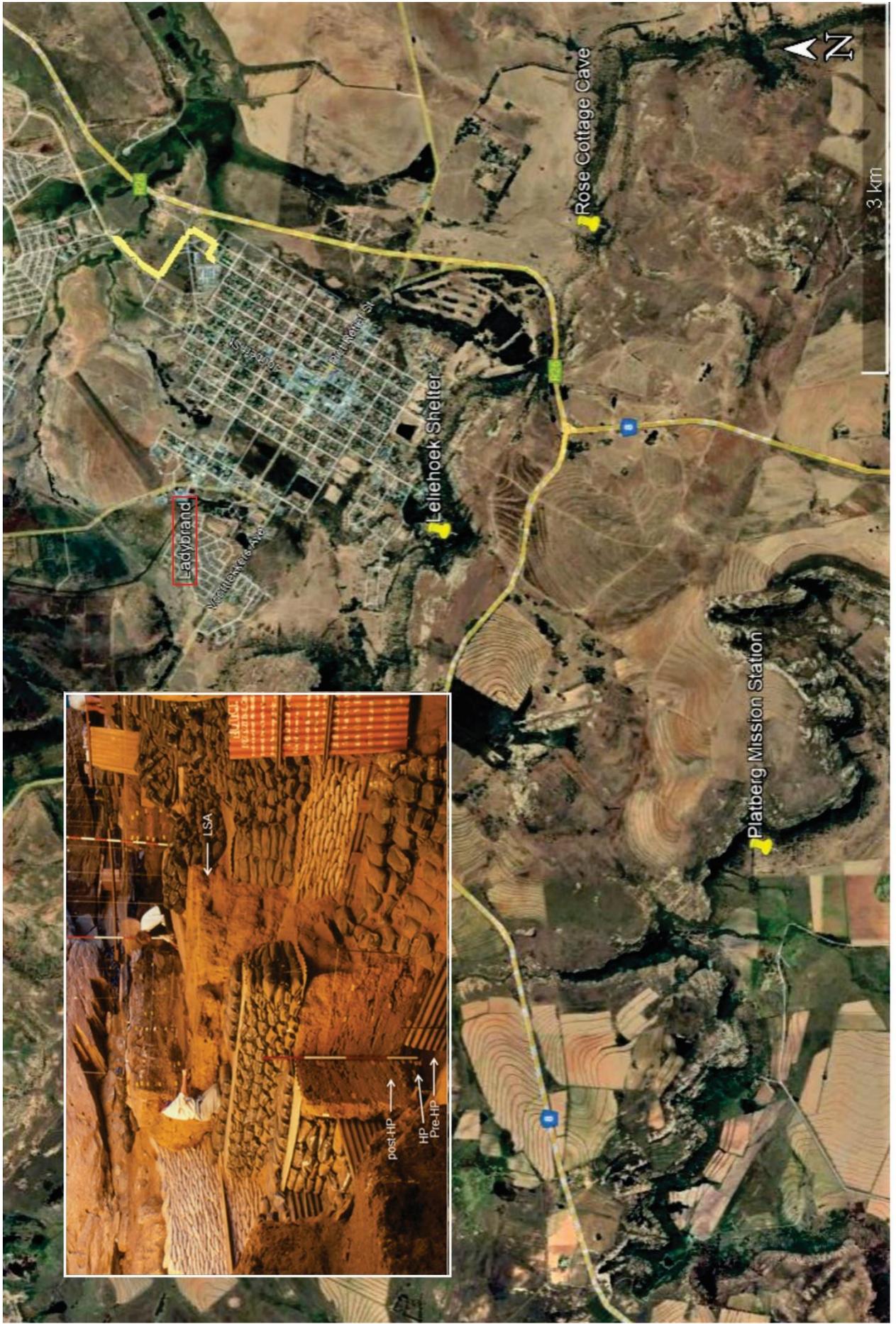


Figure 7. Position of Leleiehoek Shelter and Rose Cottage Cave archaeological sites relative to study area (yellow line). Excavations at RCC (inset).

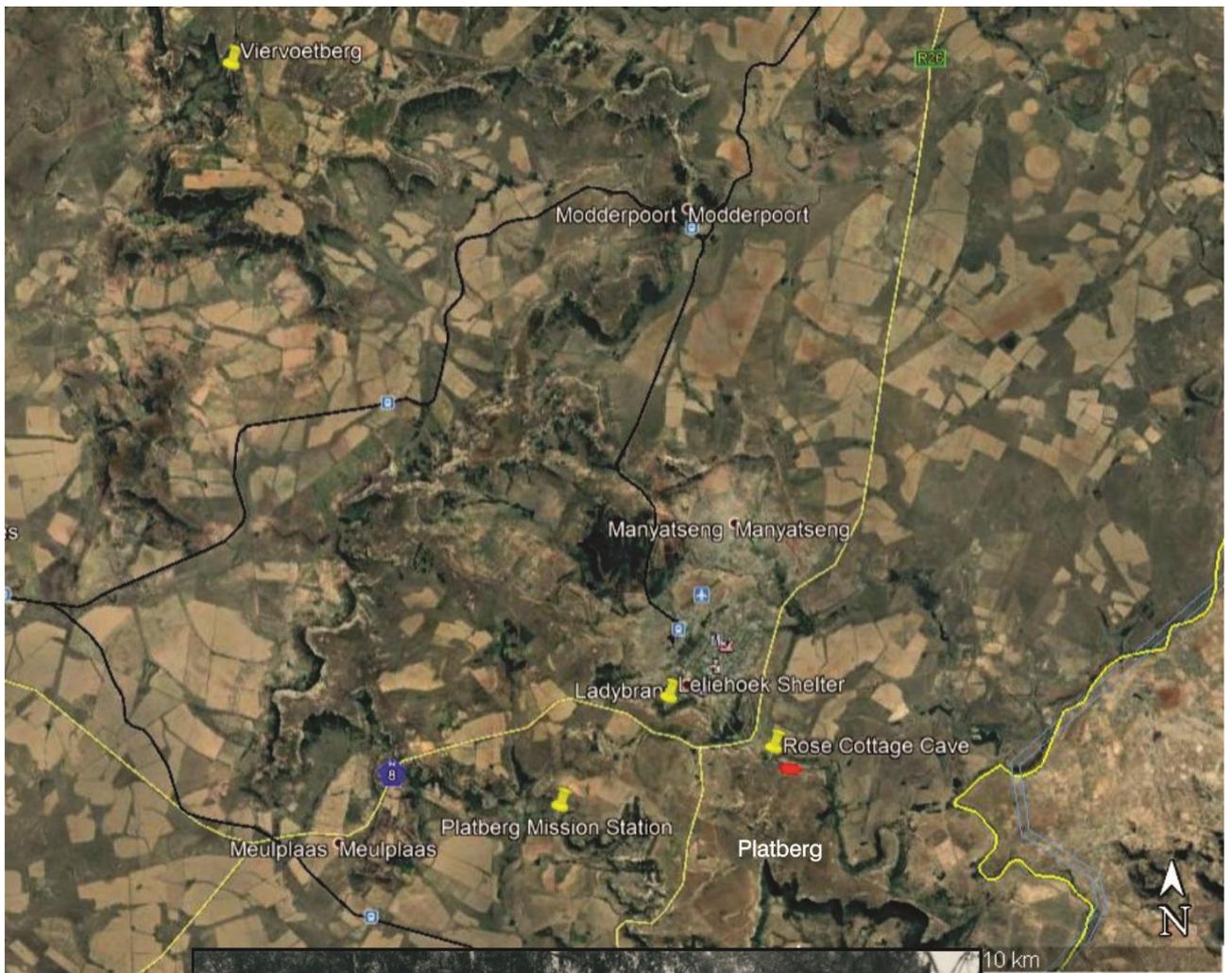


Figure 8. Archaeological and historical sites mentioned in text, including the site of a 19th century Wesleyan Missionary Society station. The photograph below depicts one of the last recorded South African kapstylhuise found at Platberg (after Walton 1981).

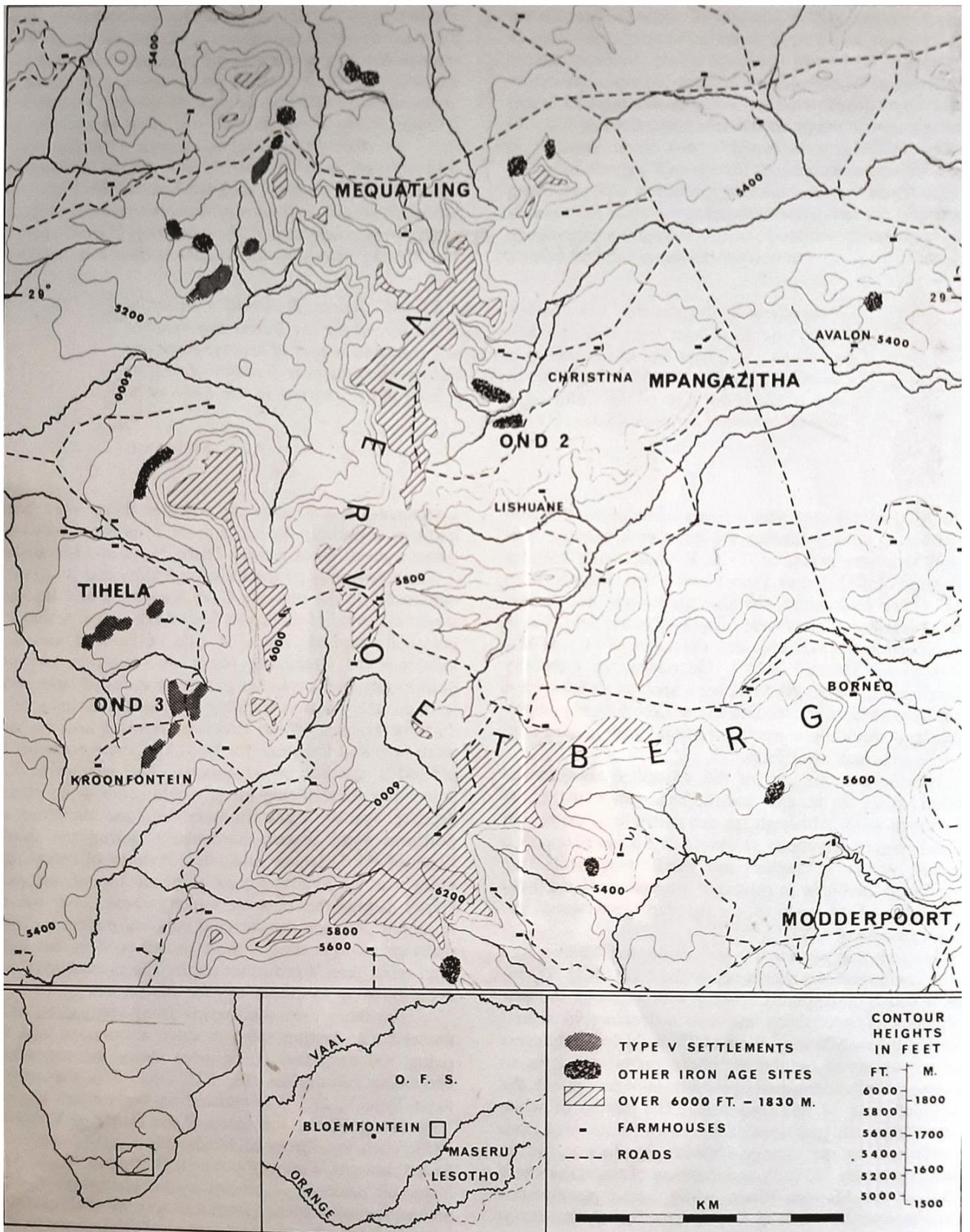


Figure 9. Map of LIA sites recoded around Viervoetberg north of Ladybrand (after Maggs 1976).

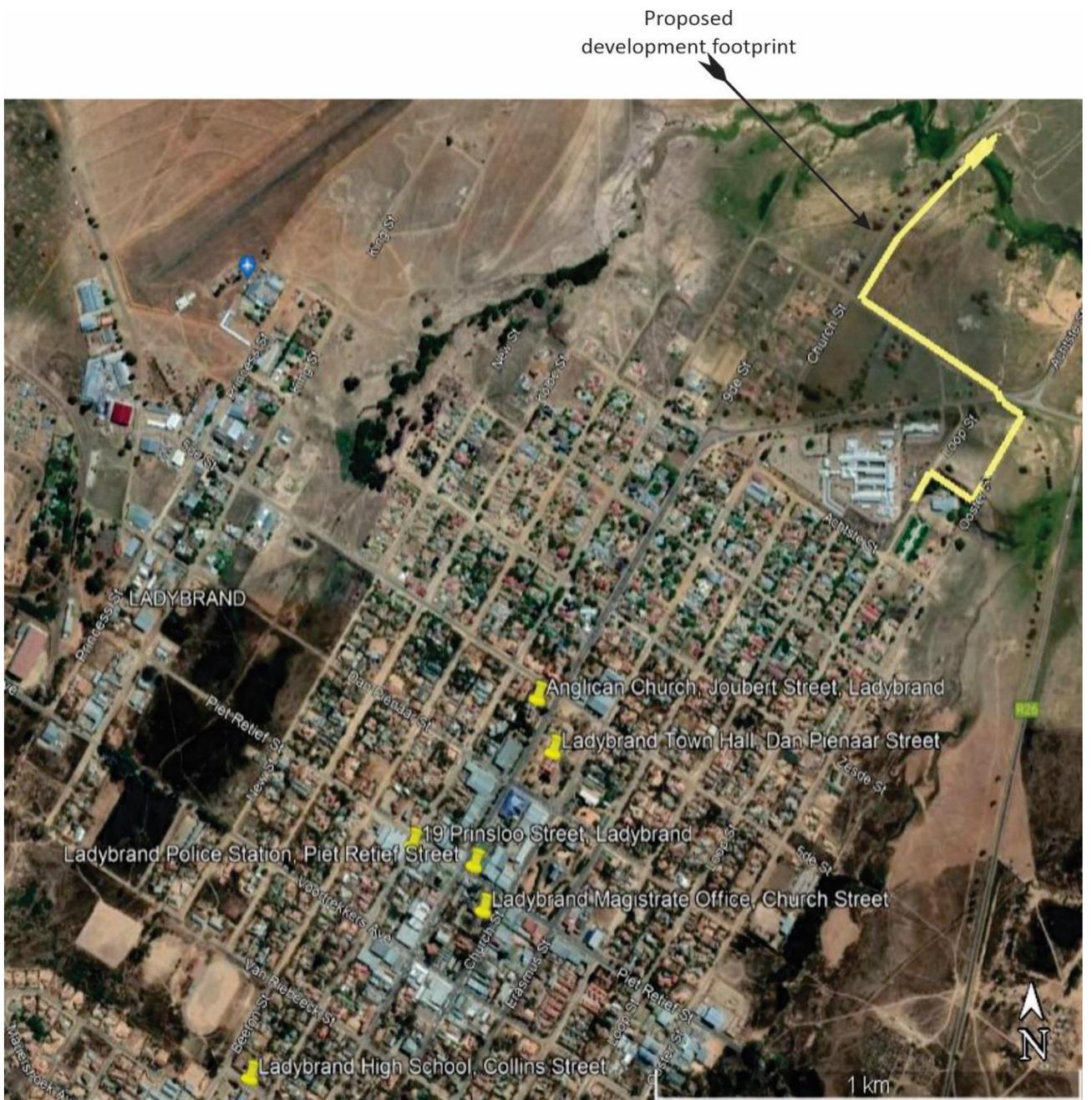


Figure 10. Historical buildings declared as heritage sites in Ladybrand.



Figure 11. General view of the terrain, from A - B looking north (above left), B-C looking east (above right), C-D looking north (below left) and D-F looking east-southeast (below right).



Figure 12. General view of the terrain, from F-G, looking north-northeast (left & center) and south-southwest (right).

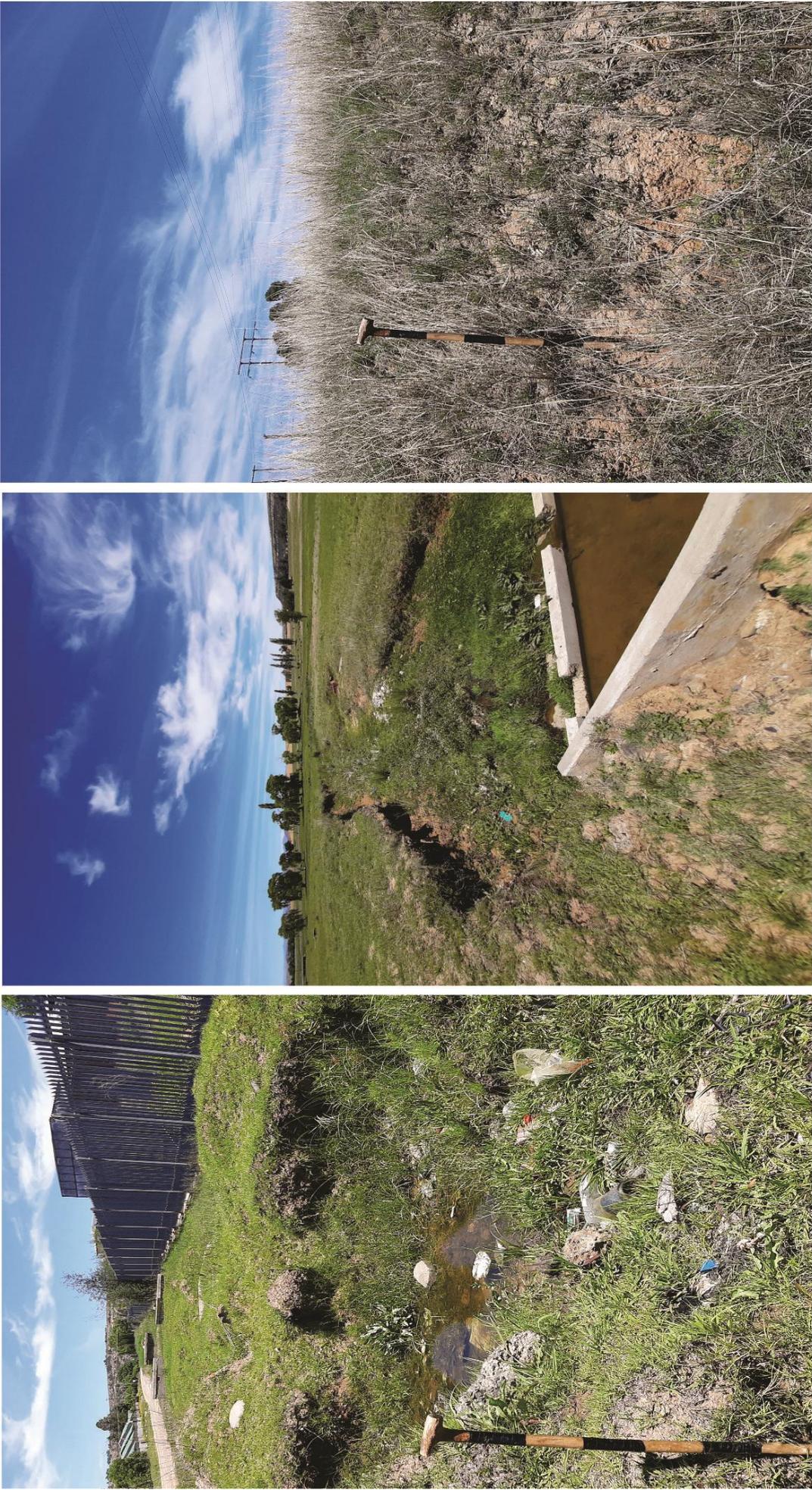


Figure 13. The footprint is mantled by a well-developed residual soil and alluvial overburden.
Scale 1 = 10 cm.