

**HERITAGE SURVEY FOR THE NDUMO-GEZISA
TRANSMISSION LINE, KWAZULU-NATAL**

FOR ESKOM HOLDINGS (Pty) Ltd

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INTRODUCTION

Eskom Distribution proposes the upgrading of the electricity infrastructure in the Makhatini flats area in northern KwaZulu Natal, as the existing powerline networks in the area are highly constrained in terms of capacity and cannot cater for the additional electrification load.

The transmission line is ~45km long with various tower structures. Most of the tower structures will consist of a single pivot point that will be supported by four stays. The stays will be screwed into the ground and thus there will be minimal surface impact. The tower types to be used are as follows:

- For 273E type towers (i.e. stayed towers with screw anchors) of which there are 22, the base of the central mast rests on a reinforced concrete pad 1000mm deep X 3100mm² wide;
- For 273A (36) and 273C (52) type towers the four tensile screw anchors and the central resting point of the tower are not capped;
- 255 type towers (35) are self-supporting; all 4 legs / footings of the towers are placed on 2 or 4 or 6 screw anchors capped with a reinforced concrete block 600mm to 900mm deep – width varies up to 2500mm X 1500mm wide.
- The 248C type terminal towers at Ndumo and Gezisa substation (2) are self-supporting; all 4 legs / footings of the towers are placed on 4 or 6 screw anchors capped with a concrete block which varies to take compressive and tensile loads. The concrete cap is 900mm deep and width 2500mm X 2500mm wide.
- The 255B type self-supporting tower in the Pongola River floodplain will be founded using screw anchor foundations 900mm deep X 1500mm² wide.

The transmission line occurs between the Ndumu and Gezisa substations and passes through the several vegetations types that include:

- Sandy bushveld
- Clay bushveld
- Tembe Sandy Bushveld / sand forest species present
- Sand Forest
- wetlands
- Maputaland Coastal Belt

Parts of the wetlands have dried up over the years and have been more recently occupied by humans. Similarly with increasing human populations in the area the Sand Forest is being settled. These two areas have low archaeological presence.

Much of the HIA survey was focussed on human graves, as these are the most common occurring heritage issue in this area.

The entire line and the Gezisa substation was surveyed.

FIG. 1 GENERAL LOCATION OF THE STUDY AREA

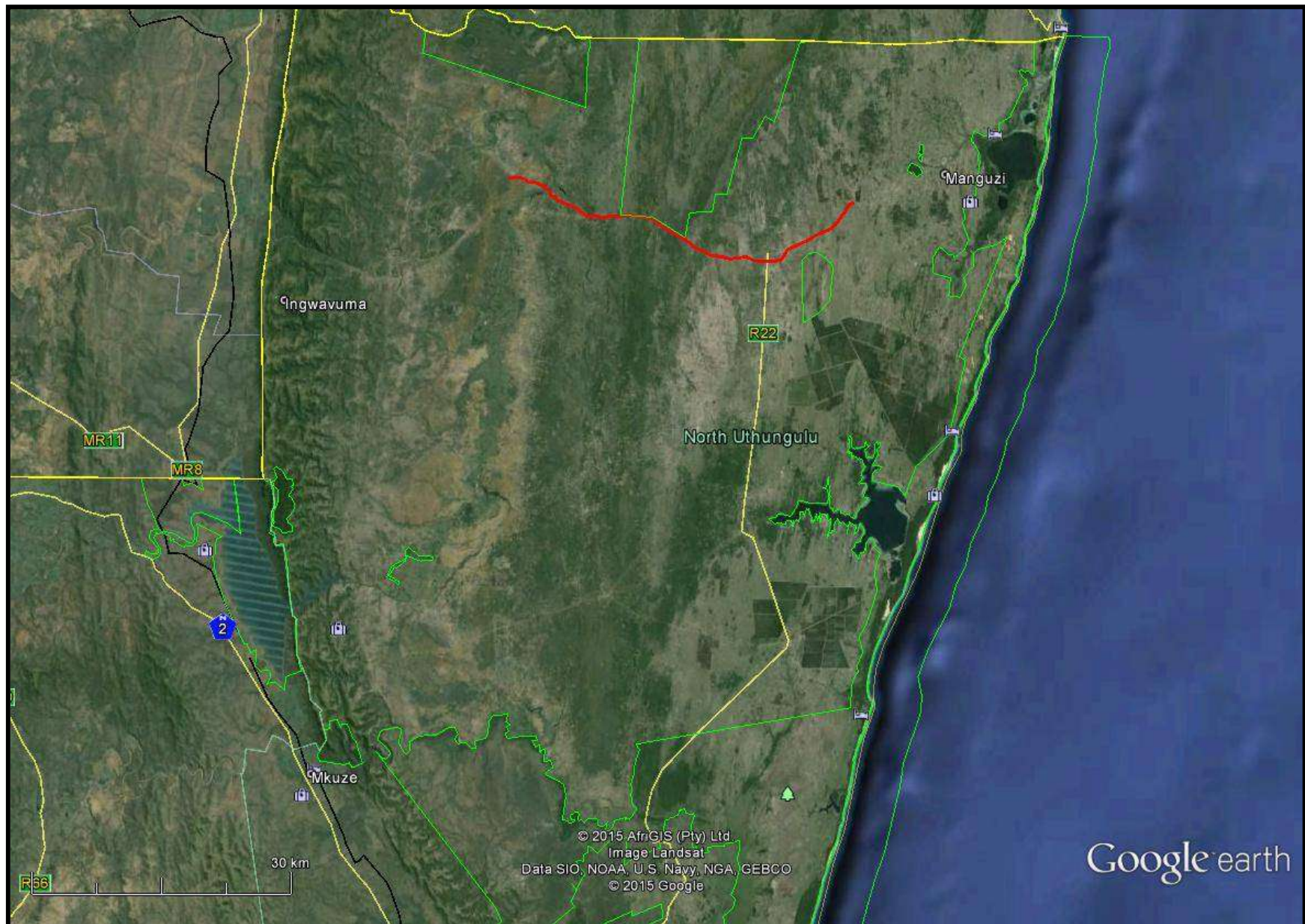


FIG. 2: AERIAL OVERVIEW OF THE STUDY AREA

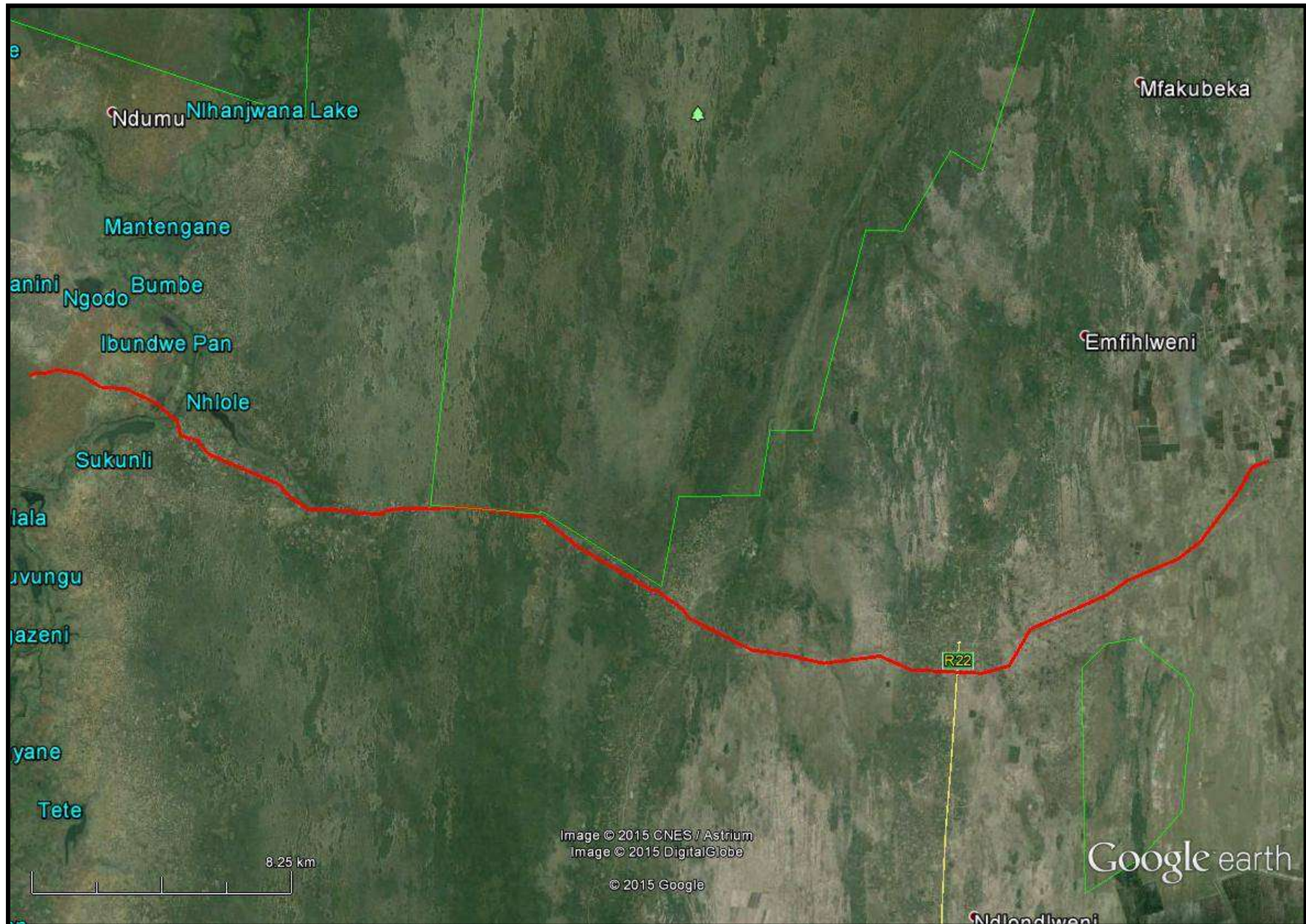


FIG. 3a: TOPOGRAPHICAL OVERVIEW OF THE STUDY AREA IN 2002

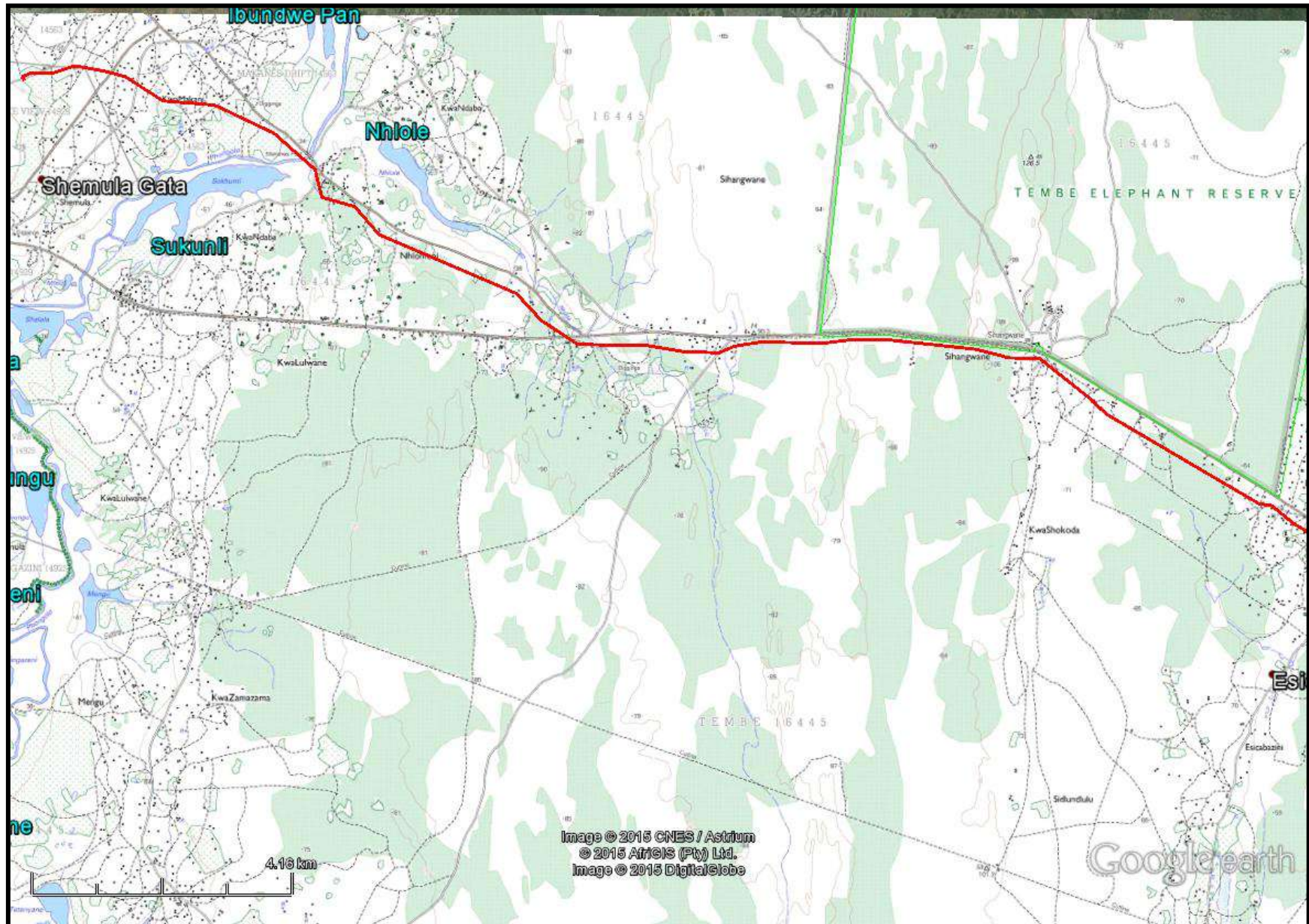
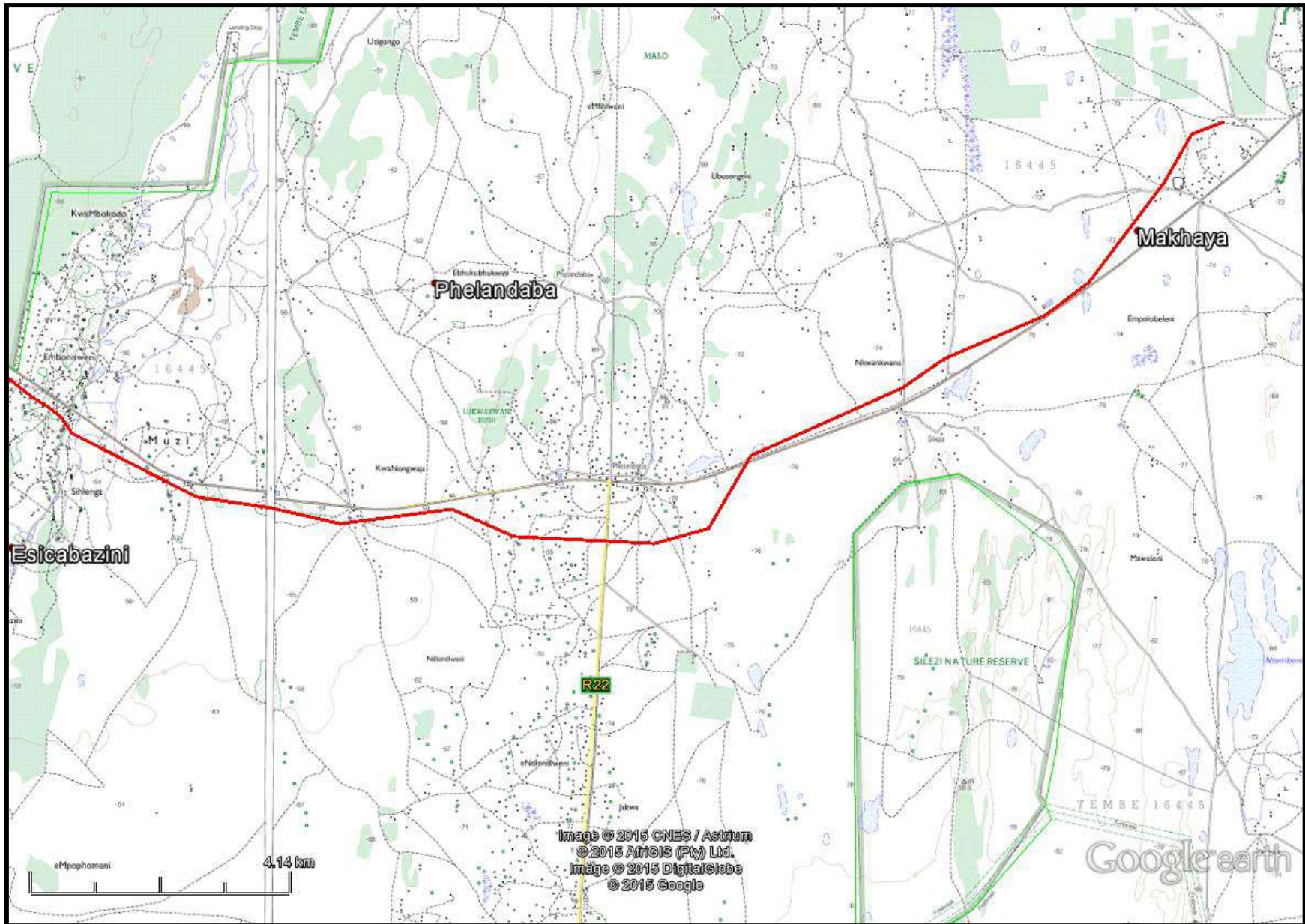


FIG. 3b: AERIAL OVERVIEW OF THE MBANGWEINI STUDY AREA IN 2002



KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

“General protection: Structures.—

- No structure which is, or which may reasonably be expected to be older than 60 years, may be demolished, altered or added to without the prior written approval of the Council having been obtained on written application to the Council.
- Where the Council does not grant approval, the Council must consider special protection in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- The Council may, by notice in the *Gazette*, exempt—
- A defined geographical area; or
- defined categories of sites within a defined geographical area, from the provisions of subsection where the Council is satisfied that heritage resources falling in the defined geographical area or category have been identified and are adequately protected in terms of sections 38, 39, 40, 41 and 43 of Chapter 9.
- A notice referred to in subsection (2) may, by notice in the *Gazette*, be amended or withdrawn by the Council.

General protection: Graves of victims of conflict.—No person may damage, alter, exhume, or remove from its original position—

- the grave of a victim of conflict;
- a cemetery made up of such graves; or
- any part of a cemetery containing such graves, without the prior written approval of the Council having been obtained on written application to the Council.
- General protection: Traditional burial places.—
- No grave—
- not otherwise protected by this Act; and
- not located in a formal cemetery managed or administered by a local authority, may be damaged, altered, exhumed, removed from its original position, or otherwise disturbed without the prior written approval of the Council having been obtained on written application to the Council.

The Council may only issue written approval once the Council is satisfied that—

- the applicant has made a concerted effort to consult with communities and individuals who by tradition may have an interest in the grave; and
- the applicant and the relevant communities or individuals have reached agreement regarding the grave.

General protection: Battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites.—

- 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 Council.
- 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.
- 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.
- 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.
- 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.
- 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.” (KZN Heritage Act of 2008)

METHOD

The method for Heritage assessment consists of several steps.

The first step forms part of the desktop assessment. Here we would consult the database that has been collated by Umlando. These databases contains archaeological site locations and basic information from several provinces (information from Umlando surveys and some colleagues), most of the national and provincial monuments and battlefields in Southern Africa (<http://www.vuvuzela.com/googleearth/monuments.html>) and cemeteries in southern Africa (information supplied by the Genealogical Society of Southern Africa). We use 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

The survey results will define the significance of each recorded site, as well as a management plan.

All sites are grouped according to low, medium, and high significance for the purpose of this report. Sites of low significance have no diagnostic artefacts or features. Sites of medium significance have diagnostic artefacts or features and these sites tend to be sampled. Sampling includes the collection of artefacts for future analysis. All diagnostic pottery, such as rims, lips, and decorated sherds are sampled, while bone, stone, and shell are mostly noted. Sampling usually occurs on most sites. Sites of high significance are excavated and/or extensively sampled. Those sites that are extensively sampled have high research potential, yet poor preservation of features.

Defining significance

Heritage sites vary according to significance and several different criteria relate to each type of site. However, there are several criteria that allow for a general significance rating of archaeological sites.

These criteria are:

1. State of preservation of:

- 1.1. Organic remains:
 - 1.1.1. Faunal
 - 1.1.2. Botanical
- 1.2. Rock art
- 1.3. Walling
- 1.4. Presence of a cultural deposit
- 1.5. Features:
 - 1.5.1. Ash Features
 - 1.5.2. Graves
 - 1.5.3. Middens
 - 1.5.4. Cattle byres
 - 1.5.5. Bedding and ash complexes

2. Spatial arrangements:

- 2.1. Internal housing arrangements
- 2.2. Intra-site settlement patterns
- 2.3. Inter-site settlement patterns

3. Features of the site:

- 3.1. Are there any unusual, unique or rare artefacts or images at the site?
- 3.2. Is it a type site?
- 3.3. Does the site have a very good example of a specific time period, feature, or artefact?

4. Research:

- 4.1. Providing information on current research projects
- 4.2. Salvaging information for potential future research projects

5. Inter- and intra-site variability

- 5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?
- 5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

6. Archaeological Experience:

6.1. The personal experience and expertise of the CRM practitioner should not be ignored. Experience can indicate sites that have potentially significant aspects, but need to be tested prior to any conclusions.

7. Educational:

- 7.1. Does the site have the potential to be used as an educational instrument?
- 7.2. Does the site have the potential to become a tourist attraction?
- 7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

- 8.1. Palaeontological sites
- 8.2. Historical buildings

- 8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites
- 8.4. Graves and/or community cemeteries
- 8.5. Living Heritage Sites
- 8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfill the above criteria, the more significant it becomes. Test-pit excavations are used to test the full potential of an archaeological deposit. This occurs in Phase 2. These test-pit excavations may require further excavations if the site is of significance (Phase 3). Sites may also be mapped and/or have artefacts sampled as a form of mitigation. Sampling normally occurs when the artefacts may be good examples of their type, but are not in a primary archaeological context. Mapping records the spatial relationship between features and artefacts.

TABLE 1: SAHRA GRADINGS FOR HERITAGE SITES

SITE SIGNIFICANCE	FIELD RATING	GRADE	RECOMMENDED MITIGATION
High Significance	National Significance	Grade 1	Site conservation / Site development
High Significance	Provincial Significance	Grade 2	Site conservation / Site development
High Significance	Local Significance	Grade 3A - C	
High / Medium Significance	Generally Protected A	3A	Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B	3B	Site conservation or mitigation / test excavation / systematic sampling / monitoring prior to or during development / destruction
Low Significance	Generally Protected C	3C	On-site sampling monitoring or no archaeological mitigation required prior to or during development / destruction

RESULTS

DESKTOP STUDY

The desktop study consisted of analysing various maps for evidence of prior habitation in the study area, as well as for previous archaeological surveys. The archaeological database indicates that there are archaeological sites in the general area (fig. 4). These sites include all types of Stone Age and Iron Age sites. No sites occur in the study area (purple dots in figure 4). Other sites in fig. 4 were recorded by Umlando for various surveys. These sites include Stone Age sites and recent graves (i.e. last 40 years).

No national monuments, battlefields, or historical cemeteries are known to occur in the study area.

The 1942 aerial photographs noted fourteen settlements occur near the line (fig. 5). Most of these settlements occur to the west of the Sand Forest, and only four occur within the Sand Forest. The locations of these settlements are given in Table 2. Any graves from these settlements are unlikely to be visible, as grave markers would have disappeared by now.

The 1962 and 1964 1:50 000 topographical maps show a similar picture: an area of low human density. Only seven settlements and one ruin were noted near the transmission line on these maps (Fig. 6). As with the previous maps, most of the settlements occur to the west of the Sand Forest.

By 2009, the human settlement pattern has changed dramatically with at least 90 settlements occurring within 50m of the line (fig. 7).

FIG. 5: LOCATION OF SETTLEMENTS NEAR THE LINE IN 1942

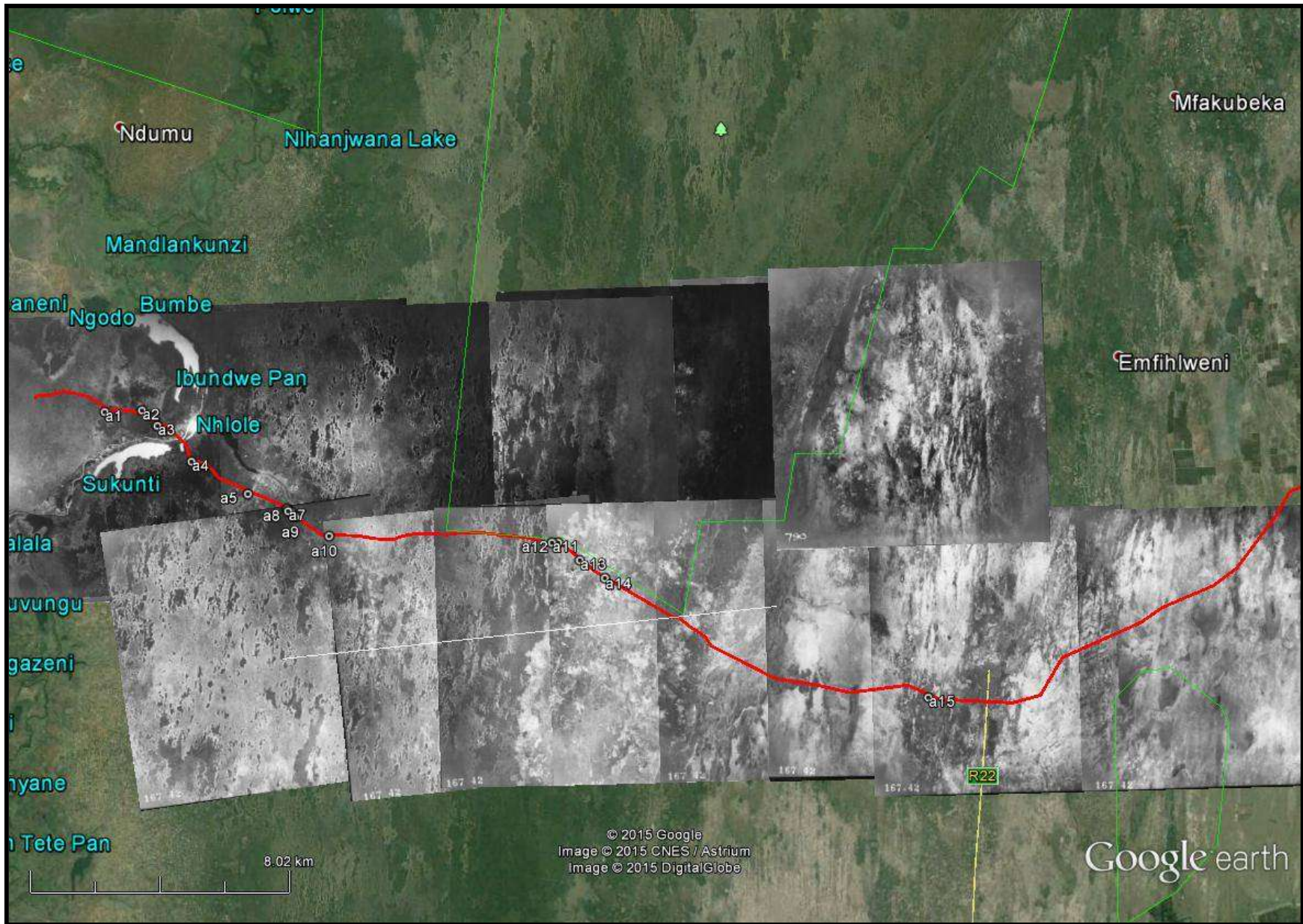


FIG. 6a: LOCATION OF SETTLEMENTS NEAR THE LINE IN 1962

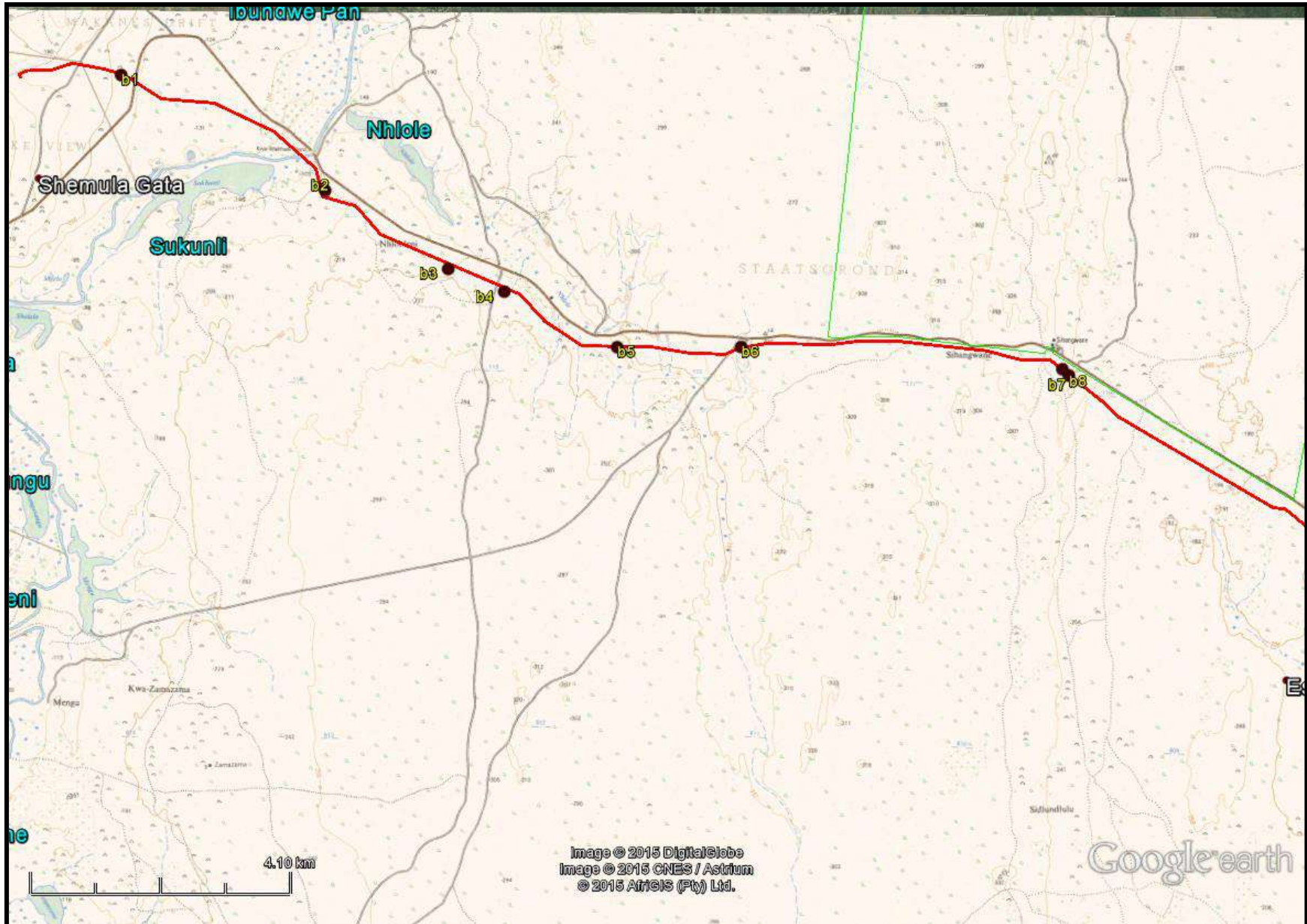


FIG. 6b: LOCATION OF SETTLEMENTS NEAR THE LINE IN 1962

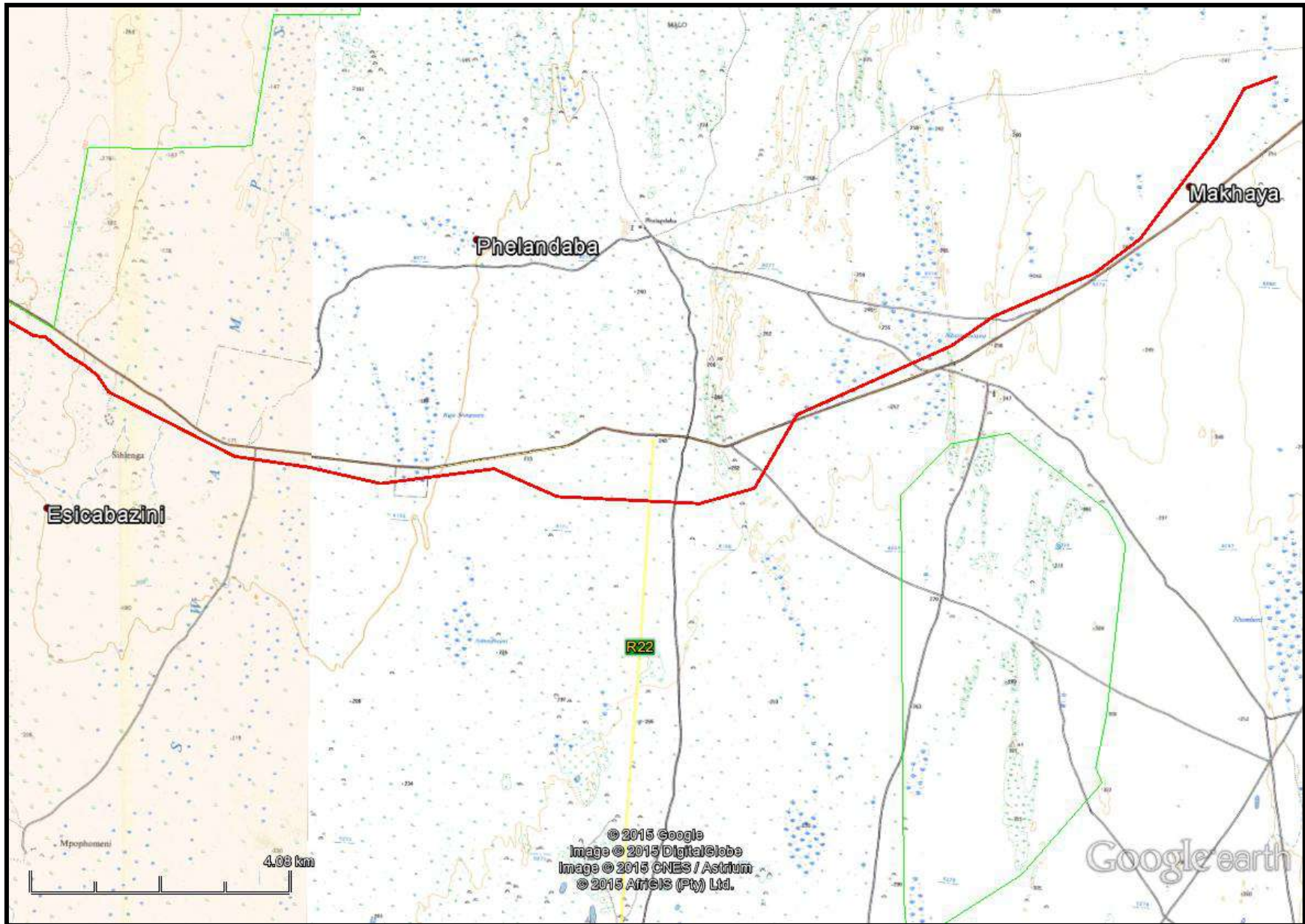


TABLE 2: LOCATION OF HERITAGE SITES FROM THE DESKTOP STUDY

	Name	Latitude	Longitude	Description
1942	a3	-27.016858112	32.294571588	Settlement
	a2	-27.012613647	32.289717868	Settlement
	a4	-27.026745722	32.305297436	Settlement
	a6	-27.039629620	32.335244588	Settlement
	a7	-27.040324818	32.335593230	Settlement
	a8	-27.040472558	32.336408579	Settlement
	a9	-27.041921220	32.337837136	Settlement
	a10	-27.047143934	32.348486338	Settlement
	a11	-27.048527530	32.417949251	Settlement
	a12	-27.048507092	32.419902317	Settlement
	a13	-27.053352119	32.426640611	Settlement
	a14	-27.058264134	32.434489933	Settlement
	a15	-27.090687976	32.535599574	Settlement
	a1	-27.013100672	32.278091961	Settlement
	1962 – 1964	b1	-27.009168908	32.272580102
b2		-27.025270124	32.305008231	Settlement
b3		-27.036273195	32.324660777	Settlement
b4		-27.039408816	32.333569911	Settlement
b5		-27.047154589	32.351539938	Settlement
b6		-27.047026085	32.371196360	Ruin
b7		-27.049835788	32.422099399	Settlement
b8		-27.050706203	32.423135614	Settlement
2009	c1	-27.009148479	32.272937996	Settlement
	c2	-27.010710055	32.275790834	Settlement
	c3	-27.011471621	32.277072626	Settlement
	c4	-27.012488203	32.278900837	Settlement
	c5	-27.012217276	32.278411734	Settlement
	c6	-27.012030423	32.278271463	Settlement
	c7	-27.012522428	32.279259259	Settlement
	c8	-27.012586475	32.279758261	Settlement
	c9	-27.012584567	32.279923845	Settlement
	c10	-27.012610681	32.280331926	Settlement
	c11	-27.012672621	32.280600713	Settlement
	c12	-27.012631350	32.281845236	Settlement
	c13	-27.013876701	32.289673819	Settlement
	c14	-27.014899068	32.291563129	Settlement
	c15	-27.015365554	32.292837623	Settlement
	c16?	-27.026089039	32.304613311	Settlement
	c17	-27.026253076	32.304675352	Settlement
	c18	-27.026410051	32.305567241	Settlement
	c19	-27.031191646	32.313692363	Settlement
	c20?	-27.031522667	32.313805492	Settlement
	c22	-27.033598051	32.319608111	Settlement
	c23	-27.035350615	32.324302637	Settlement
	c24	-27.036900875	32.328330496	Settlement
	c25	-27.038798110	32.333539727	Settlement
	c26	-27.041930961	32.338244213	Settlement
	c27	-27.045843224	32.343968618	Settlement
	c28	-27.046617594	32.375681446	Settlement
	c29	-27.046596605	32.380700901	Settlement
	c30?	-27.046445933	32.398374896	Settlement
	c31	-27.047955996	32.412719884	Settlement
	c32	-27.048506859	32.415159422	Settlement
	c33	-27.052949532	32.425995099	Settlement
	c34	-27.053489014	32.427121130	Settlement
	c35?	-27.054281135	32.428444984	Settlement

c36	-27.055143335	32.429282077	Settlement
c37	-27.056447662	32.430982672	Settlement
c38	-27.058054773	32.432842138	Settlement
c39	-27.059131208	32.435969852	Settlement
c40	-27.059606159	32.437025396	Settlement
c41	-27.064854498	32.446936367	Settlement
c42	-27.066636984	32.450844444	Settlement
c43	-27.067308590	32.452038270	Settlement
c44	-27.067945298	32.453215052	Settlement
c45	-27.068568873	32.454570535	Settlement
c45	-27.069175003	32.455662471	Settlement
c46	-27.069366472	32.457558344	Settlement
c47	-27.073239210	32.463772644	Settlement
c48	-27.074705377	32.465754666	Settlement
c49	-27.077019825	32.467678386	Settlement
c50	-27.078012496	32.469840003	Settlement
c52	-27.079613217	32.473355540	Settlement
c53	-27.079962883	32.474200231	Settlement
c54	-27.080617154	32.475675910	Settlement
c55	-27.082849854	32.480545151	Settlement
c56	-27.086117138	32.488300774	Settlement
c57	-27.086388695	32.489882160	Settlement
c58	-27.086472289	32.490981626	Settlement
c59	-27.089232547	32.515041415	Settlement
c60	-27.088161979	32.524276412	Settlement
c61	-27.087905820	32.525868275	Settlement
c62	-27.087540209	32.527594781	Settlement
c63	-27.087648987	32.529275150	Settlement
c64	-27.088222453	32.530810478	Settlement
c65	-27.088648506	32.531316942	Settlement
c66	-27.088726852	32.532052652	Settlement
c67	-27.091387399	32.538961511	Settlement
c68	-27.091405709	32.542146646	Settlement
c69	-27.091510391	32.542762063	Settlement
c70	-27.091567707	32.544578819	Settlement
c71	-27.091998773	32.549241697	Settlement
c72	-27.090316340	32.568679609	Settlement
c73	-27.090168847	32.569517485	Settlement
c74	-27.089511793	32.570728225	Settlement
c75	-27.088535934	32.571292927	Settlement
c76	-27.084210227	32.574077681	Settlement
c77	-27.078526697	32.579395494	Settlement
c78	-27.077332117	32.582378577	Settlement
c79?	-27.067314725	32.604890014	Settlement
c80?	-27.064548701	32.610623672	Settlement
c81	-27.061818511	32.617350631	Settlement
c82	-27.059078089	32.623876710	Settlement
c83	-27.058511986	32.624822117	Settlement
c84	-27.053935255	32.631510727	Settlement
c85	-27.050343076	32.634415557	Settlement
c86	-27.044875725	32.638652554	Settlement
c87	-27.042194750	32.640875175	Settlement
c88	-27.039634356	32.643178575	Settlement
c89	-27.031851539	32.650715732	Settlement
c90	-27.030923635	32.653065784	Settlement

FIELD SURVEY

The field survey was undertaken in July 2015 and figure 8 shows various views along the line. Each tower point was visited as well as potential access roads to the towers. Each tower will have a 20m x 20m footprint, although vehicles will have a higher footprint.

The archaeology of the Makhatini flats tends to consist of Early, Middle and Late Stone Age stone tools that occur across the entire area. They are in secondary contexts, often part of a lag deposit, and have little research value. They are thus of low significance and their occurrences are just noted. No Stone Age sites were observed along the route, although isolated Middle Stone Age and Late Stone Age artefacts were observed.

Similarly Early and Late Iron Age sites do occur in the general area, except not in the Sand Forest. These sites tend not to have archaeological deposits and are poorly preserved. Pottery sherds tend to be the main artefacts from these types of sites. The acidic sand and the humidity of the area tend to allow for poor preservation of organic remains. In addition to this, previous surveys indicate that when graves are demarcated they tend to be with wood and/or circles of stones. It is only recently that some of the graves have proper headstones. This results in graves disappearing within a few years if they are not attended to by the descendants.

One of the main environmental considerations of the transmission line is the Sand Forest. Minimal impact to the Sand Forest is a necessity due to its highly fragile nature. It is for this case that the 20m buffer from graves is made smaller in this report; otherwise, more Sand Forest would be damaged.

The locations of the sites are given in Table 3. Figure 8 shows the locations of these sites.

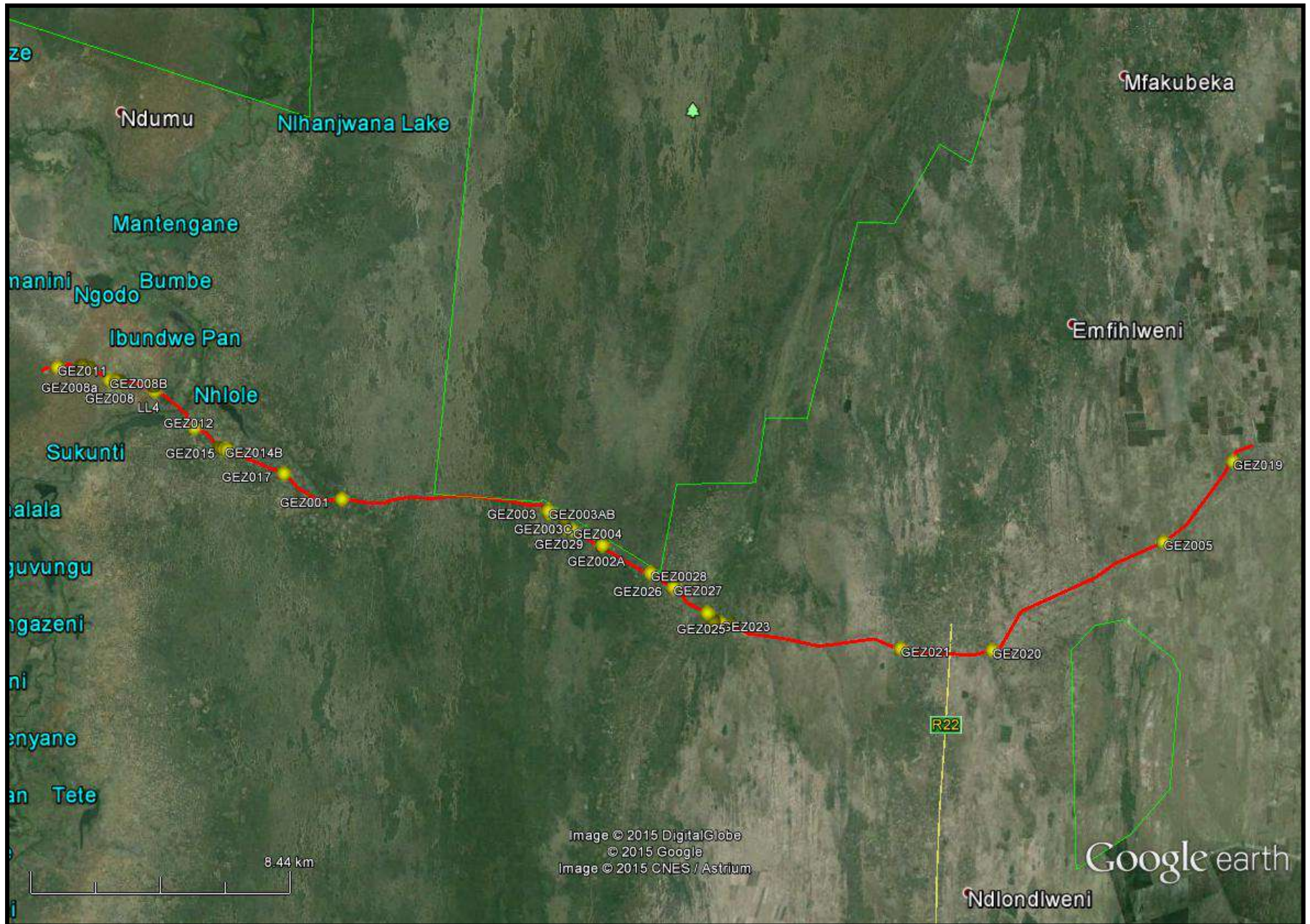
TABLE 3: LOCATION OF RECORDED SITES

Name	Latitude	Longitude	Description
GEZ001	-27.046794975	32.354641026	Grave
GEZ002A	-27.060207026	32.440014984	Grave
GEZ002B	-27.060265029	32.440080028	Grave
GEZ002C	-27.060265029	32.440039963	Grave
GEZ002D	-27.060251031	32.439990006	Grave
GEZ002E	-27.060258994	32.439981038	Grave
GEZ003A	-27.050160980	32.422466967	Settlement
GEZ003B	-27.050225018	32.422335036	“Grave”
GEZ003C	-27.050846033	32.422712976	+8 Graves
GEZ004	-27.055891016	32.430320978	Grave
GEZ005	-27.059078	32.623877	Settlement
GEZ006	-27.013817970	32.292942004	Grave
GEZ006E	-27.013661982	32.292947033	Grave
GEZ007	-27.012306964	32.281471035	Settlement
GEZ008	-27.012727778	32.280375000	Settlement Grave
GEZ008a	-27.012016028	32.278597970	Grave?
GEZ008B	-27.012120970	32.278308040	Grave?
GEZ009	-27.008621022	32.271696981	Graves
GEZ010	-27.007891964	32.269462030	Graves
GEZ010A	-27.008802993	32.269777022	Graves
GEZ011	-27.008397980	32.261338038	Graves
GEZ012	-27.026098967	32.306194967	Grave
GEZ013	-27.031804025	32.314414009	Settlement
GEZ014	-27.032107031	32.316102041	Settlement Grave?
GEZ014B	-27.032252960	32.316217963	Grave?
GEZ015	-27.032482959	32.317074006	Settlement Grave
GEZ016	-27.035074	32.326016	Shembe Circle
GEZ017	-27.039348995	32.335574962	Settlement Grave?
GEZ018	-27.047026085	32.371196360	Ruin
GEZ019	-27.035595998	32.646671981	Graves
GEZ020	-27.090680022	32.567807995	Late Iron Age
GEZ021	-27.090200996	32.537812013	Settlement Grave
GEZ022	-27.083355999	32.481883010	Graves
GEZ023	-27.082926007	32.478969041	Settlement
GEZ024	-27.082342962	32.476535020	Graves
GEZ024B	-27.082650997	32.476410968	Graves
GEZ025	-27.079891004	32.474412974	Graves
GEZ026	-27.072707964	32.463584980	Graves
GEZ026b	-27.072705030	32.463568971	Graves
GEZ027	-27.072468996	32.463269988	Graves7
GEZ028	-27.068289025	32.455792995	Grave
GEZ029	-27.055250	32.427778	Grave
GEZ030	-27.052528	32.427667	Graves

FIG. 8: SCENIC VIEWS OF THE STUDY AREA



FIG. 9: LOCATION OF RECORDED SITES



GEZ01

GEZ01 is located ~30m north of Tower 40. Two graves have a formal built headstone (fig. 10). These two graves are in a north-south orientation and are ~15m apart. There is an unmarked grave to the east of the southern grave.

The transmission line will not affect the graves; however, the access roads might come near the graves.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 10: GRAVE AT GEZ01



GEZ02

GEZ02 is located ~87m northwest from Tower 69. The site consists of five graves of which three are in a north-south orientation (fig. 11). One grave has wooden logs placed on top of it, while another is unmarked. There may be more graves in the area of this cemetery.

The transmission line will not affect the graves; however, the access roads might come near the graves.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG.11: GRAVES AT GEZ02



GEZ03

GEZ03B is located ~30m northwest and GEZ03C is located 85m southeast from Tower 63. The site consists of a recently abandoned settlement, a spiritual grave and a group of eight graves (fig. 12). The spiritual grave is not a grave per se, but rather the buried artefacts of someone who disappeared and was never found. The 'grave' is thus for the ancestral spirit. The informant lived at this settlement. The eight formal graves are north facing.

The transmission line will not affect the graves; however, the access roads might come near the graves.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 12: SPIRITUAL AND REAL GRAVES AT GEZ03



GEZ04

The transmission line will not affect the grave; however, the access roads might come near the graves (fig. 13). The grave might be affected by line stringing.

Significance: The grave is of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 13: GRAVES AT GEZ04



GEZ05

GEZ05 is located ~20m from Tower 133. The site is a recently abandoned settlement, i.e. last 10 years and no graves were noted (fig. 14). The site was recorded, as it should be noted for possible human remains

The transmission line will not affect the settlement; however, the tower footprint will be near the edge of the site.

Significance: The site is of low significance.

Mitigation: No mitigation required but it should be noted as sensitive.

SAHRA Rating: 3C

FIG. 14: SETTLEMENT AT GEZ05



GEZ06

GEZ06 is located ~170m north from Towers 14 and 15. The site consists of an abandoned settlement with no visible graves (fig. 15). Graves are most likely to occur at the settlement. The site will not be affected by the transmission line but was noted for a possible access road impact.

Significance: The site is of low significance.

Mitigation: No mitigation required but it should be noted as sensitive.

SAHRA Rating: 3C

Fig. 15: SETTLEMENT AT GEZ06



GEZ07

GEZ07 is located ~30m north from Tower 11. The site consists of an abandoned recent settlement but no graves were observed (fig. 16). Graves could occur at the site.

The transmission line will not affect the site; however, the tower footprint will be near the edge of the site.

Significance: The site is of low significance.

Mitigation: No mitigation required but it should be noted as sensitive.

SAHRA Rating: 3C

FIG. 16: SETTLEMENT AT GEZ07



GEZ08

GEZ08 is located ~100m southwest from Tower 11 and 17m from the line central point. The site consists of an abandoned settlement but no obvious graves were observed (fig. 17).

The transmission line might go over the site during stringing.

Significance: The site is of low significance.

Mitigation: No mitigation required but it should be noted as sensitive.

SAHRA Rating: 3C

FIG. 17: SETTLEMENT AT GEZ08



GEZ08a-b

GEZ08a-b is located ~60m northwest from Tower 10. GEZ08a is located 20m north of the line while BEZ08B is located underneath the line. The site (fig. 18) consists of an abandoned settlement (GEZ08B) and a single collapsed grave (GEZ08a).

Significance: The grave is of high significance.

Mitigation: The grave needs to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 18: SETTLEMENT AND GRAVE AT GEZ08A AND 8B



GEZ09

GEZ09 is located ~20m north from the line. The site consists of an occupied settlement with two graves (fig. 19).

The transmission towers or line will not affect the site. Trees naturally buffer it.

Significance: The grave is of high significance.

Mitigation: The grave needs to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 19: SETTLEMENT AND GRAVE AT GEZ09



GEZ010 and 10A

GEZ010 and 10A is located ~47m and ~60mm from Tower 7, respectively. GEZ010 consists of a mound of sand covered with thorn bush that is a single grave (fig. 20 top). GEZ010A consists of two formal graves.

The graves will not be affected by the construction of the tower.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 20: GRAVES AT GEZ010 AND 10A



GEZ011

GEZ011 is located ~30m north from Tower 4. The site is a single grave that consists of a mound of sand and has been covered by thorn bushes (fig. 21). The grave is part of an existing settlement.

The transmission towers or line will not affect the site.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 21: GRAVE AT GEZ011



GEZ012

GEZ012 is located ~50m north of the line approximately midway Towers 20 and 21. The site consists of a single formal grave 14m from a possible access road (fig. 22). It is currently buffered from the road with various bushes.

The transmission line will not affect the grave.

Significance: The grave is of high significance.

Mitigation: The grave needs to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation if the access road comes closer to the grave.

SAHRA Rating: 3A

FIG. 22: GRAVE AT GEZ012



GEZ013

GEZ013 is located ~70m southeast from Tower 24. The site consists of an abandoned settlement of at least four houses (fig. 23). No graves were observed, however these could still occur.

The site will not be affected by the tower and only line stringing will pass over the site.

Significance: The site is of low significance.

Mitigation: No mitigation is required however; the area should be noted as being sensitive for human remains.

SAHRA Rating: 3A

Fig. 23: SETTLEMENT AT GEZ013



GEZ014

GEZ014 is located ~75m northwest of Tower 25 and ~15m north of the line. Both GEZ014 and GEZ014B are graves of which one is ten years old. The graves are demarcated with wooden twigs and are barely visible (fig. 24). The neighbouring houses knew the deceased. The graves are 20m apart.

The graves will not be affected by the Tower construction. GEZ014B might be affected by line stringing.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 24: GRAVES AT GEZ014



GEZ015

GEZ0 is located ~24m northeast from Tower 25. The site consists of an abandoned settlement with a possible grave fig. 25). No house structures are visible, but modern artefacts do occur.

The possible grave might be affected by construction.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation. Tower points should avoid the grave and its buffer.

SAHRA Rating: 3A

FIG. 25: SETTLEMENT AND POSSIBLE GRAVE AT GEZ015



GEZ016

The edge of GEZ016 is located ~100m northeast from Tower 28. The site consists a large Shembe site (fig. 26).

The transmission line will not affect the site.

Significance: The graves are of high significance.

Mitigation: No mitigation is currently required.

SAHRA Rating: 3A

FIG. 26: SHEMBE CIRCLE AT GEZ016



GEZ017

GEZ017 is located ~60m northwest of Tower 32 and ~30m north of the line. The site consists of an abandoned wattle and daub house with a sand feature (fig. 27). The sand feature is similar to other sand mounds noted during the survey that are graves.

The site will not be affected by the tower and line, but might be affected by the access road.

Significance: If the sand mound is a grave then it is of high significance.

Mitigation: The “grave” needs to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 27: SETTLEMENT AT GEZ017



GEZ018

GEZ018 is located ~20m northeast from Tower 46. The site was noted on the 1962 topographical map as a ruin (B6 in Table 2) and it is thus older than 60 years in age. No definitive structure can be observed on the 1942 maps. The site is a steel/iron reinforced concrete structure ~12m x 5m in size and appears to be at least 2m+ in depth (fig. 28). The structure consists of several small compartments 1.5m x 3m in size. It has an unknown function and does not appear to be a dip. The tower footprint will affect this structure if it is not moved.

Significance: The site is of low significance.

Mitigation: The tower should move away from the structure, as it would require a permit for its destruction and further assessment. The depth of the structure is unknown and this could affect construction activity.

SAHRA Rating: 3A

FIG. 28: RUIN AT GEZ18



GEZ019

GEZ019 is located ~80m southeast from Tower 144. The site consists of three graves next to trees (fig. 29). There is an ephemeral abandoned settlement associated with these graves.

The towers or its lines will not affect the site.

Significance: The graves are of high significance.

Mitigation: No mitigation currently needed

SAHRA Rating: 3A

FIG. 29: GRAVES AT GEZ019



GEZ020

GEZ020 is located ~50m east from Tower 113. The artefacts consist of an ephemeral open scatter of pottery sherds at the base of the hill (fig. 30). One sherd had an undecorated rim while another had a double row (at least) of circular impressions. The sherds are thin-walled and weathered. This type of decoration is associated with Blackburn pottery and dates to c. 1250 – 1350 AD (Davies 1976; Anderson 1999).

The tower will occur on the top of the hill but have minimum impact, as little of the site is likely to remain. The amount of sherds noted is too few for this to be labelled a site.

Significance: The site is of low significance.

Mitigation: No mitigation is required. No permit is required as it is not an archaeological site, but an occurrence of artefacts.

SAHRA Rating: 3C

FIG. 30: POTTERY SHERDS AT GEZ020



GEZ021

GEZ021 is located ~170m northwest from Tower 104, and ~60m north of the line. The site is a single grave that consists of a mound of sand surrounded by wooden poles in an existing settlement (fig. 31).

The towers or the line will not affect the grave. The access road might occur near the site

Significance: The grave is of high significance.

Mitigation: a house and a tree already buffer the grave.

SAHRA Rating: 3A

FIG. 31: GRAVE AT GEZ21



GEZ022

GEZ022 is located ~60m northwest from Tower 86. The site is a large cleared area that is an abandoned settlement (fig. 32). No graves were observed, however the site location co-ordinates occur at an area that could be human graves.

The Towers will not affect the site. The transmission line will go over the site, but will no damage it.

Significance: The site is of high significance.

Mitigation: The area should be noted as being sensitive for human remains.

SAHRA Rating: 3A

FIG. 32: SETTLEMENT AT GEZ022



GEZ023

GEZ023 is located ~90m southwest from Tower 85 and 60m south of the line. The site is an abandoned settlement with at least one noticeable house floor (fig. 33). No graves were observed.

The Towers or the transmission line will not affect the site

Significance: The graves are of high significance.

Mitigation: The area should be noted as being sensitive for human remains.

SAHRA Rating: 3A

FIG. 33: SETTLEMENT AT GEZ023



GEZ024

GEZ024 is located ~135m south from Tower 84. The site consists of an abandoned settlement with two graves (fig. 34).

The Towers or the transmission line will not affect the site

Significance: The graves are of high significance.

Mitigation: No mitigation is currently required.

SAHRA Rating: 3A

FIG. 34: GRAVES AT GEZ024



GEZ025

GEZ025 is located ~25m northwest from Tower 83 and 15m north of the line. The site consists of an abandoned settlement and three graves. There is an occupied settlement near these graves but it does not appear to be directly related to the graves.

The Tower footprint might affect the site.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 34: GRAVES AT GEZ025



GEZ026

GEZ026 is located ~60m northwest from Tower 79 and 40m northeast of the line. The site consists of two recent formal graves, east of the access road (fig. 36). The graves are in an east-west orientation, facing east.

The Towers and line will not affect the graves; however, they might be affected by a widened access road.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation.

SAHRA Rating: 3A

FIG. 36: GRAVES AT GEZ026



GEZ027

GEZ027 is located ~95m northwest from Tower 79 and 50m northeast from the line. The site consists of a cemetery of seven graves (fig. 37). The graves vary in orientation. The site is naturally buffered from the existing access road.

The Towers and line will not affect the graves; however, they might be affected by a widened access road.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation if the access road is widened.

SAHRA Rating: 3A

FIG. 37: GRAVES AT GEZ027



GEZ028

GEZ028 is located ~100m north from Tower 75 and 25m west of a possible access road. The site consists of a cemetery of seven graves (fig. 38). The graves vary in orientation. The site is naturally buffered from the existing access road. The cemetery has been fenced off and has a natural barrier behind it.

The Towers and line will not affect the graves; however, they might be affected by a widened access road.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation if this access road is used and widened.

SAHRA Rating: 3A

FIG. 38: GRAVES AT GEZ028



GEZ029

GEZ029 is located ~100m south from Tower 65. The site consists of a single formal grave near an abandoned settlement (fig. 39).

The site will not be affected by the tower or the line, but might be affected by construction.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation if it will be affected by construction.

SAHRA Rating: 3A

FIG. 39: GRAVE AT GEZ029



GEZ030

GEZ030 is located ~200m northwest from Tower 65 and ~100m northeast of the line. The site consists of four formal graves in a north-south orientation (fig. 40). The graves are associated with an abandoned settlement.

The line or towers will not affect the graves; however, the access road might occur nearby.

Significance: The graves are of high significance.

Mitigation: The graves need to be clearly demarcated before construction with a 5m buffer between the edge of the grave and the demarcation if affected by the access road.

SAHRA Rating: 3A

FIG. 40: GRAVES AT GEZ030



DESKTOP PALAEOLOGICAL IMPACT ASSESSMENT

The desktop PIA was undertaken by Dr. Gideon Groenewald (full report in Appendix A). The PIA assessment was undertaken with the knowledge that most of the towers will have screwed in stays, and thus any possible disturbance would not be noticed as it would be subsurface. Mitigation for these impacts would not be possible. However, surface finds would indicate possible indicators of palaeontological remains. These indicators would be rock protrusions on the various hills.

“The study area is underlain by sedimentary rocks of the Cretaceous to Quaternary aged Zululand and Maputuland Groups, including the very fossil rich marine deposits of the Mzinene and Uloa Formations. Significant wood fossils have been recorded from the Berea Formation. Areas underlain by Aeolian sand are allocated a Moderate Palaeontological significance whilst the Muzi Formation and areas underlain by redistributed sand are allocated a Low Palaeontological significance.

In all areas allocated a Very High and High Palaeontological significance the chances of destruction of highly significant Palaeontological Heritage is very high and it is recommended that a phase 1 Palaeontological Impact Assessment be done to record and collect fossils from the pylon sites as well as along the proposed route of the line, as vehicles will probably move along the route of the line. The preferred pylon construction would be the structures with minimum base disturbance.

In areas allocated a Moderate Palaeontological sensitivity, the interpretation of Google images indicate deep soil cover and the chances of recording significant fossils is not high.

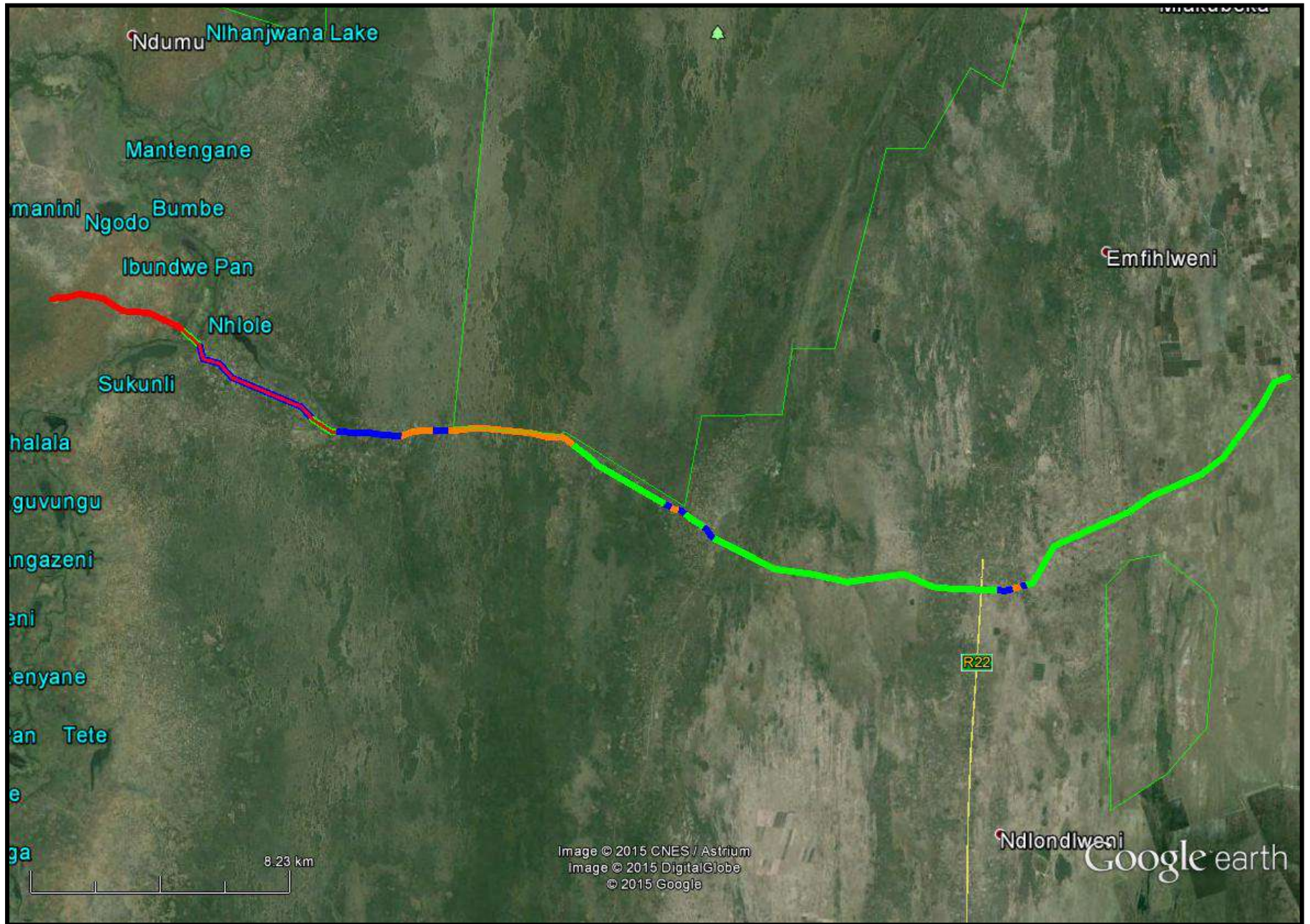
Areas allocated a Low Palaeontological sensitivity need no further mitigation for Palaeontological Heritage” (Groenewald – Appendix A).

The above is summarized in Table 4 and Figure 41.

Table 4: Palaeosensitivity of pylon positions

Pylon no's	Geological Formation	Palaeo-sensitivity For colour coding. See Table 1	Comments
1-9	Uloa	Very High	Phase 1 PIA
10-16	Mzinene	Very High	Phase 1 PIA
17-18	Alluvium	Moderate	
19-33	Yellowish redistributed sand	Low	
34-37	Alluvium	Moderate	
38	Muzi	Low	Root like structures
39-44	Yellowish redistributed sand	Low	
45-48	Berea	High	Phase 1 PIA
49-50	Yellowish redistributed sand	Low	
51-63	Berea	High	Phase 1 PIA
64-73	Aeolian Sand	Moderate	
74	Yellowish redistributed sand	Low	
75	Berea	High	Phase 1 PIA
76	Yellowish redistributed sand	Low	
77-79	Aeolian Sand	Moderate	
80-81	Muzi	Low	Root like structures
82-109	Aeolian Sand	Moderate	
110-111	Yellowish redistributed sand	Low	
112	Berea	High	Phase 1 PIA
113	Yellowish redistributed sand	Low	
114-117	Aeolian Sand	Moderate	
118-122	Alluvium	Moderate	
123	Aeolian Sand	Moderate	
124-127	Alluvium	Moderate	
128-141	Aeolian Sand	Moderate	
142-143	Alluvium	Moderate	
144-145	Aeolian Sand	Moderate	
146	Alluvium	Moderate	
147	Aeolian Sand	Moderate	

FIG. 41: PALAEOONTOLOGICAL SENSITIVITY MAP



Only one tower, Tower 17, will have an excavation for support. This tower is located near the Phongola River. Dr Groenewald stated: “No 17 falls in Moderate sensitivity alluvium. I do not know of any significant fossils reported to date from these recent alluvium sites and recommend that the ECO be aware that the site might have fossils. I do not think the sensitivity warrants a palaeontologist to be on site, but if any fossils (recent mussel shells or vertebrate remains from floods during 1988?) be found, they must report the find and we will then record the find as new information that will increase the Palaeo-sensitivity of that whole alluvium zone in KZN” (email correspondence 4/8/2015).

Significance: More than half of the transmission line is rated being of medium significance and above.

Mitigation: No mitigation is required, as the stays will have minimum impact on the palaeontological layers. Only one tower will have a deep enough excavation to impact on a paleontological layer, however it will probably not affect this layer.

SAHRA Rating: 3C – 3A

MANAGEMENT PLAN

There are three main heritage issues pertaining to this project: local archaeological sites, paleontological sites and community graves.

Archaeology

The archaeology of the area is, in general, a continual scatter of stone tools. These tools date from the Early Stone Age, Middle Stone Age, and Late Stone Age as well as Early and late Iron Age sites. These have been recorded in the general area by several surveys over the last 70 years. These stone tools and pottery shards tend to be in a secondary context due to disturbances by field ploughing, settlements and/or housing projects, roads and natural colluvial action. Other surveys in the general area (Anderson 2009, 2010, 2011, 2012a-b, 2013) have noted a similar pattern, and these artefacts are of low significance.

Sampling will not further the understanding of the archaeology of the area, unless these sites were in a primary context such as a cave. It is for this reason that I do not believe further mitigation is required.

No archaeological sites per se were noted and thus no permits are required from Amafa KZN. All archaeological artefacts tended to be occurrences, rather than sites.

Palaeontology

The palaeontological sensitivity of this area varies from low to very high. However, there will be minimal impact on these sites due to the types of stays used. If palaeontological remains are noted then these will need to be reported to the ECO. However, a final route 'walk through' will be undertaken after bush clearance, and all sensitive area will be noted and mitigated.

No permits are currently required for the palaeontological aspect of this project. Dr Groenewald does not predict permits would be required. If fossils are uncovered during excavation, then an emergency permit can be acquired.

Human Remains

The main concern for this project is unmarked human graves. The desktop study notes many areas that have the remains of settlements that will probably have human graves. The public participation process should include these areas to confirm if members of the public can claim ancestral remains to these areas, and/or indicate where the remains were interred. These areas should then be demarcated with a 20m buffer zone from the stays. However, everything between Towers 18 to 81 should have the overall buffer reduced to only 5m, as these sites are in the Sand Forest and other vegetation sensitive areas and minimal environmental disturbance is required. In some cases, reburial would be a preferred option than over additional disturbance to the Sand Forest. Most of the recorded graves occur beyond the Tower footprint, however all graves within

50m of a tower, access road, or line centre point should be clearly demarcated before construction.

Demarcation would be fence poles with signage and/or flags where they are visible to all types of vehicles. Demarcation should occur prior to construction and if bush clearance used large equipment. Danger tape would be used between the poles during construction.

If graves are uncovered during the course of construction then certain processes need to be followed. In terms of the National Heritage Resources Act (No. 25 of 1999), and KZN Heritage Act of 1997 and 2008, state those graves older than 60 years (not in a municipal graveyard) are protected, as well as all unclaimed recent graves. Only a registered undertaker should handle human remains younger than 60 years or an institution declared under the Human Tissues Act. Anyone who wishes to develop an area where there are graves older than 60 years is required to follow the process described in the legislation (section 36 and associated regulations). The specialist will require a permit from the heritage resources authority:

- Determine/ confirm the presence of the graves on the property. Normally the quickest way to proceed is to obtain the service of a professional archaeologist accredited to undertake burial relocations. The archaeologist will provide an estimate of the age of the graves. There may be a need for archival research and possibly test excavations (permit required).
- The preferred decision is to move the development so that the graves may remain undisturbed. If this is done, the developer must satisfy SAHRA/KZN Heritage that adequate arrangements have been made to protect the graves on site from the impact of the development. This usually involves fencing the grave (yard) and setting up a small site management plan indicating who will be responsible for maintaining the graves and how this is legally tied into the development. It is

recommended that a distance of 10-20 m is left undisturbed between the grave and the fence around the graves.

- If the developer wishes to relocate or disturb the graves:
 - A 60-day public participation (social consultation) process as required by section 36 (and regulations - see attachment), must be undertaken to identify any direct descendants of those buried on the property. This allows for a period of consultation with any family members or community to ascertain what their wishes are for the burials. It involves notices to the public on site and through representative media. The archaeologist, who can explain the process, may do this but for large or sensitive sites, a social consultant should be employed. Archaeologists often work with undertakers, who rebury the human remains.
 - If because of the public participation, the family (where descendants are identified) or the community agree to the relocation process then the graves may be relocated.
 - The archaeologist must submit a permit application to SAHRA/KZN Heritage for the disinterment of the burials. This must include written approval of the descendants or, if there has not been success in identifying direct descendants, written documentation of the social consultation process, which must indicate to SAHRA's satisfaction, the efforts that have been made to locate them. It must also include details of the exhumation process and the place to which the burials are to be relocated. (There are regulations regarding creating new cemeteries and so this usually means that relocation must be to an established communal rural or formal municipal cemetery.)
 - Permission must be obtained before exhumation takes place from the landowner where the graves are located, and from the owners/managers of the graveyard to which the remains will be relocated.

- Other relevant legislation must be complied with, including the Human Tissues Act (National Department of Health) and any ordinances of the Provincial Department of Health). The archaeologist can usually advise about this.

Table 4 summarises the sites, their proximity to the transmission line and the required mitigation.

TABLE 4: SUMMARY OF IMPACT AND MITIGATION PER SITE

Name	Latitude	Longitude	Type Of Site	Nearest Tower	Impact By Footprint, Access Road Or Stringing	Reduced 20m Buffer	Mitigation
GEZ001	-27.046794975	32.354641026	Graves	40	Access Road	Yes	Demarcate With 5m Buffer
GEZ002A-E	-27.060207026	32.440014984	Graves	89	Access Road	Yes	Demarcate With 5m Buffer
GEZ003A	-27.050160980	32.422466967	House Floor	63	Access Road	Yes	No Mitigation
GEZ003B	-27.050225018	32.422335036	Grave	63	Access Road	Yes	Demarcate With 5m Buffer
GEZ003C	-27.050846033	32.422712976	Graves	63	Footprint	Yes	Demarcate With 5m Buffer
GEZ004	-27.055891016	32.430320978	Grave	66	Stringing	Yes	Demarcate With 5m Buffer
GEZ005	-27.059078	32.623877	Houses	133	Footprint	No/A	Note As Sensitive
GEZ006A	-27.013817970	32.292942004	Settlement	15	Possible Access Road	No	Demarcate Only If Access Road Occurs Within 50m Of The Site.
GEZ006B	-27.013661982	32.292947033	Grave?	15	Possible Access Road	No	Demarcate Only If Access Road Occurs Within 50m Of The Site.
GEZ007	-27.012306964	32.281471035	Settlement	11	Footprint	Yes	Note As Sensitive
GEZ008	-27.012727778	32.280375000	Settlement	11	Stringing	No	Note As Sensitive
GEZ008a	-27.012016028	32.278597970	Grave?	11	Access Road	No	Demarcate With 5m Buffer If Affected
GEZ008B	-27.012120970	32.278308040	House	11	Stringing	No	No Mitigation
GEZ009	-27.008621022	32.271696981	Graves	8	Stringing	No	Has A Natural Buffer
GEZ010	-27.007891964	32.269462030	Grave	7	Stringing	No	Has A Natural Buffer
GEZ010A	-27.008802993	32.269777022	Graves	7	Stringing	No	Has A Natural Buffer
GEZ011	-27.008397980	32.261338038	Grave	4	Access Road	Yes	Has A Natural Buffer
GEZ012	-27.026098967	32.306194967	Grave	21	Access Road	Yes	Has A Natural Buffer
GEZ013	-27.031804025	32.314414009	Settlement	24	Stringing	Yes	Demarcate With 5m Buffer
GEZ014	-27.032107031	32.316102041	Grave	25	Stringing	Yes	Demarcate With 5m Buffer
GEZ014B	-27.032252960	32.316217963	Grave	25	Stringing	Yes	Demarcate With 5m Buffer
GEZ015	-27.032482959	32.317074006	Grave?	25	Stringing	Yes	Demarcate With 5m Buffer
GEZ016	-27.035074	32.326016	Shembe Circle	28	Access Road	No	No Mitigation
GEZ017	-27.039348995	32.335574962	House And Grave?	32	Access Road	Yes	Demarcate Grave With 5m Buffer
GEZ018	-27.047026085	32.371196360	Concrete Ruin	46	Footprint	Yes	Demarcate With 2m Buffer
GEZ019	-27.035595998	32.646671981	Graves	144	N/A	No	No Mitigation

Name	Latitude	Longitude	Type Of Site	Nearest Tower	Impact By Footprint, Access Road Or Stringing	Reduced 20m Buffer	Mitigation
GEZ020	-27.090680022	32.567807995	Pottery Shards	113	Footprint, Stringing	No	No Mitigation
GEZ021	-27.090200996	32.537812013	Grave	104	N/A	No	No Mitigation
GEZ022	-27.083355999	32.481883010	Settlement	86	Stringing, Footprint	No	Note As Sensitive
GEZ023	-27.082926007	32.478969041	Settlement	85	N/A	No	Note As Sensitive
GEZ024	-27.082342962	32.476535020	Settlement	84	N/A	No	No Mitigation
GEZ024B	-27.082650997	32.476410968	Graves	84	N/A	No	No Mitigation
GEZ025	-27.079891004	32.474412974	Graves	83	Footprint, Access Road	Yes	Demarcate Grave With 5m Buffer
GEZ026	-27.072707964	32.463584980	Grave	79	Access Road	Yes	Demarcate Grave With 5m Buffer
GEZ026b	-27.072705030	32.463568971	Grave	79	Access Road	Yes	Demarcate Grave With 5m Buffer
GEZ027	-27.072468996	32.463269988	Graves	79	Access Road	Yes	Demarcate Grave With 5m Buffer
GEZ028	-27.068289025	32.455792995	Grave	75	Access Road	Yes	Demarcate Grave With 5m Buffer
GEZ029	-27.055250	32.427778	Grave	65	N/A	No	No Mitigation
GEZ030	-27.052528	32.427667	Graves	64	Access Road	Yes	Demarcate Grave With 5m Buffer

CONCLUSION

A heritage survey was undertaken for the Ndumo-Gezisa transmission line. The line is ~45km in length and passes through various types' sensitive vegetation, especially the Sand Forest. The Sand Forest is highly sensitive vegetation and all activities are aimed at minimizing the impact on this system.

Thirty heritage sites were noted along route. These sites are mostly modern graves. Older graves do not tend to disappear in this area if they are not maintained nor have a formal built structure for the grave. Many graves in the general area are demarcated by a ring of stones or thorn bushes on a mound of sand. This makes these types of graves very difficult to identify if they are older than 10 years, e.g. GEZ014. It is for this reason than all settlements to be affected by the transmission line should be noted as sensitive if no graves were noted from the survey.

All graves normally have a 20m buffer placed between the grave and the footprint. This is followed by a 5m buffer between the grave and the demarcation. Due to the sensitive nature of the vegetation, I have removed the 20m buffer in area where it is required. All graves will be clearly demarcated during construction activities.

A final walk down of the line will occur after bush clearance to ensure that new graves are not uncovered and that fossil bearing areas are not exposed.

REFERENCES

- Anderson, G. 1999. Archaeological Survey & Excavations Of The Richards Bay Minerals Zulti North & Tisand Mining Leases. For Richards Bay Minerals
- Anderson, G. 2009. Heritage Survey of the Proposed P435 Road Upgrade, Ndumu, Northern KwaZulu-Natal. For Afzelia Environmental Consultants

Anderson, G. 2011. Heritage Desktop Survey of the Proposed Candover-Mbazwana-Gezisa 132kv Powerlines and 132/22kv Mbazwana and Gezisa Substations, Kwazulu-Natal. For A. Van Jaarsveld

Anderson, G. 2012a. Heritage Survey of the Phinda Game Reserve, Kwa-Zulu Natal, for Phinda Game Reserve.

Anderson, G. 2012b. Heritage Survey of the Proposed Ndumo-Nondabuyo 132kv Line, Northeastern Kwa-Zulu Natal. For SRK Consulting

Anderson, G. 2012c. Heritage Survey Of The Proposed Community Health Care Centre, Jozini, Kwa-Zulu Natal. For WSP Environment And Energy (WSP). 02 July 2012

Anderson, G. 2013. Desktop Heritage Survey of the Pongolapoort Dam, Kwazulu- Natal. For Afzelia Environmental Consultants

Davies, O. 1971. Excavations at Blackburn. *South African Archaeological Bulletin* 26: 164-178.

APPENDIX A
DESKTOP PALAEOLOGICAL REPORT

**DESKTOP PALAEOLOGICAL ASSESSMENT
FOR THE PROPOSED NDOMU-GEZISA POWERLINE
DEVELOPMENT, JOZINI AND UMHLABUYALINGANA
LOCAL MUNICIPALITIES, UMKHANYAKUDE
DISTRICT MUNICIPALITY KWAZULU-NATAL
PROVINCE.**

**FOR
Umlando**

DATE: 28 July 2015

By

**Gideon Groenewald
Cell: 078 713 6377**

EXECUTIVE SUMMARY

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential palaeontological impact of the proposed Ndomu-Gezisa Powerline Development, Jozini and Umhlabuyalingana Local Municipalities, Umkhanyakude District Municipality Kwazulu-Natal Province.

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 as well as the KwaZulu-Natal Heritage Act No 4 of 2008. In accordance with Section 38 of the National Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

The study area is underlain by sedimentary rocks of the Cretaceous to Quaternary aged Zululand and Maputuland Groups, including the very fossil rich marine deposits of the Mzinene and Uloa Formations. Significant wood fossils have been recorded from the Berea Formation. Areas underlain by Aeolian sand are allocated a Moderate Palaeontological significance whilst the Muzi Formation and areas underlain by redistributed sand are allocated a Low Palaeontological significance.

In all areas allocated a Very High and High Palaeontological significance the chances of destruction of highly significant Palaeontological Heritage is very high and it is recommended that a phase 1 Palaeontological Impact Assessment be done to record and collect fossils from the pylon sites as well as along the proposed route of the line, as vehicles will probably move along the route of the line. The preferred pylon construction would be the structures with minimum base disturbance.

In areas allocated a Moderate Palaeontological sensitivity, the interpretation of Google images indicate deep soil cover and the chances of recording significant fossils is not high. If fossils are observed they must be recorded and the information sent to the palaeontologist for reporting to SAHRA and AMAFA.

Areas allocated a Low Palaeontological sensitivity need no further mitigation for Palaeontological Heritage.

Recommendations:

1. The EAP and ECO of the project must be informed of the fact that highly significant invertebrate fossils have been described from the Mzinene and Uloa Formations and significant fossil wood remains from the Berea Formation.

2. A qualified palaeontologist must be appointed to inspect and complete a Phase 1 PIA for the sites of the pylons as well as the route sections allocated a Very High and High Palaeontological sensitivity.
3. The ECO must be aware of the possibility of fossils in the area allocated a Moderate Palaeontological sensitivity and if fossils are recorded, the palaeontologist must be notified.
4. Areas allocated a Low Palaeontological sensitivity need no further mitigation for Palaeontological Heritage.
5. These recommendations must be incorporated into the EMP of the project.

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INTRODUCTION

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential palaeontological impact of the proposed Ndomu-Gezisa Powerline Development, Jozini and Umhlabuyalingana Local Municipalities, Umkhanyakude District Municipality Kwazulu-Natal Province (figure 1).



Figure 1. Locality of the Ndomu-Gezisa powerline development in KwaZulu-Natal Province

SOUTH AFRICAN NATIONAL HERITAGE RESOURCE ACT NO 25/1999 AND KWAZULU-NATAL HERITAGE ACT NO 4/2008

This Palaeontological Assessment forms part of the Heritage Impact Assessment (HIA) and complies with the requirements of the South African National Heritage Resource Act No 25 of 1999 as well as the KwaZulu-Natal Heritage Act No 4 of 2008. In accordance with Section 38 of the National

Resources Act No 25 of 1999 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

Categories of heritage resources recognised as part of the National Estate in Section 3 of the Heritage Resources Act, and which therefore fall under its protection, include:

- geological sites of scientific or cultural importance;
- objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;
- objects with the potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage.

METHODOLOGY

Following the "SAHRA APM Guidelines: Minimum Standards for the Archaeological & Palaeontological Components of Impact Assessment Reports" the aims of the palaeontological impact assessment are:

- to identify exposed and subsurface rock formations that are considered to be palaeontologically significant;
- to assess the level of palaeontological significance of these formations;
- to comment on the impact of the development on these exposed and/or potential fossil resources and
- to make recommendations as to how the developer should conserve or mitigate damage to these resources.

In preparing a palaeontological desktop study the potential fossiliferous rock units (groups, formations etc) represented within the study area are determined from geological maps (2632 Kosibaa) and Google Earth imagery. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region and the author's field experience.

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

Table 1 Classification of Palaeontological sensitivity and colour scheme

PALAEONTOLOGICAL SIGNIFICANCE/VULNERABILITY OF ROCK UNITS	
The following colour scheme is proposed for the indication of palaeontological sensitivity classes. This classification of sensitivity is adapted from that of Almond et al (2008) and Groenewald et al (2014).	
RED	Very High Palaeontological sensitivity/vulnerability. Development will most likely have a very significant impact on the Palaeontological Heritage of the region. Very high possibility that significant fossil assemblages will be present in all outcrops of the unit. Appointment of professional palaeontologist, desktop survey, phase I Palaeontological Impact Assessment (PIA) (field survey and recording of fossils) and phase II PIA (rescue of fossils during construction) as well as application for collection and destruction permit compulsory.
ORANGE	High Palaeontological sensitivity/vulnerability. High possibility that significant fossil assemblages will be present in most of the outcrop areas of the unit. Fossils most likely to occur in associated sediments or underlying units, for example in the areas underlain by Transvaal Supergroup dolomite where Cenozoic cave deposits are likely to occur. Appointment of professional palaeontologist, desktop survey and phase I Palaeontological Impact Assessment (field survey and collection of fossils) compulsory. Early application for collection permit recommended. Highly likely that a Phase II PIA will be applicable during the construction phase of projects.
GREEN	Moderate Palaeontological sensitivity/vulnerability. High possibility that fossils will be present in the outcrop areas of the unit or in associated sediments that underlie the unit. For example areas underlain by the Gordonia Formation or undifferentiated soils and alluvium. Fossils described in the literature are visible with the naked eye and development can have a significant impact on the Palaeontological Heritage of the area. Recording of fossils will contribute significantly to the present knowledge of the development of life in the geological record of the region. Appointment of a professional palaeontologist, desktop survey and phase I PIA (ground proofing of desktop survey) recommended.

BLUE	<p>Low Palaeontological sensitivity/vulnerability. Low possibility that fossils that are described in the literature will be visible to the naked eye or be recognized as fossils by untrained persons. Fossils of for example small domal Stromatolites as well as micro-bacteria are associated with these rock units. Fossils of micro-bacteria are extremely important for our understanding of the development of Life, but are only visible under large magnification. Recording of the fossils will contribute significantly to the present knowledge and understanding of the development of Life in the region. Where geological units are allocated a blue colour of significance, and the geological unit is surrounded by highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a blue colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in larger alluvium deposits. Collection of a representative sample of potential fossiliferous material is recommended.</p>
GREY	<p>Very Low Palaeontological sensitivity/vulnerability. Very low possibility that significant fossils will be present in the bedrock of these geological units. The rock units are associated with intrusive igneous activities and no life would have been possible during emplacement of the rocks. It is however essential to note that the geological units mapped out on the geological maps are invariably overlain by Cenozoic aged sediments that might contain significant fossil assemblages and archaeological material. Examples of significant finds occur in areas underlain by granite, just to the west of Hoedspruit in the Limpopo Province, where significant assemblages of fossils and clay-pot fragments are associated with large termite mounds. Where geological units are allocated a grey colour of significance, and the geological unit is surrounded by very high and highly significant geological units (red or orange coloured units), a palaeontologist must be appointed to do a desktop survey and to make professional recommendations on the impact of development on significant palaeontological finds that might occur in the unit that is allocated a grey colour. An example of this scenario will be where the scale of mapping on the 1:250 000 scale maps excludes small outcrops of highly significant sedimentary rock units occurring in dolerite sill outcrops. It is important that the report should also refer to archaeological reports and possible descriptions of palaeontological finds in Cenozoic aged surface deposits.</p>

When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a field-based assessment by a professional palaeontologist is usually warranted.

The key assumption for this desktop study is that the existing geological maps and datasets used to assess site sensitivity are correct and reliable. However, the geological maps used were not intended for fine scale planning work and are largely based on aerial photographs alone, without ground-truthing.

These factors may have a major influence on the assessment of the fossil heritage significance of a given development and, without supporting field assessments, may lead to either:

- an underestimation of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or
- an overestimation of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium etc).

GEOLOGY

The study area is underlain by Cretaceous to Quaternary aged sedimentary rocks of the Zululand and Maputuland Groups in KwaZulu-Natal (Johnson et al, 2009). Some areas are underlain by fossil-rich strata of mostly marine origin, whilst large areas are underlain by Aeolian sand of varying age (Figure 2).

Zululand Group

The Zululand Group of siltstones and sandstone are the first deposits that formed in the newly opened Indian Ocean and consist of silt- and sandstone of Cretaceous age (145-65 million years ago). These marine sediments were deposited when dinosaurs roamed the land (MacRae, 1999).

Mzinene Formation

The Cretaceous aged Mzinene Formation consists mainly of marine, glauconitic siltstone, representing a period of relatively high sea-levels, and is therefore mainly a fossiliferous sandstone with shelly and concretionary horizons and well-defined *Teredo* –type hiatus concretions (Du Preez and Wolmarans, 1986). The Formation is separated from the underlying Makatini

Formation by a hard ground or well indurated concretionary horizon bored by *Lithophaga*, a rock boring gastropod (Johnson et al, 2009).

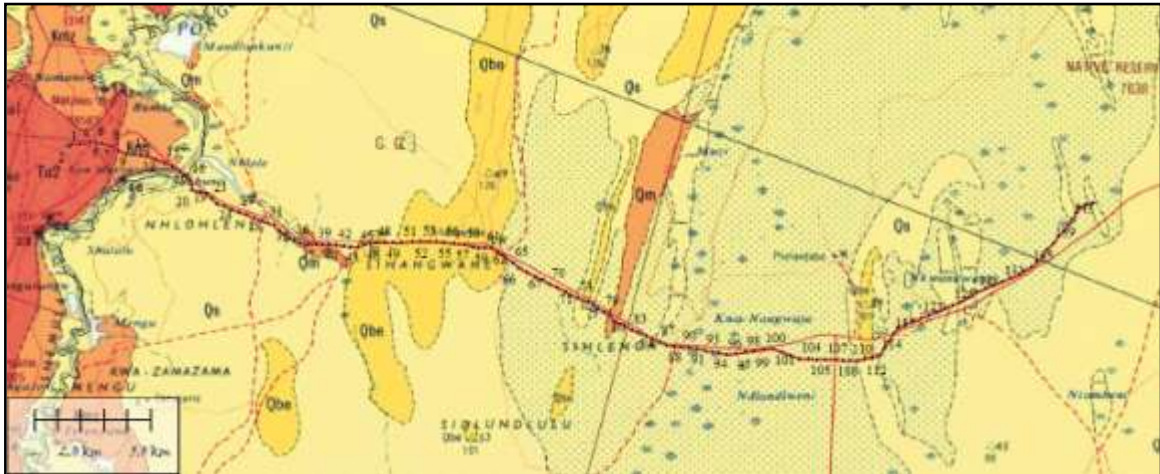
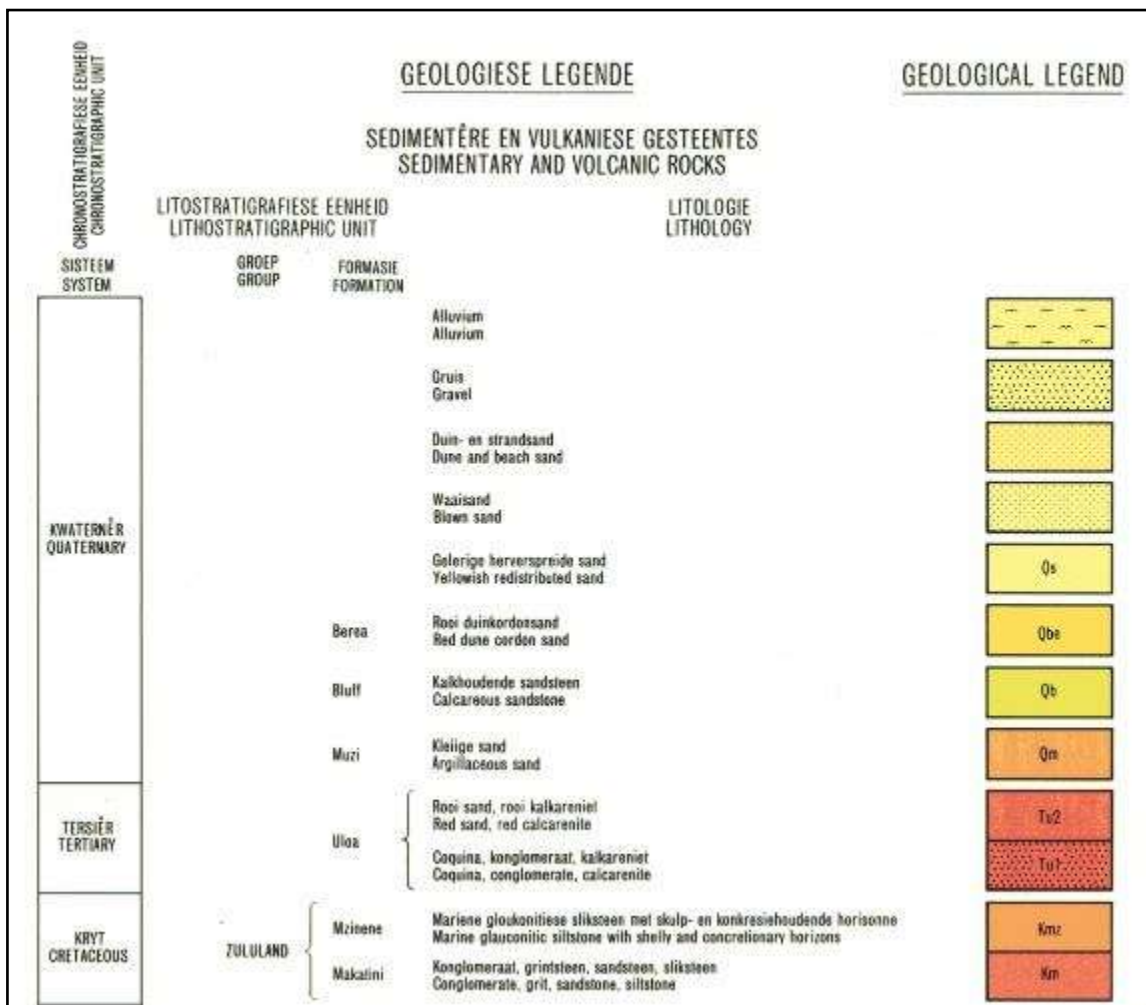


Figure 2 Geology of the area underlying the Ndomu-Gazisa line



Maputuland Group

During the last glacial period, approximately 18 000 years ago, the Earth was much colder and sea level was more than 100 metres below present. The coastline at that time would have been far out to sea and many of the larger rivers cut deep valleys along the coast. As the earth warmed and the sea-level rose, these valleys were infilled with unconsolidated estuarine muds and shelly sands, grouped together into the Maputuland Group (65 million years ago to the present day). It is for this reason that many bridges along the coast require deep foundations to reach solid bedrock.

A series of large coast-parallel dune complexes developed along most of the KwaZulu-Natal coastline and constitutes the Maputuland Group of Johnson et al (2009). These Pleistocene sediments form a thin blanket on the Tertiary and Cretaceous successions of the coastal plain of KwaZulu-Natal (Wolmarans and Du Preez (1986).

Uloa Formation

During the Cenozoic Erathem, sea-level began to fall from the high levels experienced during the Cretaceous. The Tertiary aged Uloa Formation is a highly fossiliferous formation of calcarenite and thin limestone with a basal coquina that discordantly overlies the St Lucia Formation (Wolmarans and Du Preez, 1986; Du Preez and Wolmarans, 1986; Johnson et al, 2009).

Muzi Formation

In the study area the Pleistocene sediments are represented by the lower Muzi Formation, which represents a vlei or swamp deposit consisting of mottled, brown clayey sand with few outcrops (Wolmarans and Du Preez, 1986) and the overlying Berea Formation.

Berea Formation

In the study area the Muzi Formation is overlain by the Berea Formation which consists of red, orange and yellow Aeolian sand, in the form of dune cordons along the coast of KwaZulu-Natal, also known as the “Berea Red Sand”. The Berea Formation is interpreted as the weathering product of the

Bluff Formation, which is not mapped as such in the study area (Wolmarans and Du Preez, 1986).

Yellowish Redistributed Sand

Part of the study area is covered in Tertiary aged yellow coloured redistributed sand that originated from underlying geological formations.

Aeolian Sand

Part of the study area is covered in well-defined wind blown sand, originating from underlying geological formations.

Alluvium

Lower lying vleis areas and river courses are underlain by Alluvium.

PALAEONTOLOGY

Zululand Group

Mzinene Formation

The Cretaceous aged Mzinene Formation The Mzinene Formation consists of glauconitic siltstone and sandstone with a rich invertebrate fauna, including bivalves, gastropods, ammonites, nautiloids and echinoids. *Lithophaga* bored concretions are common. Fossil logs, bored by *Teredo* are also frequently found in the formation (Johnson et al, 2009). The palaeo-environment is interpreted as shallow-marine.

Maputuland Group

Uloa Formation

The Tertiary aged Uloa Formation is a succession of calcarenite and thin limestone with a basal coquina, shelly conglomerate, low-angle stratified boulder/cobble conglomerate, sandstone and siltstone, deposited in the littoral zone on palaeoshorelines along the Lebombo foothill (Johnson et al, 2009; Wolmarans and Du Preez, 1986; Du Preez and Wolmarans, 1986). A main portion of the formation comprises about 5 metres of unbedded calcirudite, locally known as the "Pecten Bed" on account of the abundance of the bivalve *Aeqipecten uloa*.

Gastropods, brachiopods, coralline algae, corals, polyzoa, foraminifera and echinoids are also present, as well as isolated teeth of the extinct giant shark *Carcharodon megalodon* (Johnson et al, 2009). The depositional environment is interpreted as a response to at least three transgressive events superimposed on a first-order regression during the Neogene.

The Muzi Formation

The Quaternary aged Muzi Formation is, on the ground of the clayey nature and mottled appearance of the sedimentary rocks, with root-like structures, interpreted as swamp or vlei deposits (Wolmarans and Du Preez, 1986). No other fossils are described from this unit.

The Berea Formation

No significant vertebrate fossils have been recorded from the Quaternary aged Berea Formation (Wolmarans and Du Preez, 1986). Petrified wood, mainly flattened *Syzigium* logs, have been described from the Formation.

Alluvium, Sand & Calcrete

Large areas of the coastal plain of KwaZulu-Natal are covered in a blanket of alluvial sand and no significant fossils have up to date, been described from these sediments (Wolmarans and Du Preez, 1986; Johnson et al, 2009).

DISCUSSION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews. Highly significant fossils have been recorded from the Mzinene Formation, Zululand Group as well as from the Uloa Formation of the Mapuputland Group. Good examples of petrified wood were recorded in the Berea Formation.

No significant fossils have to date, been recorded from the Muzi Formation or the redistributed sand, windblown sand or alluvium of this part of KwaZulu-Natal.

MANAGEMENT PLAN

The likely impact of the proposed development on local fossil heritage is determined on the basis of the palaeontological sensitivity of the rock units concerned and the nature and scale of the development itself, most notably the extent of bedrock excavation (usually excavations deeper than 1.5m) envisaged. The different sensitivity classes used are explained in Table 1.

The palaeontological sensitivity of the development is related to the specific geology that underlies the development footprints. For the sake of this desktop survey it is assumed that there are significant outcrops on site, and that trenching of up to 1.5m depth will in fact expose bedrock of all the geological formations recorded in the desktop survey. Due to the fact that the recording of fossils will have a significant impact on our understanding of the palaeo-environments in this part of the basin, the Palaeontological sensitivity is allocated to individual sections and pylon sites in the study area. Depending on the pylon type used the impact, based on excavations of deeper than 1.5m, will differ.

The overall Palaeontological sensitivity for the entire footprint of the Ndomu-Gezisa line is based on the interpretation of the geological formations that underlies the route (Figure 3). The Palaeontological sensitivity for tower points is provided in Table 2. The type of pylon construction envisaged, will determine the severity of the palaeontological impact. The smaller the imprint, the smaller the impact. It is however necessary to note that, in areas underlain by rocks with a Very High and High Palaeontological sensitivity, the entire route is sensitive due to the fact that vehicles will be used to construct the line and to deliver materials.

The palaeontological sensitivity of the study area is shown in Figure 3.

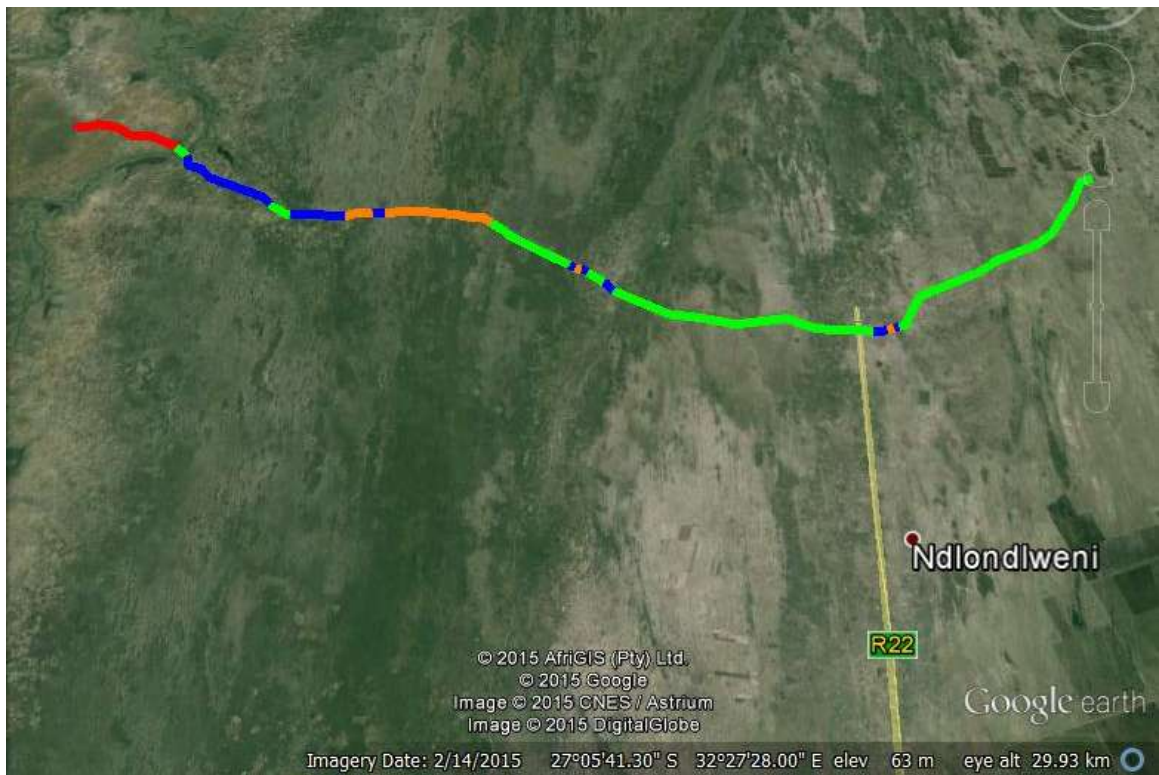


Figure 3 Palaeontological sensitivity of the Ndomu-Gezisa line. For colour coding see Table 1.

Table 2 Palaeosensitivity of pylon positions

Pylon no's	Geological Formation	Palaeo-sensitivity For colour coding. See Table 1	Comments
1-9	Uloa	Very High	Phase 1 PIA
10-16	Mzinene	Very High	Phase 1 PIA
17-18	Alluvium	Moderate	
19-33	Yellowish redistributed sand	Low	
34-37	Alluvium	Moderate	
38	Muzi	Low	Root like structures
39-44	Yellowish redistributed sand	Low	
45-48	Berea	High	Phase 1 PIA
49-50	Yellowish redistributed sand	Low	
51-63	Berea	High	Phase 1 PIA
64-73	Aeolian Sand	Moderate	
74	Yellowish redistributed sand	Low	
75	Berea	High	Phase 1 PIA
76	Yellowish redistributed sand	Low	
77-79	Aeolian Sand	Moderate	
80-81	Muzi	Low	Root like structures
82-109	Aeolian Sand	Moderate	
110-111	Yellowish redistributed sand	Low	
112	Berea	High	Phase 1 PIA
113	Yellowish redistributed sand	Low	
114-117	Aeolian Sand	Moderate	
118-122	Alluvium	Moderate	
123	Aeolian Sand	Moderate	
124-127	Alluvium	Moderate	
128-141	Aeolian Sand	Moderate	
142-143	Alluvium	Moderate	
144-145	Aeolian Sand	Moderate	
146	Alluvium	Moderate	
147	Aeolian Sand	Moderate	

CONCLUSION AND RECOMMENDATIONS

The study area is underlain by sedimentary rocks of the Cretaceous to Quaternary aged Zululand and Maputoland Groups, including the very fossil rich marine deposits of the Mzinene and Uloa Formations. Significant wood fossils have been recorded from the Berea Formation. Areas underlain by Aeolian sand are allocated a Moderate Palaeontological significance whilst the Muzi Formation and areas underlain by redistributed sand are allocated a Low Palaeontological significance (Table 2).

In all areas allocated a Very High and High Palaeontological significance the chances of destruction of highly significant Palaeontological Heritage is very high and it is recommended that a phase 1 Palaeontological Impact Assessment be done to record and collect fossils from the pylon sites as well as along the proposed route of the line, as vehicles will probably move along the route of the line. The preferred pylon construction would be the structures with minimum base disturbance.

In areas allocated a Moderate Palaeontological sensitivity, the interpretation of Google images indicate deep soil cover and the chances of recording significant fossils is not high. If fossils are observed they must be recorded and the information sent to the palaeontologist for reporting to SAHRA and AMAFA.

Areas allocated a Low Palaeontological sensitivity need no further mitigation for Palaeontological Heritage.

Recommendations:

1. The EAP and ECO of the project must be informed of the fact that highly significant invertebrate fossils have been described from the Mzinene and Uloa Formations and significant fossil wood remains from the Berea Formation.

2. A qualified palaeontologist must be appointed to inspect and complete a Phase 1 PIA for the sites of the pylons as well as the route sections allocated a Very High and High Palaeontological sensitivity.
3. The ECO must be aware of the possibility of fossils in the area allocated a Moderate Palaeontological sensitivity and if fossils are recorded, the palaeontologist must be notified.
4. Areas allocated a Low Palaeontological sensitivity need no further mitigation for Palaeontological Heritage.
5. These recommendations must be incorporated into the EMP of the project.

REFERENCES

Almond J.E. and Pether J. 2008. *Palaeontological Heritage of the Western Cape.* Internal Report Heritage Western Cape.

Du Preez JW. and Wolmamarans LG. 1986. Die Geologie van die gebied Kosibaa. Explanation Sheet 2623 (1:250 000) Geological Survey of South.Africa

Groenewald G.H., Groenewald D.P. and Groenewald S.M., 2014. *Palaeontological Heritage of the Free State, Gauteng, Limpopo, Mpumalanga and North West Provinces.* Internal Palaeotechnical Reports, SAHRA.

Johnson MR, Anhausser CR and Thomas RJ. 2009. The Geology of South Africa. Geological Society of South Africa.

Linstrom W. 1987 Die Geologie van die gebied Durban. Explanation Sheet 2930 (1:250 000). Geological Survey of South. Africa.

MacRae C. 1999. *Life Etched in Stone.* Geological Society of South Africa, Linden, South Africa.

McCarthy T and Rubidge BS. 2005. Earth and Life. 333pp. Struik Publishers, Cape Town.

Wolmarans LG. and Du Preez JW. 1986 The Geology of the St Lucia Area. Explanation: Sheet 27.532 (1:250 000), Geological Survey of South. Africa.

QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR

Dr Gideon Groenewald has a PhD in Geology from the University of Port Elizabeth (Nelson Mandela Metropolitan University) (1996) and the National Diploma in Nature Conservation from Technicon RSA (the University of South Africa) (1989). He specialises in research on South African Permian and Triassic sedimentology and macrofossils with an interest in biostratigraphy, and palaeo-ecological aspects. He has extensive experience in the locating of fossil material in the Karoo Supergroup and has more than 20 years of experience in locating, collecting and curating fossils, including exploration field trips in search of new localities in the southern, western, eastern and north-eastern parts of the country. His publication record includes multiple articles in internationally recognized journals. Dr Groenewald is accredited by the Palaeontological Society of Southern Africa (society member for 25 years).

DECLARATION OF INDEPENDENCE

I, Gideon Groenewald, declare that I am an independent specialist consultant and have no financial, personal or other interest in the proposed development, nor the developers or any of their subsidiaries, apart from fair remuneration for work performed in the delivery of palaeontological heritage assessment services. There are no circumstances that compromise the objectivity of my performing such work.



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