

**HERITAGE SURVEY OF THE JOZINI INGWAVUMA  
WATER SUPPLY PROJECT; NONDABUYA PIPELINE**

**FOR WSP ENVIRONMENT AND ENERGY**

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## INTRODUCTION

In order to improve service delivery within the Jozini area, the uMkhanyakude District Municipality (UDM), has embarked on installing a comprehensive water supply system to the area, called the Jozini Ingwavuma Water Supply Project (JIWSPNP). The area currently does not have sufficient potable water supply to provide for the needs of the residents of Jozini Local Municipality. Currently 41.7% of Jozini residents do not have access to piped water, with 26% still sourcing water directly from streams and rivers. Thus the JIWSPNP proposes the construction of the abstraction works, WTW with the associated pipelines and storage reservoirs to ensure the provision of adequate potable water. The location of the line is shown in figures 1 – 3.

This project will comprise of the following:

1. Raw Water Abstraction Works
  - a. A new raw water abstraction works capable of abstracting 40MI per day (20MI per day in Phase 1) is proposed to be constructed on the banks of the Pongola River.
  - b. Raw Water Rising Main (RWRM) - A new raw water rising main to carry raw water from the abstraction works to the new treatment works (800mm diameter, 1760 m long steel pipe from the River Abstraction Works.
2. Water Treatment Works (WTW)
  - a. The construction a new water treatment works (WTW) capable of handling 20MI of water per day. Provision will be made during the land acquisition process for possible future expansion of the works. The site selected will make allowance for future expansion of the WTW when this is required.
  - b. Storage Reservoirs - Balancing / storage reservoirs capable of storing 4.2MI of treated water will be built at the water treatment works.

- c. Potable Water Rising Main (PWRM) - A new potable water rising main (800mm in diameter, 2800m long) from the new treatment works to carry potable water to the KwaNdlazi (Jozini Local) reservoir
  - d. Construction of the Nondubuya pipeline and eSingeni Reservoir
  - e. This portion of the project will consist of the construction and installation of the following elements
  - f. Bulk gravity main – A 12,2km long 350mm diameter pipeline will be constructed from the Mgabadeli (Jozini Main) reservoir.to the Esingeni (Nondabuya) Reservoir.
  - g. A short access road will be constructed from the existing D50 to the newly built eSingeni Reservoir.
3. The reticulation system for the distribution of water to the surrounding household's does not form part of this application.
  4. Over and above the bulk water abstraction, treatment and distribution infrastructure described above, the following supplementary undertakings will be incorporated as part of the project:
  5. The existing power supply to the raw water abstraction works will be upgraded and a new power supply will be installed to the new WTW.
  6. A short access road will be constructed from the existing District gravel road (D1836) to the abstraction and water treatment works.

The pipelines will typically require a trench ~1m across and ~1-1.5m deep. However there will be a working servitude on either side of a minimum of 4 - 5m, but potentially more.

Umlando was contracted to undertake a Heritage Impact Assessment for this line. The HIA consists of an archaeological survey, a palaeontological desktop survey, and recording of human graves along the line.

IG. 1 GENERAL LOCATION OF THE WESTERN AQUADUCT

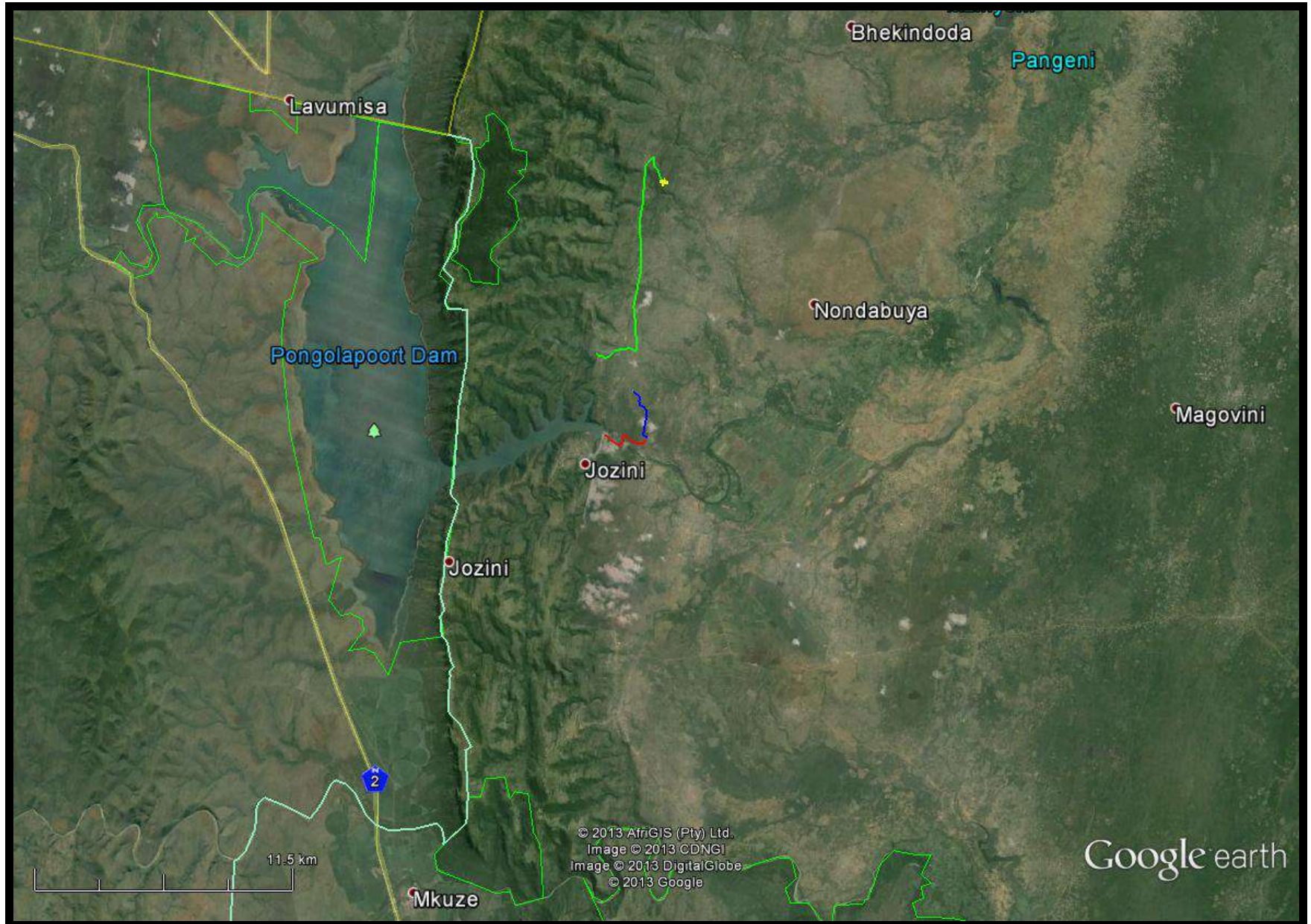


FIG. 2: AERIAL OVERVIEW OF THE WESTERN AQUADUCT

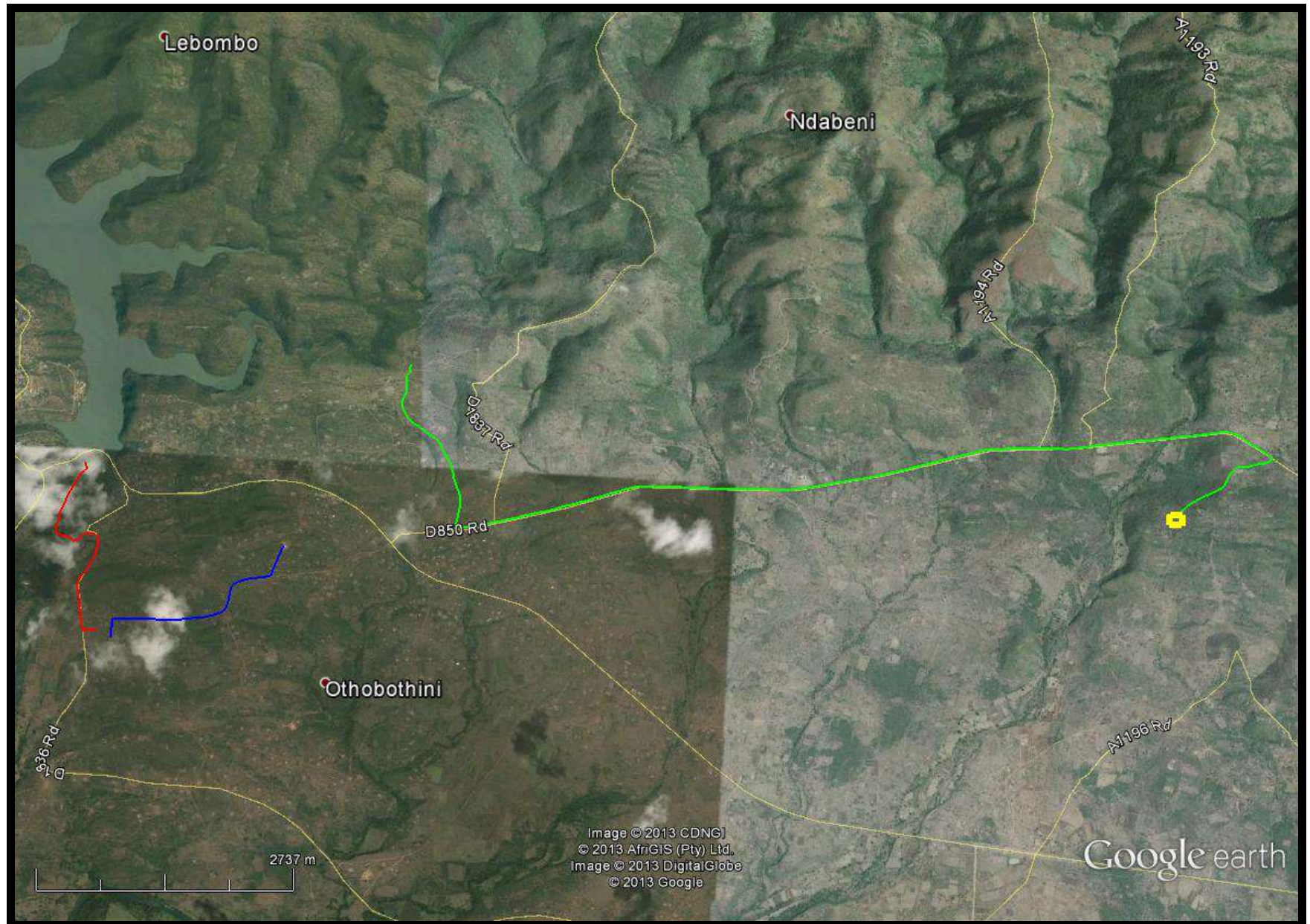
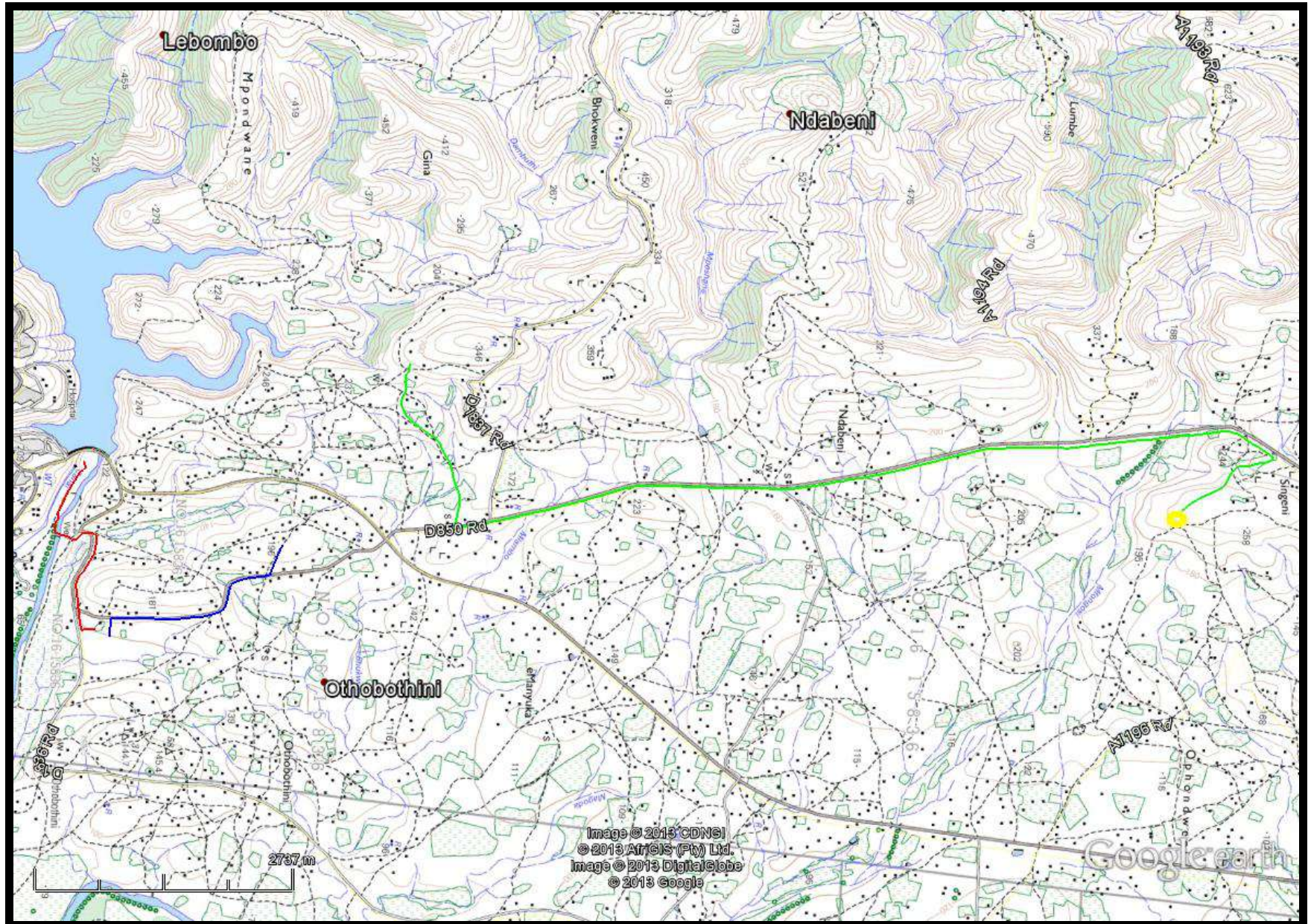


FIG. 3: TOPOGRAPHICAL MAP OF THE WESTERN AQUADUCT



## 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. This 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 1<sup>st</sup> and 2<sup>nd</sup> 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.

## **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 Early, Middle and Late Stone Age sites mostly recorded before the Jozini Dam was built. All of these sites are open scatters of stone tools located on terraces. The site 2731AC 010 is not an archaeological site, but a geological feature of river terrace gravels. JOZ01 was recorded by Anderson (2012) and the site consists of ephemeral scatters of Middle and Late Stone Age tools. This site has subsequently been partially damaged by the construction of a community health centre. While no Iron Age sites have been recorded in the general area, this is more a result of previous research that focussed on Stone Age sites.

FIG. 4: LOCATION OF KNOWN ARCHAEOLOGICAL SITES

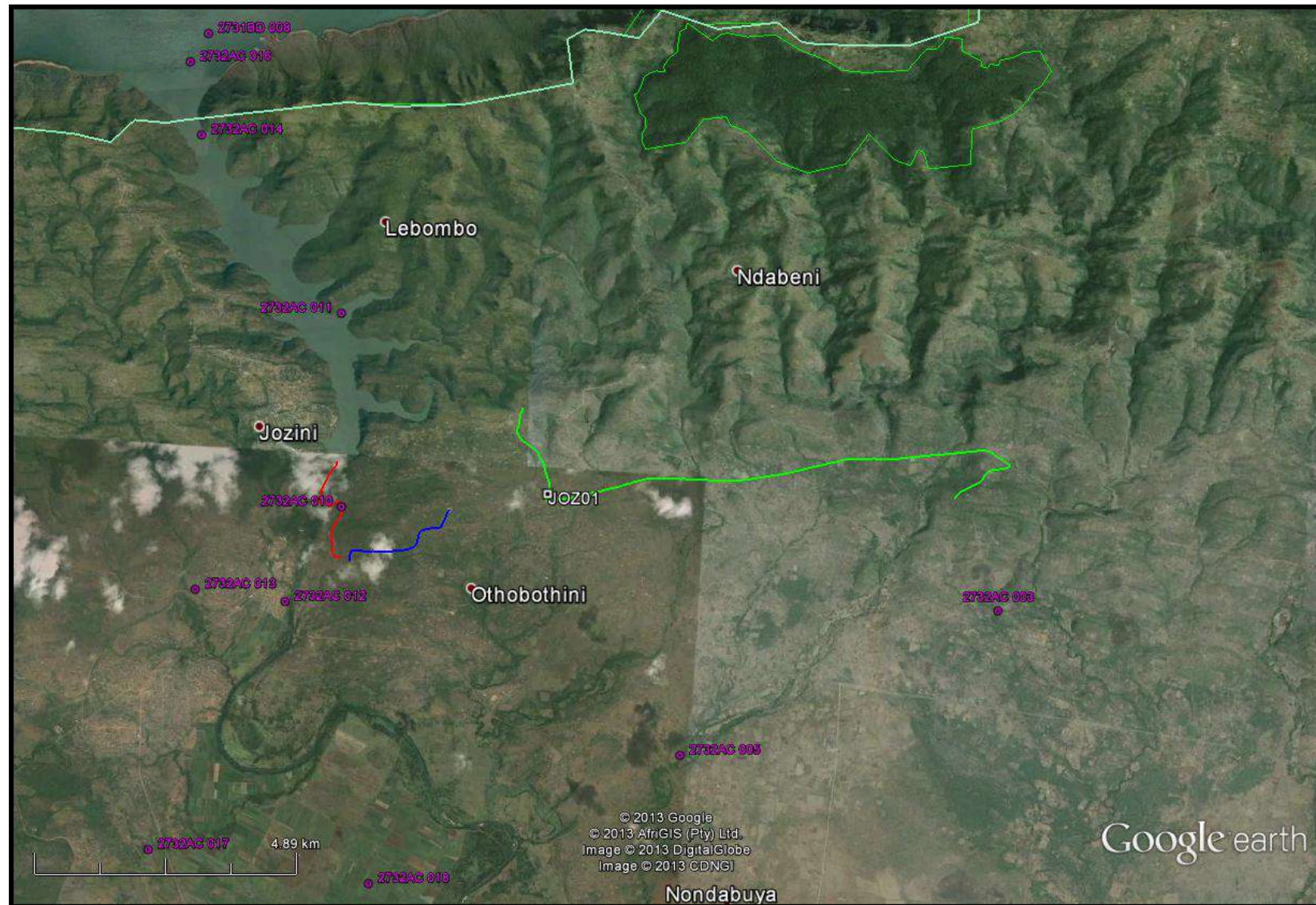


FIG. 5: LOCATION OF SETTLEMENTS IN THE STUDY AREA IN 1937

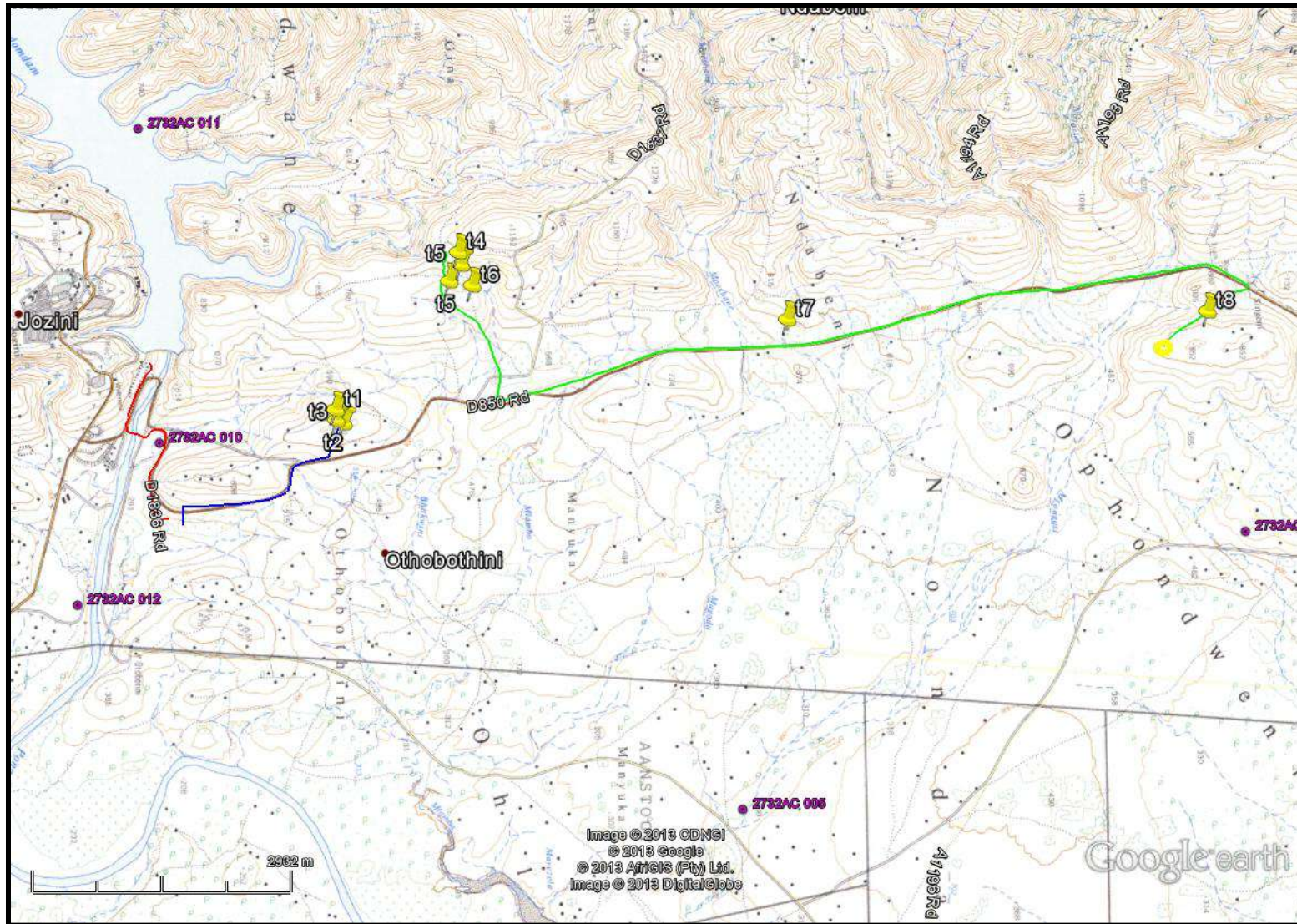


FIG. 6: LOCATION OF SETTLEMENTS IN THE STUDY AREA IN 1975

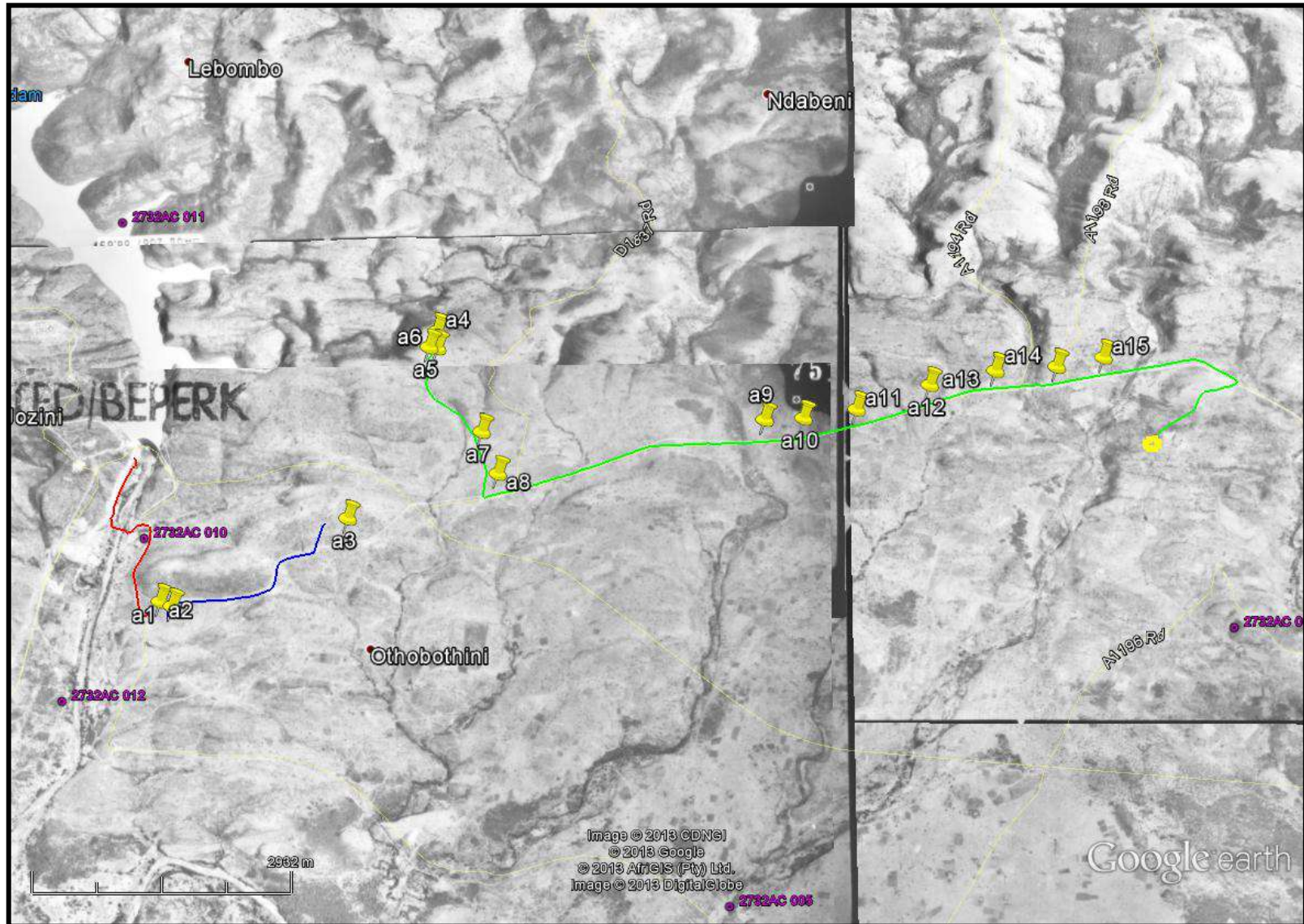
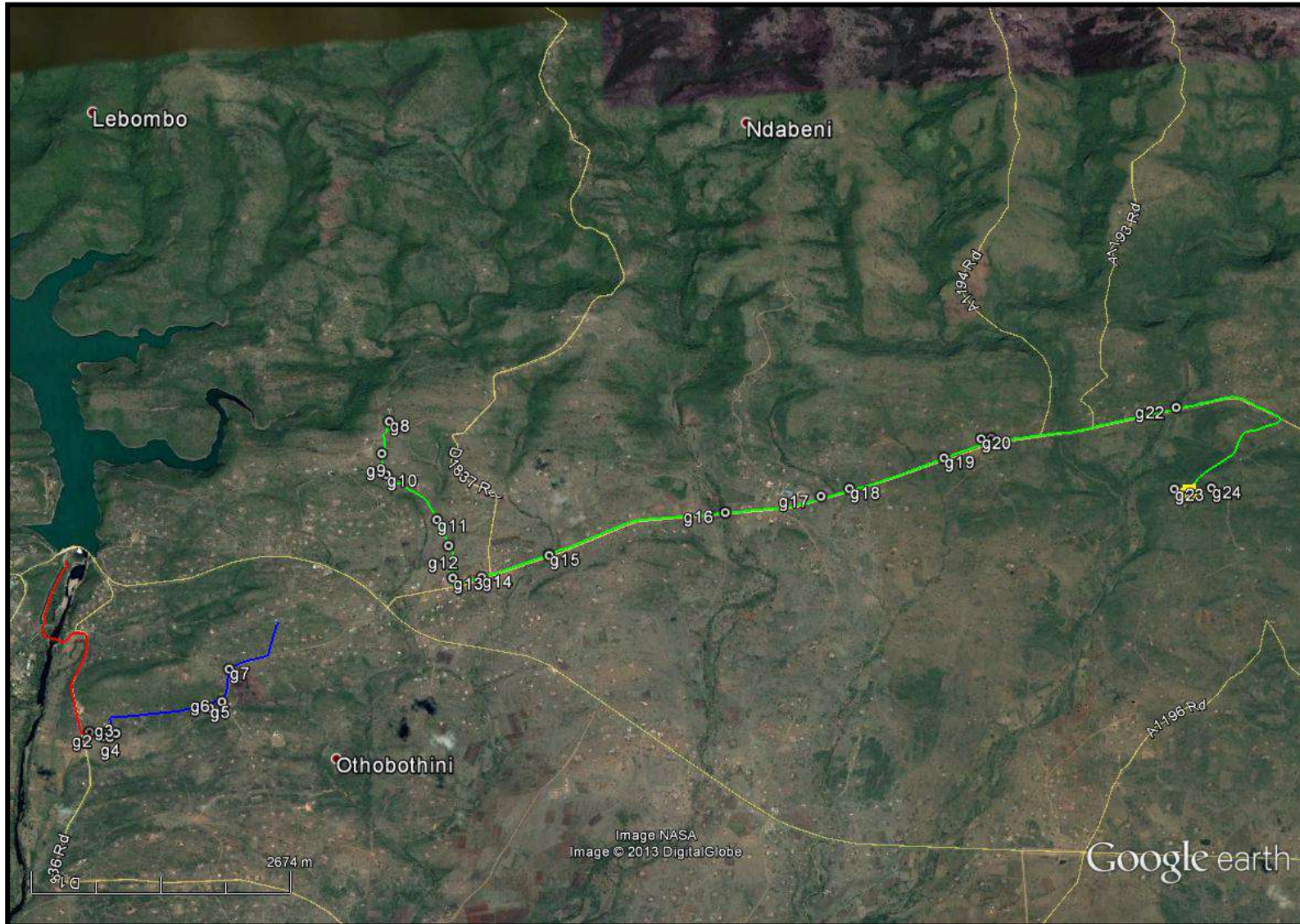




FIG. 7: LOCATION OF SETTLEMENTS IN THE STUDY AREA IN 2010



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

The 1969 1:50 000 topographical map indicates that there are eight sites near the line (fig. 5). Seven of these are human settlements and one is a building. The settlements would include human graves. The locations of these sites are summarised in Table 1.

**TABLE 1: LOCATION OF SETTLEMENTS ALONG THE LINE IN 1969**

NAME	LATITUDE	LONGITUDE	DESCRIPTION
t1	-27.401555251	32.080087305	Settlement
t2	-27.401522907	32.081261211	Settlement
t3	-27.400822980	32.081631695	Settlement
t4	-27.388634893	32.062265178	Settlement
t5	-27.389651354	32.065537632	Settlement
t5	-27.388421294	32.063664763	Settlement
t6	-27.387325888	32.066061417	Settlement
t7	-27.355031972	32.070671980	Building
t8	-27.312114021	32.070836330	Settlement

The 1975 aerial photographs for this area indicate that there are fifteen human settlements near the line, and these would include human graves (fig. 6). The locations of these sites are summarised in Table 2.

**TABLE 2: LOCATION OF HUMAN SETTLEMENTS IN 1975**

NAME	LATITUDE	LONGITUDE	DESCRIPTION
a1	-27.417265727	32.091346279	Settlement
a2	-27.418501707	32.090778821	Settlement
a3	-27.398886462	32.081586931	Settlement
a4	-27.389289104	32.060328846	Settlement
a5	-27.390155492	32.062127353	Settlement
a6	-27.389356661	32.062256959	Settlement
a7	-27.385041585	32.071931790	Settlement
a8	-27.383493979	32.076794696	Settlement
a9	-27.356041313	32.071202503	Settlement
a10	-27.352069551	32.071128052	Settlement
a11	-27.346627780	32.070242413	Settlement
a12	-27.339074001	32.067591093	Settlement
a13	-27.332301484	32.066109676	Settlement
a14	-27.325990570	32.065779772	Settlement
a15	-27.321246686	32.064851443	Settlement

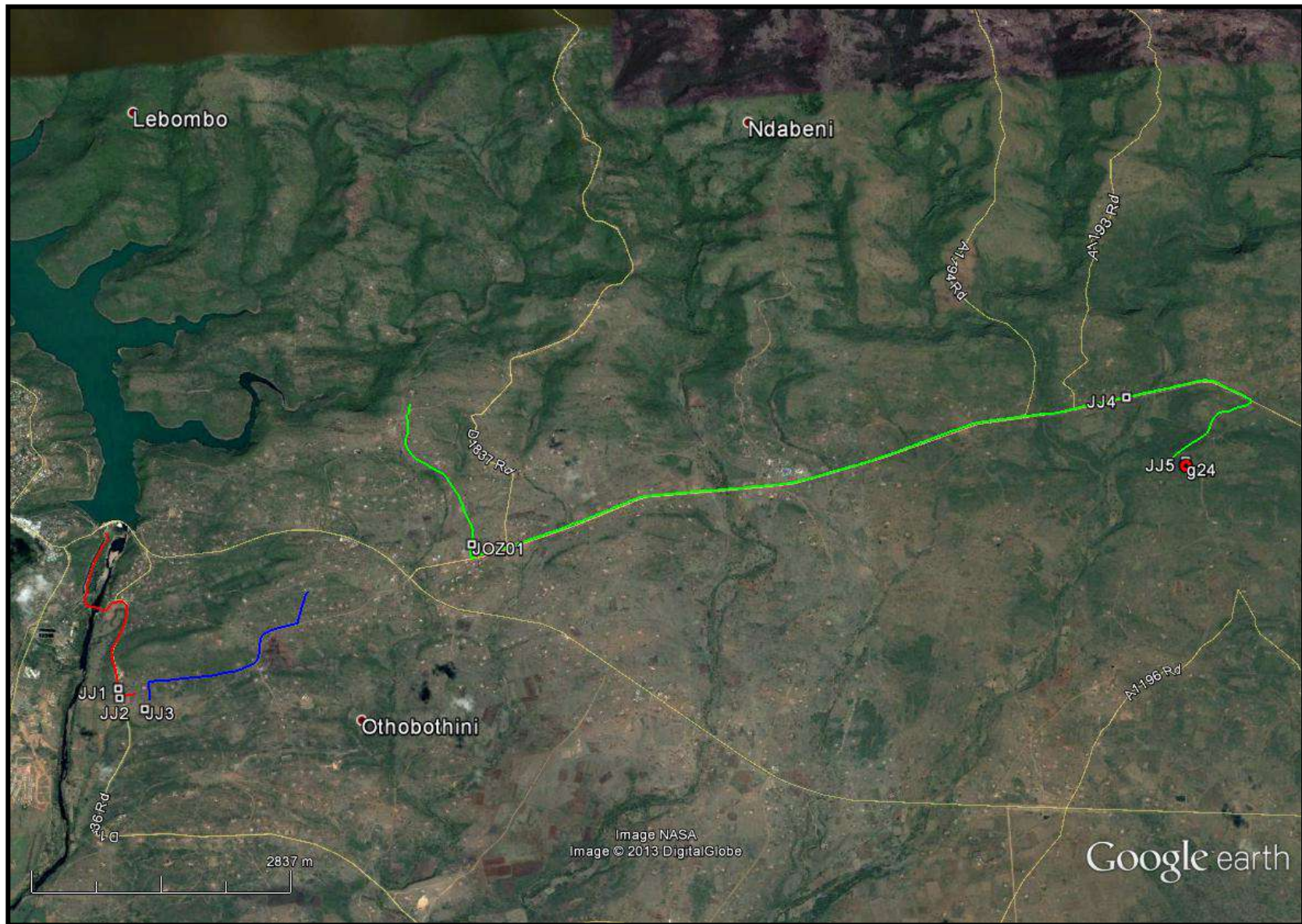
By 2010, there is a marked increase in human settlements in the area. There are twenty-four sites near the line (fig. 8). These sites include abandoned settlements that are visible on Google Earth. The locations of these sites are listed in Table 3.

**TABLE 3: LOCATION OF SETTLEMENTS IN 2010**

<b>NAME</b>	<b>LATITUDE</b>	<b>LONGITUDE</b>	<b>DESC</b>
<b>g1</b>	-27.419198866	32.090574843	Settlement
<b>g2</b>	-27.417905147	32.091166227	Settlement
<b>g3</b>	-27.417316434	32.091275345	Settlement
<b>g4</b>	-27.416722702	32.090889622	Settlement
<b>g5</b>	-27.407633020	32.088758273	Settlement
<b>g6</b>	-27.406449706	32.088194589	Settlement
<b>g7</b>	-27.405567433	32.084858401	Settlement
<b>g8</b>	-27.389031817	32.060301464	Settlement
<b>g9</b>	-27.389969194	32.063552359	Settlement
<b>g10</b>	-27.389714665	32.065757672	Settlement
<b>g11</b>	-27.385407947	32.070773199	Settlement
<b>g12</b>	-27.384518931	32.073559913	Settlement
<b>g13</b>	-27.384344705	32.076941144	Settlement
<b>g14</b>	-27.381687154	32.077085989	Settlement
<b>g15</b>	-27.375309190	32.075278809	Settlement
<b>g16</b>	-27.358771279	32.072036498	Settlement
<b>g17</b>	-27.349871868	32.070998987	Settlement
<b>g18</b>	-27.347210055	32.070407160	Settlement
<b>g19</b>	-27.338291844	32.067884346	Settlement
<b>g20</b>	-27.334759731	32.066153956	Settlement
<b>g21</b>	-27.333834743	32.066188619	Settlement
<b>g22</b>	-27.316541720	32.064270044	Settlement
<b>g23</b>	-27.317347264	32.072690687	Settlement
<b>g24</b>	-27.314040768	32.072826540	Settlement

These three tables indicate that there is a strong likelihood of human graves occurring near the line, or within 50m of it. The older settlements may not be known to the current community and thus the sites need to be treated as sensitive areas.

FIG. 8: LOCATION OF RECORDED HERITAGE SITES IN THE STUDY AREA



## FIELD SURVEY

The field survey was undertaken in August 2013. Much of the pipeline occurs within the road reserve, or within 15m of the edge of the road. These are thus already disturbed areas, with the exception of some areas that are in agricultural fields. The locations of the two new reservoirs are in areas that have not been disturbed by servitudes. Stone tools occur along the length of the pipeline. However, they are all in a secondary context as they are open scatters along the sides of roads or agricultural terraces.

The scatters are ephemeral and occur about 1 tool for every 5m. Two areas had a higher density of stone tools and were recorded as sites. If one had to record every stone tool, or small scatter of tools, then most of the Lubombo Mountain would be either one large site, or hundreds of little dots on the maps. It is for this reason I prefer to refer to them as stone tool occurrences. Table 4 lists the recorded sites.

**TABLE 4: LOCATION AND DESCRIPTION OF RECORDED SITES**

NAME	LATITUDE	LONGITUDE	ALTITUDE (M)	DESCRIPTION
<b>g24</b>	-27.314040768	32.072826540		Recent Settlement
<b>Cemetery</b>	-27.313895971	32.072649999	271.0	Graves at g24
<b>JJ1</b>	-27.420225022	32.089770036		Cemetery x2
<b>JJ2</b>	-27.420188980	32.090823976	105.4	Stone cairn
<b>JJ3</b>	-27.417731993	32.092241021	103.9	Stone Age scatter
<b>JJ4</b>	-27.319199033	32.064901013	174.4	Stone Age scatter
<b>JJ5</b>	-27.314047012	32.072326038	264.3	Grave

## JJ1

JJ1 is a current settlement with two sets of graves located between the houses and the road (fig. 9). The western area consists of ~6 graves, while the eastern area consists of four graves. All of the graves are large stone cairns and of varying age. The ancestral remains probably belong to the people living in the nearby houses.

The houses are between 10m and 20m from the existing road. Thus, the graves will be within the 20m buffer zone and should require some form of mitigation.

Significance: The graves are of high significance.

Mitigation: The graves should be clearly demarcated with metal poles and fencing before construction begins. There should be a 5m buffer between the graves and the fencing. If these were older graves, the pipeline would not be allowed within 20m of the grave. The descendants may give permission of the pipeline to occur near the graves.

**FIG. 9: GRAVES AT JJ1**



## JJ2

JJ2 occurs ~20m from the turning point of the line, and 100m east of JJ1, No sites were noted from the desktop, however this means the feature could pre-date 1969. The site consists of a single stone cairn ~1.5m x 1m in size (fig. 10). The feature is not a natural occurrence as there is a definite semi-circular construction. The feature may be a sunken, or collapsed, grave, or the remnants of a domestic feature. Unfortunately, it is not possible to determine the exact nature of the cairn unless it is excavated. It is for this reason that I prefer to treat it as a potential grave. The feature will not be affected by the pipeline.

Significance: The site is currently of high significance.

Mitigation: The site should be treated as a grave. The cairn needs to be clearly demarcated and fenced off before construction begins. There needs to be a 5m buffer between the edge of the feature and the fence.

**FIG. 10: STONE FEATURE AT JJ2**



### JJ3

JJ3 is located on a terrace that is ~1000m x 250m in size. The area has been used for agricultural for over 30 years and thus the soil is disturbed. Stone tools occur along the entire terrace. The stone tools consist of the following (fig. 11):

- ESA
  - Chopper
  - Cleaver
- MSA
  - Irregular cores
  - General flakes
  - Utilised flakes
  - Unifacial point
- LSA
  - General flakes
  - Utilised flakes
  - Bipolar cores
  - Irregular cores
  - Adze
- General
  - Upper grinding stones

The stone tools are made from locally available raw materials such as CCS, quartz and quartzite.

Significance: The site is of low significance as the tools are the standard variety for the area and in a secondary context.

Mitigation: No further mitigation is required; however, a permit from Amafa KZN to impact on the site will be required.



FIG. 11: EXAMPLES OF STONE TOOLS AT JJ3



## JJ4

JJ4 is located along the northern slope of a hill. The site consists of a scatter of LSA tools that have been exposed by walking and driving tracks. The stone tools were not as dense as at JJ3, however there were more frequent in comparison to other hills where the tools would be classified as isolated scatters. The stone tools consist of LSA stone tools, although some are re-worked MSA tools (fig. 12). They are as follows:

- Utilised flakes
- General flakes
- Irregular cores
- Bipolar core
- MSA flakes reworked in the LSA
- Upper grinding stone

The tools are made from basalt and CCS

The stone tools appear to become more frequent further uphill. However, they are in a secondary context.

Significance: The site is of low significance.

Mitigation: No further mitigation is required, as the site will not increase the knowledge of the Late Stone Age in the area. A permit from Amafa KZN will be required.

FIG. 12: STONE TOOLS ASSOCIATED WITH JJ4



## **G24 and JJ5**

G24 was recognised from the 2010 Google Earth Map as an abandoned settlement. It does not appear on the 1969 and 1975 maps, and thus dates between 1975 and 2010. The site consists of a settlement, i.e. houses, an agricultural field, and a small kraal. There are remains of stone walling near the agricultural field. There is a main cemetery (fig. 13) and a single grave – JJ5 (fig. 14). The cemetery at G24 consists of ~8 graves that are all raised cairns.

The pipeline and nearby reservoir will occur between 100m and 140m from the nearest grave: JJ5 and thus it will not have an impact on the site. My current concern is that there is an access path leading to the proposed reservoir. Preconstruction activity has already occurred at the proposed reservoir in terms of (possible) geotechnical analysis. The machinery that was used came within 5m of JJ5. These graves are claimed by the local community.

Significance: The human graves are of high significance.

Mitigation: No mitigation is required for the construction phase of the pipeline. However, if access roads for the reservoir occur near this site then the graves need to be clearly demarcated and the access road must be at least 25m from the graves.

**FIG. 13: CEMETERY AT G24**



**FIG. 14: GRAVE AT JJ5**



## **JOZ01**

JOZ01 was previously recorded in 2012 (Anderson 2012) and has now been mostly cleared for a community health care centre. The site was a large scatter of stone tools that occurs in patches across the property. The patches are not a result of spatial patterning, rather due to exposure and/or erosion. The site consists of a mostly Middle Stone Age (MSA) tools and some Late Stone Age (LSA) tools (fig. 8). All of the tools are in a secondary context. The stone tools include the following:

- LSA scraper on cryptocrystalline silicates
- Upper grinding stone
- MSA flakes – general
- MSA flakes – utilised
- Irregular cores

These stone tools are normal for the area, and no special artefacts were observed. The stone tools could be sampled for a teaching collection; however, many of these types already occur in teaching collections. They would thus take up valuable space in institutions.

Significance: the site is of low significance as the tools are in a secondary context and standard examples for their Period.

Mitigation: No further mitigation is required. A permit was granted for the site to be partially damaged for the previous development.

## **PALAEONTOLOGICAL DESKTOP SURVEY**

The PIA desktop reports (see Appendix B) notes that the affected areas are underlain by Jurassic aged igneous rocks of the Jozini Formation and dolerite intrusions. Due to the igneous nature of these rocks, the study areas are allocated a low palaeontological sensitivity rating. No further palaeontological mitigation is required.

## MANAGEMENT PLAN & DISCUSSION

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

### 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. These stone tools 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. A permit for the partial damage to the two sites will be required...

### Palaeontology

The palaeontological sensitivity of this area is very low and no further management is required.

### Human Remains

The main concern for this project is unmarked human graves. The desktop study notes several 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 pipeline.

If graves are uncovered during the course of the pipeline 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 as a result 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.

## CONCLUSION

A heritage survey was undertaken for the Jozini Ingwavuma Water Supply Project. The project is to supply potable water to the community and will involve water pipelines and water reservoirs.

The heritage survey noted two sets of recent graves that will occur within 20m of the pipeline, as well as a recent cemetery near the Nondabuya Reservoir. These graves will not be directly affected but should be demarcated before construction begins. This is especially the case for JJ1 and JJ2. The two Stone Age sites require a permit for their partial damage.

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Anderson, G. 2009. Heritage Survey of the Proposed P435 Road Upgrade, Ndumu, Northern KwaZulu-Natal. For Afzelia Environmental Consultants

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

**APPENDIX A  
SITE RECORD FORMS**



**APPENDIX B  
PIA DESKTOP REPORT**

**DESKTOP PALAEOLOGICAL  
ASSESSMENT OF  
JOZINI INGWAVUMA WATER SUPPLY  
PROJECT; NONDABUYA PIPELINE AND  
REGIONAL WATER TREATMENT WORKS,  
KWA-ZULU NATAL**

**FOR  
Umlando**

**DATE: 8 August 2013**

**By**

**Gideon Groenewald**

**Cell: 082 339 9202**

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## **EXECUTIVE SUMMARY**

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential palaeontological impact of the Jozini Ingwavuma Water Supply Project consisting of the Nondabuya Pipeline, reservoir and regional Water Treatment Works.

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. In accordance with Section 38 (Heritage Resources Management), a HIA is required to assess any potential impacts to palaeontological heritage within the development footprint.

The study areas of the proposed Jozini Ingwavuma Water Supply Project are underlain by Jurassic aged igneous rocks of the Jozini Formation with several dolerite dykes cutting the volcanic sequence. Due to the igneous nature of the rock sequences, the study areas are allocated a low palaeontological sensitivity rating. No further palaeontological mitigation is required.

## INTRODUCTION

Gideon Groenewald was appointed to undertake a desktop survey, assessing the potential palaeontological impact of the Jozini Ingwavuma Water Supply Project consisting of the Nondabuya Pipeline, reservoir and regional Water Treatment Works (Figures 1 and 2).

In order to improve service delivery within the Jozini area, the uMkhanyakude District Municipality (UDM), via various national and provincial funding initiatives, has embarked on installing a comprehensive water supply system to the area, and the Jozini Ingwavuma Water Supply Project Regional Water Treatment Works (JIWSPRWTW) has been proposed. This project will comprise the construction of the following:

- Raw Water Abstraction Works - A new raw water abstraction works capable of abstracting 40MI per day (20MI per day in Phase 1) to be constructed on the banks of the Pongola River. An alternative Raw Water Abstraction taking water from an outlet manifold in the Pongolapoort Dam wall will also be investigated.
- Raw Water Rising Main - A new raw water rising main to carry raw water from the abstraction works to the treatment works (800mm diameter, 1760 m long steel pipe from the River Abstraction Works or alternatively, plus a further 1020m to the Dam wall from the river Abstraction works site).
- Water Treatment Works – The construction a new water treatment works (WTW) capable of handling 20MI of water per day. Provision will be made during the land acquisition process for possible future expansion of the works
- The site selected will make allowance for future expansion of the WTW when this is required.
- Storage Reservoirs - Balancing / storage reservoirs capable of storing 4.2MI of treated water will be built at the water treatment works.
- Potable Water Rising Main - A new potable water rising main (800mm in diameter, 2800m long) from the new treatment works to carry potable water to the KwaNdlazi (Jozini Local) reservoir. Please note: The reticulation system distributing water from this point is not part of this phase of the project.

- Bulk gravity main – A 12,2km long 350mm diameter pipeline will be constructed from the Mgabadeli (Jozini Main) reservoir to the Esingeni (Nondabuya) Reservoir.

Over and above the bulk water abstraction, treatment and distribution infrastructure described above, the following supplementary undertakings will be incorporated as part of the project:

- The existing power supply to the raw water abstraction works will be upgraded and a new power supply will be installed to the new water treatment works.
- A short access road will be constructed from the existing District gravel road (D1836) to the abstraction and water treatment works.
- A short access road will be constructed from the existing District gravel road (D850) to the Nondabuya Reservoir. Access to the Mgabadeli Reservoir is already in existence. The pipeline will follow existing roads for the most part and access roads will therefore not be required along the pipeline route.



Figure 1 Location of the Nondabuya Pipeline

## SOUTH AFRICAN NATIONAL HERITAGE RESOURCE ACT NO 25/1999

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. In accordance with Section 38 (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 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 fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 below.

**Table 1 Palaeontological sensitivity analysis outcome classification**

<b>Sensitivity</b>	<b>Description</b>
--------------------	--------------------

<b>Low Sensitivity</b>	Areas where there is likely to be a negligible impact on the fossil heritage. This category is reserved largely for areas underlain by igneous rocks. However, development in fossil bearing strata with shallow excavations or with deep soils or weathered bedrock can also form part of this category.
<b>Moderate Sensitivity</b>	Areas where fossil bearing rock units are present but fossil finds are localised or within thin or scattered sub-units. Pending the nature and scale of the proposed development the chances of finding fossils are moderate. A field-based assessment by a professional palaeontologist is usually warranted.
<b>High Sensitivity</b>	Areas where fossil bearing rock units are present with a very high possibility of finding fossils of a specific assemblage zone. Fossils will most probably be present in all outcrops and the chances of finding fossils during a field-based assessment by a professional palaeontologist are very high. Palaeontological mitigation measures need to be incorporated into the Environmental Management Plan

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 areas of both the Nondabuya pipeline as well as the reservoir is underlain by Jurassic aged rocks of the Jozini Formation that consist primarily of a sequence of rhyodacite and alternating bands of flow breccia (Figures 3 and 4). Several dolerite dykes cut the volcanic sequence (Johnson et al., 2009).

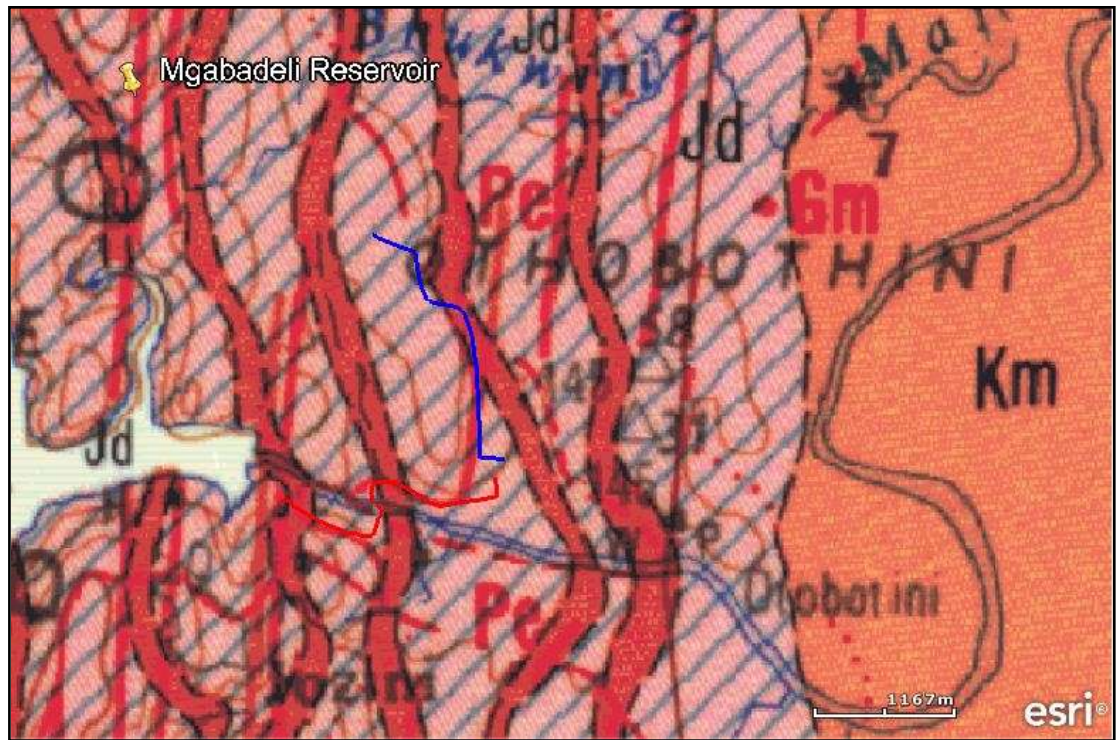
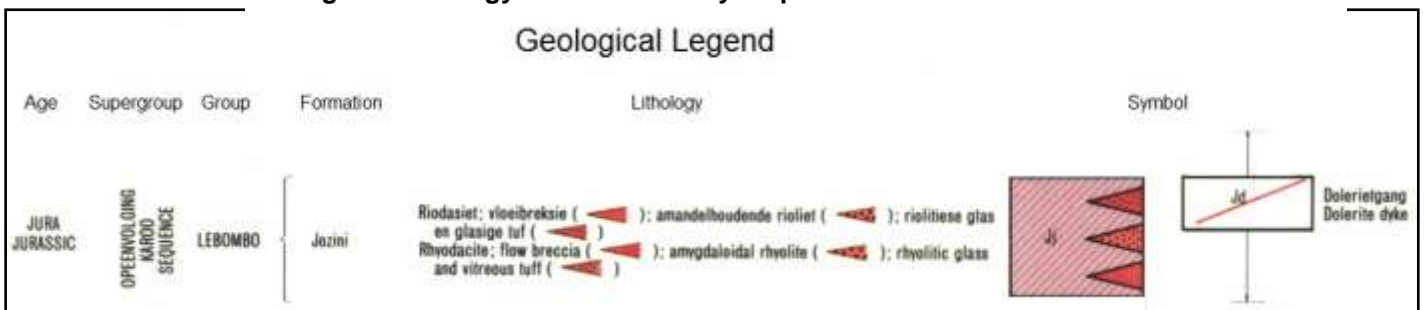


Figure 3 Geology of the Nondabuya Pipeline



**PALAEONTOLOGY**



Figure 4 Geology of the Nondabuya reservoir

Due to the igneous nature of the rocks in Jozini Formation it will not contain fossils. Similarly, the dolerite sequences will also not contain fossils.

### DISCUSSION

The predicted palaeontological impact of the development is based on the initial mapping assessment and literature reviews. The palaeontological significance is summarised in Table 2.

**Table 2 Palaeontological significance of geological units on site**

<b>Geological Unit</b>	<b>Rock Type and Age</b>	<b>Fossil Heritage</b>	<b>Vertebrate Biozone</b>	<b>Palaeontological Sensitivity</b>
Jozini Formation	Rhyodacite and alternating bands of flow breccia JURASSIC	None		Low sensitivity

### 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 fresh bedrock excavation envisaged. The different sensitivity classes used are explained in Table 1 above.

The palaeontological sensitivity of the development is related to the specific geology that underlies the development footprints. Areas underlain by the Jozini Formation are allocated low sensitivity ratings and will have no significance for fossils (Figures 5 and 6).

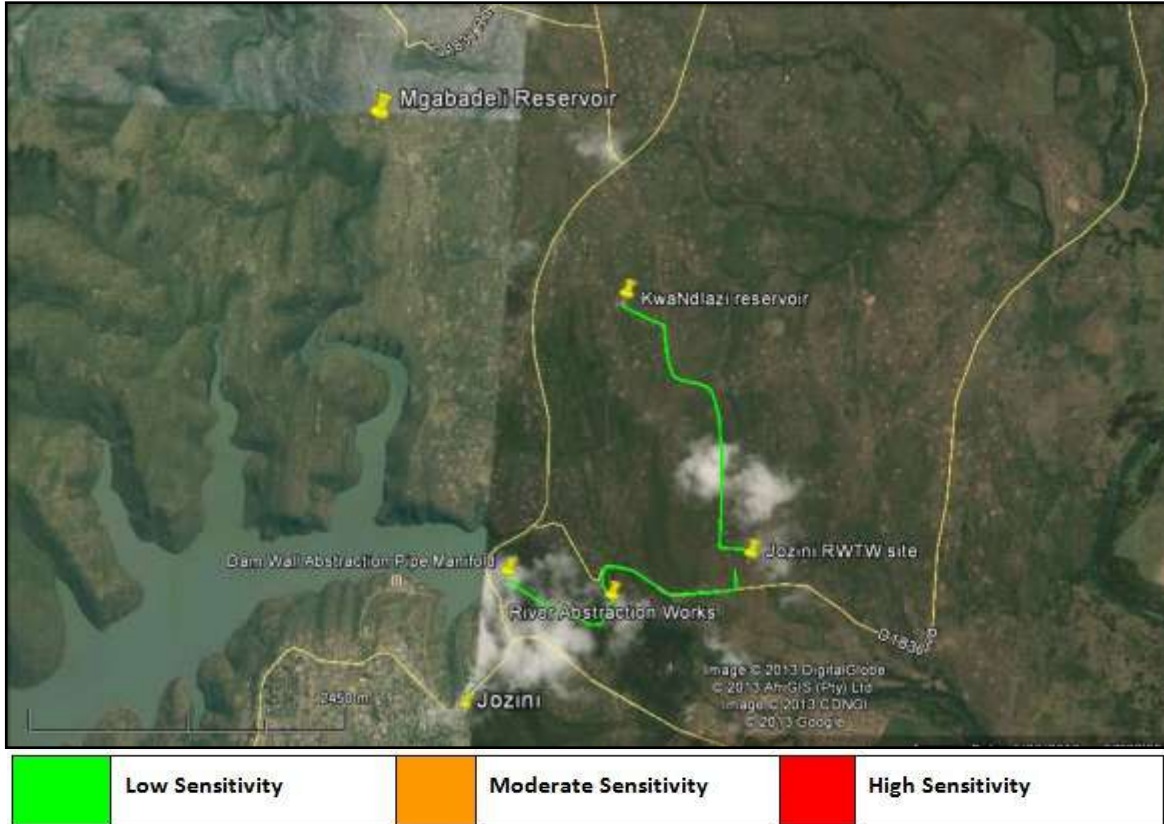


Figure 5 Palaeontological sensitivity of the pipeline





## CONCLUSION

The study areas of the proposed Jozini Ingwavuma Water Supply Project are underlain by Jurassic aged igneous rocks of the Jozini Formation and dolerite intrusions. Due to the igneous nature of these rocks, the study areas are allocated a low palaeontological sensitivity rating. No further palaeontological mitigation is required.

## REFERENCES

**Johnson MR , Anhaeusser CR and Thomas RJ (Eds) (2006).** The Geology of South Africa. GSSA, Council for Geoscience, Pretoria.

## **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.



Dr Gideon Groenewald  
Geologist

**UMLANDO ARCHAEOLOGICAL SITE RECORD FORM****SITE CATEGORY:** (X where applicable)

Stone Age: x

Early Iron Age:

Late Iron Age

Historical Period:

Recorder's Site No.: JJ3

Official Name:

Local Name:

Map Sheet:

GPS reading:

**-27.417731993****32.092241021****Alt. 103.9m****DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.**

From the Jozini Water treatment plant, get on the P449 and drive west for 126m. Turn right onto the P522-1 and follow it for 1.1km before turning right onto the D1836. JJ3 is located 5.3km from here on a terrace that is ~1000m x 250m in size. The area has been used for agricultural for over 30 years and thus the soil is disturbed. Stone tools occur along the entire terrace.

**SITE DESCRIPTION:**

Type of Site: Stone Age scatter

Merits conservation: No. The site is of low significance as the tools are the standard variety for the area and in a secondary context. No further mitigation is required; however, a permit from Amafa KZN to impact on the site will be required.

Threats: Yes

What threats: **THE JOZINI INGWAVUMA WATER SUPPLY PROJECT; NONDABUYA PIPELINE****RECORDING:**

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin and Louise Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 02/08/2013

Owner:

References:

**Description of site and artefactual content.**

. The stone tools consist of the following:

- ESA
  - Chopper
  - Cleaver
- MSA
  - Irregular cores

- General flakes
- Utilised flakes
- Unifacial point
- LSA
  - General flakes
  - Utilised flakes
  - Bipolar cores
  - Irregular cores
  - Adze
- General
  - Upper grinding stones

The stone tools are made from locally available raw materials such as CCS, quartz and quartzite.

**UMLANDO ARCHAEOLOGICAL SITE RECORD FORM****SITE CATEGORY:** (X where applicable)

Stone Age: x

Early Iron Age:

Late Iron Age

Historical Period:

Recorder's Site No.: JJ4

Official Name:

Local Name:

Map Sheet:

GPS reading:

---

-27.319199033

32.064901013

Alt.174.4m

---

**DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.**

From the Jozini Water treatment plant, get on the P449 and drive west for 126m. Turn right on the P552-1 and follow it for 4.2km before turning left on the D850. JJ4 is located 8.2km from here along the northern slope of a hill. The site consists of a scatter of LSA tools that have been exposed by walking and driving tracks. The stone tools were not as dense as at JJ3, however there were more frequent in comparison to other hills where the tools would be classified as isolated scatters.

**SITE DESCRIPTION:**

Type of Site:

Merits conservation: No. The site is of low significance. No further mitigation is required, as the site will not increase the knowledge of the Late Stone Age in the area. A permit from Amafa KZN will be required.

Threats: Yes

What threats: **THE JOZINI INGWAVUMA WATER SUPPLY PROJECT; NONDABUYA PIPELINE****RECORDING:**

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin and Louise Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 02/08/2013

Owner:

References:

**Description of site and artefactual content.**

The stone tools consist of LSA stone tools, although some are re-worked MSA tools (fig. 12). They are as follows:

- Utilised flakes
- General flakes
- Irregular cores

- Bipolar core
- MSA flakes reworked in the LSA
- Upper grinding stone

The tools are made from basalt and CCS

The stone tools appear to become more frequent further uphill. However, they are in a secondary context.