

**PROPOSED DEVELOPMENT OF MAKALU B
SUBSTATION AND ASSOCIATED TRANSMISSION
LOOP-IN LINES, SASOLBURG, FREE STATE
PROVINCE**

Phase 1 Heritage Impact Assessment

21 August 2017

Updated 05 October 2017

**Client: Nemaï Consulting
Donavan Henning**

**Author: Jean Beater
JLB Consulting**

EXECUTIVE SUMMARY

The existing Makalu substation forms part of the Sasolburg Customer Load Network in the Free State grid. In 2012 studies indicated that the 88 kV fault levels were higher than the equipment rating at Makalu substation which would result in the 275 / 88 kV transformation at Makalu substation becoming unstable in 2022 and the Distribution (Dx) network becoming constrained. A study was initiated to assess a number of options. The findings of the study indicated that Makalu B substation should be established so that load and current embedded generation be shifted off the existing substation to the new proposed substation. This includes a loop in of one of the existing 275 kV Lethabo – Makalu Lines.

In early October 2017, an additional access road was added to the scope of work for this project. The access road falls within the proposed study area.

This report serves as the Phase 1 heritage impact assessment (HIA) for the proposed development of the Makalu B substation and associated 2 x 275kV transmission (Tx) loop-in lines and access road.

The size of the substation is 500 m x 500 m which covers a total area of 25 HA, thereby triggering section 38 (1) (c) of the National Heritage Resources Act (NHRA) that refers to any development or other activity which will change the character of a site that: (i) exceeds 5 000 m² in extent (25 HA = 250 000 m²).

The proposed Tx loop-in power lines trigger sub-section (1) (a) of section 38 of the NHRA that refers to the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length. The proposed power line routes both exceed 300 m with the distance to site 1 approximately 2.1 km in length and 5.8 km for site 2.

Two alternative substation locations (site 1 and site 2) and associated Tx line alignments have been assessed. The study area includes a 1 km corridor around the Tx lines (i.e. 500 m on either side of the centre line), as well as a 1km x 1km buffer around the two alternative substation sites. This is to allow for any possible deviations from the proposed alignment of the power line within the corridor or location of the substation within the buffer area.

Substation site 1

Site 1 is situated on an existing maize field and the associated buffer area also crosses areas that are disturbed by cultivation and existing infrastructure including power lines and Sasol pipelines that are located on the southern western side of the substation site and buffer.

No heritage sites were found on the substation site; however within the buffer area, a stone structure that could have been a water well was found amongst the copse of gum trees south of the substation site. The age and use of the structure could not be determined; however, it was recommended that the structure should not be impacted by the construction of the substation if site 1 is selected.

Substation site 2

No heritage sites were found on the substation site. However, a cemetery containing several graves is situated north of the location of site 2 within the buffer area. There are between 7 and 10 graves in the cemetery. There are at least 5 graves that are unmarked that could be from the late 1800s / early 1900s. The other graves in the cemetery have inscribed headstones and the one that could be accessed indicated a date of death as 1960.

Graves are a highly significant heritage resource as they are of high significance to many people and there are many traditional, cultural and personal sensitivities concerning the removal of graves. It is therefore recommended that the cemetery should be left *in situ* and fenced to prevent any damage to it if substation site 2 is selected as the preferred site.

In addition, the substation is situated close to the Sasolburg riding school and several buildings belonging to Stols Vervoer. The original farmhouse is found amongst the buildings and is, according to the owner, older than 60 years. Although much altered, the structure is of a moderate heritage sensitivity as it retains some historical features as well as some of the history of the area.

Approximately 330 m north east of the edge of buffer of substation site 2 there is another informal cemetery with graves that date from the late 1800s. There are between 11 and 15 graves in the cemetery. There are also the remains of numerous structures and kraals north of the graves that are over 60 years of age. It is the understanding of the specialist that these sites will not be impacted as they fall outside the proposed substation development.

The graves are of high significance whilst the remains of the structures and kraals are of moderate significance as they appear to be associated thereby possibly indicating a farm complex with dwellings, associated kraals and graves.

Transmission lines to substation site 1

Much of the route alignment was walked. No heritage sites were found during the site inspection. The buffer of the proposed Tx power lines to the east of the R82 incorporates several farm structures that were not inspected due to the presence of ostriches around the buildings. Graves could be located in the vicinity of the structures therefore it has been recommended that the power lines are not moved any closer to the structures and that a 10 m buffer is placed around the structures to prevent any damage to them during the construction / placing of the power lines.

Transmission lines to substation site 2

No heritage resources were found along the power line alignment probably because of the highly disturbed environment that will be crossed by the power lines.

Additional access road

The existing gravel road (extension of Jan Haak Road) is highly disturbed and the area that the access road crosses to terminate at substation site 1 is disturbed due to farming activities hence it is anticipated that no heritage resources will be impacted by the proposed access road. Close to where the proposed access road begins the buffer of the road impacts on structures near the dam. The one structure appears to be a residential house. It is unknown if there are any graves located in the vicinity of the structures. It is recommended that if the road is to directly impact on the structures then the existence (or not) of graves should be confirmed.

Palaeontology

The SAHRA Fossil Sensitivity Map indicates that the project area falls within an area of very high sensitivity as indicated on the above map. A very high sensitivity requires that a palaeontological field assessment needs to be undertaken.

However, because the project area is highly disturbed by farming activity and infrastructure development, it is likely that if there were any fossils, these will have been impacted (damaged or destroyed) by this activity. In addition, the area that is undisturbed is covered by dense grassland which will provide a thick barrier between potential fossil finds and the construction of the proposed project. It was therefore recommended that no further palaeontological studies are required for the proposed substation and associated Tx power lines.

Conclusion

An assessment of the alternative substation sites indicated that from a heritage perspective substation site 1 was the preferred site as it will be situated on a highly disturbed site where the chance of impacting on heritage resources is negligible. In addition, the Tx power lines associated

with substation site 1 are much shorter than those with site 2 hence reducing the risk of the construction of the power lines impacting on unidentified heritage resources. It is recommended that the proposed access road should avoid impacting on the structures located north-east of the dam close to the start of the proposed access road.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ii
TABLE OF CONTENTS	vi
AUTHOR DETAILS	viii
1. INTRODUCTION	9
2. LEGISLATIVE BACKGROUND	9
3. LOCATION	11
4. PROJECT DESCRIPTION	11
5. TERMS OF REFERENCE	14
6. METHODOLOGY	14
7. SITE CONDITIONS AND RESTRICTIONS	14
8. HISTORICAL DESCRIPTION OF STUDY AREA	15
9. SITE INSPECTION RESULTS	16
9.1 Substation site 1:	17
9.2 Substation site 2:	20
9.3 Transmission Lines to substation site 1:	24
9.4 Transmission Lines to substation site 2:	26
9.5 Access road	27
9.6 Palaeontological	27
10. SUBSTATION SITE ALTERNATIVE ASSESSMENT AND SELECTION	29
11. RECOMMENDATIONS AND CONCLUSIONS	32
12. MITIGATION MEASURES	32
13. REFERENCES	34

FIGURES

Figure 1: Proposed substation sites and associated power lines.....	12
Figure 2: Aerial view of Makalu B substation, Tx power lines and access road indicated in yellow.....	13
Figure 3: Section of 1:50 000 map 2627DD with project area indicated with red circle	16
Figure 4: View of substation site 1 looking northwards.....	17
Figure 5: Industry, power lines and pipelines in close proximity to site 1	18
Figure 6: Stone structure.....	19
Figure 7: Inside of stone structure	19
Figure 8: Approximate mid-point of substation site 2 showing grass cover facing west.....	20
Figure 9: Substation site facing north with horse stables and club in background	21
Figure 10: Grave with no inscription	21
Figure 11: Inscribed headstone	22
Figure 12: Original farm house	23
Figure 13: Headstone and remains of kraal	24
Figure 14: Vegetation along power line route	24
Figure 15: Area towards existing power lines	25
Figure 16: Structures within buffer area of power lines	25
Figure 17: Area crossed by Tx line to substation site 2	26
Figure 18: Cultivated and undisturbed land crossed by Tx lines to substation site 2.....	26
Figure 19: Access road in relation to structures.....	27
Figure 20: Fossil sensitivity with project area indicated with blue circle.....	28

TABLES

Table 1: Assessment of substation site 1	30
Table 2: Assessment of substation site 2	31

AUTHOR DETAILS

Name	Qualifications	Professional Registration
Jean Beater	MA (Heritage Studies) MSc (Environmental Management)	Member of Association of South African Professional Archaeologists (No. 349) Member of IAIAAsa (No. 1538)

1. INTRODUCTION

The existing Makalu substation forms part of the Sasolburg Customer Load Network in the Free State Grid. The current nature of the load at Makalu substation is predominately industrial / mining, as well as small commercial, residential and traction loads. Makalu substation is connected to the Transmission (Tx) network by four 275 kV lines, namely two from Lethabo Power Station, one to Everest substation and one to Scafell substation.

In 2012 studies indicated that the 88 kV fault levels were higher than the equipment rating at Makalu substation which would result in the 275 / 88 kV transformation at Makalu substation becoming unstable in 2022 and the Distribution (Dx) network becoming constrained. A study was initiated to assess a number of options. The findings of the study indicated that Makalu B substation should be established so that load and current embedded generation be shifted off the existing substation to the new proposed substation. This includes a loop in of one of the existing 275 kV Lethabo – Makalu Lines.

Nemai Consulting (Nemai) was appointed by Eskom Holdings SOC Limited to conduct the environmental assessment, in terms of Government Notice (GN) No. R 982 of 4 December 2014 (as amended), for the development of the Makalu B substation and associated Tx loop-in lines. In turn, JLB Consulting was appointed by Nemai to undertake a heritage impact assessment of the proposed development.

In early October 2017, an additional access road was added to the scope of work of this project. The access road falls within the project area that was inspected during the initial site inspection hence no additional site inspection was required.

This report serves as the Phase 1 heritage impact assessment (HIA) for the proposed development of the Makalu B substation, associated transmission loop-in lines and access road.

2. LEGISLATIVE BACKGROUND

Both the size of the proposed substation and the length of the proposed Tx lines trigger section 38 of the National Heritage Resources Act (Act No. 25 of 1999) that lists developments that may require a heritage impact assessment (HIA).

The size of the substation is 500 m x 500 m which covers a total area of 25 HA, thereby triggering section 38 (1) (c) that refers to any development or other activity which will change the character of a site that: (i) exceeds 5 000 m² in extent (25 HA = 250 000 m²).

The proposed Tx loop-in power lines trigger sub-section (1) (a) of section 38 that refers to the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length. The power line routes to the two alternative substation sites all exceed 300 m with the distance to site 1 approximately 2.1 km in length and 5.8 km for site 2.

In addition, the construction of the proposed substation and power lines could impact on graves, protected structures, archaeological and palaeontological resources that are protected in terms of sections 34, 35, and 36 of the National Heritage Resources Act (NHRA).

In terms of Section 3 of the NHRA, heritage resources are described as follows:

- (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 paleontological 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).

This Phase I HIA is undertaken to assess whether any heritage resources will be impacted by the proposed substation and transmission line development.

3. LOCATION

The project is located within the Metsimaholo Local Municipality and Fezile Dabi District Municipality, in the north of the Free State Province. The town of Sasolburg, which forms part of the Vaal Triangle (Vanderbijlpark, Vereeniging and Sasolburg regions), is situated to the west of the project area. The proposed project area is bordered by petro-chemical industries to the west and is located on both agricultural and undeveloped land (see **Figures 1 and 2** below).

4. PROJECT DESCRIPTION

The area required for the proposed Makalu B substation is 500 m x 500 m, which covers a total area of 25 Ha. Two alternative substation locations (site 1 and site 2) and associated Tx line alignments have been assessed.

The project proposes the construction of 2 x 275 kV line loop-ins to Makalu B substation from the existing Lethabo – Makalu power lines.

The study area includes a 1 km corridor around the Tx lines (i.e. 500 m on either side of the centre line), as well as a 1km x 1km buffer around the two alternative substation sites. This is to allow for any possible deviations from the proposed alignment of the power line within this corridor or location of the substation within this buffer area.

In addition, an access road is proposed from Jan Haak Road to substation site 1 with a 50 m buffer.



Figure 1: Proposed substation sites and associated power lines



Figure 2: Aerial view of Makalu B substation, Tx power lines and access road indicated in yellow

5. TERMS OF REFERENCE

- Undertake an HIA in accordance with the NHRA (No. 25 of 1999).
- The identification and mapping of all heritage resources in the area affected, as defined in Section 2 of the NHRA, including archaeological and palaeontological sites on or close (within 100 m) of the proposed development.
- Undertake a screening palaeontological assessment (evaluate site in terms of SAHRIS).
- The assessment of the significance of such resources in terms of the heritage assessment criteria as set out in the regulations.
- An assessment of the impact of development on such heritage resources including an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development.
- Prepare a heritage sensitivity map (GIS-based), based on the findings of the study.
- Identify heritage resources to be monitored.
- Comply with specific requirements and guidelines of Free State Provincial Heritage Resources Authority (FSPHRA) (where relevant).
- All specialist reports must adhere to Appendix 6 of GN No. R 982 of 4 December 2014 (as amended).

6. METHODOLOGY

A survey of literature, including previous HIAs, was undertaken in order to gain an understanding of potential heritage resources along and in close proximity to the proposed substation sites, associated Tx loop-in lines and access road.

An inspection of the substation sites and power line routes was undertaken on 10 August 2017.

The EAP will upload the HIA report onto the SAHRIS database in order that the FSHRA / SAHRA can assess and comment on the report and project.

7. SITE CONDITIONS AND RESTRICTIONS

Both substation sites were inspected and most of the Tx power line route alignments. In general, visibility was good apart from a few areas (such as substation site 2) where a thick grass cover

limited visibility of heritage resources such as unmarked low-lying burial mounds / graves and archaeological material.

Inspection of the Tx route alignment east of the R82 to the existing Makalu substation was inhibited by the presence of ostriches on the farm. The ostriches congregated near the structures on the farm hence inspection of these structures was limited. According to the tenant, Mr H. Nienaber, there are no graves associated with the structures.

8. HISTORICAL DESCRIPTION OF STUDY AREA

Archaeologically, sites associated with the Stone Age have been identified in the wider area. Pistorius noted the numerous Stone Age sites discovered along the ancient banks of the Vaal and Klip Rivers at localities such as Klipplaatdrift, the Klip River Quarry site and the Duncanville Archaeological Reserve. Vaal River gravels remain an important source of information on the Early Stone Age (ESA) which is associated with the Oldowan and Acheulian industries as they contribute to the understanding of early hominid cognitive evolution through the examination of stone tool production techniques. These industries are typified by large core tools such as choppers, bi-facial handaxes and cleavers (Digby Wells Environmental 2015:15).

The presence of Middle Stone Age (MSA) artefacts occur within the wider area that date to between 300 000 years ago (kya) and 20 kya consisting primarily of blade technologies (Digby Wells Environmental 2015:15).

Previous heritage impact assessment reports identified a wide range of tangible heritage resources within the general region. However, there was agreement by most of the authors of these reports that the identified heritage resources were largely of low significance apart from burial grounds.

During the Anglo-Boer War of 1899-1902, the larger Vereeniging area saw a lot of activity. By 23 May 1900, all the Republic's (Boer) forces engaged in the Orange Free State had withdrawn to Vereeniging and on 26 May 1900, the British forces discovered that the town had been evacuated by the Boers with the railway bridge across the Vaal River near Viljoen's Drift having being wrecked by the Boer forces to limit British transport movements. Discussions to end the war were held in Vereeniging in May 1902 and the Treaty of Vereeniging was accepted by both sides on 31 May 1902 (Jones & Jones 1999: 233-235).

Sasolburg was established on 8 September 1954 to house workers of SASOL (South African Coal, Oil and Gas Cooperation). The siting of the Sasol plant was determined by the presence of large deposits of low-grade coal and the Vaal River which provides water for Sasol's various petro-chemical operations (Bulpin 1986:545).

As can be seen in the relevant section of the 1:50 000 map shown below in **Figure 3**, much of the project area has been used for cultivation in the past thereby indicating a disturbed environment.

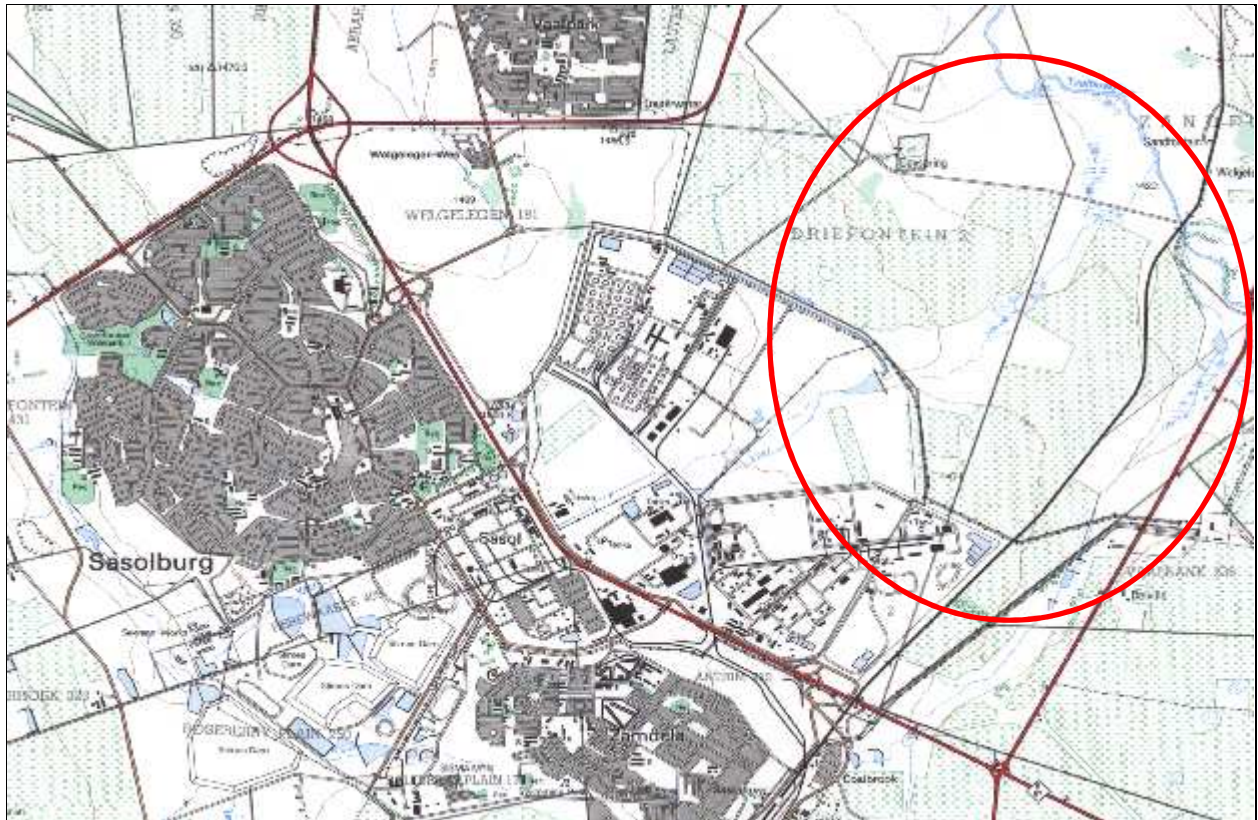


Figure 3: Section of 1:50 000 map 2627DD with project area indicated with red circle

9. SITE INSPECTION RESULTS

The study area falls within the Grassland biome, which is found mainly on the high central plateau of South Africa, the inland areas of KwaZulu-Natal and the Eastern Cape. The Central Free State Grassland is found in Free State Province and marginally into Gauteng Province. A broad zone of this vegetation type starts from around Sasolburg in the north to Dewetsdorp in the south. This vegetation type is listed as Vulnerable, with a national conservation target of 24% (Nemai 2017:66).

The cultural landscape is primarily agriculture with large parts altered by industry and mining. Agricultural activities would have, over the years, destroyed most heritage and archaeological resources that may have been present in the study area. In addition, the construction of existing power lines and Sasol pipelines would have added to the destruction of heritage resources.

9.1 Substation site 1:

Site 1 is situated on an existing maize field and the associated buffer area also crosses areas that are disturbed by cultivation as well as existing infrastructure. The site is situated approx. 577m north east of the nearest industrial area and 185 m west of a railway line. There are several existing power lines and Sasol pipelines on the southern western side of the substation site and buffer. The maize crop had been recently harvested hence visibility was good.



Figure 4: View of substation site 1 looking northwards



Figure 5: Industry, power lines and pipelines in close proximity to site 1

No heritage sites were found in the substation site area which was unsurprising due to the high degree of disturbance of the area because of farming activity, as well as the disturbance that would have been caused by the construction of the power lines and pipeline/s.

In the copse of gum trees to the south of the substation site, an old well / structure was found that falls within the buffer area for site 1. It is located at: 26°49'24.7"S; 27°53'29.9"E. It could have been a water well. It is made of stone/rocks cemented together and is in good condition. It is possible that it is older than 60 years therefore protected by 34 (1) of the NHRA that states that no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority. It was previously barricaded/fenced to prevent people and animals from falling into it but this fencing no longer exists.



Figure 6: Stone structure



Figure 7: Inside of stone structure

This site is of low heritage significance as its use and age could not be determined. Additionally, it appears no longer to be used. However, it is recommended that the site should not be impacted by the construction of the substation if site 1 is selected as the preferred site. In addition, a barricade (fencing or danger tape) should be placed around the structure as it is a danger to both animals and people.

9.2 Substation site 2:

Site 2 is situated approx. 500 m east of Jan Haak Road and close to several structures on its northern boundary. The site was covered in a thick grass cover which made the observation of low lying heritage resources, such as archaeological scatter, difficult. It appears as if the wider substation area may have been previously cultivated as furrows (possibly indicating contour lines) were seen; in addition, piles of rock were found that had been removed to allow for cultivation of the land. Ploughed firebreaks occur along the boundary lines in the substation site.

No heritage sites were found on the substation site. However, a cemetery containing several graves were pointed out by Mr. I. Stols that fall within the buffer of substation site 2. The graves are situated at: 26°47'32.9"S 27°52'44.2"E. The graves are overgrown by vegetation making access to them difficult. There are between 7 and 10 graves in this area that was fenced off in the past but the fencing is no longer in place.



Figure 8: Approximate mid-point of substation site 2 showing grass cover facing west



Figure 9: Substation site facing north with horse stables and club in background

There are at least 5 graves that are unmarked that are, according to Mr. Lotz, from the late 1800s / early 1900s. These graves appear to be of five adults and one child. They have concrete beds and uninscribed headstones.

The other graves in the cemetery have inscribed headstones and the one that could be accessed indicated a date of death as 1960 (see **Figure 11** below).



Figure 10: Grave with no inscription



Figure 11: Inscribed headstone

As the graves without inscription appear to be older than 60 years, the cemetery is protected by section 36 (3) (a) of the NHRA which states that: no person may, without a permit issued by SAHRA or a provincial heritage resources authority—

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority.

Graves are a highly significant heritage resource as they are of high significance to many people and there are many traditional, cultural and personal sensitivities concerning the removal of graves. It is not recommended that the graves be moved. It is recommended that the cemetery should be left *in situ* with a buffer of 10 m to be placed around it if substation site 2 is selected as the preferred substation site. This should prevent impacts to the cemetery during the construction of the substation and associated power lines.

Several structures fall within the buffer area including the Sasolburg (horse) riding school which is situated less than 30 m from the substation site and within the buffer area. It consists of stables, arena and other structures. The buildings are less than 60 years.

There is a complex of buildings from which the company, Stols Vervoer, operates that partially falls within the buffer area. According to Mr. Stols, the newer buildings date from 1991; however, the original farmhouse (26°47'16.83"S 27°52'48.31"E) is situated within the complex of buildings

and is, according to Mr. Stols, over 60 years old hence protected by section 34 (1) of the NHRA that states that no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.



Figure 12: Original farm house

This structure is therefore protected by section 34 (1) of the NHRA that states that: no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority.

Although much altered, the structure is of a moderate heritage sensitivity as it retains some historical features as well as retaining some of the history of the area.

Approximately 330 m north east of the edge of buffer of substation site 2 there is another informal cemetery with graves that date from the late 1800s as most of them have inscribed headstones. There are also the remains of numerous structures and kraals in the same area of the graves that are over 60 years of age. The graves and structures are all protected by the NHRA. It is the understanding of the specialist that these sites will not be impacted by the proposed substation development.

The graves are of high significance as discussed previously. The remains of the structures and kraals are of moderate significance as they appear to be associated thereby possibly indicating a farm complex with dwellings, associated kraals and graves.



Figure 13: Headstone and remains of kraal

9.3 Transmission Lines to substation site 1:

From substation site 1, these lines exit in a north easterly direction before turning in an easterly direction to cross a railway line, a watercourse and then the R82 road before looping in to the existing Lethabo-Makalu power lines. Much of the route was walked. Vegetation from the railway line to the R82 was very thick and covered with burrows. No heritage sites were found during the site inspection.



Figure 14: Vegetation along power line route

The vegetation east of the R82 was not as thick and was interspersed with pockets of dense sickle bush. The area may have been cultivated previously as several contours / furrows were observed during the site inspection.



Figure 15: Area towards existing power lines

The buffer of the power lines to the east of the R82 incorporates several farm structures that were not inspected due to the presence of ostriches around the buildings. Graves could be located in the vicinity of the structures. It is recommended that the power lines are not moved any closer to the structures and that a 10 m buffer is placed around the structures to prevent any damage to them during the construction / placing of the power lines.



Figure 16: Structures within buffer area of power lines

9.4 Transmission Lines to substation site 2:

From the existing Lethabo-Makalu power lines, the proposed route alignment to substation site 2 follows the same alignment as the Tx lines to substation site 1 for a short distance. About 115 m after crossing the watercourse, the proposed route turns sharply to the south west for 1.5 km before turning in a mainly north-westerly direction to run for 3.15 km parallel to existing power lines and pipe lines, and crossing cultivated and undisturbed land and a watercourse before terminating at substation site 2. Most of the route alignment was walked and no heritage resources were found probably because of the highly disturbed environment of much of the power line route.



Figure 17: Area crossed by Tx line to substation site 2



Figure 18: Cultivated and undisturbed land crossed by Tx lines to substation site 2

9.5 Access road

Jan Haak Road becomes a gravel road that passes substation site 2 and on towards substation site 1. The existing gravel road is highly disturbed and the area that the access road crosses to terminate at substation site 1 is disturbed due to farming activities hence it is anticipated that no heritage resources will be impacted by the proposed access road.

Close to where the proposed access road begins (see **Figure 19** below) the buffer impacts on structures near the dam. The one structure appeared to be a residential house. All the structures appear to be recently built. It is unknown if there are any graves located in the vicinity of the structures. It is recommended that if the road is to directly impact on the structures then the existence (or not) of graves should be confirmed.



Figure 19: Access road in relation to structures

9.6 Palaeontological

The SAHRA Fossil Sensitivity Map indicates that the project area falls within an area of very high sensitivity as indicated on the above map. A very high sensitivity requires that a palaeontological field assessment needs to be undertaken.

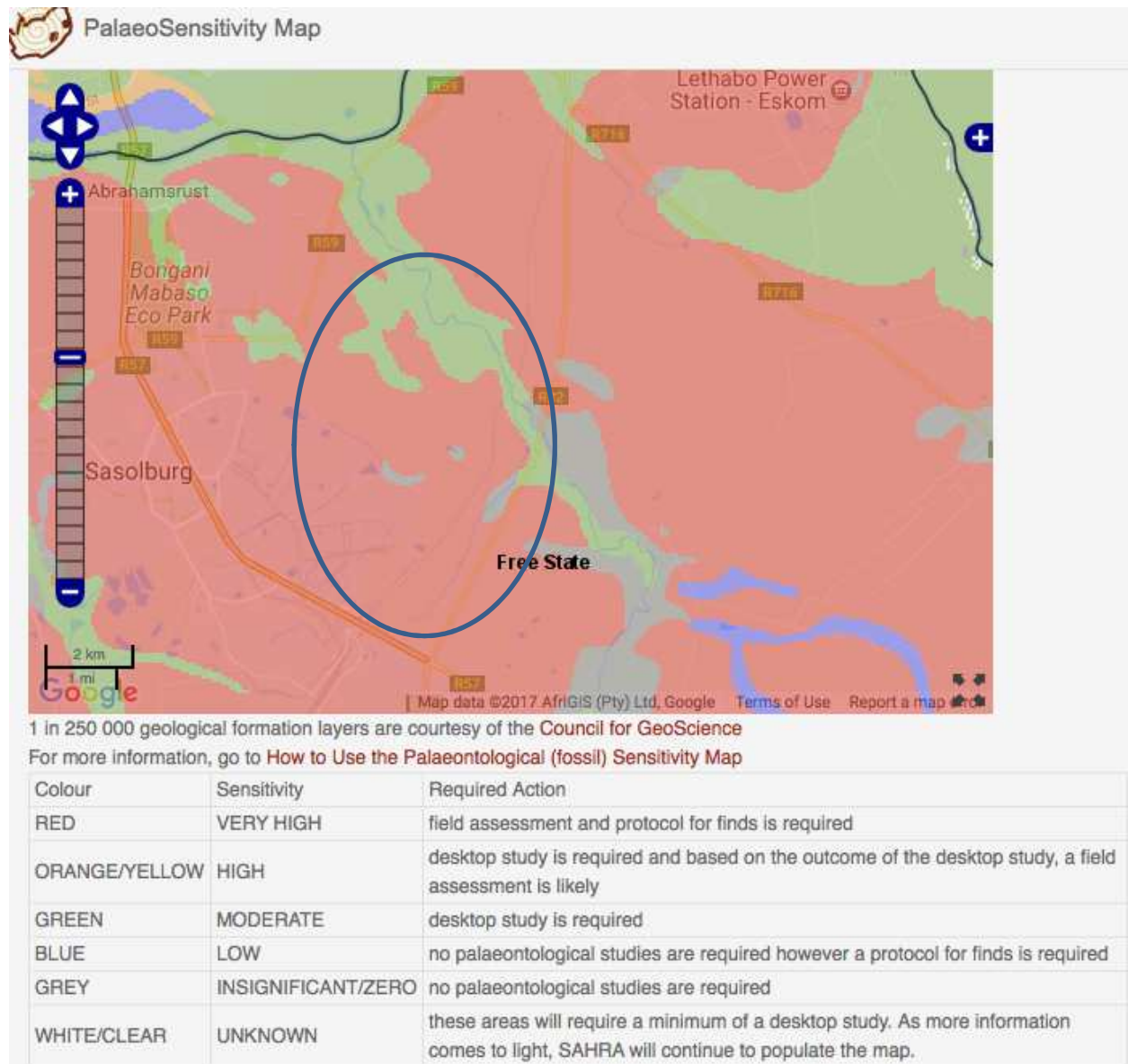


Figure 20: Fossil sensitivity with project area indicated with blue circle

A desktop geotechnical study was undertaken by Nemaï for the substation sites to confirm that these sites are suitable for the proposed development. The project area is primarily underlain by the Vryheid Formation, Ecca Group, Karoo Supergroup. According to the geological map (1:250 000 Geological Series 2626 WES-RAND), the regional geology of the site comprises of sandstone, shale and coal (Pv), overlain by Aeolian Sands (QW), with intrusions of Dolerite Sills and Dykes (Jd) also expected (Nemaï 2017:55).

According to Rubidge (2008:5), who undertook a palaeontological assessment for a pipeline between Secunda and Sasolburg, the rocks of the Vryheid formation of the Ecca group are renowned for their wealth of plant fossils of the Gondwanan *Glossopteris* flora. This flora is the source of the coal which is mined from the Vryheid formation in South Africa.

However, because the project area is highly disturbed by farming activity and infrastructure development, it is likely that if there were any fossils, these will have been impacted (damaged or destroyed) by this activity. In addition, the area that is undisturbed (where the power line route alignment crosses between the railway line and R82) is covered by dense grassland which would provide a thick barrier between potential fossil finds and the construction of the proposed project.

In light of the above, it is recommended that no further palaeontological studies are required for the proposed substation and associated Tx power lines.

10. SUBSTATION SITE ALTERNATIVE ASSESSMENT AND SELECTION

The impact assessment for each alignment focuses on the direct and indirect impacts to heritage resources associated with the project. All impacts have been analysed with regard to their nature, extent, magnitude, duration, probability and significance as described below:

Nature (/Status)

The project could have a positive, negative or neutral impact on the environment.

Extent

- Local - extent to the site and its immediate surroundings.
- Regional - impact on the region but within the province.
- National - impact on an interprovincial scale.
- International - impact outside of South Africa.

Magnitude

Degree to which impact may cause irreplaceable loss of resources.

- Low - natural and social functions and processes are not affected or minimally affected.
- Medium - affected environment is notably altered; natural and social functions and processes continue albeit in a modified way.
- High - natural or social functions or processes could be substantially affected or altered to the extent that they could temporarily or permanently cease.

Duration

- Short term - 0-5 years.
- Medium term - 5-11 years.
- Long term - impact ceases after the operational life cycle of the activity either because of natural processes or by human intervention.
- Permanent - mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient.

Probability

- Almost certain - the event is expected to occur in most circumstances.
- Likely - the event will probably occur in most circumstances.
- Moderate - the event should occur at some time.
- Unlikely - the event could occur at some time.
- Rare/Remote - the event may occur only in exceptional circumstances.

Significance

Provides an overall impression of an impact's importance and degree to which it can be mitigated.

- 0 – Impact will not affect the environment. No mitigation necessary.
- 1 – No impact after mitigation.
- 2 – Residual impact after mitigation.
- 3 – Impact cannot be mitigated.

Table 1: Assessment of substation site 1

SITE 1		
	Without Mitigation	With Mitigation
Extent	Local	Local
Duration	Permanent	Permanent
Magnitude	Low	Low
Probability	Unlikely	Rare / Remote
Status	Negative	Negative
Reversibility	No	No
Level of Significance	2 – if mitigation measures not implemented	1 – no impact after mitigation
Can impacts be mitigated	Yes	
Mitigation		
<ul style="list-style-type: none"> • Ensure that the substation site remains on cultivated land and does not impact on the gum trees where stone structure discussed in sub-section 9.1 and 9.3 of this report is located. • A barricade of 10 m must be placed around the structure to ensure that it is not damaged by the construction of the substation if site 1 is selected. The barricade is also essential from a human and animal safety perspective. • If the location of the substation is moved to where it will impact on the structure, then an application for the demolition of the structure must be made to the FSPHRA. This is required as the structure appears to be older than 60 years and is protected by section 34 (1) of the NHRA. • If, during construction, any unidentified heritage resources are discovered, all work in the vicinity of the find must be stopped immediately, the heritage specialist consulted and, depending on the specialist's advice, work is stopped until the correct procedures and actions have taken place. 		

Table 2: Assessment of substation site 2

SITE 2		
	Without Mitigation	With Mitigation
Extent	Regional	Local
Duration	Permanent	Permanent
Magnitude	Medium	Low
Probability	Moderate	Unlikely
Status	Negative	Negative
Reversibility	No	No
Level of Significance	2 – residual impact after mitigation	1
Can impacts be mitigated	Yes	
Mitigation		
<ul style="list-style-type: none"> • The location of the substation should not be moved any closer to the riding school and Stols Vervoer buildings. • A barricade of 10 m must be placed around the cemetery referred to in section 9.2 of this report in order to prevent any impact by the construction of substation 2 and power lines if this site is selected. • If the buildings are impacted by the proposed substation site, then an application for the alteration or demolition of the protected farm house must be made to the FSPHRA. • If, during construction, any unidentified heritage resources are discovered, all work in the vicinity of the find must be stopped immediately, the heritage specialist consulted and, depending on the specialist's advice, work is stopped until the correct procedures and actions have taken place. 		

From a heritage perspective, **substation site 1** is the preferred site as it is situated in an area that is highly disturbed. The one constraint is the structure located in the gum trees south of the substation site. Currently it falls within the buffer area of the substation and should therefore not be impacted as long as the mitigation measures provided are enforced.

In addition, the Tx power lines linking the substation to the existing power lines are substantially shorter than the power lines to substation site 2. The shorter the power lines, the less risk of the construction of the power lines impacting on unidentified heritage resources hence the preference for substation site 1.

Substation site 2 could have a highly negative impact on the Sasolburg riding school, a cemetery as well as buildings located north of the site. In addition, the Tx power lines linking the substation and existing power lines is much longer than those to substation site 1 with the concomitant increase in possible impacts on any unidentified heritage resources.

11. RECOMMENDATIONS AND CONCLUSIONS

The following is recommended in terms of the proposed Makalu B substation and Tx loop-in power lines project:

- Substation 1 is the preferred substation site from a heritage perspective;
- A barricade (fencing or danger tape) should be placed around the stone structure located in the gum trees south of substation 1 as it is a danger to both people and animals as well as protecting it from damage during the construction of the substation.
- It is recommended that the power lines between substation 1 and the existing power lines are not moved any closer to the structures located north of the current alignment and that a 10 m buffer is placed around the structures to prevent any damage to them during the construction of the power lines.
- If site 2 is selected as the substation site, then the cemetery situated north of it must be fenced and protected from construction activities.
- The proposed access road to substation 1 should not impact on heritage resources as it crosses disturbed land. The road should avoid impacting on the structures located north-east of the dam close to the start of the proposed access road.

In conclusion, from a heritage perspective, the construction of the Makalu B substation, associated power lines and access road can proceed with the provision that the recommendations and mitigation measures provided above and below are adhered to and implemented as required.

12. MITIGATION MEASURES

- For any chance finds of heritage resources, all work must cease in the area affected and the Contractor will immediately inform the Project Manager. A registered heritage specialist / palaeontologist must be called to site for inspection. The relevant heritage resource agency, the FSPHRA must be informed about any finds.
- The heritage specialist will assess the significance of the heritage resource/s found and provide guidance on the way forward.
- Permits must be obtained from the FSPHRA if heritage resources are to be removed, destroyed or altered.
- If fossils are found and the fossils need to be rescued (removed from site), the necessary permit from FSPHRA / SAHRA must be obtained and the rescued fossils must then be housed in a suitable, recognized institute.

- All heritage resources found in close proximity to the construction area are to be protected by a 10 m buffer in which no construction can take place. The buffer material (danger tape, fencing, etc.) must be highly visible to construction crews.
- Under no circumstances may any heritage material be destroyed or removed from site unless under direction of a heritage specialist.
- Should any remains be found on site that is potentially human remains, the South African Police Service (SAPS) should also be contacted. Members of the SAPS may not remove remains until the necessary permits have been obtained.

13. REFERENCES

Digby Wells Environmental. 2013. *Heritage Statement for the Sasol Mining Sigma Colliery Ash Backfilling Project, Sasolburg, Free State Province*

Digby Wells Environmental. 2015. *Heritage Basic Assessment Report for Basic Assessment Report: Environmental Authorisation Application in support of the Section 102 Amendment for the Copper Sunset Sand Mining Operation, near Sasolburg, Free State.*

Nemai Consulting. 2017. *Draft Scoping Report for the Proposed Development of the Makalu B Substation and Associated Transmission Loop-in Lines, Sasolburg, Free State Province*

Rubidge, B. 2008. *Installation of High Pressure Natural Gas Transmission Pipeline from Sasol Synfuels in Secunda to Sasol Infrachem in Sasolburg via Balfour. Palaeontological Impact Assessment*