FIRST PHASE CULTURAL HERITAGE IMPACT ASSESSMENT OF THE PROPOSED CONSTRUCTION OF A SINGLE LANE LOW-LEVEL VEHICLE RIVER BRIDGE AT THE CROSSING POINT BETWEEN THE CWEMBE RIVER AND THE LOCAL ROAD L1292, ALFRED DUMA LOCAL MUNICIPALITY, KWAZULU-NATAL.

For: Hanslab (Pty) Ltd

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TABLE OF CONTENTS

LIST OF TABLES

Declaration of Consultants independence

Frans Prins is an independent consultant to Hanslab (PTY) Ltd and has no business, financial, personal or other interest in the activity, application or appeal in respect of which he was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances whatsoever that compromise the objectivity of this specialist performing such work.

Frans Prins

LIST OF ABBREVIATIONS AND ACRONYMS

EIA	Early Iron Age
ESA	Early Stone Age
HISTORIC PERIOD	Since the arrival of the white settlers - c. AD 1836 in this part of the country
IRON AGE	Early Iron Age AD 200 - AD 1000 Late Iron Age AD 1000 - AD 1830
LIA	Late Iron Age
LSA	Late Stone Age
MSA	Middle Stone Age
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998 and associated regulations (2006).
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999) and associated regulations (2000)
SAHRA	South African Heritage Resources Agency
STONE AGE	Early Stone Age 2 000 000 - 250 000 BP Middle Stone Age 250 000 - 25 000 BP Late Stone Age 30 000 - until c. AD 200

EXECUTIVE SUMMARY

A phase one heritage survey of the proposed construction of a single lane low-level vehicle river bridge at the crossing point between the Cwembe River and the local road L1292, Alfred Duma Local Municipality, KwaZulu-Natal identified no heritage sites on or near the footprint. There is no reason from a heritage perspective why the development may not proceed as planned. The area is also not part of any known cultural landscape. The Paleontological desktop study reports that no significant fossils are expected due to the fact that the nearest outcrops of fossiliferous bedrock are a considerable distance from the proposed bridge. Furthermore the site crosses over a riverbed where there is a continual weathering process via the action of the channel deposits actively rolling, tumbling and scouring the bedrock. This on-going process would mean that fossils in the river bed would generally be out of context or damaged due to the action of the water. However, attention is drawn to the South African National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and the KwaZulu-Natal Heritage Act (Act No. 4 of 2008) which requires that operations that expose paleontological, archaeological and historical remains should cease immediately, pending evaluation by the provincial heritage agency.

1 BACKGROUND INFORMATION ON THE PROJECT

The consultant was approached by Hanslab (Pty) Ltd to conduct a heritage impact assessment (HIA) of the proposed construction of a single lane low-level vehicle river bridge between the crossing point of the Cwembe River and the local road L1292, Alfred Duma Municipality. According to the National Heritage Resources Act, 1999 (NHRA) (Act No. 25 of 1999), the heritage resources of South Africa include:

a. places, buildings, structures and equipment of cultural significance;
b. places to which oral traditions are attached or which are associated with living heritage;
c. historical settlements and townscapes;
d. landscapes and natural features of cultural significance;
e. geological sites of scientific or cultural importance;
f. archaeological and palaeontological sites;
g. graves and burial grounds, including-
i. ancestral graves;
ii. royal graves and graves of traditional leaders;
iii. graves of victims of conflict;
iv. graves of individuals designated by the Minister by notice in the Gazette;

v. historical graves and cemeteries; and
vi. other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);
h. sites of significance relating to the history of slavery in South Africa;
i. movable objects, including-
i. objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
ii. objects to which oral traditions are attached or which are associated with living heritage;
iii. ethnographic art and objects;
iv. military objects;
v. objects of decorative or fine art;
vi. objects of scientific or technological interest; and
vii. books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

The newly promulgated KwaZulu-Natal Heritage Act (Act No. 4 of 2008) also makes specific mention to rock art and archaeological sites.

It is furthermore stated that:

(1) No person may destroy, damage, excavate, alter, write or draw upon, or otherwise disturb any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the KwaZulu-Natal Heritage Council.
(2) Upon discovery of archaeological or palaeontological material or a meteorite by any person, all activity or operations in the general vicinity of such material or meteorite must cease forthwith and a person who made the discovery must submit a written report to the Council without delay.
(3) The Council may, after consultation with an owner or controlling authority, by way of written notice served on the owner or controlling authority, prohibit any activity considered by the Council to be inappropriate within 50 metres of a rock art site.
(4) No person may exhume, remove from its original position or otherwise disturb, damage, destroy, own or collect any object or material associated with any battlefield site,

archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site without the prior written approval of the Council having been obtained on written application to the Council.

(5) No person may bring any equipment which assists in the detection of metals and archaeological and palaeontological objects and material, or excavation equipment onto any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, or meteorite impact site, or use similar detection or excavation equipment for the recovery of meteorites, without the prior written approval of the Council having been obtained on written application to the Council.

(6) (*a*) The ownership of any object or material associated with any battlefield site, archaeological site, rock art site, palaeontological site, historic fortification, meteorite or meteorite impact site, on discovery, vest in the Provincial Government and the Council is regarded as the custodian on behalf of the Provincial Government.

(*b*) The Council may establish and maintain a provincial repository or repositories for the safekeeping or display of—

(i)

archaeological objects;

(ii)

palaeontological material;

(iii)

ecofacts;

(iv)

objects related to battlefield sites;

(v)

material cultural artefacts; or

(vi)

meteorites.

(7) The Council may, subject to such conditions as the Council may determine, loan any object or material referred to in subsection (6) to a national or provincial museum or institution.

(8) No person may, without the prior written approval of the Council having been obtained on written application to the Council, trade in, export or attempt to export from the Province—

(*a*)

any category of archaeological object;

(*b*)
any palaeontological material;
(*c*)
any ecofact;
(*d*)
any object which may reasonably be regarded as having been recovered from a battlefield site;
(*e*)
any material cultural artefact; or
(*f*) any meteorite.
(9) (*a*) A person or institution in possession of an object or material referred to in paragraphs (*a*) – (*f*) of subsection (8), must submit full particulars of such object or material, including such information as may be prescribed, to the Council.
(*b*) An object or material referred to in paragraph (*a*) must, subject to paragraph (*c*) and the directives of the Council, remain under the control of the person or institution submitting the particulars thereof.
(*c*) The ownership of any object or material referred to in paragraph (*a*) vest in the Provincial Government and the Council is regarded as the custodian on behalf of the Provincial Government.

This study aims to identify and assess the significance of any heritage and archaeological resources occurring on the site. Based on the significance, the impact of the development on the heritage resources would be determined. Then appropriate actions to reduce the impact on the heritage resources would be put forward. In terms of the NHRA, a place or object is to be considered part of the national estate if it has cultural significance or other special value because of:

a. its importance in the community, or pattern of South Africa's history;
b. its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
c. its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
d. its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;

e. its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;

f. its importance in demonstrating a high degree of creative or technical achievement at a particular period;

g. its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;

h. its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and

i. sites of significance relating to the history of slavery in South Africa.

Table 1. Background information

Consultants:	Active Heritage cc for Hanslab (Pty) Ltd
Type of development:	The KZN Department of Transport (Applicant) proposes to construct a single lane low-level vehicle river bridge at the crossing point between the Cwembe River and the Local Road L1292, within the Alfred Duma Local Municipality, KwaZulu-Natal. The design specifications for the proposed structure include: a vehicle lane (minimum of 4.15m wide) lined with standard bollards as barriers, and the pedestrian walkway, the total width of the bridge **= 5.8m**, total length is **= 30m**, the height (to the underside of the deck from the river bed) approximately **= 2.73m, 3 no. piers 0.6m wide, 2 abutments, 4 no. spans of 9m** each to give an opening width of **6.68m,** deck is raised **3.38m** above the river bed and will accommodate a 1:10 year flood event, and the proposed structure will be doweled **1500mm into the rock layer**. The proposed project triggers ***listed activities of the EIA Regulations of 2014, specifically Activity 12 & 19,*** and forms the focus of this application.
Rezoning or subdivision:	Rezoning
Terms of reference	To carry out a Heritage Impact Assessment
Legislative requirements:	The Heritage Impact Assessment was carried out in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and following the requirements of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and the KwaZulu Natal Heritage Act (Act No. 4 of 2008)

1.1. Details of the area surveyed:

The bridge construction will take place in the Matiwane area to the immediate north of Ladysmith under the Alfred Duma Local Municipality (Figs 1 & 2). The footprint is situated approximately 10km to the west of the N11. The GPS coordinates for the proposed bridge are:

Abutment 1: 28°21'2.65"S 29°52'4.07"E
Abutment 2: 28°21'1.49"S 29°52'3.89"E

The design specifications for the proposed structure include: a vehicle lane (minimum of 4.15m wide) lined with standard bollards as barriers, and the pedestrian walkway, the total width of the bridge = 5.8m, total length is = 30m, the height (to the underside of the deck from the river bed) approximately = 2.73m, 3 no. piers 0.6m wide, 2 abutments, 4 no. spans of 9m each to give an opening width of 6.68m, deck is raised 3.38m above the river bed and will accommodate a 1:10 year flood event, and the proposed structure will be doweled 1500mm into the rock layer. The proposed project triggers listed activities of the EIA Regulations of 2014, specifically Activity 12 & 19, and forms the focus of this application.

2 BACKGROUND TO ARCHAEOLOGICAL HISTORY OF AREA

Portions of the Alfred Duma Local Municipality has been systematically surveyed for archaeological heritage sites in the past. These were mostly conducted by archaeologists attached to the KwaZulu-Natal Museum as well as by Amafa staff. Sixty one sites are recorded in the data base of the KwaZulu-Natal Museum. These include five Early Stone Age sites, five Middle Stone Age sites, six Later Stone Age sites, three rock art sites (two rock paintings and one rock engraving), and eleven Later Iron Age sites and twenty historical period Nguni homesteads. The majority of the Later Iron Age and historical period Nguni homesteads are demarcated by characteristic stone walling. Stone walling and graves related to the Anglo-Boer War period of 1899-1901 are also abundant in the area. Ten sites are recorded in the KwaZulu-Natal Museum data base but many more sites belonging to this period should occur in the greater Ladysmith area. The project area

has not been systematically surveyed in the past and no heritage sites are known from the footprint. However, various Later Iron Age sites occur approximately 10km to the north east of the project area. The closest known archaeological site to the project area is a rock art site that occurs in a sandstone shelter approximately 5km to the west of the footpritn (Fig 2).

The San were the owners of the land for almost 30 000 years but the local demography started to change soon after 2000 years ago when the first Bantu-speaking farmers crossed the Limpopo River and arrived in South Africa. Around 800 years ago, if not earlier, Bantu-speaking farmers also settled in the greater Ladysmith area. Although some of the sites constructed by these African farmers consisted of stone walling not all of them were made from stone. Sites located elsewhere in the KwaZulu-Natal Midlands show that many settlements just consisted of wattle and daub structures. These Later Iron Age sites were most probably inhabited by Nguni-speaking groups such as the amaBhele and others (Bryant 1965). However, by 1820 the original African farmers were dispersed from this area due to the expansionistic policies of the Zulu Kingdom of King Shaka. Many individuals of former chiefdoms in the area became bandits and oral tradition suggests that cannibalism may also have been practised by some of these groups. African refugee groups and individuals were given permission to settle in the area by the British colonial authorities after 1845 where most of them became farm labourers. After the Anglo-Zulu war of 1879 and the Bambatha Rebellion of 1911 many of the African people in the study area adopted a Zulu ethnic identity.

European settlement of the area started soon after 1838 when the first Voortrekker settlers marked out large farms in the area. However, most of these farms were abandoned in the 1840's when Natal became a British colony only to be reoccupied again by British immigrants. Nevertheless, a group of Dutch farmers declared an independent republic in 1847 on the banks of the Klip River and called it the Klip River Republic with Andries Spies as commandant. This pocket republic only survived for a few months before British authority over the area was declared. The British planned a town as an administrative centre for the Klip River District, proclaiming it on 20 June 1850 and called it Ladysmith. Ladysmith became world famous during the Anglo-Boer War of 1899-1901 when it was besieged by Boers from 2 November 1899 until 28 February 1900. Ghandi, Smuts and Churchill are figures of international significance who were also present during the siege of Ladysmith. During the 118 day long siege the stone Town Hall sustained considerable

damage. It has since been restored to the original vision of the architects. Located next to the Town Hall the building housing the Siege Museum was erected in 1884. It was used as a rations post for civilians. The Museum displays relics from the time of the siege, including documents, uniforms and firearms. Several of the most celebrated battles of the war were fought around Ladysmith. These include the Battles of Elandslaagte, Spionkop, Wagon Hill, Caesars Camp, Lombards Kop and Umbulwana Hill. These battle field sites as well as associated graves and buildings of the era are proclaimed heritage sites and are protected by provincial heritage legislation (Derwent 2006).

2.1 Short History of the Siege of Ladysmith

As war with the Boer republics appeared likely in June 1899, the War Office in Britain dispatched a total of 15,000 troops to Natal, expecting that if war broke out they would be capable of defending the colony until reinforcements could be mobilized and sent to South Africa by steamship. Some of these troops were diverted while returning to Britain from India, others were sent from garrisons in the Mediterranean and elsewhere. Lieutenant General Sir George White was appointed to command this enlarged force. White was 64 years old and suffered from a leg injury incurred in a riding accident. Having served mainly in India, he had little previous experience of South Africa.

Contrary to the advice of several British officials such as Sir Alfred Milner, the High Commissioner for Southern Africa, the Boer governments were not over-awed by the despatch of British troops to Natal. Instead, they regarded it as evidence of Britain's determination to seize control of the Boer republics. The Transvaal government under President Paul Kruger considered launching an attack in September, but President Steyn of the Orange Free State, who would later become the spiritual heart of the Boer resistance, dissuaded them for several weeks while he tried to act as intermediary. With the complete breakdown in negotiations, both republics declared war and attacked on 12 October.

A total of 21,000 Boers advanced into Natal from all sides. White had been advised to deploy his force far back, well clear of the area of northern Natal known as the "Natal Triangle", a wedge of land lying between the two Boer republics. Instead, White deployed

his forces around the garrison town of Ladysmith, with a detachment even further forward at Dundee. The entire British force could concentrate only after fighting two battles at Talana Hill and Elandslaagte. As the Boers surrounded Ladysmith, White ordered a sortie by his entire force to capture the Boer artillery. The result was the disastrous Battle of Ladysmith, in which the British were driven back into the town having lost 1,200 men killed, wounded or captured.

The Boers then proceeded to surround Ladysmith and cut the railway link to Durban. Major General French and his Chief of Staff, Major Douglas Haig escaped on the last train to leave, which was riddled with bullets. The town was then besieged for 118 days. White knew that large reinforcements were arriving, and could communicate with British units south of the Tugela River by searchlight and heliograph. He expected relief soon. Meanwhile, his troops carried out several raids and sorties to sabotage Boer artillery.

Louis Botha commanded the Boer detachment which first raided Southern Natal, and then dug in north of the Tugela to hold off the relief force. On 15 December, the first relief attempt was defeated at the Battle of Colenso. Temporarily unnerved, the relief force commander, General Redvers Henry Buller, suggested that White either break out or destroy his stores and ammunition and surrender. White could not break out because his horses and draught animals were weak from lack of grazing and forage, but also refused to surrender.

On Christmas Day 1899, the Boers fired into Ladysmith a carrier shell without fuse, which contained a Christmas pudding, two Union Flags and the message "compliments of the season". The shell is still kept in the museum at Ladysmith. A drive around Ladysmith and the surrounding hills will reveal many gravesites and memorials to the fallen soldiers on both sides (Lewis 1999).

3 BACKGROUND INFORMATION OF THE SURVEY

3.1 Methodology

A desktop study was conducted of the SAHRA inventory of heritage sites as reflected on the SAHRIS website. Various CRM related studies have been conducted in the Alfred Duma Municipality. Most of these were conducted in and around Ladysmith to the south of the project area. No surveys have previously been done in the project area. In addition, the archaeological database of the KwaZulu-Natal Museum was consulted. The ground survey was supplemented by a desktop paleontological survey reported in Appendix 1. Although the greater Ladysmith area is rich in paleontological, archaeological and historical sites none are listed for the footprint.

The study area was visited on the 25 January 2018. A ground survey following standard and accepted archaeological procedures was conducted. The total length of the proposed bridge and associated pedestrian walkway was walked by foot. A transect of 50m on either side of the centre of the proposed bridge was surveyed. The consultant also spoke to local residents of the greater project area. None were aware of any graves or other heritage features on the footprint.

3.2 Restrictions encountered during the survey

3.2.1 Visibility

Visibility during the site visit was good.

3.2.2 Disturbance.

No disturbance of any heritage sites have been observed.

3.3 Details of equipment used in the survey

GPS: Garmin Etrek
Digital cameras: Canon Powershot A460
All readings were taken using the GPS. Accuracy was to a level of 5 m.

4 DESCRIPTION OF SITES AND MATERIAL OBSERVED

4.1 Locational data

Province: KwaZulu-Natal
Town: Ladysmith
Municipality: Alfred Duma Local Municipality

4.2 Description of the general area surveyed

Although the greater Ladysmith area is rich in archaeological and other heritage sites none were recorded on the actual footprint. Historical period sites relating to the Voortrekker era (1830's), Anglo-Zulu War (1879) and the Anglo-Boer War period of 1899-1901 do occur abundantly in the greater Ladysmith area but none of those listed on national and provincial data bases occur less than 10km from the footprint (Fig 2). A desktop survey of the greater area identified stone walling and potential Later Iron Age sites (Appendix 1). However, none of these sites are situated closer than 1km to the proposed Bridge crossing. Particular care was taken to locate grave sites but none were observed (Fig 6). The proposed bridge is also not part of any known cultural landscape (Table 2). The Paleontological desktop study reports that no significant fossils are expected due to the fact that the nearest outcrops of fossiliferous bedrock are a considerable distance from the proposed bridge. Furthermore the site crosses over a riverbed where there is a continual weathering process via the action of the channel deposits actively rolling, tumbling and scouring the bedrock. This on-going process would mean that fossils in the river bed would generally be out of context or damaged due to the action of the water (Appendix 1).

Table 2. Evaluation and statement of significance.

Significance criteria in terms of Section 3(3) of the NHRA		
	Significance	**Rating**
1.	**Historic and political significance -** The importance of the cultural heritage in the community or pattern of South Africa's history.	None on footprint but greater area contains many sites
2.	**Scientific significance** – Possession of uncommon, rare or endangered aspects of South Africa's cultural heritage.	None.
3.	**Research/scientific significance** – Potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.	None.
4.	**Scientific significance** – Importance in demonstrating the principal characteristics of a particular class of South Africa's cultural places/objects.	None.
5.	**Aesthetic significance** – Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.	None.
6.	**Scientific significance** – Importance in demonstrating a high degree of creative or technical achievement at a particular period.	None.
7.	**Social significance** – Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons.	None.
8.	**Historic significance** – Strong or special association with the life and work of a person, group or organization of importance in the history of South Africa.	None.
9.	The significance of the site relating to the history of slavery in South Africa.	None.

4.3 Dating the findings

Not applicable, as no heritage sites occur on the footprint.

5 STATEMENT OF SIGNIFICANCE (HERITAGE VALUE)

5.1 Field Rating

The SAHRA system of field rating (Table 3) does not apply in this study as no heritage sites occur on the footprint.

Table 3. Field rating and recommended grading of sites (SAHRA 2005)

Level	Details	Action
National (Grade I)	The site is considered to be of National Significance	Nominated to be declared by SAHRA
Provincial (Grade II)	This site is considered to be of Provincial significance	Nominated to be declared by Provincial Heritage Authority
Local Grade IIIA	This site is considered to be of HIGH significance locally	The site should be retained as a heritage site
Local Grade IIIB	This site is considered to be of HIGH significance locally	The site should be mitigated, and part retained as a heritage site
Generally Protected A	High to medium significance	Mitigation necessary before destruction
Generally Protected B	Medium significance	The site needs to be recorded before destruction
Generally Protected C	Low significance	No further recording is required before destruction

6 RECOMMENDATIONS

The proposed construction of the single lane low-level vehicle river bridge may proceed from a heritage perspective as no heritage sites (including potential fossil occurrences) are threatened by the proposed development. The footprint is also not part of any known cultural landscape. It should, however, be pointed out that the KwaZulu-Natal Heritage Act requires that operations exposing paleontological, archaeological and historical residues should cease immediately pending an evaluation by the heritage authorities.

7 MAPS AND PHOTOGRAPS

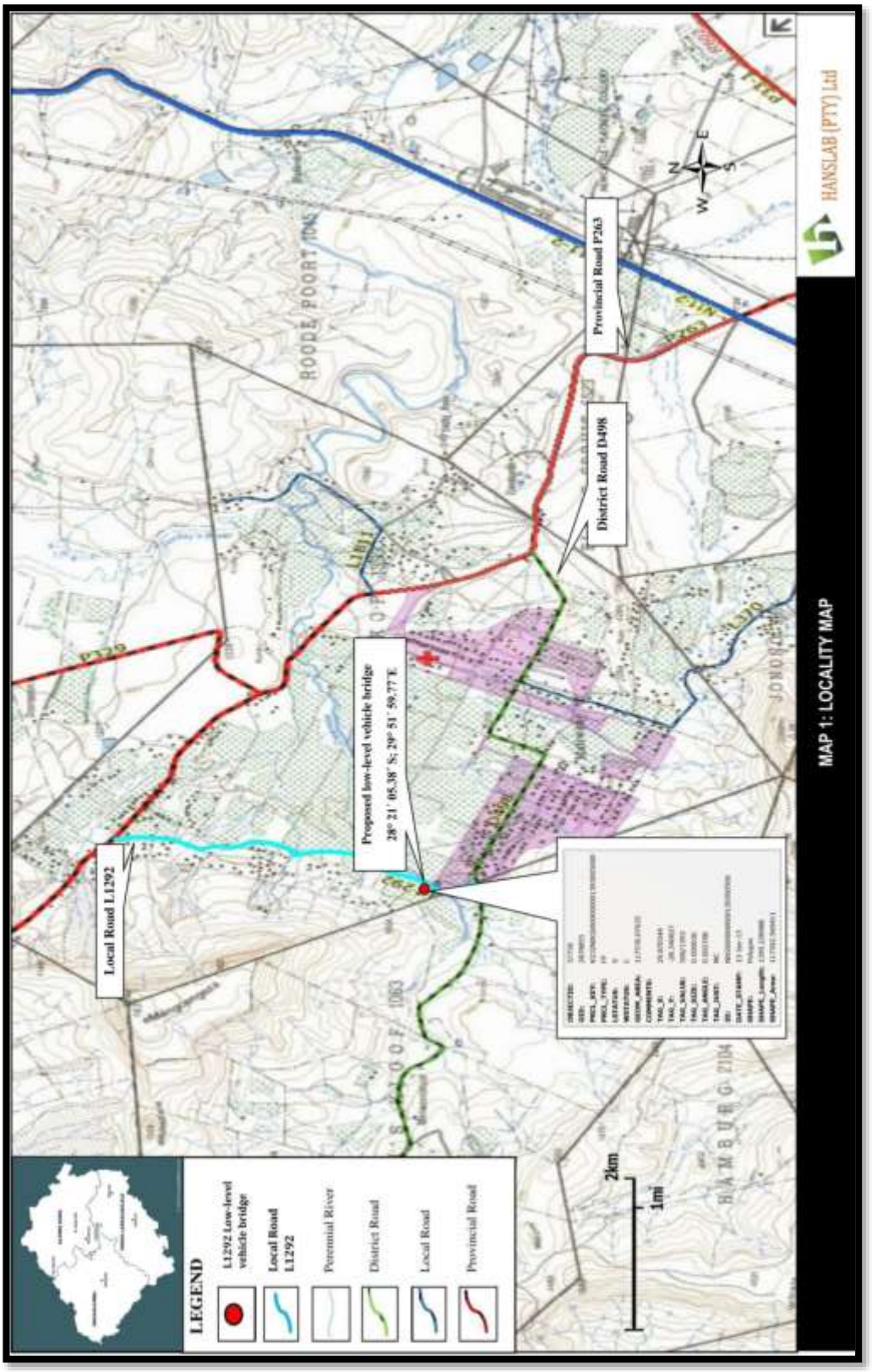

Figure 1. Locality Map of the Project Area (Source: Hanslab).

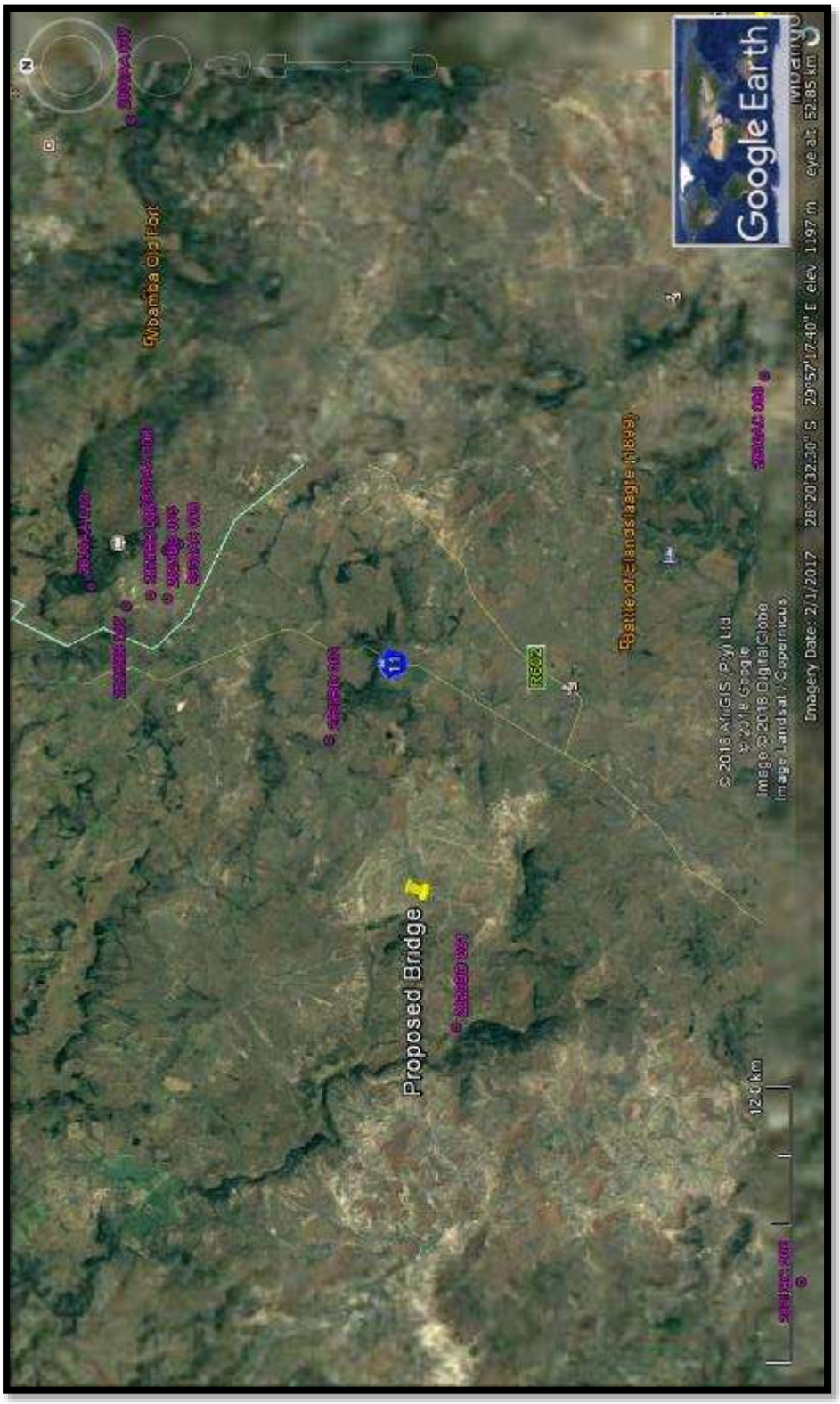

Figure 3. Distribution of known archaeological sites (purple polygons) in the greater project area. The orange polygons indicate known historical period sites.

Figure 4. View of the L1292 leading to the proposed bridge site.

Figure 5. The proposed river crossing point. No heritage sites or graves occur in this area.

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APPENDIX 1

Desktop Palaeontological Impact Assessment for the proposed construction of a low-level vehicular bridge over the Cwembe River on the L1292 road within the Alfred Duma Local Municipality, KwaZulu-Natal

Conducted by Gary Trower (MSc in Environmental Management, UFS)

For: Active Heritage CC

28 January 2018

Contents

Figures

1. Introduction

In terms of the National Environmental Management Act 107 of 1998, Section 38 (8) of the National Heritage Resources Act 25 of 1999, and the KwaZulu-Natal Heritage Act 4 of 2008, all aspects of cultural heritage are protected and proposed developments that are likely to impact on heritage resources (i.e. historical, archaeological, palaeontological & cosmological) require a desktop and/or field assessment in order to ensure that such resources are not damaged or destroyed in the process.

The KZN Department of Transport proposes to build a single lane, low level vehicle bridge with a pedestrian crossing traversing the Cwembe River in an area situated approximately 25 kilometres north-east of Ladysmith within the Alfred Duma Local Municipality, Kwa-Zulu Natal. The whole structure will measure 5.8 metres wide and 30 metres long. There will be some disturbance of the bedrock in that the structure will be doweled 1.5 metres into the underlying rock layer to anchor it in position. Furthermore, as per Activity 19 of the site investigation report, damage may occur to any potential palaeontological and archaeological material present at the site. This is due to the fact that the geology of the region is highly fossiliferous and several archaeological sites are present within the broader landscape (Figure 1), therefore a desktop study was required to ascertain the probability of encountering fossil specimens within geological units underlying the pathway of the proposed development.

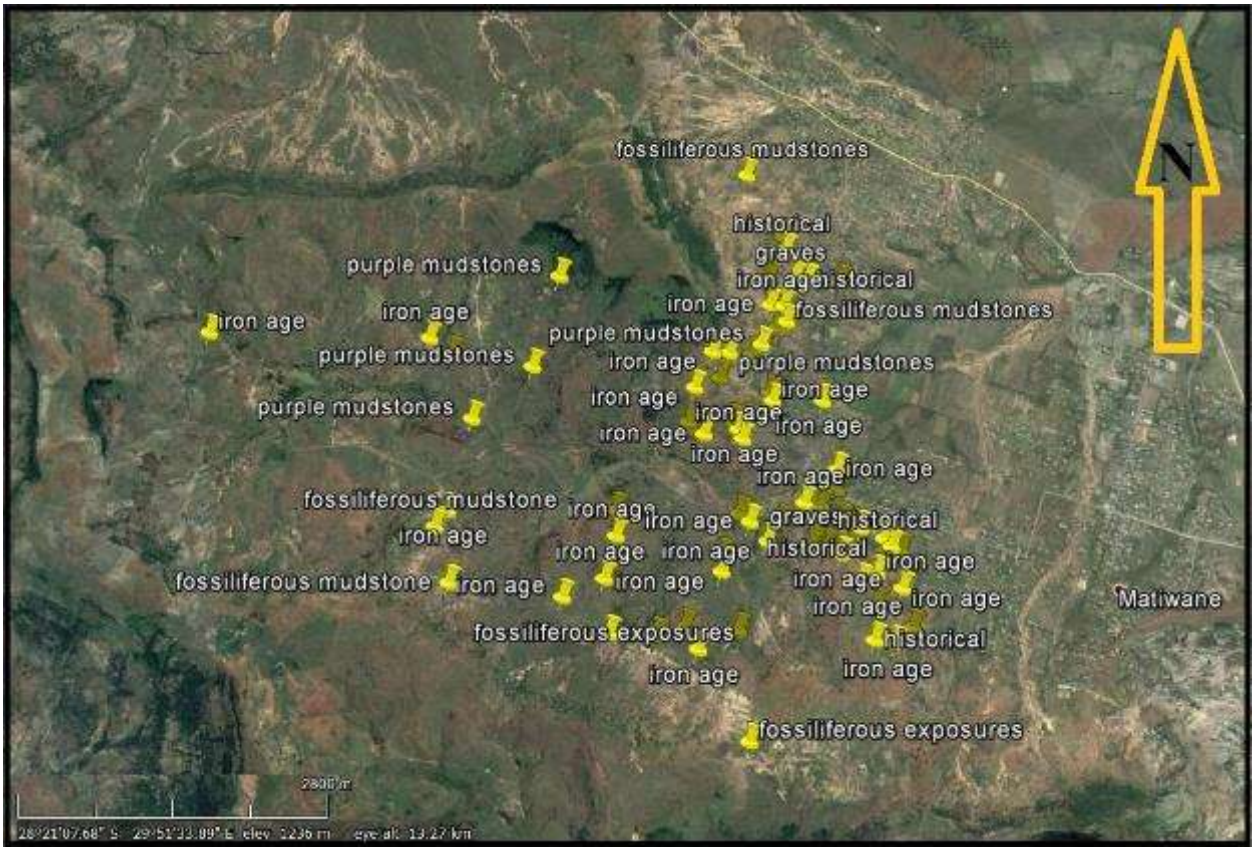

Figure 1: Satellite image showing the dense concentration of stone-walled features, graves and fossiliferous mudstones in the general landscape surrounding the site. Several of the stone-walled features likely represent Iron Age dwellings and kraals whereas others are historical in age. In spite of the density of sites, none of them occur near the proposed development so will be unaffected by it. The village of Matiwane is present on the right-hand side of the image, viewed from approximately 13km; North is at the top of the page (Modified Google Earth image, Digital Globe, 2018)

2. Geology

The geology in the vicinity of the site is dominated by late Permian argillaceous deposits of the Ecca and Beaufort Groups (Figure 2). The Ecca shales are representative of the Volksrust Formation and are blue-grey to dark-grey in colour. The Beaufort is represented by the Adelaide Subgroup and comprises of dark-grey shales which are carbonaceous in places, as well as grey mudstones, siltstone and sandstone. There are also several outcrops of dolerite in the region, representing Jurassic lava intrusions which gave rise to the dolerite

dykes in the landscape. Considerably younger alluvial deposits occur alongside many of the drainage lines within the valleys and are Quaternary in age (Figure 2).

The sediment package on the valley floor is predominantly comprised of alluvial deposits, and none of the potentially fossiliferous bedrock is directly exposed along the route leading up to the bridge. A water source such as the Cwembe River will naturally attract a lot of animal and human activity, therefore theoretically the alluvial deposits adjacent to the river (areas to the left and right of the bridge marked with **orange**, Figure 5) are likely to contain archaeological and palaeontological material.

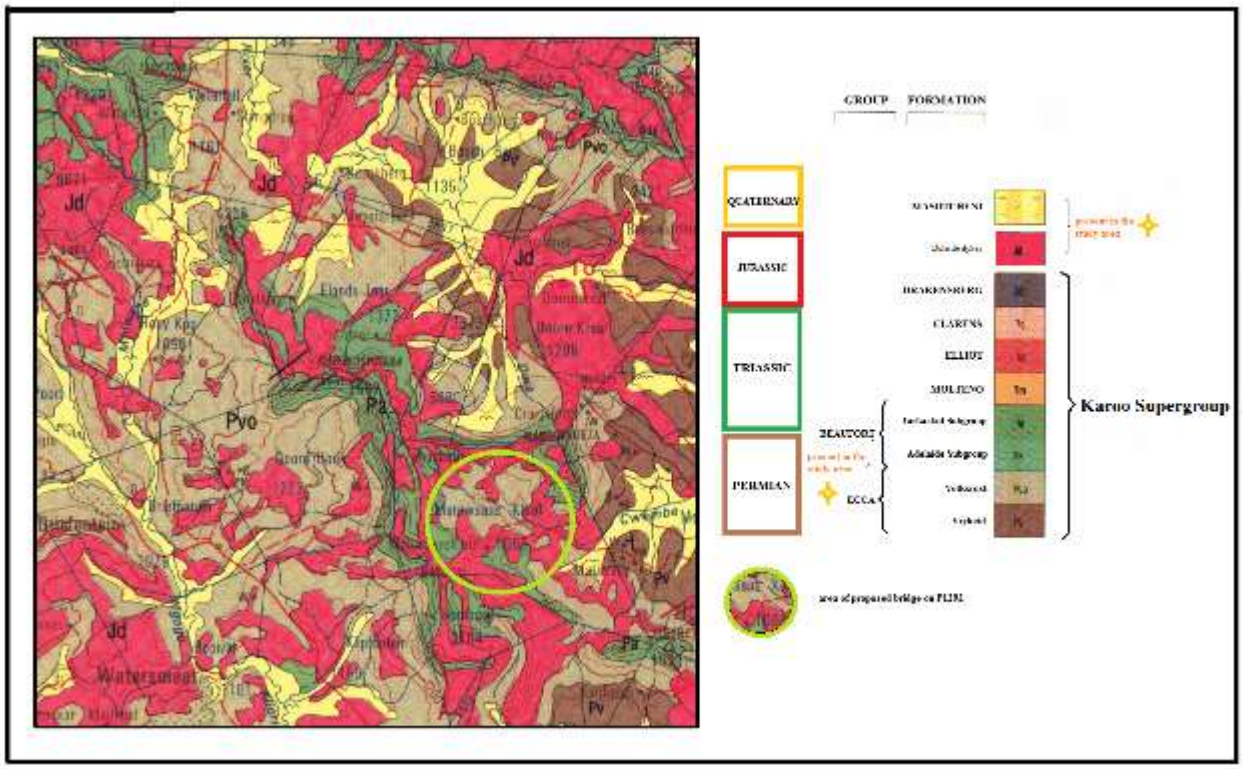

Figure 2: Geological map showing the lithology of the region where the proposed development will take place. Stratigraphic layers of palaeontological interest include Late Permian Ecca deposits comprising of blue-grey to dark-grey shale of the Volksrust Formation (**Pvo, light brown**) & predominantly argillaceous sediments (grey mudstone, dark-grey shale & siltstone) representing the Adelaide Subgroup of the Beaufort (**Pa, green**). Other common geological occurrences observed in the landscape include Jurassic intrusions giving rise to dolerite dykes (**Jd, pink**), as well as much younger Quaternary alluvial deposits (**yellow**). (Modified from 1:250 000 Geological Series 2828 Harrismith, Council for Geoscience 1998)

When looking at Figures 1-4, it is clear than fossiliferous outcrops do occur in the region, but these are mostly exposed along the mountain slopes. Valley floors often contain a mixture of top soil, alluvial and colluvial deposits, with the riverbed itself comprising of bedrock. When examining the location of the proposed development using the SAHRA (South African Heritage Resources Agency) SAHRIS PalaeoSensitivity Map (www.sahra.org.za/sahris/map/palaeo), the area is predominantly red with patches of grey. Grey is given a "zero" or "insignificant" sensitivity rating and does not require a palaeontological study, whereas red is the highest sensitivity rating for potential fossil occurrences palaeontological resources.

Such an assessment would generally require a ground survey, but due to the fact that the nearest outcrops of fossiliferous bedrock are a considerable distance from the proposed bridge (Figures 3 & 4), this is not necessary. Furthermore the site crosses over a riverbed where there is a continual weathering process via the action of the channel deposits actively rolling, tumbling and scouring the bedrock. This on-going process would mean that fossils in the river bed would generally be out of context or damaged due to the action of the water.

4. Archaeology

Figures 1, 3 & 4 give a clear indication of the density of stone-walled features in the surrounding landscape. The circular structures probably represent kraals and dwellings, and may date back to the Iron Age. Other circular, square and rectangular structures are probably more recent in age and represent historical dwellings. Two graveyards were noted during the desktop study (GPS coordinates S 28° 21' 32.30", E 29° 52' 11.25" and S 28° 20' 14.65", E 29° 51'58.7"), but these are located a considerable distance from the proposed bridge construction.

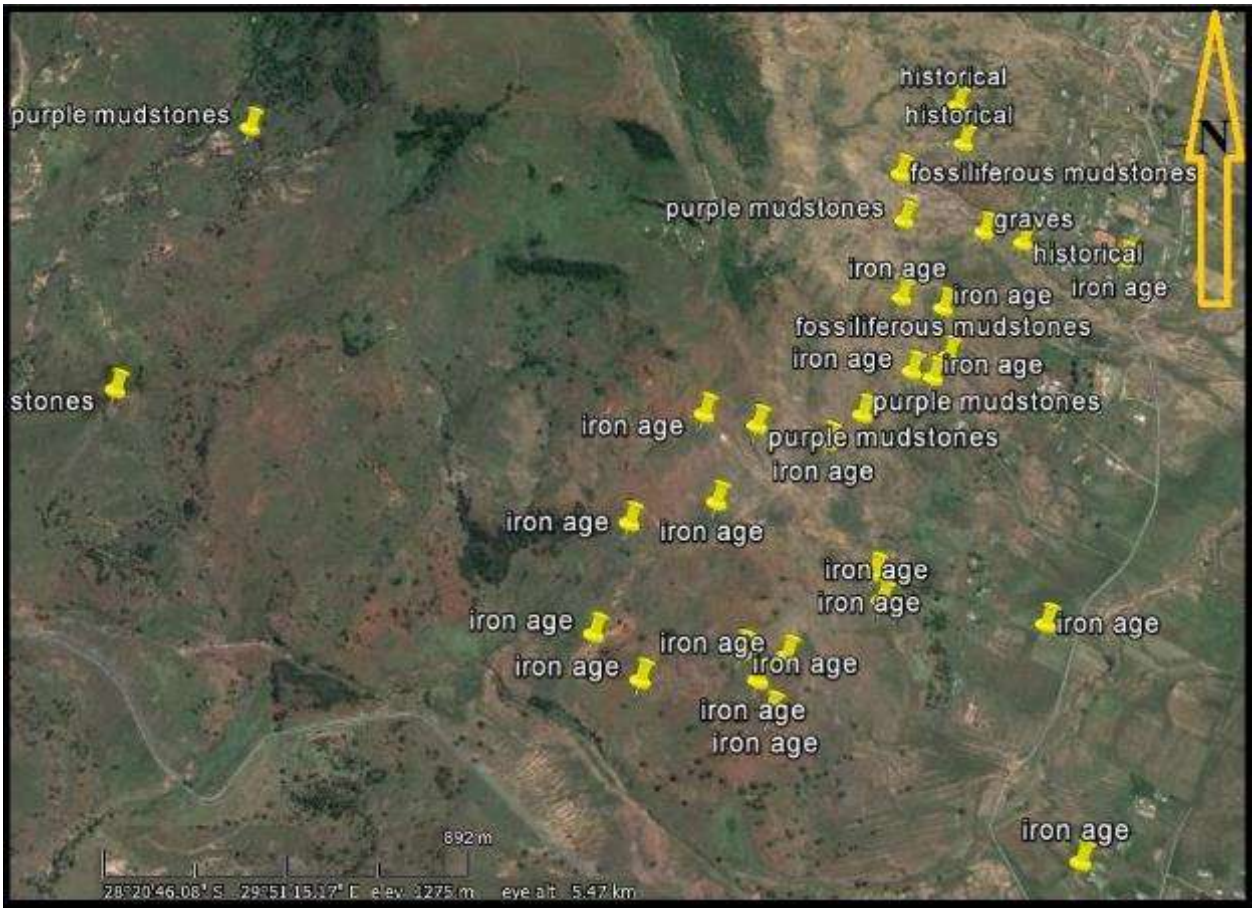

Figure 3: Satellite view showing mapped out aspects of heritage in the landscape surrounding the proposed site. Several stone-walled features are present, as well as graves and potentially fossiliferous mudstones. *Note the label "Iron Age" does not always denote that these features date back to the Iron Age as many of them may be historical dwellings and/or kraals. (Modified Google Earth image, Digital Globe, 2018)

Figure 4: Zoomed in view of archaeological sites and potentially fossiliferous mudstones in the near vicinity of the proposed bridge site (marked with a red star). As can be seen, none of these aspects of heritage are located close to the proposed vehicle bridge and will therefore be unaffected by it (Modified Google Earth image, Digital Globe, 2018)

Figure 5: Zoomed in view of the alluvial deposits to the left and right of the proposed bridge site. The orange zones are very likely to contain archaeological and/or palaeontological material and should be avoided. The >10 cubic metres of soil that is to be removed from the watercourse should be sourced from the area within the red circle as this represents old in-fill and highly disturbed material. In so doing, the potentially sensitive alluvial deposits highlighted in orange can remain intact. The lime green arrow represents bedrock; North is at the top of the page (Modified Google Earth image, Digital Globe, 2018)

5. Contingency plan for possible fossil discoveries

Due to the disturbed nature of the river bed from both natural and anthropogenic factors, the likelihood of finding fossil during the bridge construction is very improbable. The normal procedure for recovering palaeontological material would be to identify areas which are dense in fossils and whose recovery and preparation could address certain scientific questions. The process would then entail obtaining permission from the

landowner and applying to SAHRA (South African Heritage Resources Agency) to remove blocks of bedrock and prepare them with a pressured rock drill in the lab.

The probability of construction workers operating heavy earth moving equipment and working to a strict time schedule spotting fossils amongst tons of quarried riverbed material is unlikely. If by chance fossils were discovered, construction would need to cease immediately and a protocol should be followed whereby the relevant heritage custodians in KwaZulu-Natal (Natal Museum or Amafa) would need to be informed. Developers would also need to acquire the services of a palaeontologist to conduct a Phase 2 field assessment so that if anything relevant is discovered scientists could be given the opportunity to record and/or recover the specimens if they are ranked as significant and likely to make a positive contribution to the field of palaeontology.

6. Recommendations

The fact that an existing road is already present along the route of the proposed low level bridge indicates that the landscape has already been disturbed and modified during the construction of this feature. In addition, the riverbed comprises of heavily reworked deposits, with any heritage-related material which may be present being highly disturbed and out of context. If fossils were present they are likely to be scoured and/or damaged due to the weathering action of the water. Exposures of intact bedrock are situated close to the bridge (marked with a green arrow, Figure 5), but these represent dolerite intrusions and will therefore contain no fossil material.

Even though this area has a high rating for palaeo-sensitivity, the likelihood of encountering fossils is low as the nearest outcrops of potentially fossiliferous bedrock

occurs some distance away from the site. In Figures 3 & 4, outcrops of fossil bearing-mudstones have been marked in the surrounding landscape, but as can be seen occur hundreds of metres from the proposed bridge. The nearest stone-walled structures also occur hundreds of metres from this proposed construction, and will therefore be unaffected by it.

The areas indicated with orange in Figure 5 comprise of younger stratigraphic layers which contain Quaternary alluvial deposits. These channel and overbank deposits are likely repositories for palaeontological and archaeological material, so no heavy machinery should operate in these zones. Listing Notice 1, Listed Activity 19 of the Site Investigation Report mentions: "The infilling or depositing of any material of more than 10 cubic metres into, or the **dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock** of more than 10 cubic metres from [─(i)] a watercourse". Due to the fact that this project requires the removal of more than 10 cubic metres of soil from the watercourse, it is possible that if any palaeontological and/or archaeological material is present it may be damaged or destroyed.

Therefore it is highly recommended that the 10 cubic metres of material be acquired from the area marked with a red circle in Figure 5 and NOT from areas indicated with orange as these are sensitive zones in terms of potential heritage resources. Furthermore it is recommended that the heavy earth moving equipment refrain from parking on these zones as they are likely to damage any palaeontological and/or archaeological material present. Material present within the red circle was likely brought in during the construction of the previous river crossing, so represents disturbed in-fill. Even if this in-fill was acquired from the streambed during previous projects, it should be reused as any heritage-related material

which may once have been present will now be severely compacted and crushed from vehicles riding over it or water washing over it during high water levels in the river. Recycling this material will therefore minimize any potential negative side effects of the bridge construction by eliminating the need to acquire it from the watercourse.

In conclusion, the construction of the bridge can go ahead and there is no need for a Phase 2 PIA as it is very improbable that any palaeontological material will be encountered during this project.

7. References

1) KwaZulu-Natal Heritage Act 4 of 2008

2) Neveling, J (2003). Stratigraphy and sedimentological investigation of the contact between the Lystrosaurus and Cynognathus Assemblage Zones (Beaufort Group: Karoo Supergroup). Council for Geoscience, Bulletin 137, 165pp

3) National Environmental Management Act 107 of 1998

4) Section 38 (8) of the National Heritage Resources Act 25 of 1999