

MOOI-MGENI TRANSFER SCHEME, PHASE 2, KWA-ZULU NATAL

HERITAGE IMPACT ASSESSMENT



Gavin Anderson

Umlando: Archaeological Tourism and Resource
Management

PO Box 102532, Meerensee, 3901

Phone/fax: 035-7531785 Fax: 0865445631

Cell: 0836585362

Prepared by:



Coastal & Environmental Services

GRAHAMSTOWN

P.O. Box 934

Grahamstown, 6140

046 622 2364

Also in East London

www.cesnet.co.za

July 2012

This Report should be cited as follows: Coastal & Environmental Services, July 2012, Mooi-Mgeni Transfer Scheme, Phase 2, Heritage Impact Assessment Report, CES, Grahamstown.

COPYRIGHT INFORMATION

This document contains intellectual property and propriety information that is protected by copyright in favour of Coastal & Environmental Services and the specialist consultants. The document may therefore not be reproduced, used or distributed to any third party without the prior written consent of Coastal & Environmental Services.

TABLE OF CONTENT

1	INTRODUCTION	1
2	KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008.....	7
1.	“ General protection: Structures.—.....	7
2.	The Council may, by notice in the Gazette, exempt—.....	7
3.	General protection: Graves of victims of conflict.—No person may damage, alter, exhume, or remove from its original position—	7
4.	General protection: Traditional burial places.—.....	7
5.	The Council may only issue written approval once the Council is satisfied that—	7
3	METHOD	9
3.1	Defining significance	9
4	RESULTS	12
4.1	DESKTOP STUDY	12
4.2	FIELD SURVEY	12
4.3	MM01	20
4.4	MM02	21
4.5	MM03	21
4.6	MM04	23
4.7	MM05	24
4.8	MM06	25
4.9	MM07	26
4.10	MM08	27
5	PALAEONTOLOGY	29
6	SIGNIFICANCE OF IMPACTS	30
7	MANAGEMENT PLAN	31
8	CONCLUSION	35
9	REFERENCES	36
	APPENDIX A	37
	SITE RECORD FOMS	37
	APPENDIX B	45
	PALAEONTOLOGICAL IMPACTS ASSESSMENT: DESKTOP	45

TABLE OF FIGURES

Figure 1: General location of the proposed route MMTS-2.....	2
Figure 2-1: Northern aerial overview of the proposed MMTS-2	3
Figure 2-2: Northern aerial overview of the proposed MMTS-2	4
Figure 3-1: Topographical map of the northern section of the proposed MMTS-2	5
Figure 3-2: Topographical map of the northern section of the proposed.....	6
Figure 4: Location of known heritage sites in the general area.....	13
Figure 5-1: Location of settlements along the northern route in 1973	14
Figure 5-2: Location of settlements along the southern route in 1973	15
Figure 6-1: Location of settlements along the northern in 1968	16
Figure 6-2: Location of settlements along the southern in 1968 & 1973	17
Figure 7: Views of the pipeline	18
Figure 8: Location of recorded sites during the survey	19
Figure 9: Features at MM01	20
Figure 10: Stone terracing at MM02	22
Figure 11: Pine tree boundary at MM03	23
Figure 12: Tree boundaries at MM04	24
Figure 13: Row of recent trees at MM05	25
Figure 14: Blue gums at MM06	26
Figure 15: Old trees boundary at MMO7	27
Figure 16: Old trees boundary at MMO8	28
Figure 17: Management plan for MM01	32
Figure 18: Location of terrace at MM02	33
Figure 19: Palaeontologically sensitive areas along the route	34

1 INTRODUCTION

“Phase 1 of the Mooi-Mgeni Transfer Scheme (MMTS-1) was completed in 2003. This scheme utilised the transfer infrastructure of the original emergency scheme and included the construction of a new Mearns Weir on the Mooi River and the raising of the Midmar Dam. In 2000, DWA and Umgeni Water jointly initiated the feasibility study of the second phase of the proposed Mooi-Mgeni Transfer Scheme (MMTS-2). This proposed development comprised the construction of the Spring Grove Dam (a dam on the Mooi River at Spring Grove, about 8 km upstream of the Mearns Weir near the town of Rosetta in the KwaZulu-Natal Midlands), a pump station and 2 measuring weirs, an artificial fish barrier weir on the Mooi River upstream of the Inchbrakie Falls on the farm Coldstream, the construction of a transfer pipeline (including breakwater pressure tank and outfall works) from Spring Grove Dam to the Mpofana River and a potential quarry site to obtain materials for the building of the dam wall. The final EIR was submitted to DEA in January 2009 and was granted an authorisation on 15 June 2009. This authorised the construction of the project activities, subject to specific conditions. Subsequently, two appeals were lodged against the authorisation. The Mooi River Farmers Association appealed against the Spring Grove Dam since it was felt that other strategic resources were not considered. However, this appeal was withdrawn. The second appeal was from the Mziki Homes Association and related to the lack of alternatives for the routing of the pipeline from the Spring Grove Dam to the existing servitude for the MMTS-1 pipeline. On 28 September 2010, the Minister of Justice and Constitutional Development upheld the appeal against the Water Transfer Scheme. Therefore this EIA process involves the proposed construction of the pipeline only, since the authorisation for the other infrastructure was upheld.

The physical impacts will be the construction of:

- canals;
- channels;
- bridges;
- dams;
- weirs;
- bulk storm water outlet structures;
- marinas;
- jetties exceeding 50 square meters in size;
- slipways exceeding 50 square meters in size;
- buildings exceeding 50 square meters in size;
- infrastructure or structures covering 50 square meters or more “ (CES BID 2012)

“The eastern part of uMngeni is considered to have gentle to moderate hills, whereas the western part is considered to be mountainous, leading towards the Drakensberg (uMngeni IDP 2002). The project area is considered to have a gentle topography, with slightly undulating slopes between Nottingham Road and Rosetta.

The site area consists of many small streams which can become dangerous during flood events. The main rivers include the Mooi and Little Mooi Rivers...” The vegetation is Drakensberg Foothill Moist Grassland and Mooi River Highland Grassland (C.E.S. Draft Environmental Scoping Report, 21012).

Umlando was contracted by Coastal & Environmental Services to undertake the heritage survey of the proposed MMTS-2. The transfer scheme occurs between Mooi River and south of Nottingham Road (fig.’s 1 – 3). The area is sensitive for archaeological sites, as several have been recorded in the general area.

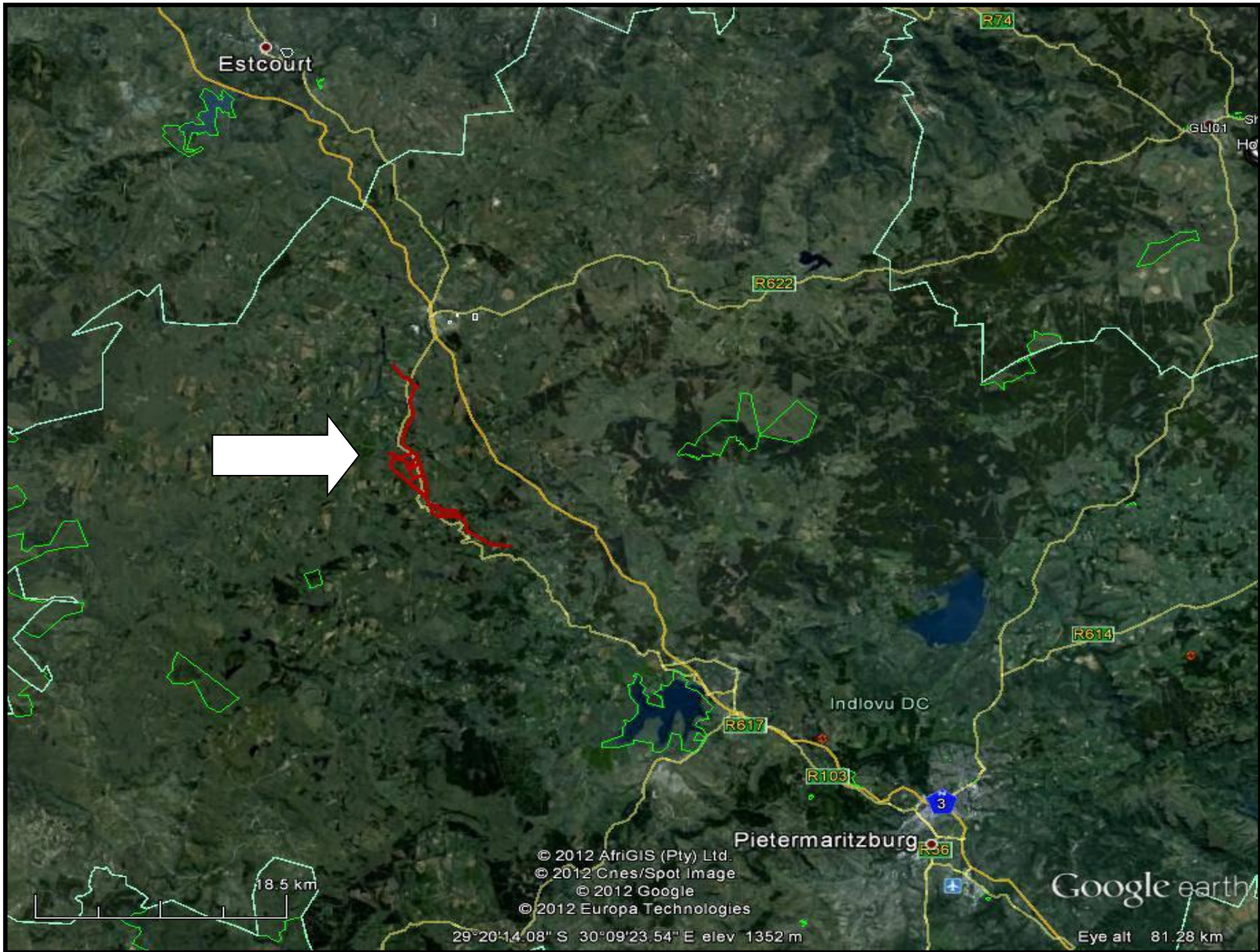


Figure 1: General location of the proposed route MMTS-2



Figure 2-1: Northern aerial overview of the proposed MMTS-2



Figure 2-2: Northern aerial overview of the proposed MMTS-2

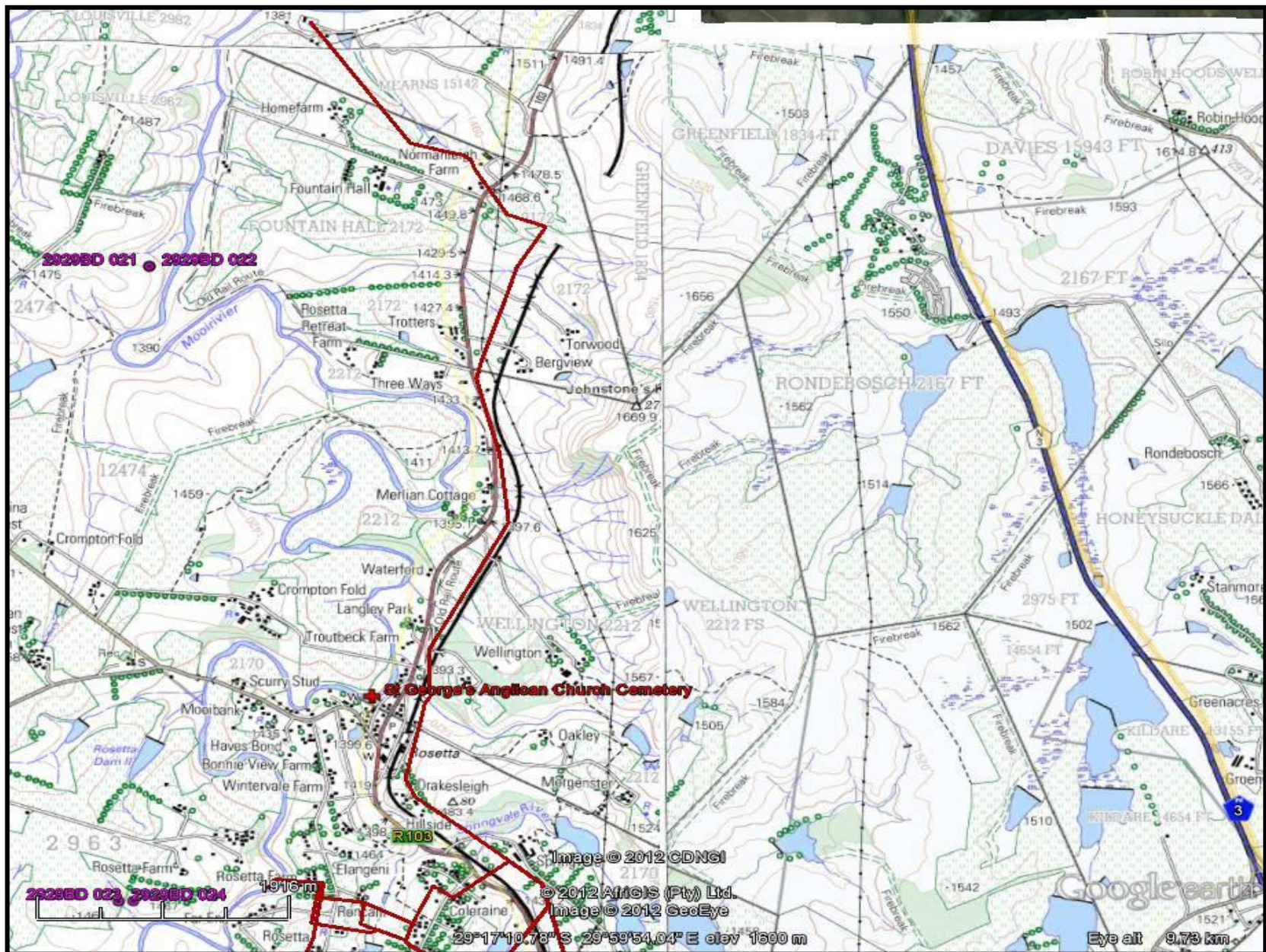


Figure 3-1: Topographical map of the northern section of the proposed MMTS-2

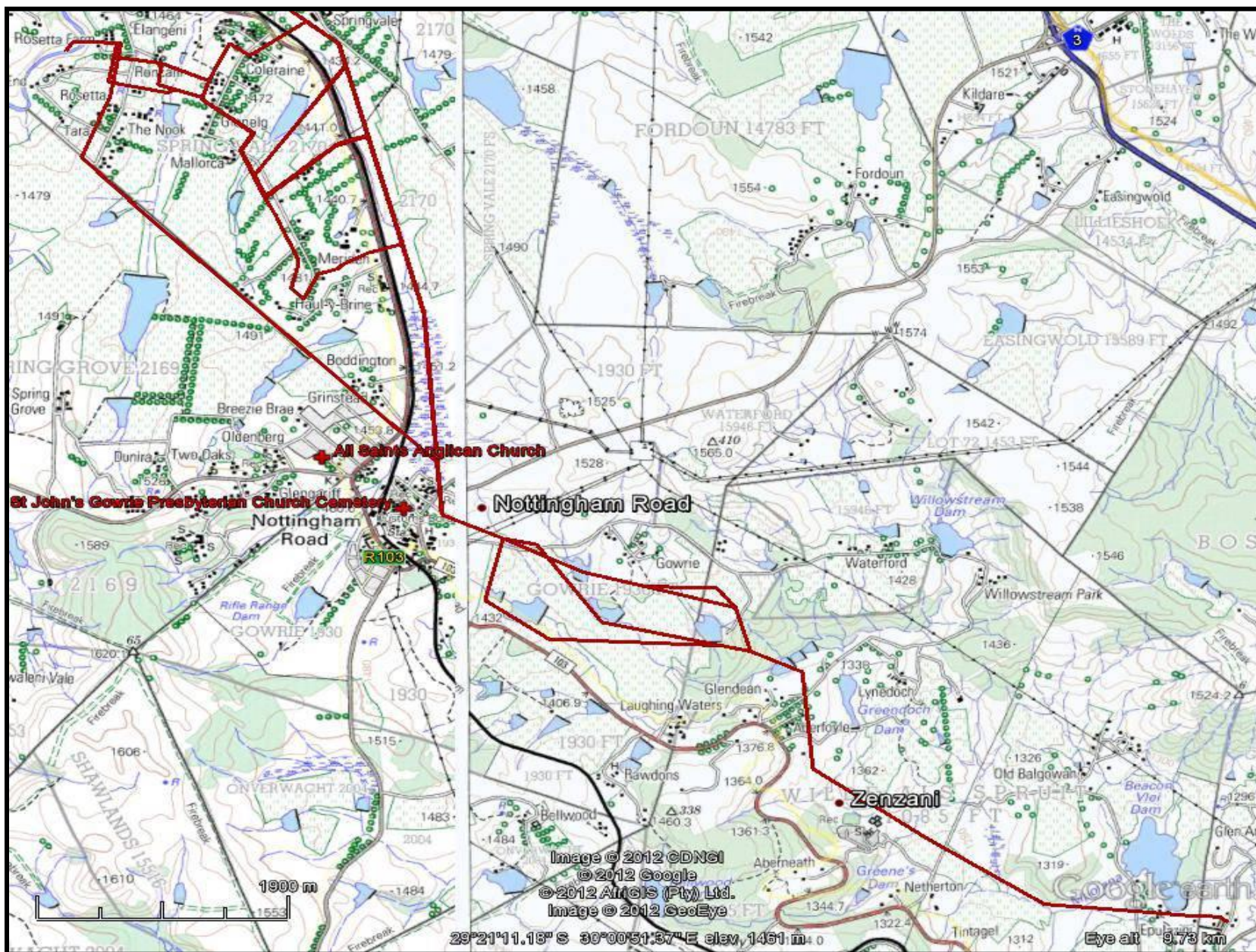


Figure 3-2: Topographical map of the northern section of the proposed

2 KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

1. “ General protection: Structures.—

- a. 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.
- b. 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.

2. The Council may, by notice in the Gazette, exempt—

- a. a defined geographical area; or
- b. 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.
- c. A notice referred to in subsection (2) may, by notice in the Gazette, be amended or withdrawn by the Council.

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

- a. the grave of a victim of conflict;
- b. a cemetery made up of such graves; or
- c. 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

4. General protection: Traditional burial places.—

- a. No grave—
- b. not otherwise protected by this Act; and
- c. 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.

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

- a. the applicant has made a concerted effort to consult with communities and individuals who by tradition may have an interest in the grave; and
- b. the applicant and the relevant communities or individuals have reached agreement regarding the grave.
- c. 36. General protection: Battlefield sites, archaeological sites, rock art sites, palaeontological sites, historic fortifications, meteorite or meteorite impact sites.—

6. 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.

7. 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.
8. The Council may, after consultation with a controlling authority, by way of written notice served on the controlling authority, prohibit any activity considered by the Council to be inappropriate within 50 metres of a rock art site.
9. 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.
10. 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.
11. The ship 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)

3 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 database 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 settlements with 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 use of historical maps allows us to note the locations of potential heritage sites in areas where the vegetation is too dense, or where there is no physical evidence of a settlement. That is, some areas have a high rate of deterioration of archaeological/organic remains, and human graves are generally ephemerally marked or demarcated with organic remains. By using the maps we can indicate sensitive areas and suggest appropriate management plans.

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.

3.1 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 artifacts.

4 RESULTS

4.1 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 shows that several archaeological sites occur in the general area (fig. 4). Many of the sites date to the Late Stone Age, and include rock art; however Early and Middle Stone Age sites do occur. A few Late Iron Age, and Historical Period, sites have also been recorded. Rock art sites and shelters with archaeological deposit have been recorded and excavated (Anderson 2000, 2002). No known sites occur along the line route.

The various maps (fig.'s 5 -6) indicate that there are no structural features along the route. However, many of the trees used for farm boundaries are of some age by 1973. The 2010 Google Earth imagery only noted one stone walled feature (MM01).

4.2 FIELD SURVEY

The field survey was undertaken in July 2012. Table 1 lists these sites while Figure 7 shows their location. Archaeological visibility was good as the grasses were short due to winter (fig. 7). Eight heritage sites were recorded (fig. 8)

Table 1: List of sites and their location

NAME	LATITUDE	LONGITUDE	DESCRIPTION
MM01	29°18'34.55"	29°58'49.94"	Stone walling
MM02	29°18'47.15"	29°58'59.81"	Stone walling
MM03	29°19'6.13"	29°58'55.51"	Tree boundaries
MM04	29°20'12.85"	29°59'14.92"	Tree boundaries
MM05	29°19'28.85"	29°58'18.36"	Tree boundaries
MM06	29°19'5.08"	29°58'21.48"	Tree boundaries
MM07	29°19'9.89"	29°58'28.67"	Tree boundaries
MM08	29°19'19.31"	29°58'40.05"	Tree boundaries

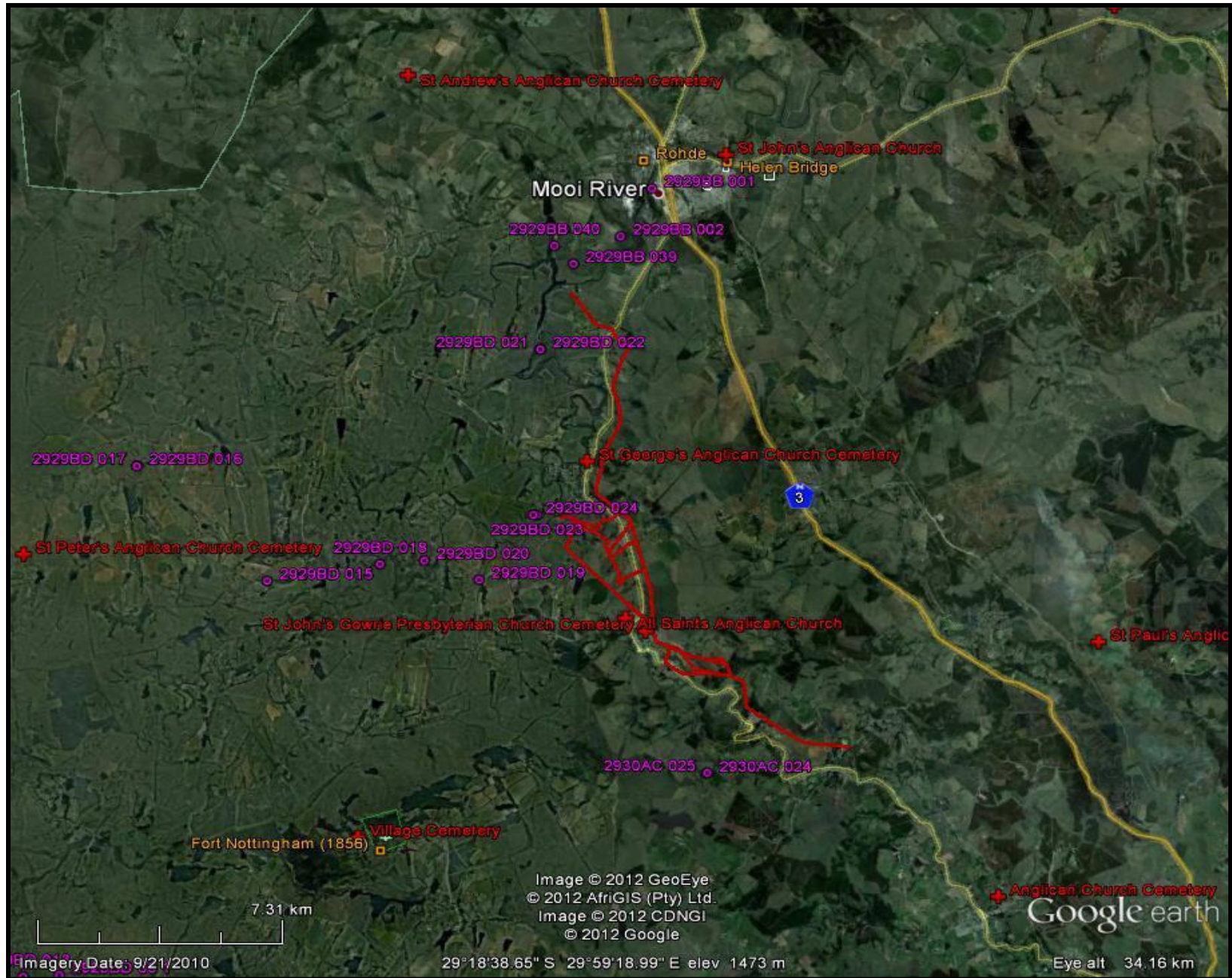


Figure 4: Location of known heritage sites in the general area

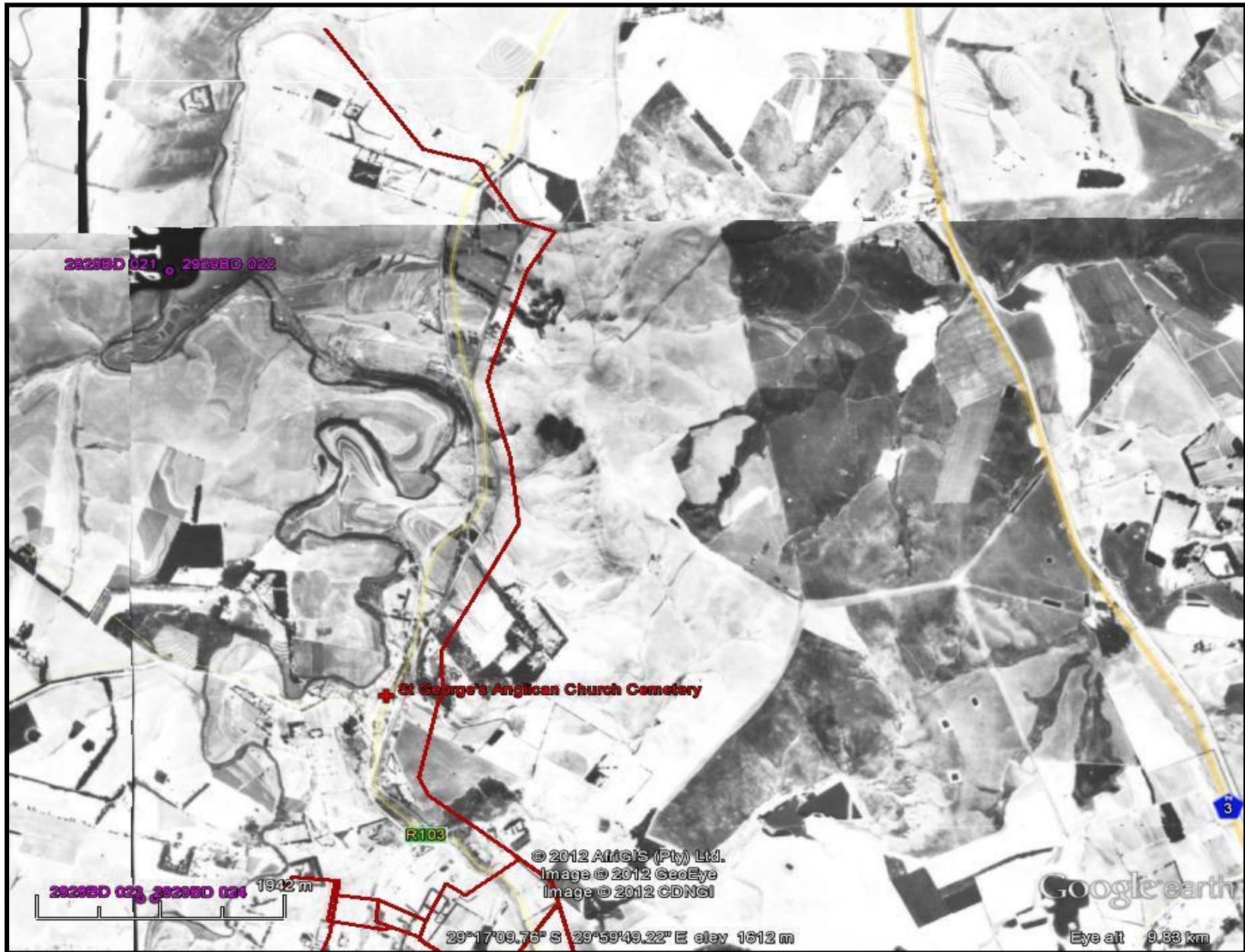


Figure 5-1: Location of settlements along the northern route in 1973

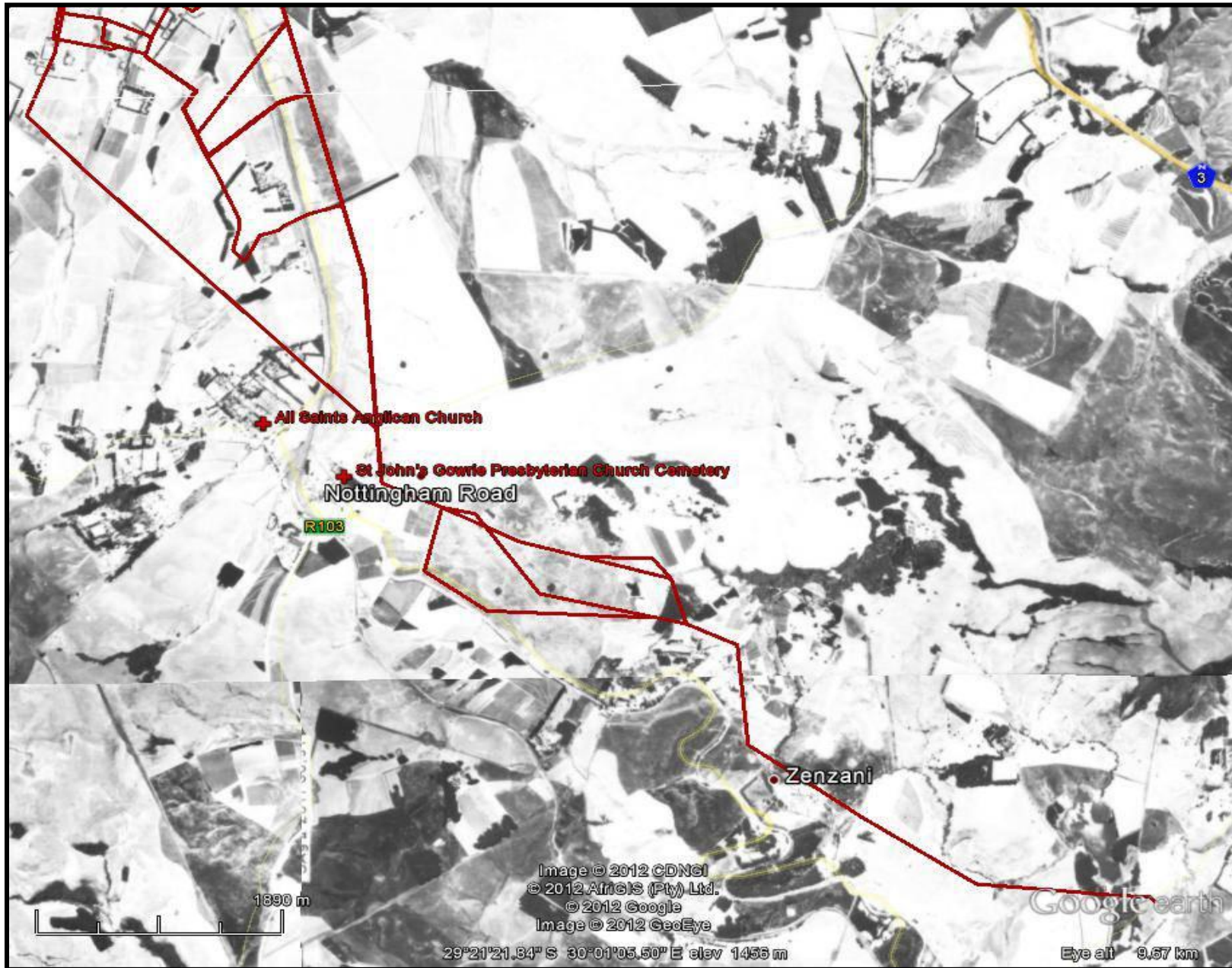


Figure 5-2: Location of settlements along the southern route in 1973

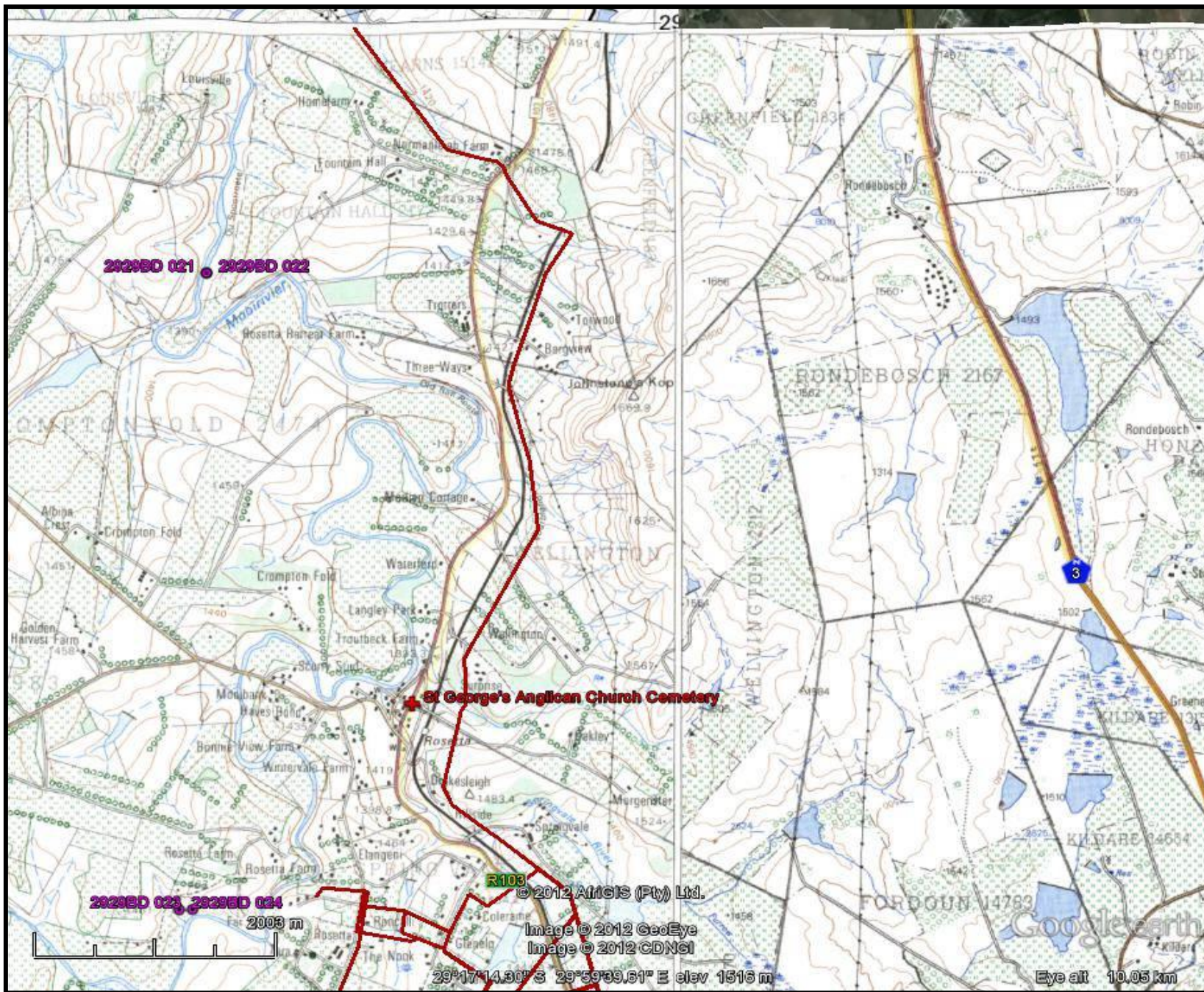


Figure 6-1: Location of settlements along the northern in 1968

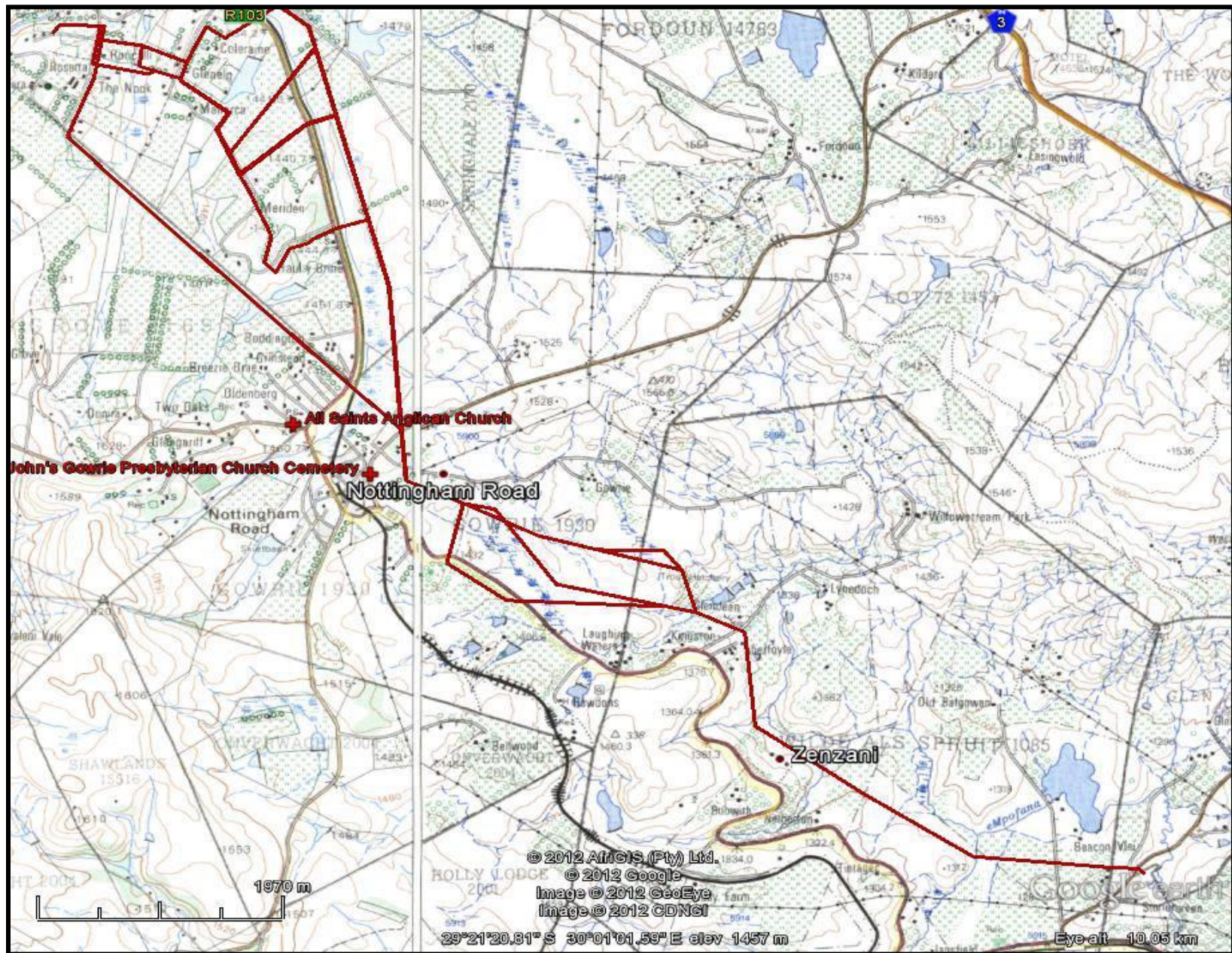


Figure 6-2: Location of settlements along the southern in 1968 & 1973



Figure 7: Views of the pipeline 1

¹ Clockwise: Means Dam uphill, south towards Rosetta, Gowrie, Southern end



Figure 8: Location of recorded sites during the survey

4.3 MM01

MM01 is located near the top of a hill on a gentle slope. The site consists of a large circular stone walled kraal and two possible house floors (fig. 9). The kraal consists of a low stone walling ~50cm high, with a 10m diameter. The western (or downhill) side of the kraal is missing, and this would have had the kraal entrance. There are two small circular features ~3m in diameter uphill from the kraal, and these are visible by the longer grass. These features could be the location of hut floors. The site is probably a Late Iron Age (LIA) settlement as described by Maggs (1988) and Maggs et al (1986). While the soil is shallow, there is probably an archaeological deposit. I did not observe any graves, which would have occurred below the kraal entrance. There are very few examples of LIA walling in the midlands area, specifically around Nottingham Road.

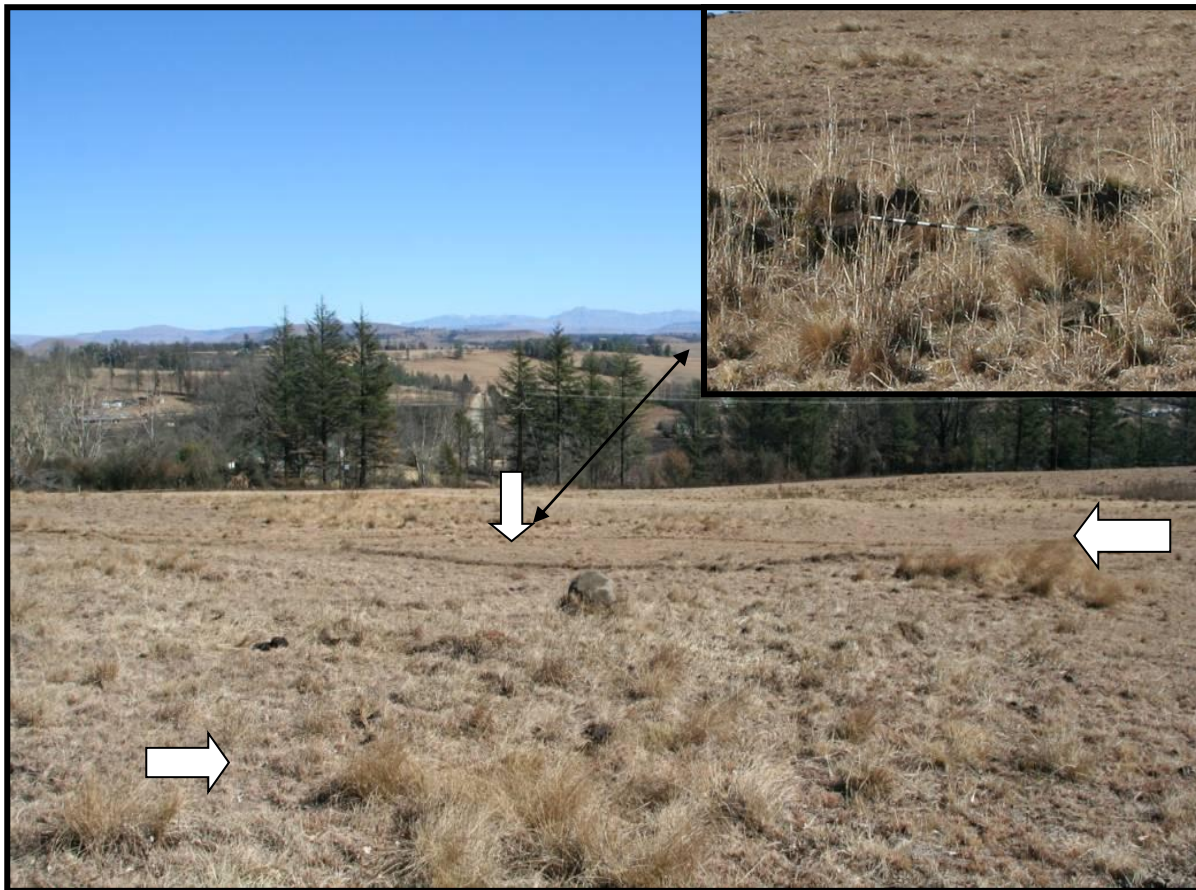


Figure 9: Features at MM01²

Significance:

The site is of medium significance due to its rarity and good preservation of the wall and possible deposit.

² Inset: close up of the wall

Mitigation:

The current pipeline is ~10m from the site, and probably damaged part of the site during construction. The general ruling is that no development may occur within 20m of an archaeological site, and all sites within 50m need to be fenced off. The new line will need to remain on the western side of the existing pipeline. The kraal will need to be fenced off before construction phase and this will need to be supervised by a heritage specialist.

4.4 MM02

MM02 is located ~465m southeast of MM1, on the same hill. The site consists of a stone walled terrace ~50m in length (fig. 10). There are no other features associated with the terrace; however, there is dense bush towards the hill that may contain features. It is not possible to date the terrace. The existing pipeline has gone through part of the terrace.

Significance:

The site is of low significance.

Mitigation:

The pipeline should be slightly rerouted to the west to avoid the terrace. If it is not possible to move the line, then the terrace will need to be fully documented before construction, and the minimum width for the pipeline should occur here. In addition to this, an archaeologist should be on site in case artefacts are exposed. The terrace should be rebuilt with the same material after construction, and thus it will have a minimum impact.

4.5 MM03

MM03 is located beside the dirt road and amongst open land (fig. 11). The “site” consists of rows of pine trees that appear to be older than 60 years. The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands its sense of history. The original farmers of the 19th century tried to recreate England by dividing the land and planting trees as at home. A similar scenario of cultural landscapes with alien vegetation would be the Jacarandas of Pretoria.

Significance:

The trees are of medium significance as it forms part of the cultural landscape

Mitigation:

The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape.



Figure 10: Stone terracing at MM02



Figure 11: Pine tree boundary at MM03

4.6 MM04

MM04 is located south of MM03. The “site” consists of rows of pine trees that appear to be older than 60 years, especially the northern parts of this row (fig. 12). The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands its sense of history.

Significance:

The trees are of medium significance as it forms part of the cultural landscape

Mitigation:

The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape.



Figure 12: Tree boundaries at MM043

4.7 MM05

MM05 is located south of and near Springrove Dam. The “site” consists of a row of pine trees that appear to be recent in age (fig. 13). The trees are part of a property boundary, but were not part of the original farm boundary markers. The trees thus do not form part of the cultural landscape. The “site” was recorded as an example of ‘trees not forming part of the cultural landscape’

Significance:

The trees are of low significance. While they form part of the cultural landscape, they are not the original trees.

Mitigation:

No further mitigation is required.

³ Arrow indicates the older trees



Figure 13: Row of recent trees at MM05

4.8 MM06

MM06 is located at the entrance of Shonalanga accommodation on the D146. The “site” consists of a row of old blue gum trees that appear to be older than 60 years (fig. 14). Saplings that are more recent have grown to the south of the original row. The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands it sense of history.

Significance:

The trees are of medium significance as it forms part of the cultural landscape

Mitigation:

The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape. The more recent trees can be removed for the pipeline, as they are not part of the original border.



Figure 14: Blue gums at MM06

4.9 MM07

MM07 is located just north of MM06 on the D146. The “site” consists of a row of various old trees that appear to be older than 60 years (fig. 15). The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands its sense of history.

Significance:

The trees are of medium significance as it forms part of the cultural landscape

Mitigation:

The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape. The more recent trees can be removed for the pipeline, as they are not part of the original border.



Figure 15: Old trees boundary at MM07

4.10 MM08

MM08 is located just north of MM06 on the D146. The “site” consists of a row of various old trees that appear to be older than 60 years (fig. 16). The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands it sense of history.

Significance:

The trees are of medium significance as it forms part of the cultural landscape

Mitigation:

The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape. The more recent trees can be removed for the pipeline, as they are not part of the original border.



Figure 16: Old trees boundary at MMO8

5 PALAEOLOGY

The Paleontological Impact Assessment (PIA) is initially undertaken at a desktop level, as it is possible to predict where palaeontological remains can occur. The complete PIA occurs in Appendix B

“The desktop survey indicates that the planned Mooi-Mgeni Transfer Scheme is underlain by sedimentary rocks and igneous rocks of the Karoo Supergroup. The potential impact and significance of the palaeontology for a specific rock unit is determined through comparison of existing geological and palaeontology database information.

The Volksrust Formation is normally deeply weathered and it is unlikely that significant fossils will be associated with this formation in the study area.

The Adelaide Subgroup is known to contain abundant plant fossils of Glossopteris and vertebrate fossils of both the Dicynodon and Lystrosaurus Assemblage zones have been recorded from these units.

The dolerite units will not contain any fossil material” (MetsiMetseng PIA report 2012)

The Adelaide group occurs along the western part of the pipeline on all route options and will be affected by the pipeline.

6 SIGNIFICANCE OF IMPACTS

The overall significance of impacts of the pipeline on heritage sites is low to moderate. If mitigation is undertaken then the impact is low for each site. Table 2 summarises the significance of impact per site.

Table 2: Significance of impact on heritage sites

Site	Impact	Effect			Risk or Likelihood	Overall Significance
		Temporal Scale	Spatial Scale	Severity of Impact		
MM01	Without mitigation	Short	Localised	Slight	May occur	Low
	With mitigation	Short	Localised	Slight	Unlikely	Low
MM02	Without mitigation	Permanent	Localised	Severe	Definite	Moderate
	With mitigation	Short	Localised	Slight	May occur	Low
MM03	Without mitigation	Permanent	Localised	Moderate	Definite	Moderate
	With mitigation	Short	Localised	Slight	May occur	Low
MM04	Without mitigation	Permanent	Localised	Moderate	Definite	Moderate
	With mitigation	Short	Localised	Slight	May occur	Low
MM05	Without mitigation	Permanent	Localised	Moderate	Definite	Moderate
	With mitigation	Short	Localised	Slight	May occur	Low
MM06	Without mitigation	Permanent	Localised	Moderate	Definite	Moderate
	With mitigation	Short	Localised	Slight	May occur	Low
MM07	Without mitigation	Permanent	Localised	Moderate	Definite	Moderate
	With mitigation	Short	Localised	Slight	May occur	Low
MM08	Without mitigation	Permanent	Localised	Moderate	Definite	Moderate
	With mitigation	Short	Localised	Slight	May occur	Low
Palaeontology	Without mitigation	Permanent	Localised	Severe	Definite	High
	With mitigation	Permanent	Localised	Moderate	Definite	Moderate

7 MANAGEMENT PLAN

All heritage sites have some importance, and my policy is that it is better not to impact on a heritage site, regardless of its significance, unless there is no option. There are four types of sites that require mitigation for the MMTS-2 (Table 2).

- Stone walling
- Stone terracing
- Historical tree boundaries
- Palaeontological sites

Table 3: Summary of management plan per site

NAME	DESCRIPTION	SIGNIFICANCE	REQUIRES MITIGATION	TYPE OF MITIGATION
MM01	Stone walling	Low-medium	Yes	Move pipe 20m from site; fence of site
MM02	Stone walling	Low	Yes	Record, monitor, rehabilitate
MM03	Tree boundaries	Low-medium	Yes	Avoid damage to trees
MM04	Tree boundaries	Low-medium	Yes	Avoid damage to trees
MM05	Tree boundaries	Low-medium	No	None
MM06	Tree boundaries	Low-medium	Yes	Avoid damage to trees
MM07	Tree boundaries	Low-medium	Yes	Avoid damage to trees
MM08	Tree boundaries	Low-medium	Yes	Avoid damage to trees
Palaeontology	Palaeontology	Medium	Yes	Phase 1 survey; possible monitoring during construction

The stone walling at MM01 should not be disturbed due to the rarity of these features in the area. There needs to be a 5m boundary between the fence and the walling, and a 15m buffer between the fence and the pipeline). The existing pipeline may have already damaged part of the site. The pipeline will need to be placed on the western side of the existing pipeline (fig. 17). The fencing will need to be supervised by an archaeologist.

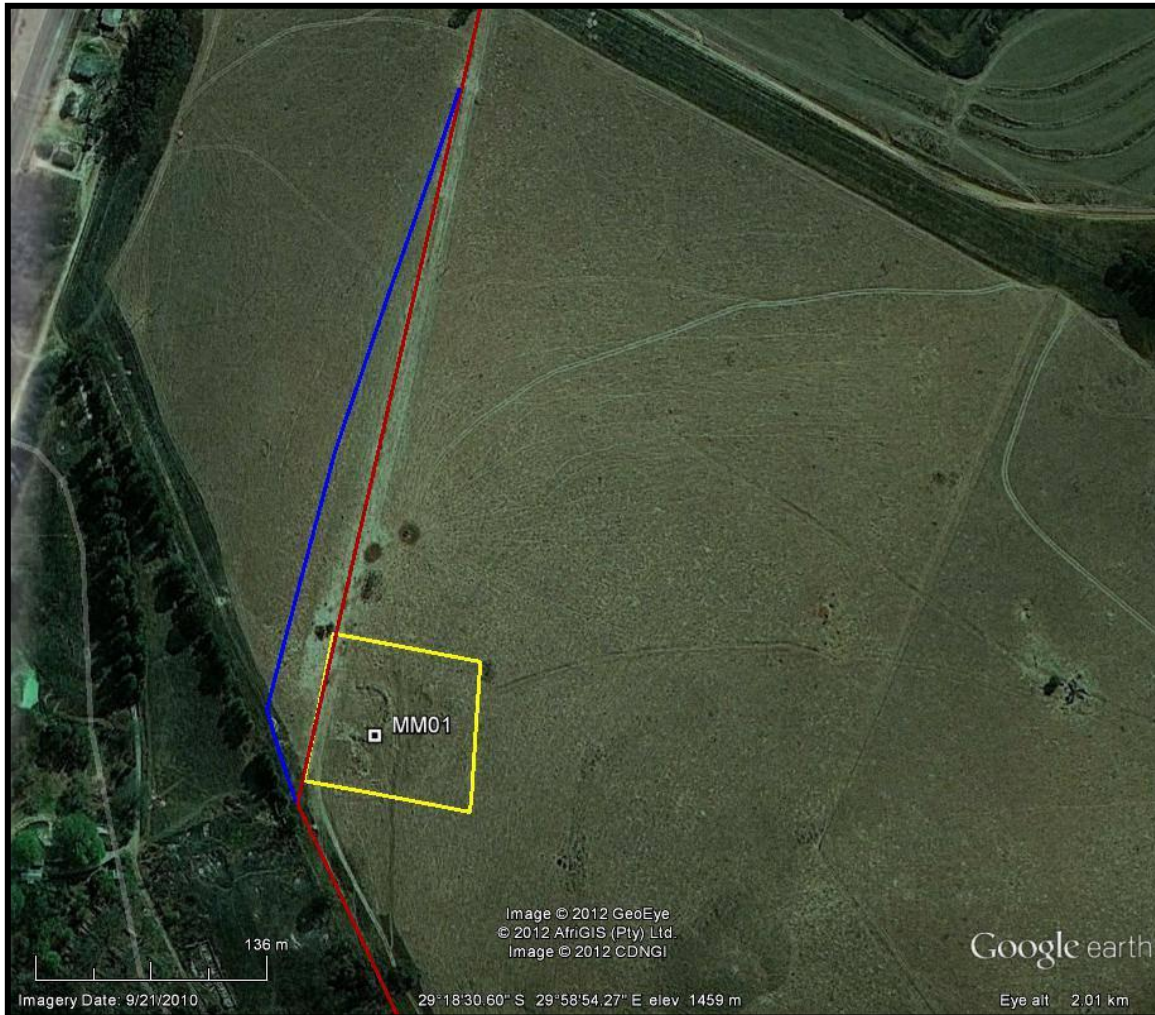


Figure 17: Management plan for MM01⁴

The terrace at MM02 has been partially damaged by the existing line. There are two options for the line. First, the line is moved ~40m southwest of the existing line, and thus not impact on the terrace (fig. 18). Second, the line continues in its current position; however, this area will need:

- To be monitored by an archaeologist for potential artefacts
- Minimum width for the pipe excavations
- Terracing on each side of the excavation needs to be sand-bagged during construction
- The terracing is replaced, with the same stones, after construction.

⁴ Yellow polygon = buffer zone around MM01; Blue line indicates suggested realignment

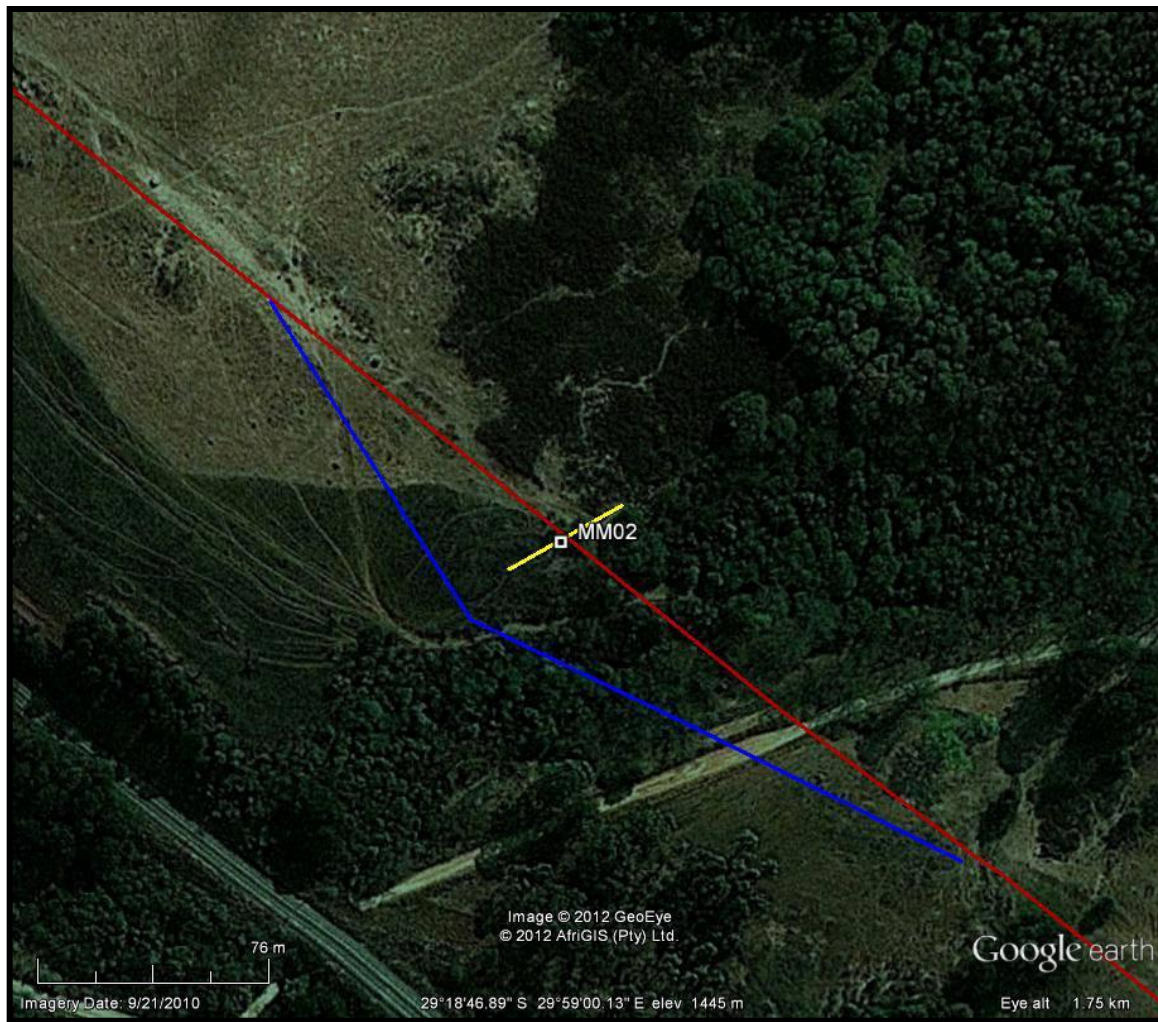


Figure 18: Location of terrace at MM02 ⁵

The historical Tree Boundaries should not be damaged as they form part of the cultural landscape. Excavations need to remain at a safe distance from the root system. The tree boundaries not identified during the survey are not considered to be historical and may be removed for the pipeline proposed. Some of the historical tree boundaries have grown through seeding and these are not considered to be historical. The secondary trees may thus be removed, e.g. at MM06.

The PIA desktop survey indicates that there are sedimentary rocks of the Volksrust Formation of the Ecca Group and Adelaide Subgroup of the Beaufort Group (fig. 19). These geological formations contain palaeontological remains and require a Phase 1 survey to determine the full significance of the sites. On-site monitoring may be required during the construction phase.

⁵ Red line = existing alignment; blue line = proposed re-alignment; yellow line = terrace

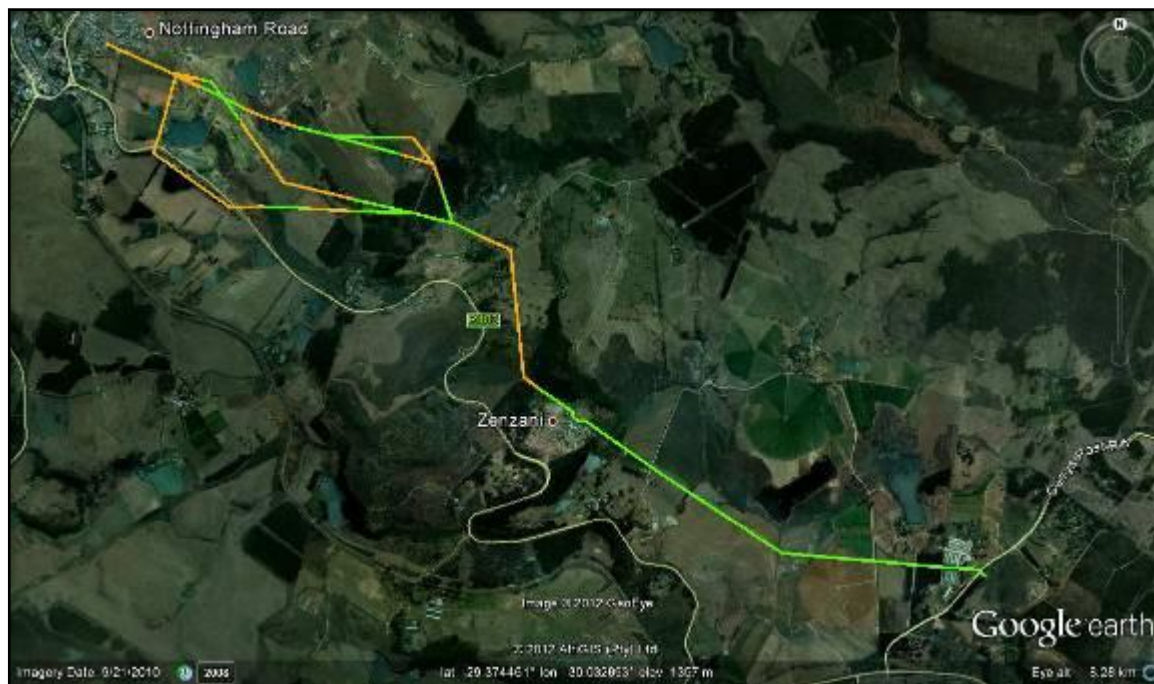


Figure 19: Palaeontologically sensitive areas along the route⁶

The final route option has not been finalised; however, the heritage survey did not locate any red flags along the line, provided mitigation is undertaken. Once the final route option is chosen, then a desktop study should be undertaken to confirm the mitigation required.

⁶ Orange areas = sensitive

8 CONCLUSION

A heritage survey was undertaken for the proposed MMTS-2. Much of the area to be affected by the pipeline has been ploughed, afforested, or used for grazing, and is thus not pristine. While several archaeological sites exist in the general area, most of these are of low significance as they are open sites that are in a secondary context. This general pattern was confirmed during the survey, where only large structures, or features, remain intact.

The heritage survey noted two stone walled features and a few historical tree boundaries. The stone walled features would require mitigation before and during construction. The trees are alien species, however they may be protected since they form part of the cultural landscape. This aspect of the cultural landscape began when the first British farmers settled in the Midlands and tried to recreate the British landscape. I recommended that these boundaries are not damaged. A palaeontological field survey will be required to fully assess the line.

9 REFERENCES

Anderson, G. 2000. Archaeological Survey of the Proposed Mooi-Mgeni River Transfer Scheme. Report for Mgeni Water.

Anderson, G. 2002. Archaeological Excavations And Rock Art Tracings Along The Mearns River. Report for Mgeni Water

Maggs, T., Oswald, D. Hall, M and Ruther, H. 1986. Spatial parameters of Late Iron Age Settlements in the Upper Thukela Valley. *Annals of the Natal Museum* 27(2): 455 – 480

Maggs, T. 1988. Patterns and perceptions of stone-built settlements from the Thukela Valley Late Iron Age. *Annals of the Natal Museum* 29(2): 417 - 432

APPENDIX A

SITE RECORD FORMS

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age X

Historical Period: x

Recorder's Site No.: MM01

Official Name: Drakesleigh 14834

Local Name: Springvale Farm

Map Sheet: 2929BD Nottingham

GPS reading: S29 18.576 E29 58.832 1458 m

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station get onto the unpaved road. Drive for 313m, turn left. MM01 is 368m from here, located near the top of the hill on a gentle slope.

SITE DESCRIPTION:

Type of Site: Stone walling

Merits conservation: Yes. The current pipeline is ~10m from the site, and probably damaged part of the site during construction. The general ruling is that no development may occur within 20m of an archaeological site, and all sites within 50m need to be fenced off. The new line will need to remain on the western side of the existing pipeline. The kraal will need to be fenced off during construction phase and this will need to be supervised by a heritage specialist.

Threats: Yes

What threats: Mooi - Mngeni TS

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/17

:

References:

Description of site and artefactual content.

The site consists of a large circular stone walled kraal and two possible house floors . The kraal consists of a low stone walling ~50cm high, with a 10m diameter. The western (or downhill) side of the kraal is missing, and this would have had the kraal entrance. There are two small circular features ~3m in diameter uphill from the kraal, and these are visible by the longer grass. These features could be the location of hut floors. The site is probably a Late Iron Age (LIA) settlement as described by Maggs () and Maggs et al (). While the soil is shallow, there is probably an archaeological deposit. I did not observe any graves, which would have occurred below the kraal entrance. There are very few examples of LIA walling in the midlands area, specifically around Nottingham Road. The site is of medium significance due to its rarity and good preservation of the wall and possible deposit.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age

Historical Period: ?

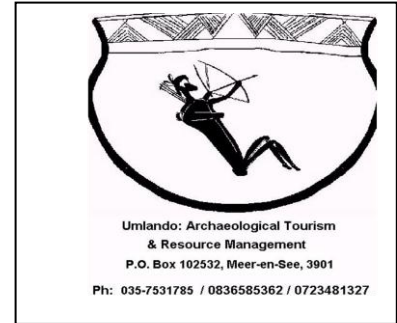
Recorder's Site No.: MM02

Official Name: Drakesleigh 14834

Local Name: Springvale Farm

Map Sheet: Map Sheet: 2929BD

GPS reading: S29 18.786 E29 58.997 1447 m



DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station turn left onto the R103. Drive for 861m and turn left. MM02 is 303m from here, ~465m southeast of MM1, and similar altitude.

SITE DESCRIPTION:

Type of Site: Stone walling

Merits conservation: The site is of low significance. The pipeline should be slightly rerouted to the west to avoid the terrace. If it is not possible to move the line, then the terrace will need to be fully documented before construction, and the minimum width for the pipeline should occur here. In addition to this, an archaeologist should be on site in case artefacts are exposed. The terrace should be rebuilt with the same material after construction, and thus it will have a minimum impact.

Threats: Yes

What threats: Mooi-Mngeni TS

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/17

:

References:

Description of site and artefactual content.

The site consists of a stone walled terrace ~50m in length. There are no other features associated with the terrace. It is not possible to date the terrace. The existing pipeline has gone through part of the terrace.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age

Historical Period: x

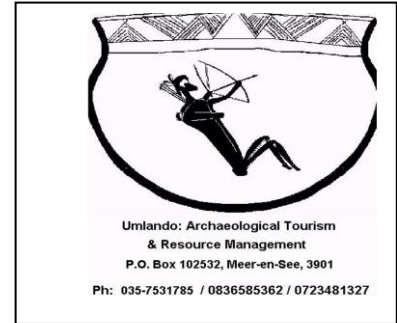
Recorder's Site No.: MM03

Official Name: Springvale 2170

Local Name: Coleraine

Map Sheet: Map Sheet: 2929BD Nottingham Road

GPS reading: S29 19.102 E29 58.925 1459 m



DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station turn left onto the R103. Drive for 1.2km and turn right. MM03 is 300m from here, beside the dirt road and amongst open land.

SITE DESCRIPTION:

Type of Site: Tree boundaries

Merits conservation: Yes. The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape.

Threats: Yes

What threats: Mooi-Mngeni TS

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/18

:

References:

Description of site and artefactual content.

The "site" consists of rows of pine trees that appear to be older than 60 years. The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands it sense of history. The original farmers of the 19th century tried to recreate England by dividing the land and planting trees as at home. A similar scenario of cultural landscapes with alien vegetation would be the Jacarandas of Pretoria.

The trees are of medium significance as it forms part of the cultural landscape

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age

Historical Period: x

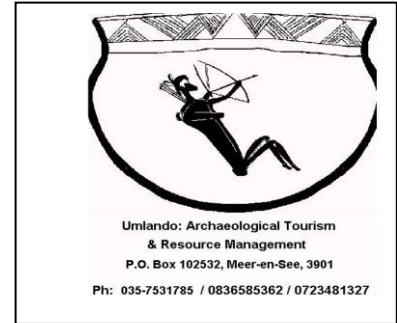
Recorder's Site No.: MM04

Official Name: Springvale 2170

Local Name: Haul-y-Brine

Map Sheet : 2929BD Nottingham Road

GPS reading: S29 20.214 E29 59.249 1473 m



DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station turn left onto the R103. Drive for 3.5km and turn right. MM04 is 909m from here, south of MM03.

SITE DESCRIPTION:

Type of Site: Tree boundaries

Merits conservation: Yes. The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape.

Threats: Yes

What threats: Mooi-Mngeni TS

RECORDING:

Graphic record: Yes

Digital pictures: x Tracings : Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/18

:

References:

Description of site and artefactual content.

The "site" consists of rows of pine trees that appear to be older than 60 years, especially the northern parts of this row. The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands it sense of history.

The trees are of medium significance as it forms part of the cultural landscape.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age

Historical Period: x

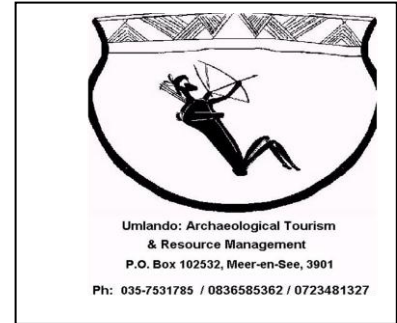
Recorder's Site No.: MM05

Official Name: Springvale 2170

Local Name: Tara

Map Sheet : 2929BD Nottingham Road

GPS reading: S29 19.481 E29 58.306 1469 m



DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station turn left onto the R103. Drive for 81m and turn right onto the D146. MM05 is located south of Springrove Dam.

SITE DESCRIPTION:

Type of Site: Tree boundaries

Merits conservation: No. No further mitigation is required.

Threats: Yes

What threats: Mooi-Mngeni TS

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/18

:

References:

Description of site and artefactual content.

The "site" consists of a row of pine trees that appear to be recent in age. The trees are part of a property boundary, but were not part of the original farm boundary markers. The trees thus do not form part of the cultural landscape. The "site" was recorded as an example of 'trees not forming part of the cultural landscape'

The trees are of low significance as it forms part of the cultural landscape

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age

Historical Period: x

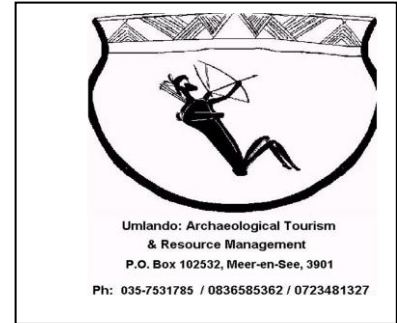
Recorder's Site No.: MM06

Official Name: Springvale 2170

Local Name: Shonalanga

Map Sheet: : 2929BD Nottingham Road

GPS reading: S29 19.085 E29 58.358 1439 m



DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station turn left onto the R103. Drive for 81m and turn right onto the D146. MM06 is located at the entrance of Shonalanga accommodation.

SITE DESCRIPTION:

Type of Site: Tree boundaries

Merits conservation: Yes. The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape. The more recent trees can be removed for the pipeline, as they are not part of the original border.

Threats: Yes

What threats: mooi-Mngeni TS

RECORDING:

Graphic record: Yes

Digital pictures: x Tracings : Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/18

:

References:

Description of site and artefactual content.

The "site" consists of a row of old blue gum trees that appear to be older than 60 years. Saplings that are more recent have grown to the south of the original row. The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands it sense of history.

The trees are of medium significance as it forms part of the cultural landscape.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age

Historical Period: x

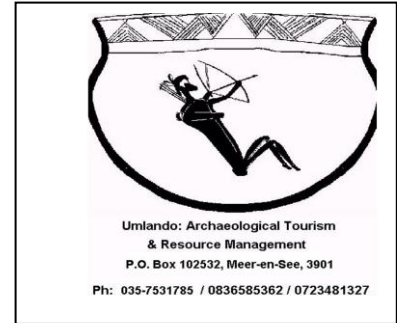
Recorder's Site No.: MM07

Official Name: Springvale 2170

Local Name: Boncalli

Map Sheet : 2929BD Nottingham Road

GPS reading: S29 19.174 E29 58.506



DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station turn left onto the R103. Drive for 81m and turn right onto the D146. MM07 is 1.5km from here, located just north of MM06 on the D146.

SITE DESCRIPTION:

Type of Site: Tree boundaries

Merits conservation: Yes. The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape. The more recent trees can be removed for the pipeline, as they are not part of the original border.

Threats: Yes

What threats: Mooi-Mngeni TS

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/18

:

References:

Description of site and artefactual content.

The "site" consists of a row of various old trees that appear to be older than 60 years. The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands it sense of history.

The trees are of medium significance as it forms part of the cultural landscape.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)

Stone Age:

Early Iron Age:

Late Iron Age

Historical Period: x

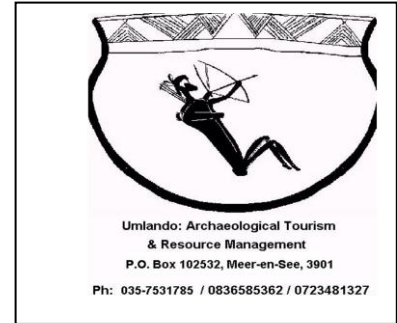
Recorder's Site No.: MM08

Official Name: Springvale 2170

Local Name: Mallorca

Map Sheet : 2929BD Nottingham Road

GPS reading: S29 19.322 E29 58.668



DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From the Rosetta Railway Station turn left onto the R103. Drive for 1.2km and turn right. MM08 is 1.1km from here, just north of MM06 on the D146.

SITE DESCRIPTION:

Type of Site: Tree boundaries

Merits conservation: Yes. The old tree boundaries should not be removed, regardless of their alien status. Amafa KZN will need to approve the destruction of a cultural landscape. The more recent trees can be removed for the pipeline, as they are not part of the original border.

Threats: Yes

What threats:

RECORDING:

Graphic record: Yes

Digital pictures: x

Tracings :

Re-drawings:

Recorder/Informant: Name: Gavin Anderson

Address: PO Box 102532, Meerensee, 3901

Date: 2012/07/18

:

References:

Description of site and artefactual content.

The "site" consists of a row of various old trees that appear to be older than 60 years. The trees are part of a property boundary, of which some may predate 20th century. The trees form part of the cultural landscape, that gives the Midlands it sense of history.

The trees are of medium significance as it forms part of the cultural landscape

APPENDIX B

PALAEONTOLOGICAL IMPACTS ASSESSMENT: DESKTOP

PALAEONTOLOGICAL ASSESSMENT OF

Pipeline Route options Analysis Report Mooi-Mgeni Transfer Scheme - Phase 2, KwaZulu Natal.

FOR

Umlando

DATE: 25 July 2012

By

Gideon Groenewald
Metsi Metseng Geological and Environmental Services
Fax: 086 619 2136
Cell: 082 829 4978

TABLE OF CONTENT

INTRODUCTION	49	
SAHRA ACT OR KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008		49
METHODOLOGY	50	
RESULTS	51	
GEOLOGY	51	
Volksrust Formation	51	
Adelaide Subgroup (Formation) and Estcourt Formation		51
Karoo Dolerite	51	
PALAEONTOLOGY	53	
Volksrust Formation	53	
Adelaide Subgroup / Formation (Pa) or Estcourt Formation (Pes)		53
Karoo Dolerite	53	
DISCUSSION	54	
MANAGEMENT PLAN		54
CONCLUSION	56	
REFERENCES	56	
QUALIFICATIONS AND EXPERIENCE OF THE AUTHOR	Error! Bookmark not defined.	

TABLE OF FIGURES

Figure 1	Geological Map of proposed pipeline	53
Figure 2	Sensitivity Map for pipeline north of Nottingham Road	55
Figure 3	Sensitivity Map for pipeline south of Nottingham Road	55

EXECUTIVE SUMMARY

Metsi-Metseng Geological and Environmental Services CC was appointed to undertake a desktop survey, assessing the potential palaeontology impact of the Pipeline Route for the Mooi-Mgeni Transfer Scheme - Phase 2, KwaZulu Natal.

The potential palaeontology of a rock unit relates directly to the geology of the area. The desktop survey includes the comparison of relevant referenced geological maps and locality maps and/or waypoints provided for the development project. The potential impact and significance of the palaeontology for a specific rock unit is determined through comparison of existing geological and palaeontology database information.

The desktop survey indicates that the planned Mooi-Mgeni Transfer Scheme is underlain by sedimentary- and igneous rocks of the Karoo Supergroup. The Volksrust Formation is normally deeply weathered and it is unlikely that significant fossils will be associated with this formation in the study area.

The Adelaide Subgroup is known to contain abundant plant fossils of *Glossopteris* and vertebrate fossils of both the *Dicynodon* and *Lystrosaurus* Assemblage zones have been recorded from these units.

The dolerite units will not contain any fossil material and has no significance for palaeontological finds and no mitigation measures will be needed to preserve or rescue palaeontological data.

A phase 1 Palaeontological Impact Assessment must be done for areas underlain by rocks of the Adelaide Subgroup (Adelaide Formation).

INTRODUCTION

Metsi-Metseng Geological and Environmental Services CC was appointed to undertake a desktop survey, assessing the potential palaeontology impact of the Pipeline Route for the Mooi-Mgeni Transfer Scheme - Phase 2, KwaZulu Natal.

SAHRA ACT OR KWAZULU-NATAL HERITAGE ACT NO. 4 OF 2008

The National Heritage Resources Act of 1999 (pp 12-14) and the KwaZulu heritage Act of 2008 protects a variety of heritage resources. These resources are defined as follows:

1. “For the purposes of this Act, those heritage resources of South Africa which are of cultural significance or other special value for the present community and for future generations must be considered part of the national estate and fall within the sphere of operations of heritage resources authorities.

2. Without limiting the generality of subsection (1), the national estate may include -

2.1. Places, buildings, structures and equipment of cultural significance;

2.2. Places to which oral traditions are attached or which are associated with living heritage;

2.3. Historical settlements and townscapes;

2.4. Landscapes and natural features of cultural significance;

2.5. Geological sites of scientific or cultural importance;

2.6. Archaeological and palaeontological sites;

2.7. Graves and burial grounds, including—

2.8. Ancestral graves;

2.9. Royal graves and graves of traditional leaders;

2.10. Graves of victims of conflict;

2.11. Graves of individuals designated by the Minister by notice in the Gazette;

2.12. Historical graves and cemeteries; and

2.13. Other human remains which are not covered in terms of the Human Tissue Act, 1983 (Act No. 65 of 1983);

3. Sites of significance relating to the history of slavery in South Africa;

3.1. Movable objects, -

4. Objects recovered from the soil or waters of South Africa, including archaeological and palaeontological objects and material, meteorites and rare geological specimens;

4.1. Objects to which oral traditions are attached or which are associated with living heritage;

4.2. Ethnographic art and objects;
4.3. Military objects;
4.4. objects of decorative or fine art;
4.5. Objects of scientific or technological interest; and
4.6. books, records, documents, photographic positives and negatives, graphic, film or video material or sound recordings, excluding those that are public records as defined in section 1(xiv) of the National Archives of South Africa Act, 1996 (Act No. 43 of 1996).

5. Without limiting the generality of subsections (1) and (2), a place or object is to be considered part of the national estate if it has cultural significance or other special value because of—

- 5.1. Its importance in the community, or pattern of South Africa's history;
- 5.2. Its possession of uncommon, rare or endangered aspects of South Africa's natural or cultural heritage;
- 5.3. Its potential to yield information that will contribute to an understanding of South Africa's natural or cultural heritage;
- 5.4. Its importance in demonstrating the principal characteristics of a particular class of South Africa's natural or cultural places or objects;
- 5.5. Its importance in exhibiting particular aesthetic characteristics valued by a community or cultural group;
- 5.6. Its importance in demonstrating a high degree of creative or technical achievement at a particular period;
- 5.7. Its strong or special association with a particular community or cultural group for social, cultural or spiritual reasons;
- 5.8. Its strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa; and
- 5.9. sites of significance relating to the history of slavery in South Africa”

METHODOLOGY

The potential palaeontology of a rock unit relates directly to the geology of the area. The desktop survey includes the comparison of relevant referenced geological maps and locality maps and/or waypoints provided for the development project. The potential impact and significance of the palaeontology for a specific rock unit is determined through comparison of existing geological and palaeontology database information.

The only limitation on this methodology is the scale of mapping, which restricts comparison of the geology to a scale of 1:250 000. This restriction only applies in areas where major changes in the geological character of the area occur over very short distances.

RESULTS

The planned Pipeline Route options Analysis Report Mooi-Mgeni Transfer Scheme - Phase 2, KwaZulu Natal is geologically underlain by Sedimentary deposits and igneous intrusive dolerite of the Karoo Supergroup (Figure 1).

GEOLOGY

The planned pipeline route is underlain by Permian aged sedimentary rocks of the Volksrust Formation (Pvo), which forms part of the Eccca Group, sedimentary rocks of the Estcourt Formation (Pes/Pe), which forms part of the Beaufort Group and Jurassic aged Dolerite which is an intrusive igneous rock. All these rock units form part of the Karoo Supergroup.

Volksrust Formation

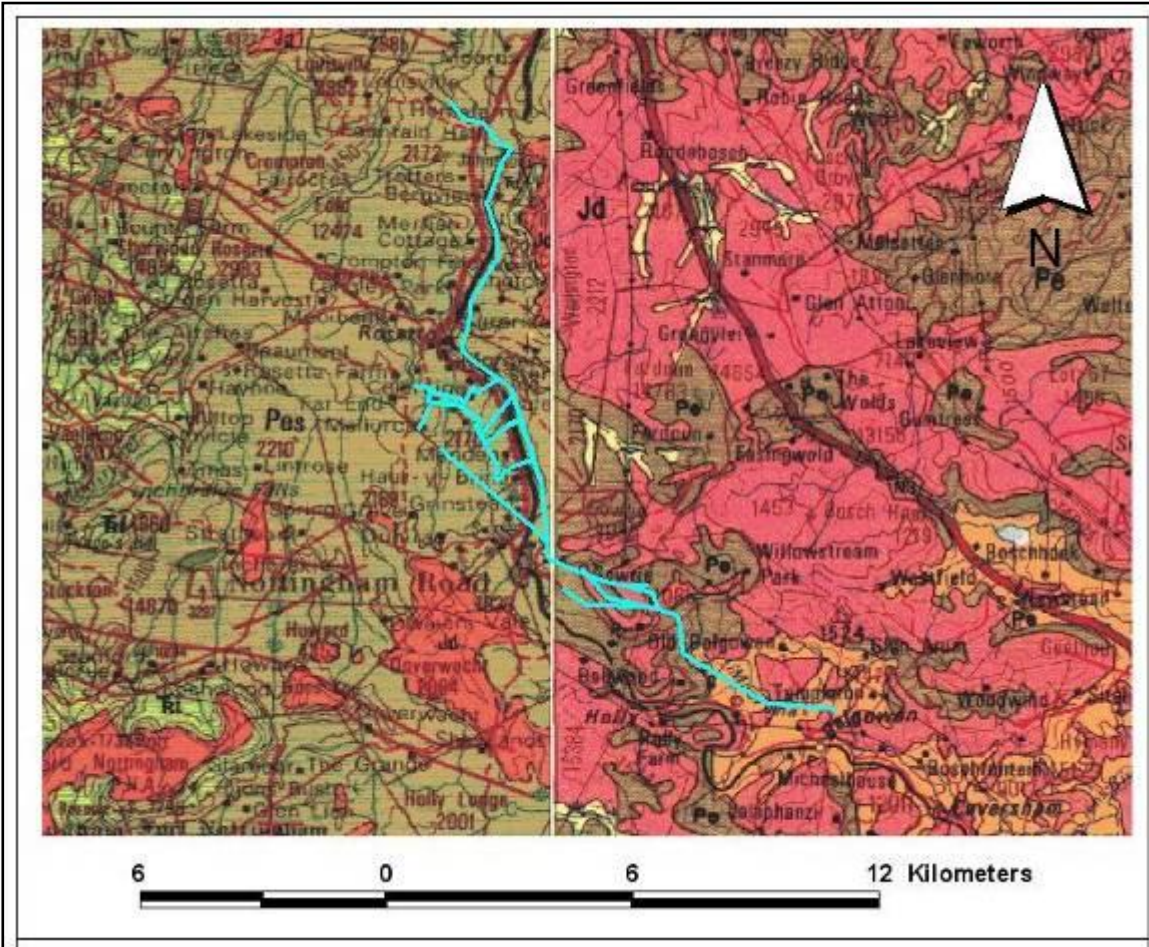
The most southern part of the pipeline cuts the Permian Volksrust Formation (Pvo) of the Eccca Group. This unit of dark greenish-grey siltstone or shale, weathering into a light yellow to khaki colour is interpreted as a deep water deposit that accumulated in an off-shore marine environment (Botha and Botha, 2002)

Adelaide Subgroup (Formation) and Estcourt Formation

The Estcourt Formation (Pes) represents the lower part of the Adelaide Subgroup (Pa) of the Beaufort Group, which on the map in Figure 1 is indicated as the Adelaide Formation (Pa). The sequence of interbedded fine-grained sandstone and siltstone with carbonaceous shale is interpreted as a fluvio-deltaic deposit and the thickness of sandstone lenses increase in upward coarsening cycles. The upper part of the Adelaide Subgroup is interpreted as a fluvial sequence of sandstone and siltstone, grading upwards into a lacustrine environment (Groenewald, 1996).

Karoo Dolerite

Sections of the proposed pipeline cut dolerite sill outcrops to the south of the study area. Dolerite is a very hard, intrusive igneous rock.



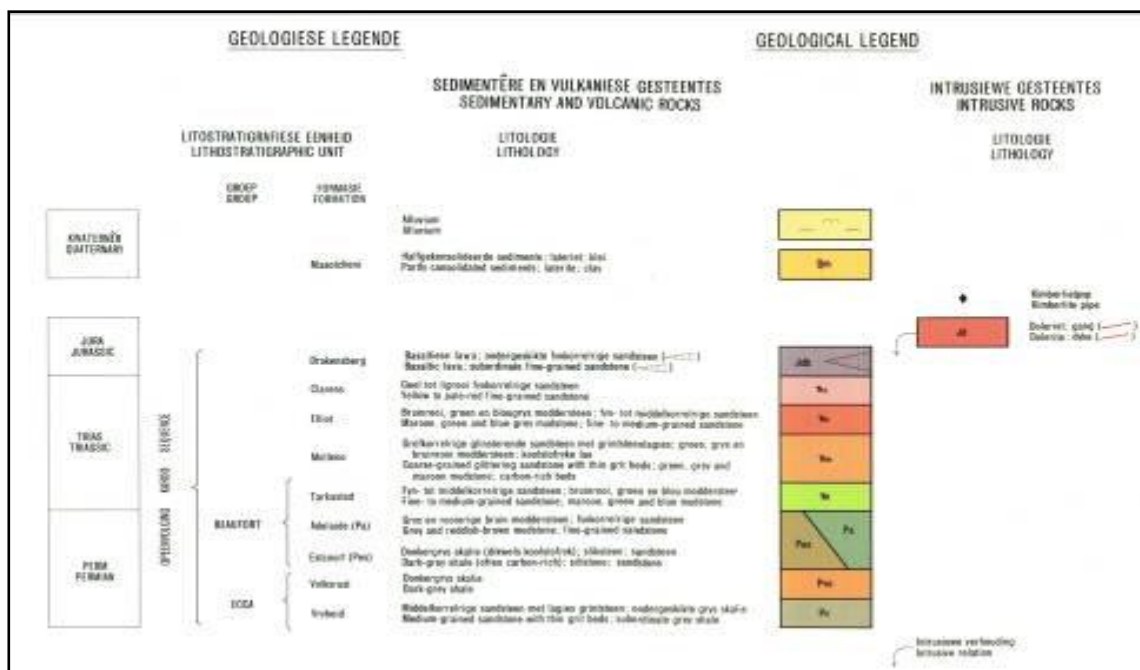


Figure 1 Geological Map of proposed pipeline

PALAEONTOLOGY

The potential palaeontology of a rock unit relates directly to the geology of the area. The desktop survey includes the comparison of relevant referenced geological maps and locality maps and/or waypoints provided for the development project.

Volksrust Formation

The Volksrust Formation generally is unproductive as far as fossils are concerned and minor trace fossils might be associated with the upper most parts of the formation (Johnson et al 2006).

Adelaide Subgroup / Formation (Pa) or Estcourt Formation (Pes)

The Adelaide Subgroup is highly productive as far as fossils are concerned. Fossils include plant fossils of *Glossopteris* and vertebrate fossils of the *Dicynodon* and *Lystrosaurus* Assemblage zones have been recorded from these rock units in KwaZulu-Natal (Rubidge ed, 1995; Groenewald, 1996; Johnson et al, 2006).

Karoo Dolerite

Due to the igneous character of these rocks they do not contain fossils.

DISCUSSION

The desktop survey indicates that the planned Mooi-Mgeni Transfer Scheme is underlain by sedimentary rocks and igneous rocks of the Karoo Supergroup. The potential impact and significance of the palaeontology for a specific rock unit is determined through comparison of existing geological and palaeontology database information.

The Volksrust Formation is normally deeply weathered and it is unlikely that significant fossils will be associated with this formation in the study area.

The Adelaide Subgroup is known to contain abundant plant fossils of *Glossopteris* and vertebrate fossils of both the *Dicynodon* and *Lystrosaurus* Assemblage zones have been recorded from these units.

The dolerite units will not contain any fossil material.

MANAGEMENT PLAN

The desktop survey indicates that the planned pipeline development is underlain by sedimentary rocks of the Volksrust Formation of the Ecca Group and Adelaide Subgroup of the Beaufort Group

For management purposes a colour scheme is proposed (Figure 2 & 3) with the following interpretations:

- Green areas along the proposed route indicate that the chances of finding fossils are too low to warrant any management action.
- Orange areas along the route cuts geology with a significant chance of finding fossils and these areas will have to be subjected to a Phase 1 Palaeontological Impact Assessment.

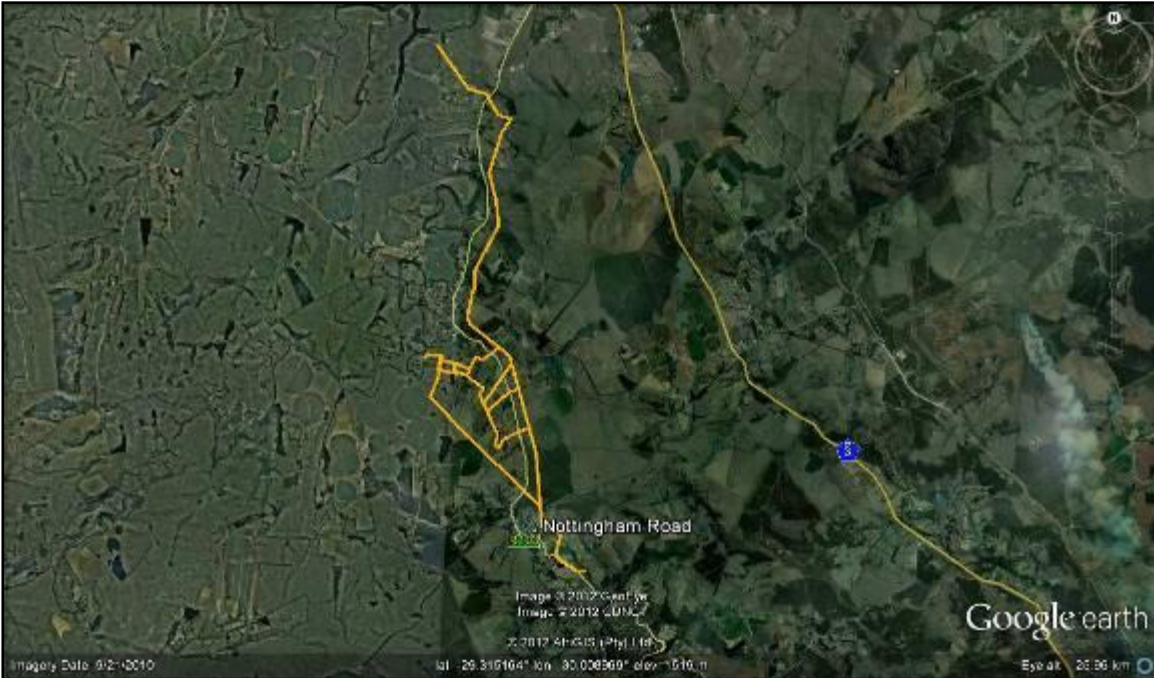


Figure 2 Sensitivity Map for pipeline north of Nottingham Road

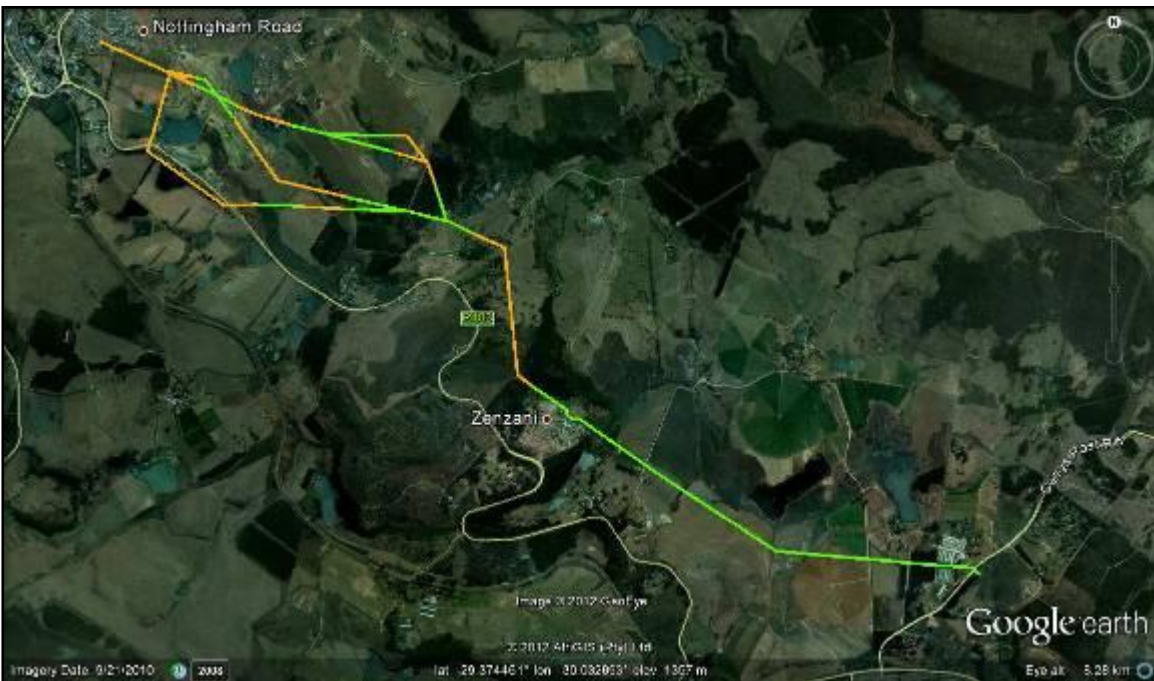


Figure 3 Sensitivity Map for pipeline south of Nottingham Road

CONCLUSION

The planned Pipeline Route for the Mooi-Mgeni Transfer Scheme is located on sedimentary and igneous rocks of the Karoo Supergroup. The Volksrust Formation is highly weathered and it is unlikely that trace fossils will be recognised in this unit of rocks. The dolerite outcrops has no significance for palaeontological finds and no mitigation measures will be needed to preserve or rescue palaeontological data. .

It is recommended that a phase 1 Palaeontological Impact Assessment must be done for areas underlain by rocks of the Adelaide Subgroup (Adelaide Formation in Figure 1)

REFERENCES

Botha R.C.N. and Botha GA. 2002. Geological Description of sheet 2930CB Pietermaritzburg. Council for Geoscience, Pretoria.

Groenewald GH. 1996. Stratigraphy and Sedimentology of the Tarkastad Subgroup, Karoo Supergroup, South Africa. Unpubl PhD Thesis, University of Port Elizabeth.

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

Rubidge BS (ed) 1995. Biostratigraphy of the Beaufort Group (Karoo Supergroup), South Africa. South African Committee for Stratigraphy.