HERITAGE SURVEY OF THE PROPOSED NORTHERN AQUEDUCT AUGMENTATION PROJECT

FOR KNIGHT PIÉSOLD CONSULTING

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INTRODUCTION

"eThekwini Water and Sanitation (EWS) is currently constructing a new bulk water pipeline from Cato Ridge to Inchanga, Pinetown, Tshelimnyama and Ntuzuma (and surrounds) with gravity-fed potable water. The pipeline ties into Umgeni Water's existing bulk water infrastructure beyond the municipal boundary, which receives potable water from the Midmar Dam system. The pipeline currently under construction consists of a steel pipe of varying diameters (1.6m – 0.6m), and has been named the "Western Aqueduct" (WA)...EWS are considering the possibility of injecting water from the WA into the NA Augmentation system via an off-take at KwaDabeka. To achieve this, EWS propose to implement the construction of a new bulk water pipeline from Emachobeni to Umhlanga via the proposed Blackburn Reservoir, supplying areas north of the Umgeni River; south of the Ohlanga River and east of Ntuzuma (and surrounds) with gravity-fed potable water. The 50km pipeline proposed, will consist of a steel pipe of varying diameters, and will be named the "Northern Aqueduct Augmentation".

The Northern Aqueduct Augmentation is to start at Emachobeni in the Umgeni Valley and will terminate in Umhlanga, in the north, after various off-takes along the route (see attached Route Map). The northern pipeline will feed into Phoenix, Ntuzuma, Umhlanga, Waterloo, Nyaninga, Ogunjini and the proposed new Lindalani, Ntanda and Kwa Silwane break pressure tank reservoirs. The current land-use of the areas that the project will transect are comprised of low to high density informal and formal residential and business areas, with scattered sugar cane plantations and some forested areas" (Knight Piésold Consulting BID, pp 1-2)

Umlando was contracted to undertake the Heritage Impact Assessment (HIA) survey of the NAA (figs 1 – 2). The survey was undertaken over three days in May 2011. The survey consisted of a desktop study that noted sensitive areas and/or existing sites, and a field survey. A Phase 0 Palaeontological Impact Assessment (PIA) was undertaken to note areas of sensitivity. Six heritage sites, and one Palaeontological site, were recorded during the survey.

Fig. 1 General Location of the Proposed Pipeline

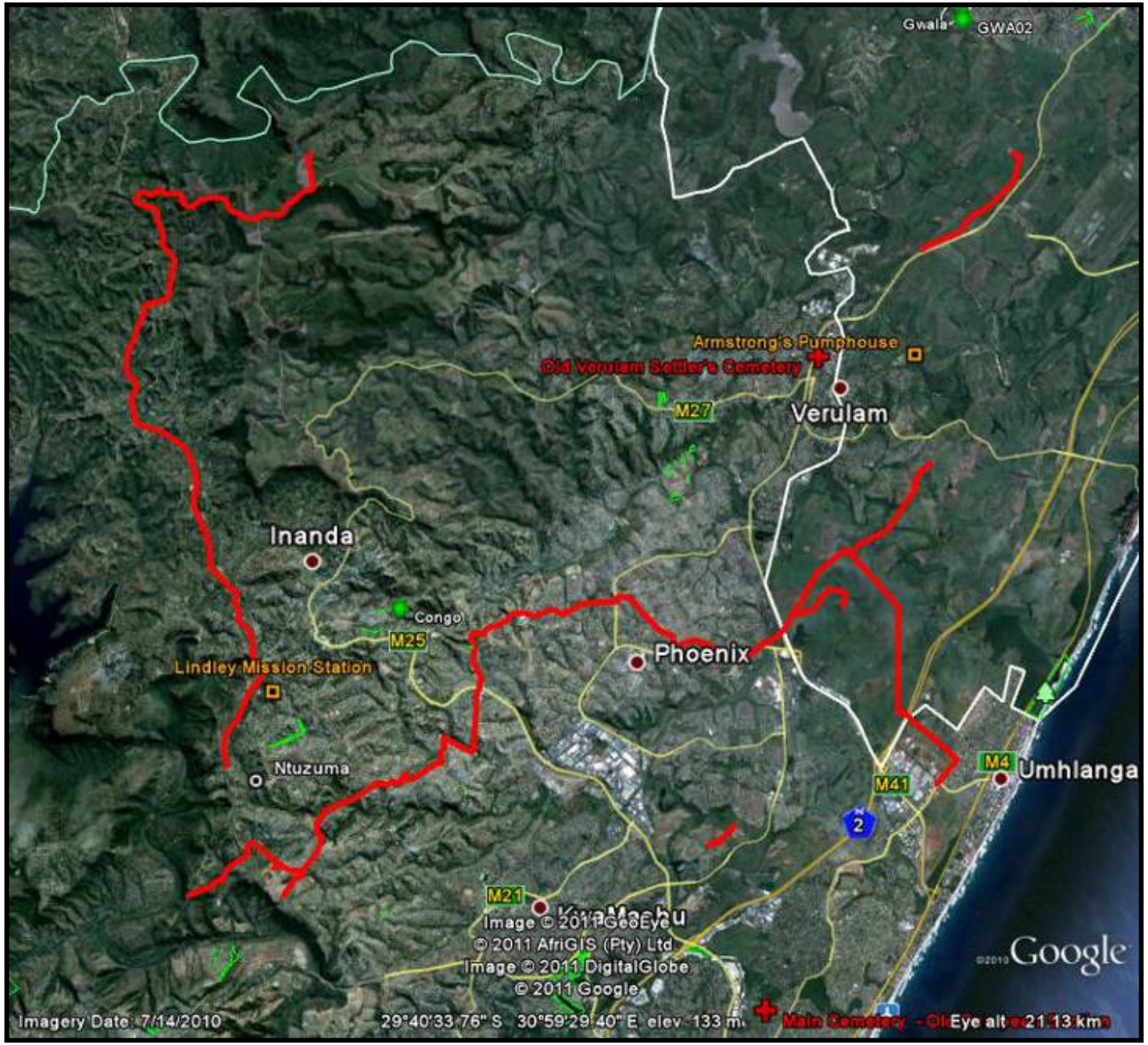
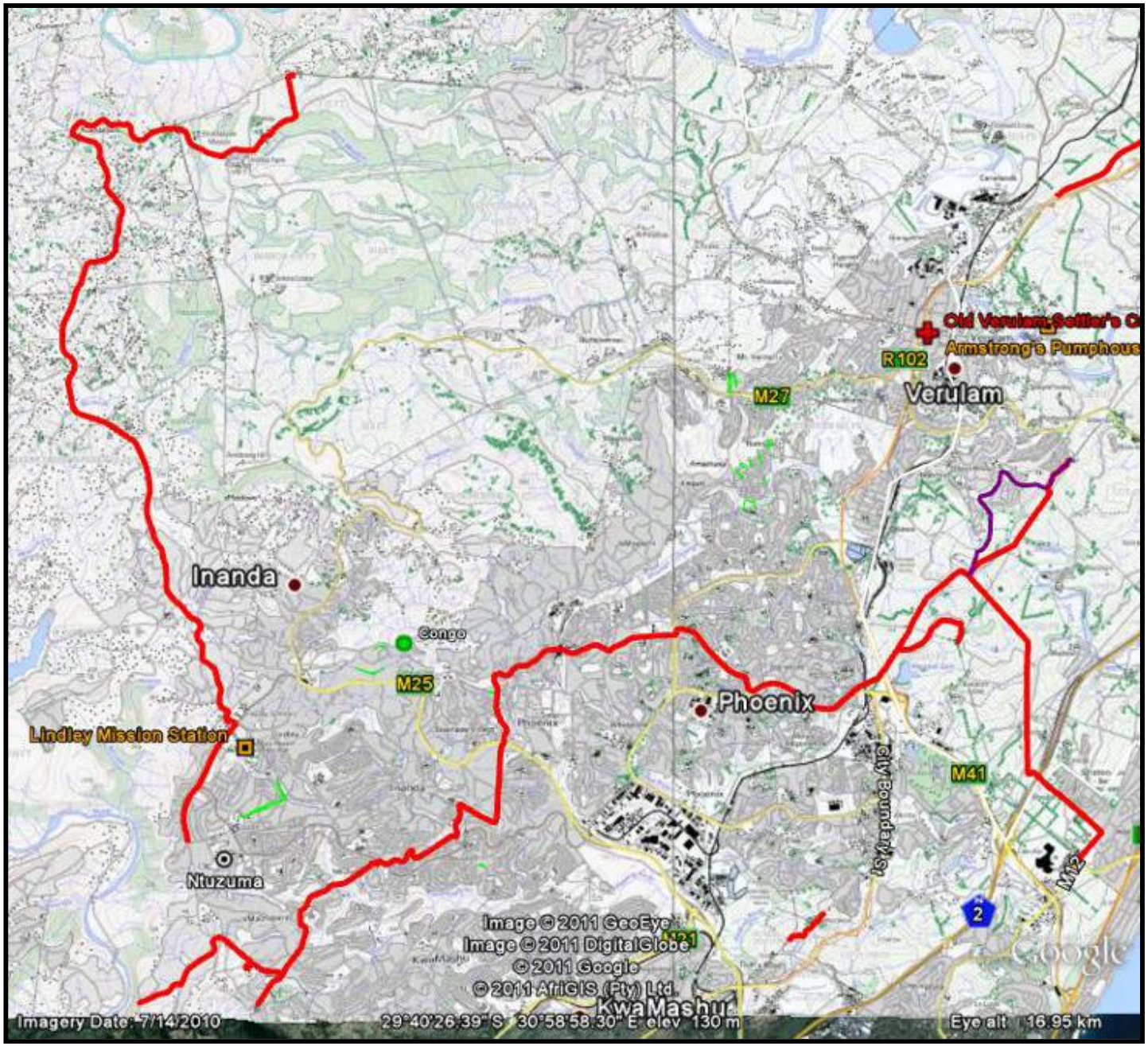


Fig. 2: 2000 Topographical Map of the NAA



OBJECTIVES

The aim of the survey was to note all heritage sites that would be affected by the NAA. Each site would need to be assessed in terms of its significance, and a management plan proposed. The EIA was undertaken at a desktop level and noted sensitive areas. The EIA was supplied with detailed geotech. information.

LEGISLATION

The National Heritage Resources Act of 1999 (pp 12-14) 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, including—
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"

DATA SOURCES & 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 1st and 2nd edition 1:50 000 topographical and 1937 aerial photographs where available, to assist in general location and dating of buildings and/or graves. The database is in Google Earth format and thus used as a quick reference when undertaking desktop studies. Where required we would consult with a local data recording centre, however these tend to be fragmented between different institutions and areas and thus difficult to access at times. We also consult with an historical architect, palaeontologist, and an historian where necessary.

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

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

Defining significance

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

1. State of preservation of:

1.1. Organic remains:

1.1.1. Faunal

1.1.2. Botanical

1.2. Rock art

1.3. Walling

1.4. Presence of a cultural deposit

1.5. Features:

1.5.1. Ash Features

1.5.2. Graves

1.5.3. Middens

1.5.4. Cattle byres

1.5.5. Bedding and ash complexes

2. Spatial arrangements:

2.1. Internal housing arrangements

2.2. Intra-site settlement patterns

2.3. Inter-site settlement patterns

3. Features of the site:

3.1. Are there any unusual, unique or rare artefacts or images at the site?

3.2. Is it a type site?

3.3. Does the site have a very good example of a specific time period, feature, or artefact?

4. Research:

4.1. Providing information on current research projects

4.2. Salvaging information for potential future research projects

5. Inter- and intra-site variability

5.1. Can this particular site yield information regarding intra-site variability, i.e. spatial relationships between various features and artefacts?

5.2. Can this particular site yield information about a community's social relationships within itself, or between other communities?

6. Archaeological Experience:

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

7. Educational:

7.1. Does the site have the potential to be used as an educational instrument?

7.2. Does the site have the potential to become a tourist attraction?

7.3. The educational value of a site can only be fully determined after initial test-pit excavations and/or full excavations.

8. Other Heritage Significance:

8.1. Palaeontological sites

8.2. Historical buildings

8.3. Battlefields and general Anglo-Zulu and Anglo-Boer sites

8.4. Graves and/or community cemeteries

8.5. Living Heritage Sites

8.6. Cultural Landscapes, that includes old trees, hills, mountains, rivers, etc related to cultural or historical experiences.

The more a site can fulfil 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.

PROJECT TEAM

Gavin Anderson from Umlando assessed the archaeological and general heritage sites. Dr Gideon Groenewald from Metsi-Metseng undertook the palaeontological survey. Debbie Whelan, from Archaic, assisted in discussing some of the buildings.

Results

Much of the NAA occurs in very disturbed areas. The area has seen a vast increase in (in) formal housing, road works, and various servitudes. Thus, there is little chance of finding *in situ* archaeological and historical sites. Only those areas with sugar cane farming tend to have better preserved sites, and these have been affected by ploughing activity. Only the large historical buildings remain along the NAA. The historical maps are used to identify areas with potential human remains.

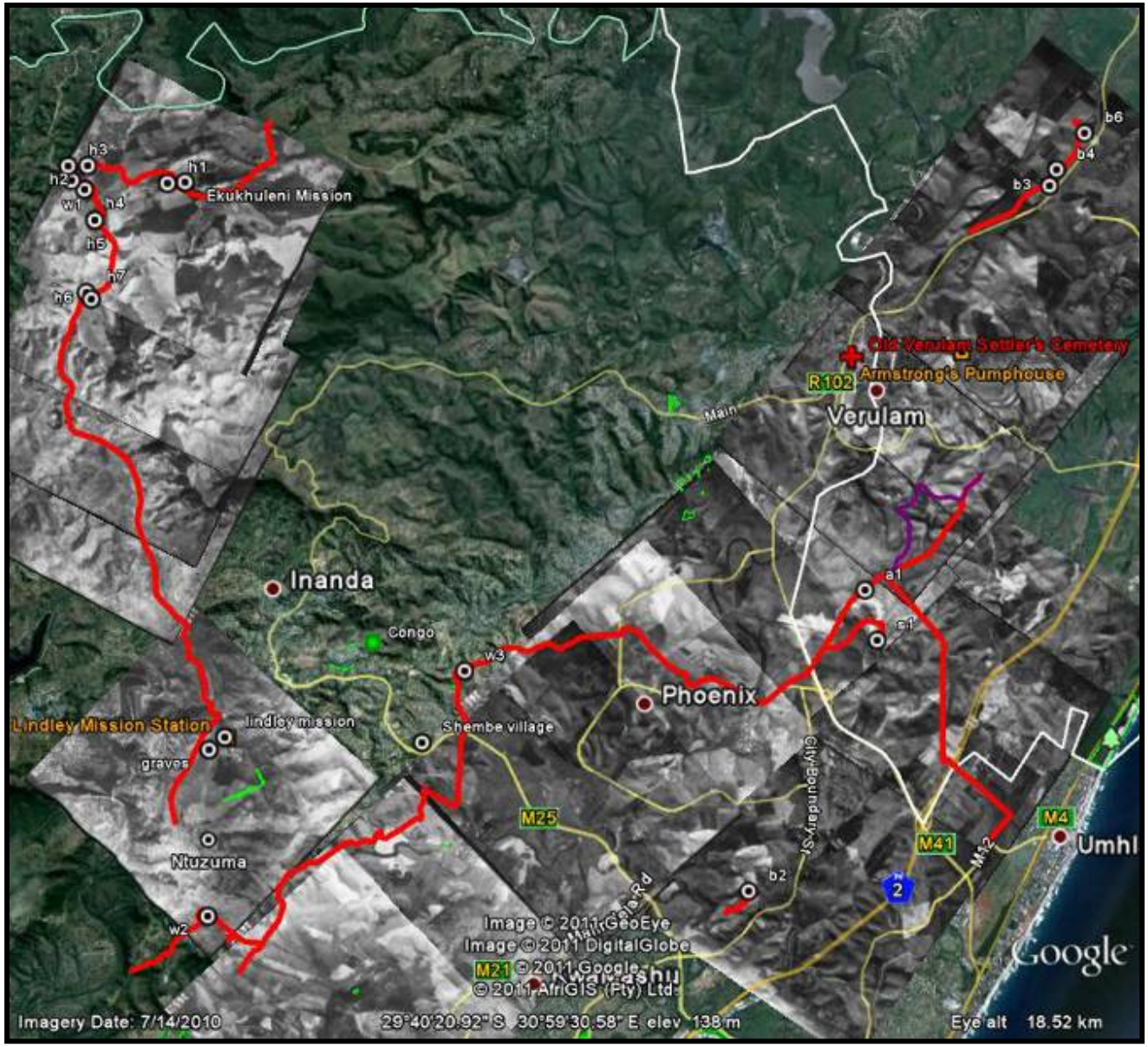
Desktop survey

Twenty sites were noted on the 1937 aerial photographs (fig. 3). These sites occur within 300m of the line, but are not necessarily affected by it. These sites included the Ekukhanyeni Mission, the Lindley Mission, various farm buildings, and homesteads.

Only the Ekukhanyeni Mission and the Lindley Mission still exist, while there are ruined structures near the Farm Blackburn. The rest of the sites, identified on the 1937 aerial photographs sites, within 50m of the pipeline do not exist anymore.

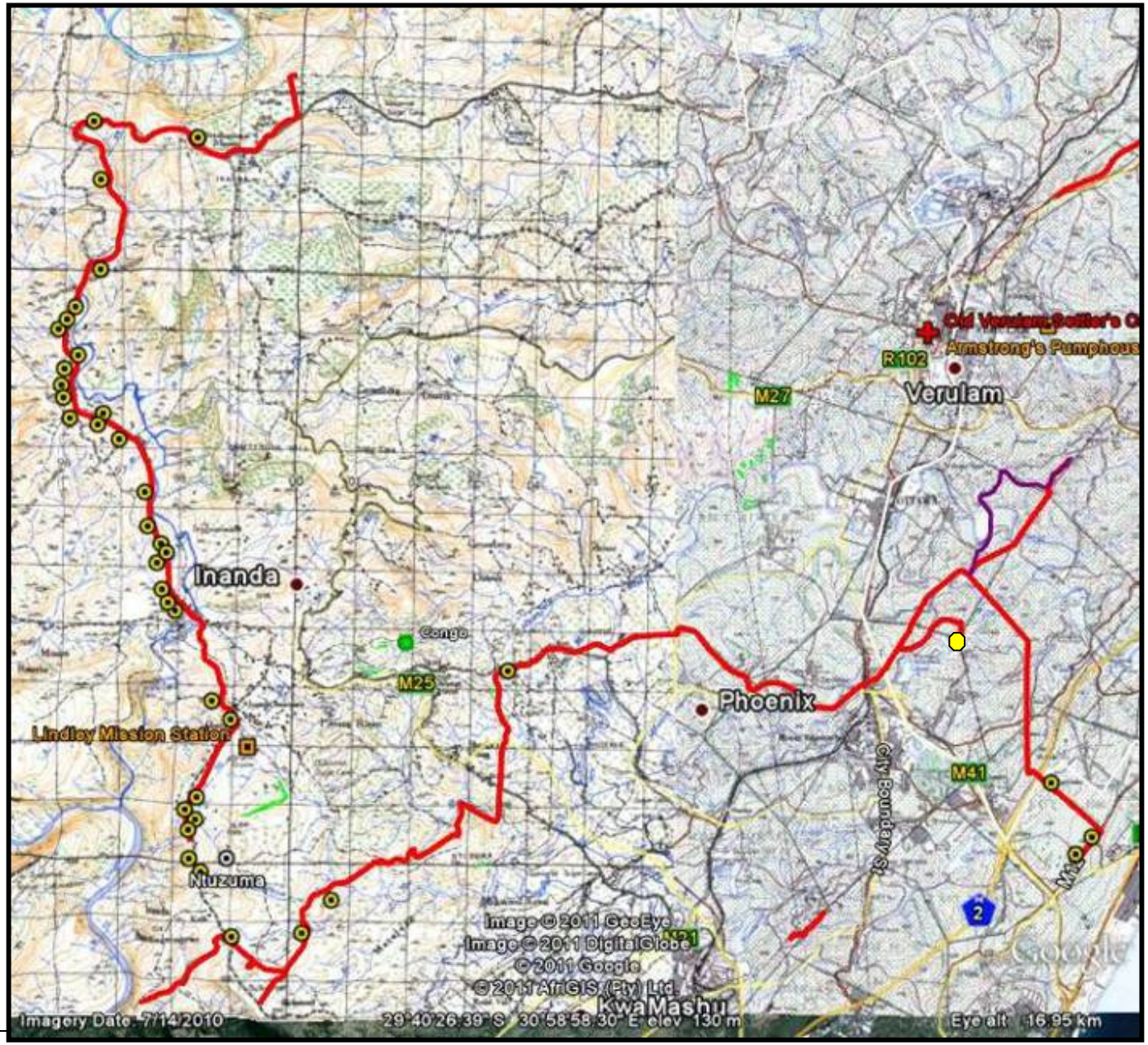
The 1942 2930DB Inanda, and 1969 2931CA Verulam 1:50 000 maps were used to identify potential heritage sites. These are the oldest 1:50 000 maps available from the surveyor general (Cape Town). A total of 38 sites were noted from these maps, of which most occur on the 1942 map (fig. 4). These sites are mostly homesteads, farm buildings, churches, and schools. All sites within 50m of the pipeline no longer exist and have been replaced by houses that are more modern.

Fig. 3: Location of Heritage Sites From 1937 Aerial Photographs[1]



[1] White circle with black centre = human settlement or structure in 1937. A = feature, h = homestead, w = shop, b = building

Fig. 4: Location of Heritage Sites in 1942/1960 Along The NAA[2]



[2] 2930DB Inanda 1942, 2931CA Verulam 1969. Yellow Circle = human settlement or structure

Fig. 5: Location of Surveyed Sites along the NAA

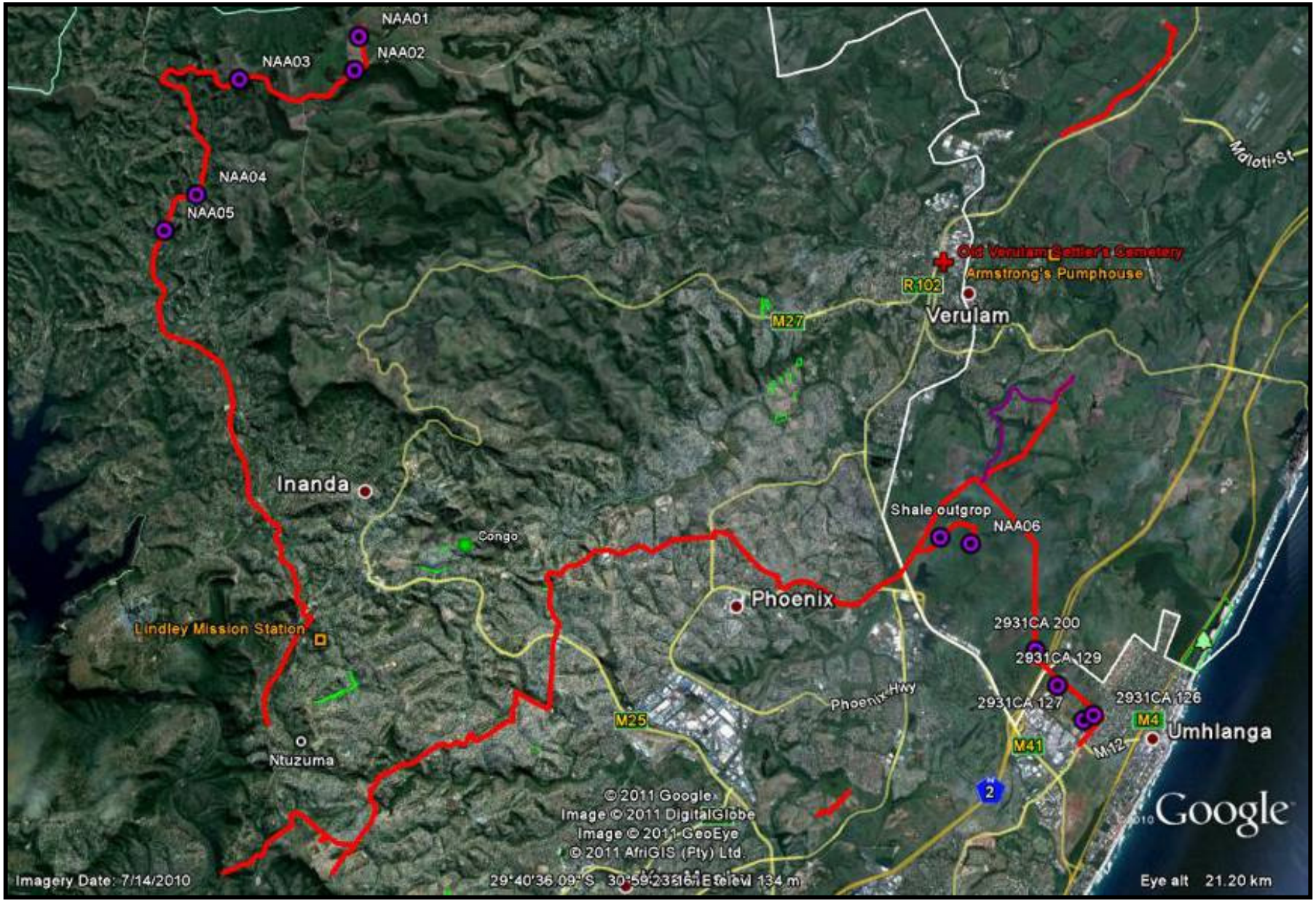


Fig. 6: Location of Sites in the Northern Study Area

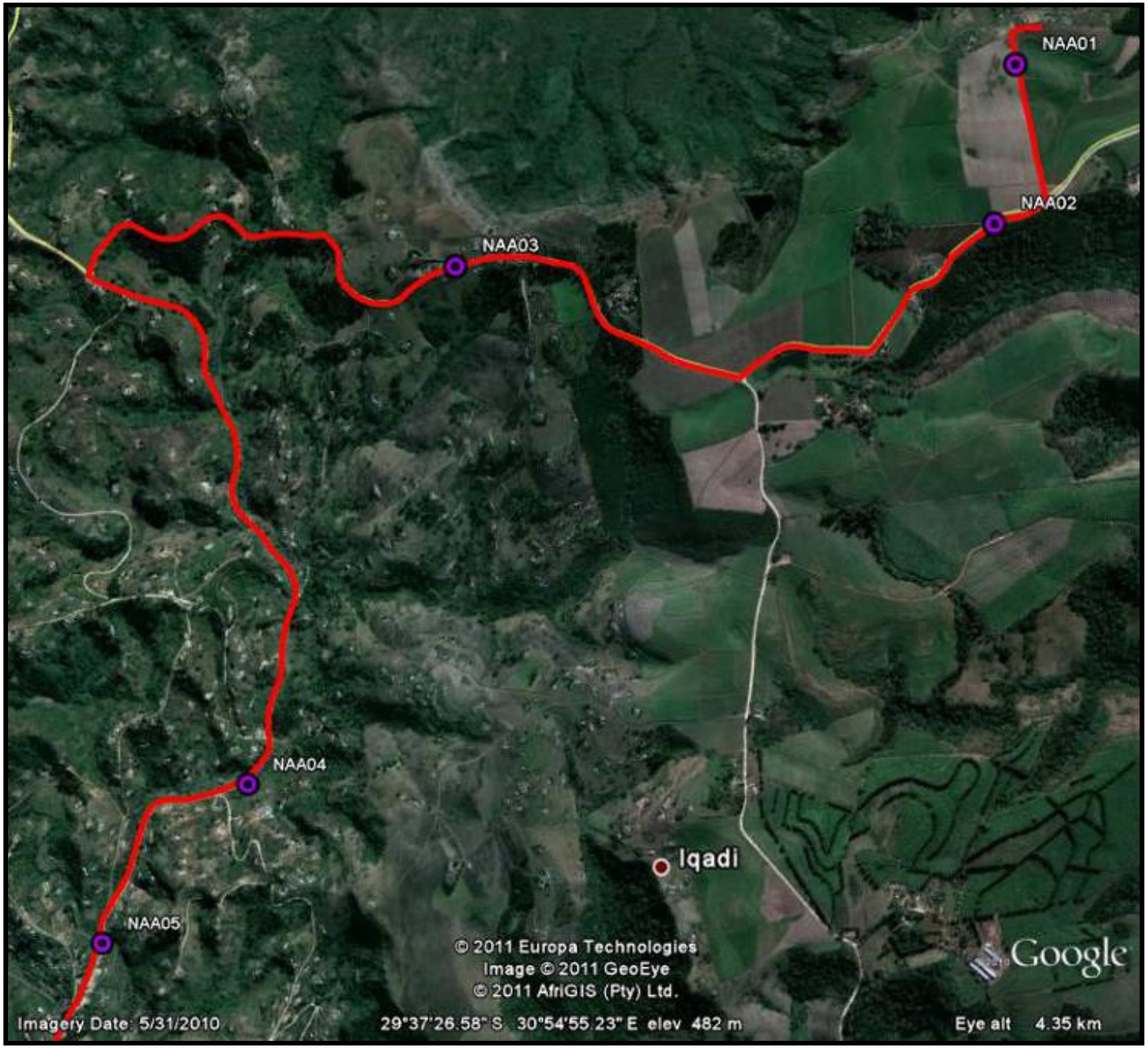
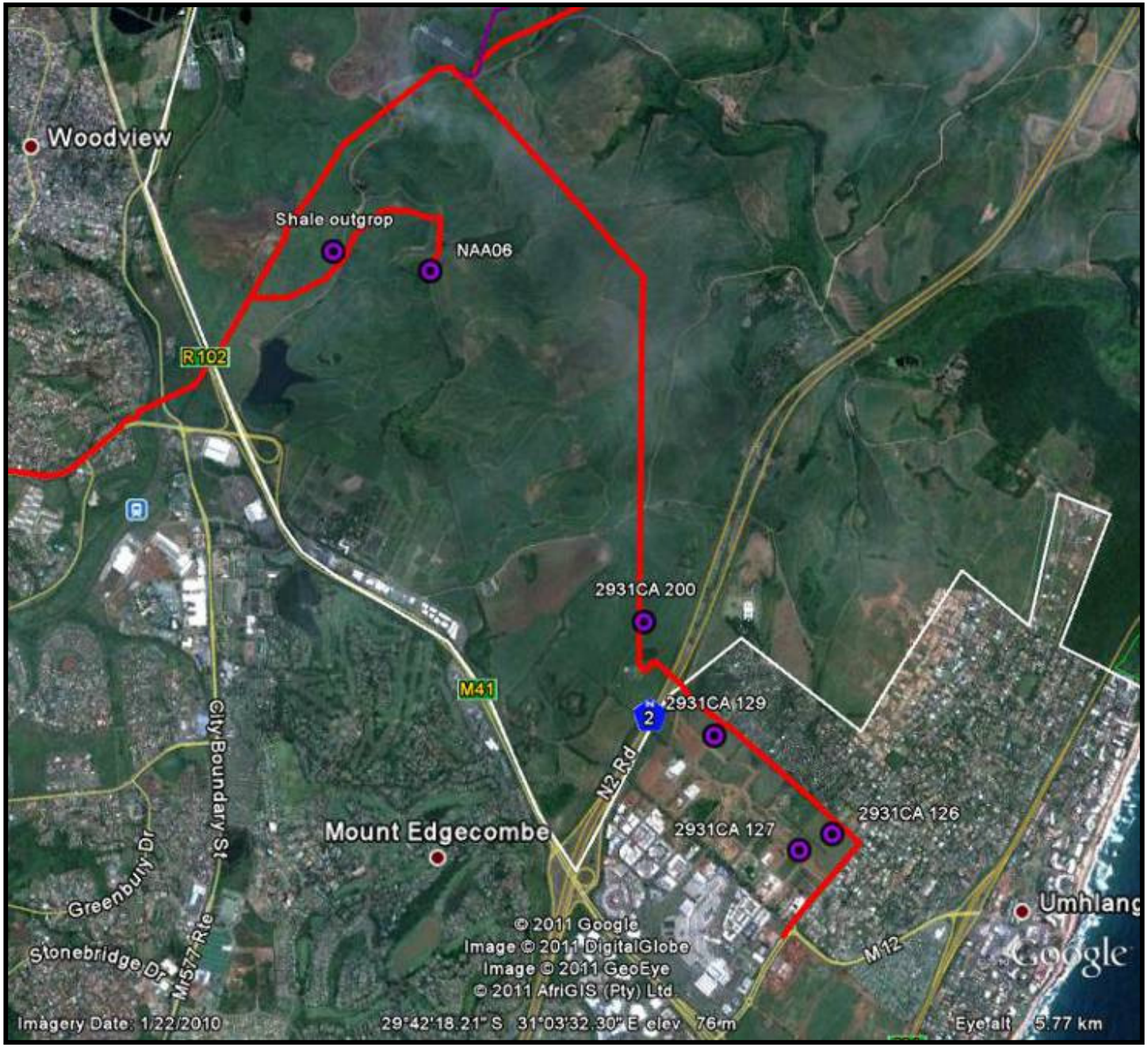


Fig. 7: Location of Sites in the Eastern Study Area



Field Survey

NAA01

NAA01 is located southwest of the Ogunjini Reservoir in the sugar cane fields (fig. 8). While the sugar cane was dense, I surveyed along the road and tracks to gain an overall impression of the site. This is a standard practice and allows one to estimate the density of artefacts over an area.

The site consists of an ephemeral scatter of Late Iron Age, or Historical Period, pottery sherds (fig. 8a-b). There does not appear to be an archaeological deposit.

The NAA will directly affect this site

Significance: The site is of low significance.

Mitigation: No mitigation is required.

Map Sheet Reference: Sheet 45

Fig. 8a: Location of NAA01

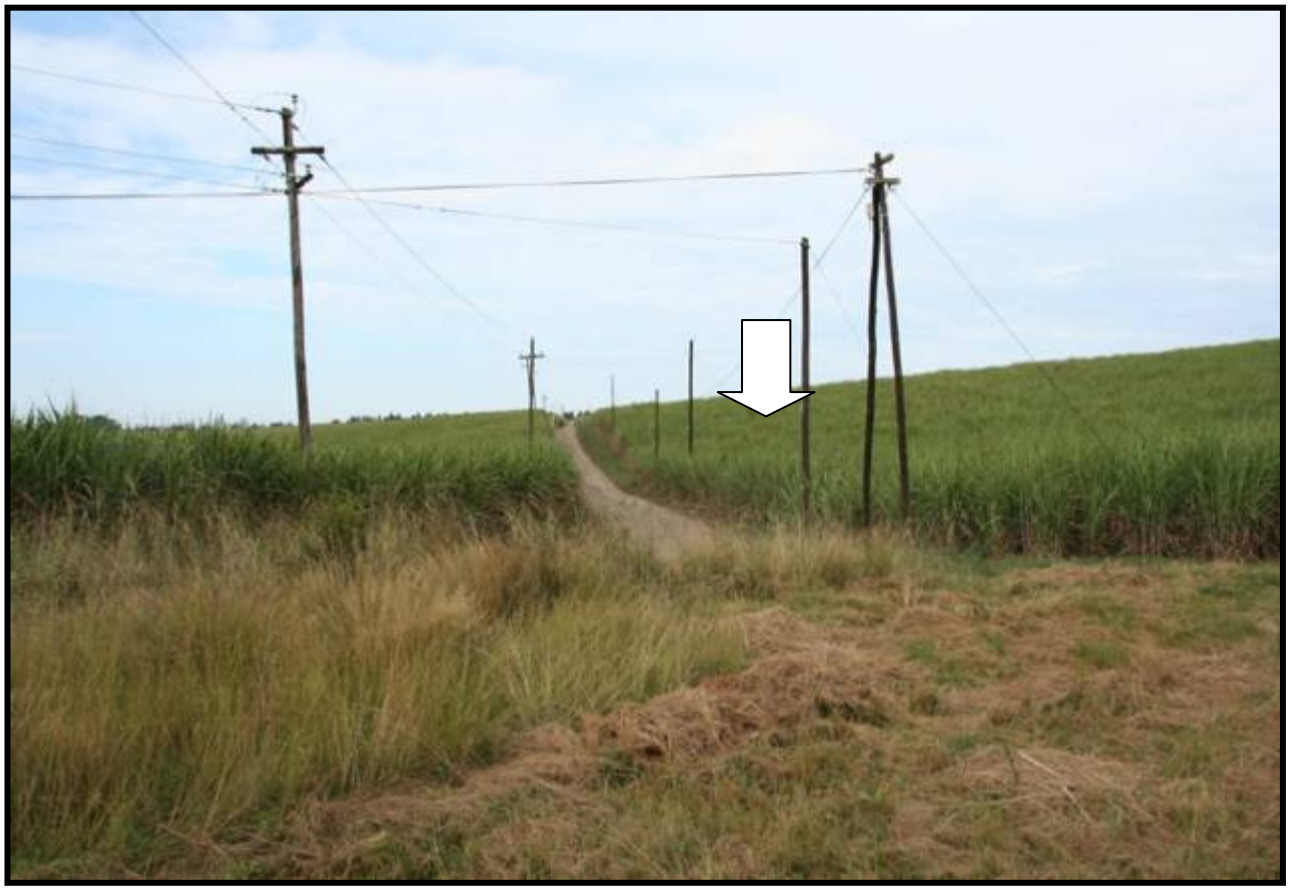


Fig. 8b: Pottery Sherds at NAA01

NAA02

NA002 is located in the same sugar cane fields as NA001, but further south. The site consists of a scatter of pottery sherds that have been exposed by the road cutting and erosion. The pottery sherds extend for ~20m along the road cutting and consist of at least three pots (fig. 9). All of the pottery sherds are undecorated; however, these tend to be thicker and more weathered than those at NAA01 are. The site may date to the Early Iron Age. There is no archaeological deposit at the site.

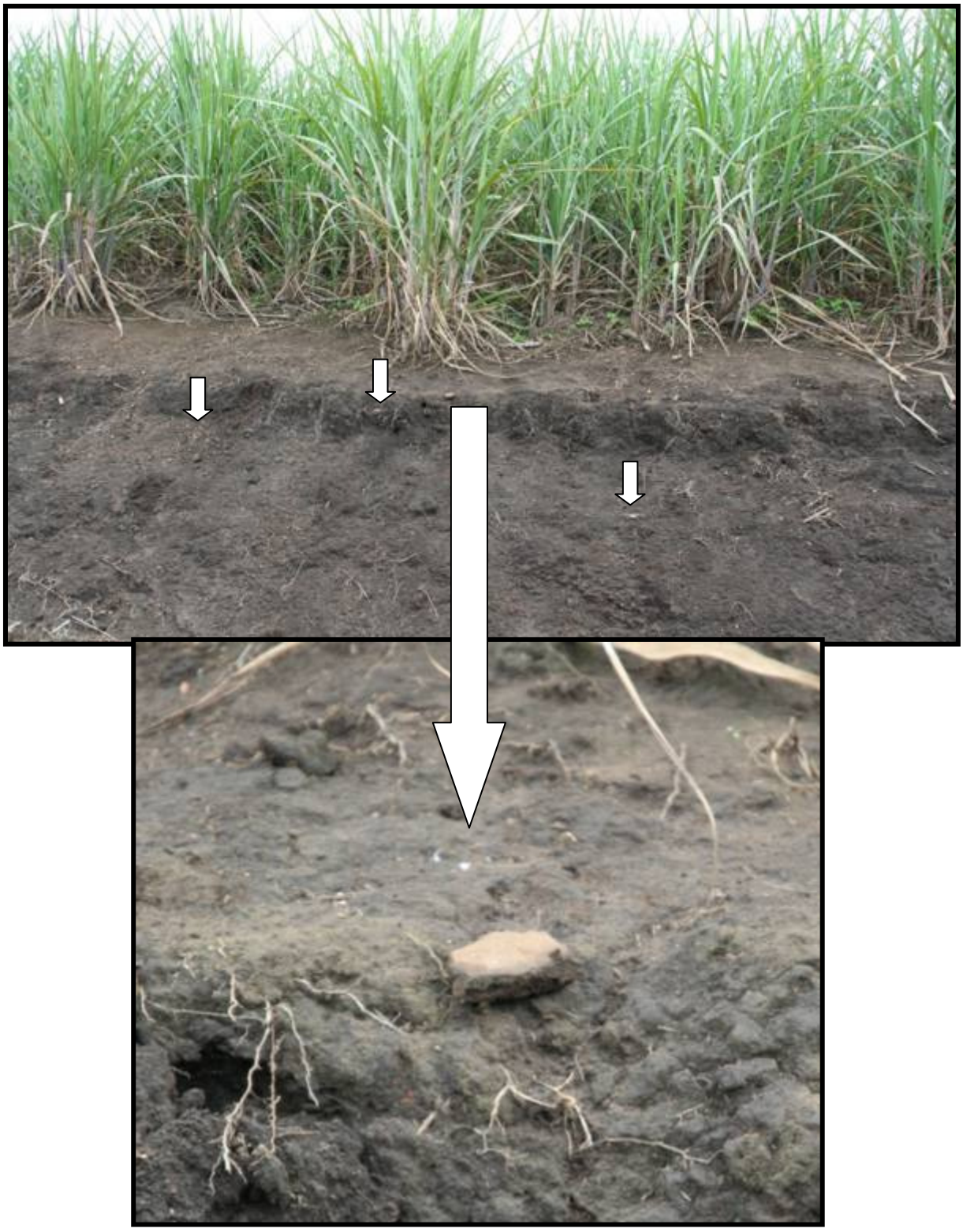
The NAA will directly affect this site

Significance: The site is of low significance

Mitigation: No mitigation is required.

Map Sheet Reference: Sheet 44

Fig. 9: Pottery Sherds at NAA02



NAA03

NAA03 is located near the top of the hill and observed from a road cutting (fig. 10). The site consists of an ephemeral scatter of stone tools. Three quartz flakes were observed in the road cutting, and more are likely to occur in the general area. The stone tools date to the late Stone Age and are in secondary context.

The NAA will directly affect this site.

Significance: The site is of low significance

Mitigation: no further mitigation is required.

Map Sheet Reference: Sheet 43

Fig. 10: Location of Stone Tool at NAA03

NAA04

NAA04 is located near the base of the hill and adjacent to the road. The site consists of a circular building and circle of stones used by the Nazareth Baptist Church. The features are of a recent construction, although the area may have been used for some time.

The NAA will not directly affect this site as it occurs on the opposite side of the road.

Significance: The site is significant to those who worship at this area.

Mitigation: No mitigation is required since the site will not be disturbed.

Map Sheet Reference: Sheet 40

Fig. 11: Place of Worship at NAA04

NAA05

NAA05 is located near the bridge crossing of the Mzinyati River. The site is a stone cairn that is either part of field clearance or a human grave that is located on a flood plain (fig. 12).

The NAA will not directly affect this site as it occurs on the opposite side of the road.

Significance: The site is of low significance if it is related to field clearance. If the cairn is a human grave, then it is of high significance.

Mitigation: No mitigation is required since it is not affected.

Map Sheet Reference: Sheet 39

Fig. 12: Stone Cairn at NAA05

NAA06

NAA06 is located at the top of a hill. The site is a built structure that has been enclosed by thicket and bushes. The vegetation was too dense to take a photograph. Two buildings occur on the 2000 and 1942 topographical maps, while buildings occur on the 1937 aerial photograph. This means that the buildings would be older than 60 years and would require a permit to be damaged. There would also be historical period middens near the house.

Archaic consulting stated (Appendix B):

'The structure on Lot 20 1557 (S29 41.518 E31 03.023), obscured by foliage, could be a remnant of early twentieth century farming, possibly associated with Ottowa, given its presence on early topocadastrals and 1937 aerial photographs. However, the practicalities of its retention, situated, as it is distant from the town, are minimal, and the necessity of its retention is marginal. Were it of any merit, local interest groups such as the Verulam Historical Society would have ensured its well-being... At this point, the merit in its retention and the practicality of its interpretation is minimal.'

The Proposed Blackburn Reservoir will occur on this site.

Significance: The house is of low significance as it is already in ruins with apparently few remaining walls.

Mitigation: The vegetation will need to be cleared before the reservoir is built. The remaining buildings should be re-assessed, measured, and photographed after vegetation clearance by a qualified architect historian. The excavations for the reservoir should be monitored for potential historical middens and sampled if necessary.

Map Sheet Reference: Sheet 16

Ekukhanyeni Mission

The Ekukhanyeni Mission will not be directly affected by the NAA as it occurs on the opposite side of the road. Several trees were planted as boundaries for the Mission and these should not be disturbed as they form part of the cultural landscape.

The proposed KwaSilwane Surge Tank occurs between the Mission and the clinic. This area has had several buildings related to the mission in this general area as well as human settlements. There may be historical middens and/or human remains.

Significance: The Mission is of high significance due to its historical value.

Mitigation: No mitigation is required for the mission; however, the area for the proposed KwaSilwane Surge Tank would require monitoring during earthmoving activity.

Map Sheet Reference: Sheet 43

General archaeological sites

Several previously recorded archaeological sites exist near the pipeline. These sites are Late Iron Age sites recorded in the 1990s and early 2000 by staff at the Natal museum. These include:

1. 2931CA 200
2. 2931CA 129
3. 2931CA 126

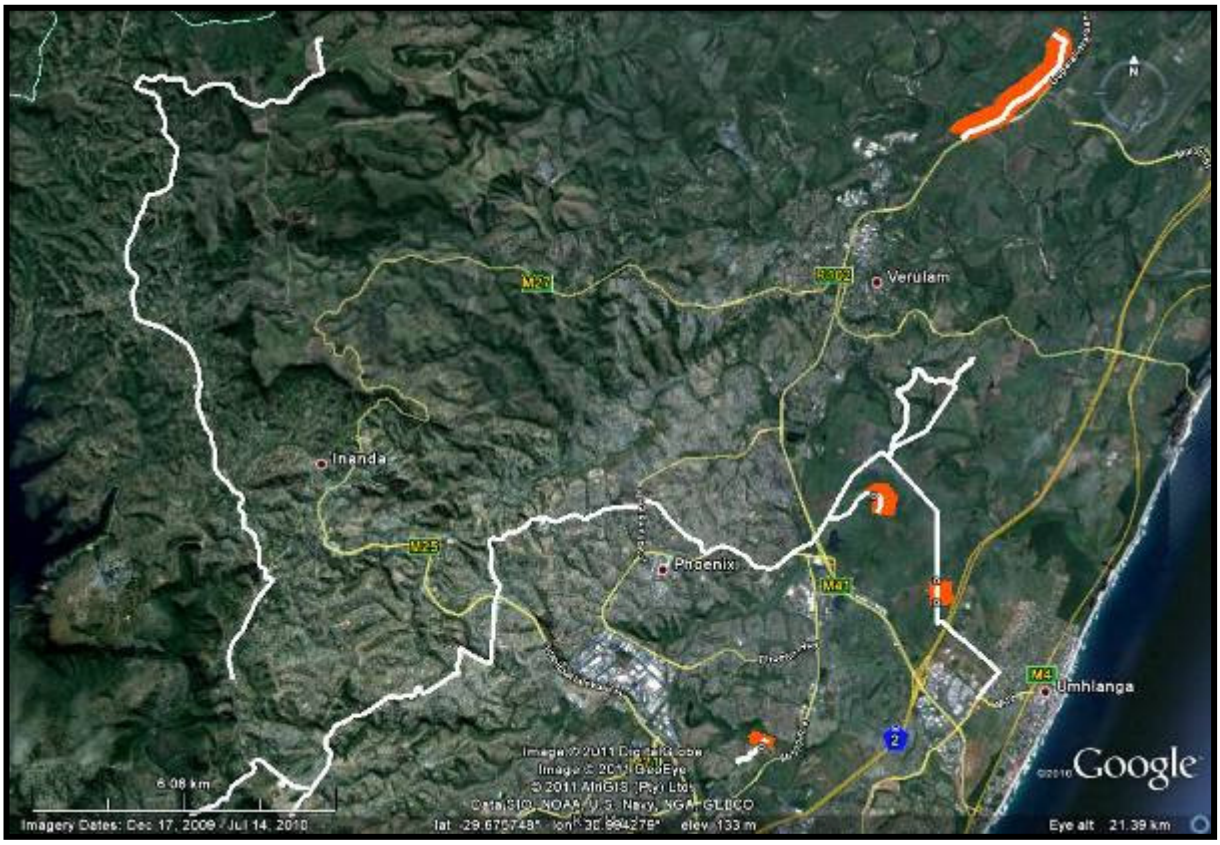
Sites 2931CA 129 and 2931CA 126 have since been destroyed by development, only site 2931CA 200 will need to be monitored during construction.

These sites are not directly affected by the pipeline and the edges of the site occur ~20m – 50m from the pipeline.

Palaeontology

The Palaeontological assessment (Appendix A) noted a few areas that would have Palaeontological remains. These are the areas with shale outcrops (Fig. 13).

Fig. 13: Location of Sensitive Palaeontological Areas



Metsi Metseng stated:

"The Palaeontological Impact Assessment indicates that fossils will be restricted to outcrop areas of the Vryheid Formation as well as areas where deep excavation exposes sandstone and shale of this rock sequence.

It is recommended that outcrops of the Vryheid Formation, where present, be recorded for closer inspection by a trained palaeontologist. Where deep excavation into Vryheid Formation shale is expected, it is recommended that a trained palaeontologist visit the sites of excavation and, if ichnofossils are present; obtain a permit from SAHRA and/or AMAFA for collection of a representative sample for study purposes."

The sensitive areas are as follows:

1. PAL01: The entire Nyaninga Link (29°37'25.07"S 31° 4'4.84"E to 29°36'15.86"S 31° 5'15.35"E)
2. PAL02: Phoenix 2 Reservoir to the Proposed Blackburn Offtake (29°41'33.03"S 31° 2'38.04"E to 29°41'33.28"S 31° 2'59.59"E)
3. PAL03: Phoenix 6 Reservoir to the Phoenix 1 Reservoir (29°44'6.81"S 31° 1'31.00"E to 29°44'1.30"S 31° 1'36.19"E)

4. PAL04: Proposed Blackburn Offtake to Umhlanga 2 Reservoir (29°42'5.15"S 31° 3'43.70"E to 29°42'34.61"S 31° 3'44.16"E)

Significance: There are potential fossil remains of varying significance.

Mitigation: A registered palaeontologist would need to be on site during any excavations in the designated areas.

Map Sheets:

- PAL01: Sheet 26, 27 28
- PAL02: Sheet 16
- PAL03: Sheet 46
- PAL04: Sheet 20, 21

Green Flag Status Areas

Most of the heritage sites are of a Green Flag Status after mitigation. These include:

- NAA01
- NAA02
- NAA03
- NAA04
- NAA05
- KwaSilwane Surge Tank

Orange Flag Status Areas

All of the palaeontological sites and NAA06 are of Orange Flag status. These are:

- PAL01
- PAL02
- PAL03
- PAL04
- NAA06 (Blackburn Reservoir Site)
- KwaSilwane Surge Tank

Red Flag Status Areas

There are no red flag status sites

SIGNIFICANCE RATING

BEFORE MITIGATION					
	Probability	**Scale**	**Duration**	**Magnitude**	**ES**
NAA01	5	1	4	1	30
NAA02	5	1	4	1	30
NAA03	5	1	4	1	30
NAA04	0	1	4	0	0
NAA05	0	1	4	0	0
NAA06	4	1	4	4	36
P1	5	1	4	4	45
P2	5	1	4	4	45
P3	5	1	4	4	45
P4	5	1	4	4	45
KwaSilwane Surge Tank	5	1	4	4	45

AFTER MITIGATION					
	Probability	**Scale**	**Duration**	**Magnitude**	**ES**
NAA01	5	1	4	1	30
NAA02	5	1	4	1	30
NAA03	5	1	4	1	30
NAA04	0	1	4	0	0
NAA05	0	1	4	0	0
NAA06	2	1	4	1	12
P1	5	1	4	1	30
P2	5	1	4	1	30
P3	5	1	4	1	30
P4	5	1	4	1	30
KwaSilwane Surge Tank	5	1	4	1	30

MITIGATION MEASURES & RECOMMENDATIONS

There are no mitigation measures for archaeological sites, as these sites are of low significance and unlikely to yield much information. Site 2931CA 200 will require monitoring during construction.

The ruins at NAA06 will require photography and basic measurements after the area has been cleared of vegetation. The area of the reservoir will need to be monitored for possible historical middens. If middens do occur then an archaeologist should selectively sample them. The main vegetation clearance should occur sometime ahead of the construction phase in case Amafa KZN requires additional information. The vegetation clearance may not damage any walls or related structures until they have been assessed and photographed.

The four palaeontological areas need to be monitored during the construction phase. All fossil remains will need to be sampled.

eThekwini Water Services will need to apply for a partial destruction permit from Amafa KZN. This permit may take from 1 – 6 months to obtain. The project will be partially affecting the sites, and it is a legal requirement to obtain a permit for the (partial) damage to a site, regardless of the magnitude of the impact, or the significance of the site. These sites are as follows:

- Historical sites: NAA06: the reservoir and/or may uncover historical middens and affect some structures.
- Palaeontological sites: The line may affect palaeontological remains
- Archaeological sites: NAA01, NAA02, NAA03 will be partially affected.

The monitoring of the various sites will require timeous notification.

CONCLUSION

A heritage survey for the proposed Northern Aqueduct Augmentation was undertaken in May 2011. The proposed bulk water pipeline will occur between Emachobeni and Umhlanga via the proposed Blackburn Reservoir, supplying areas north of the Umgeni River, south of the Ohlanga River and east of Ntuzuma with gravity-fed potable water. The pipeline is an estimated 50km in length, and includes three new reservoirs.

The heritage survey recorded four archaeological sites, one historical building, two places of worship, one stone cairn, and four areas of palaeontological sensitivity. The Palaeontological areas and the historical buildings are of medium significance and would require further mitigation. The mitigation would require a palaeontologist to be on site during the construction phase of the project. The historical building, and surrounds, would need to be photographed after vegetation clearance and monitored during construction phase. The stone cairn and place of worship will not be affected and thus do not require monitoring

There are no red flag heritage sites, although there are five orange flag areas/sites. These sites can be effectively mitigated and turned into green flag status.

eThekwini Water and Sanitation will need to apply to Amafa KZN for a permit to damage the heritage sites. These sites are:

- Historical sites: NAA06: the reservoir and/or may uncover historical middens and affect some structures.
- Palaeontological sites: The line may affect palaeontological remains
- Archaeological sites: NAA01, NAA02, NAA03 will be partially affected.

APPENDIX A - PALAEONTOLOGICAL IMPACT ASSESSMENT

PALAEONTOLOGICAL IMPACT ASSESSMENT REPORT FOR THE NORTHERN AQUEDUCT AUGMENTATION (NAA)

North of the Umgeni River, South of the Ohlanga River and East of Ntuzuma in KwaZulu-Natal.

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Developer: eThekwini Water and Sanitation

Consultant: Gavin Anderson

UMLANDO: Archaeological Tourism & Resource Management

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28 April 2011

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EXECUTIVE SUMMARY

eThekwini Water and Sanitation proposes to develop of a new bulk water pipeline from Emachobeni to Umhlanga via the proposed Blackburn Reservoir, supplying areas north of the Umgeni River, south of the Ohlanga River and east of Ntuzuma (and surrounds) with gravity-fed potable water. The proposed pipeline will consist of a steel pipe of varying diameters and will be named the "Northern Aqueduct Augmentation".

This report forms part of the Environmental Impact Assessment for the Northern Aqueduct Augmentation and complies with the requirements for a Phase 0 Palaeontological Impact Report as required from SAHRA.

The proposed Northern Aqueduct Augmentation is underlain by a series of geological formations, varying in age from very old Precambrian granites to recent sand dunes on the KwaZulu-Natal North Coast.

The Palaeontological Impact Assessment indicates that fossils will be restricted to outcrop areas of the Vryheid Formation as well as areas where deep excavation exposes sandstone and shale of this rock sequence.

It is recommended that outcrops of the Vryheid Formation, where present, be recorded for closer inspection by a trained palaeontologist. Where deep excavation into Vryheid Formation shale is expected, it is recommended that a trained palaeontologist visit the sites of excavation and, if ichnofossils are present; obtain a permit from SAHRA for collection of a representative sample for study purposes.

TABLE OF CONTENTS

INTRODUCTION

This report forms part of the Environmental Impact Assessment for the Northern Aqueduct Augmentation (NAA) and complies with the requirements for a Phase 0 Palaeontological Impact Report as required from SAHRA.

Palaeontological Impact Assessments are often specialist reports that form part of the wider heritage component of: i) Environmental Impact Assessments (EIAs) required in terms of the National Environmental Management Act, Act 107 of 1998, or ii) of the Environment Conservation Act (Act 73 of 1989) by the provincial Department of Environmental Affairs; or iii) Environmental Management Plans (EMPs) required by the Department of Minerals and Energy. These specialist reports may also form part of Heritage Impact Assessments (HIAs) called for in terms of Section 38 of the National Heritage Resources Act (Act No. 25, 1999) by a heritage resources authority.

PROJECT SUMMARY

Figure 2.1 Routes of the NAA Development in KwaZulu-Natal

eThekwini Water and Sanitation (EWS) has recognised the need to meet the predicted water demands of consumers within the north eastern portion of the eThekwini Metropolitan boundary. To achieve this EWS proposes to implement the construction of a new bulk water pipeline from Emachobeni to Umhlanga via the proposed Blackburn Reservoir,

supplying areas north of the Umgeni River, south of the Ohlanga River and east of Ntuzuma (and surrounds) with gravity-fed potable water.

The proposed pipeline (**Figure 2.1**) will consist of a steel pipe of varying diameters and will be named the "Northern Aqueduct Augmentation" (Knight Piésold Consulting 2011). The proposed Northern Aqueduct Augmentation (NAA) will provide additional potable water to areas that lie north of the Umgeni River, south of the Ohlanga River and east of Ntuzuma.

The construction of the pipeline is a listed activity under the National Environmental Management Act (No. 107 of 1998, revised June 2010) – Regulation 544 (Listing Notice 1, Activities 9 and 12) and Regulation No R 545 (Listing Notice 2, Activity 10). Knight Piésold Consulting has been appointed as the independent environmental consultants to apply for the necessary environmental approval, commencing with a Scoping Report leading to a full Environmental Impact Assessment Study.

GEOLOGY AND PALAEONTOLOGICAL POTENTIAL

The proposed Northern Aqueduct Augmentation (NAA) is underlain by a series of geological formations, varying in age from very old Precambrian granites to recent sand dunes on the KwaZulu-Natal North Coast (**Figure 3.1**).

Pre-Karoo Geological Formations

Pre-Karoo geology comprises Natal Granites and Natal Group sandstone. Granites do not contain fossils and with the information available there are no recordings of fossils in the Ordovician Natal Group sandstone. It is assumed that outcrops of Natal Group sandstone will be associated with areas of rugged topography as indicated in **Figure 3.1**.

Karoo Super group

The Karoo Super group consist of the Dykwa Formation, the Ecca Group and Karoo Dolerite.

Dwyka Formation

The Dwyka Formation constitutes mainly a tillite deposit and, although recordings of vertebrate remains of *Mesosaurus* are known from other parts of the Karoo Basin, no fossils have been recorded from the northern sections where the deposits are dominated by tillite. Outcrops of tillite are expected in areas with rugged topography only as indicated in **Figure 3.1**.

Ecca Group

The Ecca Group is made-up of the Pietermaritzburg and Vryheid Formations. The Vryheid Formation is further divided into Sandstone and Shale.

Pietermaritzburg Formation

The lower Pietermaritzburg shale formation is interpreted as a deep water deposit and no recordings of fossils are known from this formation in this part of the basin. It is expected that outcrops will be restricted to areas with rugged topography (**Figure 3.1**).

Vryheid Formation

Vryheid Formation sandstone.

The Vryheid Formation is well-known as a deltaic sandstone deposit that contains coal beds and plant fossils of *Glossopteris sp*. Outcrops will be restricted to areas of rugged topography and fossils of petrified trees might be associated with this sandstone when deep excavations are made during construction of the trenches for the pipeline. It is expected that most of the areas underlain by this formation will have thick soil cover on deeply weathered sandstone (**Figure 3.1**).

Vryheid Formation Shale

Although no body fossils have been recorded from the Vryheid Formation shale, the fluvio-deltaic and marine character of the deposit has been confirmed with the discovery of ichnogenus fossils (trace fossils), specifically U-shaped burrows of ichnogenus *Diplocraterion torell* (Mason and Christie, 1985). It is expected that outcrops of the Vryheid Formation shale will be restricted to areas with rugged topography. Most of the areas underlain by shale will however have deep soils on deeply weathered shale where fossils are unlikely to be found. Recording of trace fossils will be restricted to areas of good outcrop and also where excavations for the pipeline cut into un-weathered shale (**Figure 3.1**).

Karoo Dolerite

Karoo dolerite is an igneous rock and does not contain fossils (**Figure 3.1**).

Berea Formation

The Tertiary to Pleistocene red dune sands of the Berea Formation overlies the older formations. No fossils have been recorded from this formation. It is expected that the formation will be exposed in two short sections of the pipeline (Figure 3.1).

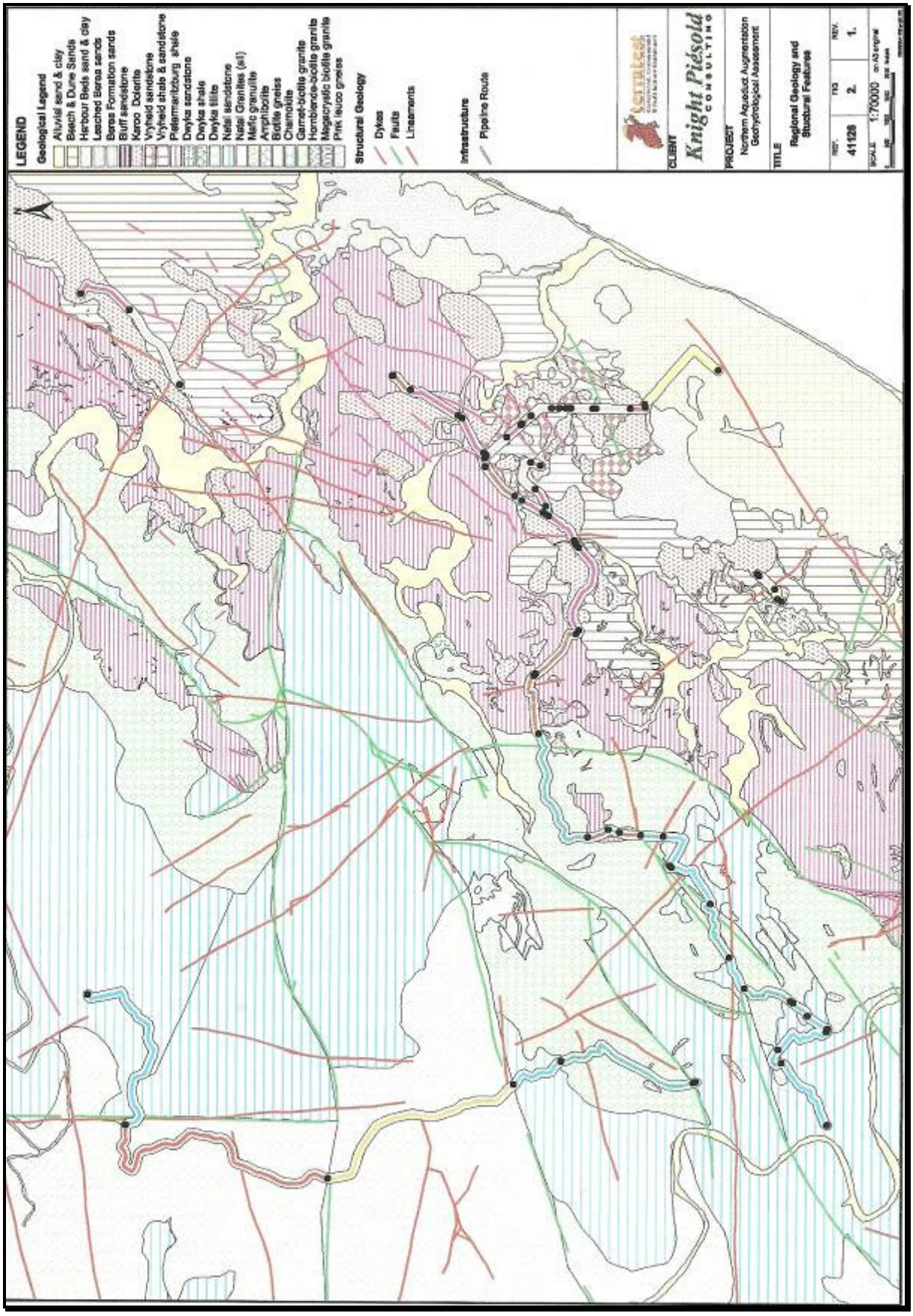

Figure 3.1 Geological Outlay of the Development (Terratest Consulting 2011).

Alluvium

The route of the pipeline cuts through limited alluvium and no fossils are expected from these sections (**Figure 3.1**).

PALAEONTOLOGICAL ASSESSMENT

From information provided by Terratest (via Knight Piésold Consulting), the geological formations and potential impact on the palaeontology is summarised in **Figure 4.1**.

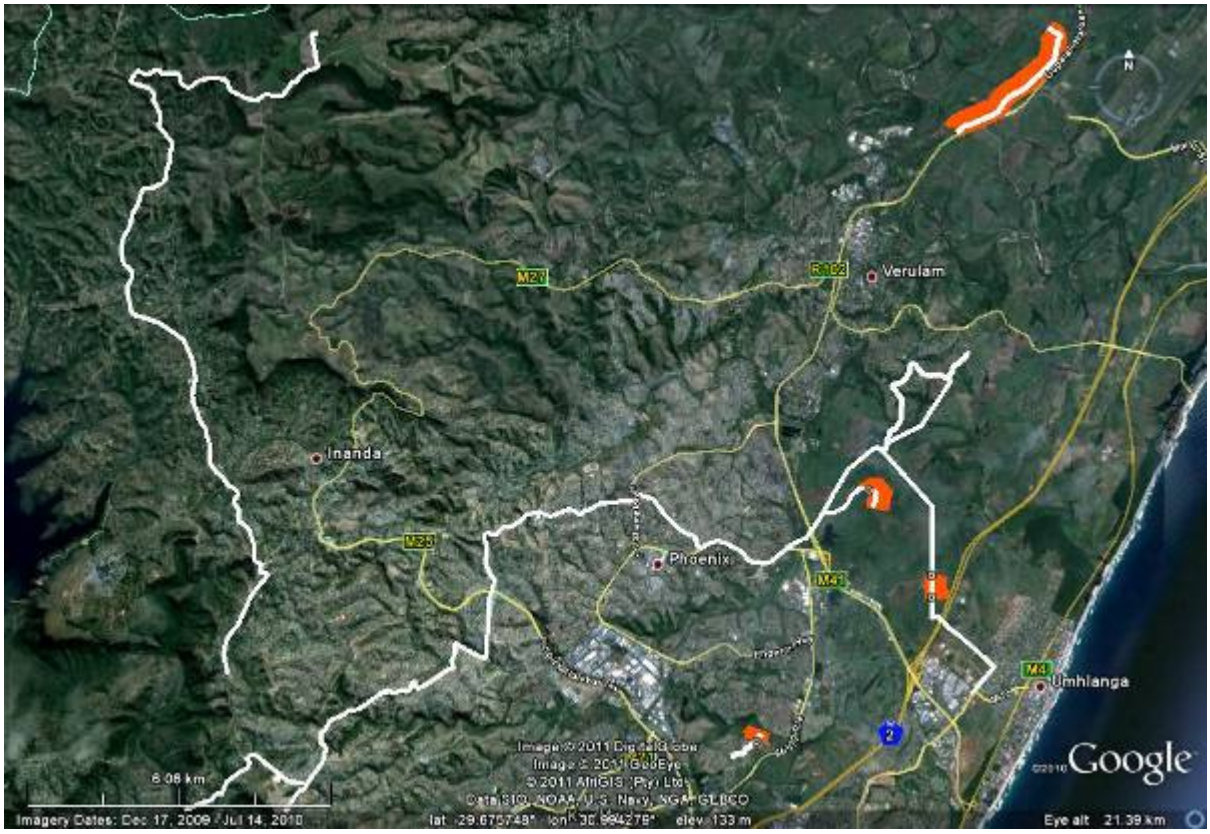

Figure 4.1 Potential Impact on Palaeontology

The colour coding refers to the potential of finding fossils. The colour coding is in accordance with the Terms of Reference provided for this study. Due to the scale of aerial photographs and geological maps used, no areas with outcrops and a high probability for fossils were identified. Small outcrops of the Vryheid Formation might however be present and must be regarded as high risk areas during construction. These areas must be inspected by a Palaeontologist.

Areas where fossils are expected during excavations are indicated in orange. Where feasible the colour code must be used by the EIA consultants in their final assembly of environmental risk areas.

The relevant sheets with significant Palaeontological remains are as follows:

1. Sheets 26, 27 and 28 (referred to as P1)
2. Sheet 16 (referred to as P2)
3. Sheet 46 (referred to as P3)
4. Sheets 21, 22 (referred to as P4)

CONCLUSION AND RECOMMENDATION

The Palaeontological Impact Assessment indicates that fossils will be restricted to outcrop areas of the Vryheid Formation as well as areas where deep excavation exposes sandstone and shale of this rock sequence.

It is recommended that outcrops of the Vryheid Formation, where present, be recorded for closer inspection by a trained palaeontologist. Where deep excavation into Vryheid Formation shale is expected, it is recommended that a trained palaeontologist visit the sites of excavation and, if ichnofossils are present, obtain a permit from SAHRA and/or AMAFA for collection of a representative sample for study purposes.

BIBLIOGRAPHY

Knight Piésold Consulting 2011. Terms of Reference: Specialist Studies for the Environmental Impact Assessment Phase on the proposed Northern Aqueduct Augmentation. Internal Report.

Mason TR and Christie ADM, 1985. Palaeoenvironmental significance of ichnogenus Diplocraterion torell from the Permian Vryheid Formation of the Karoo Super group, South Africa. University of Natal, South Africa.

APPENDIX B

ARCHITECTURAL DESKTOP

Basic Assessment of Possible Historic Structure Named Lot 20 1557

May 2011

Archaic Consulting

Architecture: Research: Conservation: Anthropology: Impacts Consulting

Debbie Whelan	**Tel: 033 3442522**
Po Box 21834	**Fax: 033 3443122**
Mayors Walk	**Cell: 083236 0410**
3208	**email: debbie@archaic.co.za**

The structure on Lot 20 1557 (S29 41.518 E31 03.023), obscured by foliage, could be a remnant of early twentieth century farming, possibly associated with Ottowa, given its presence on early topocadastrals and 1937 aerial photographs. However, the practicalities of its retention, situated, as it is distant from the town, are minimal, and the necessity of its retention is marginal. Were it of any merit, local interest groups such as the Verulam Historical Society would have ensured its well-being. Ottowa House, a major structure, and a declared Heritage Landmark, is difficult to monitor. At this point, the merit in its retention and the practicality of its interpretation is minimal.

APPENDIX C

SITE RECORD FORMS

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)
Stone Age:
Early Iron Age:
Late Iron Age ?
Historical Period: ?

Recorder's Site No.: NAA01
Official Name: Inanda 818 FT
Local Name: Inanda Farm
Map Sheet: 2930DB Inanda
GPS reading: 29°36'28.26"S 30°55'59.34"E

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

Take R102 north towards Verulam, take left onto Oakfield Priory Road, then left onto the P98 (Oakford). Take right to Thumbela Primary school. Site is before the soccer field.

SITE DESCRIPTION:

Type of Site: Open
Merits conservation: No
Threats: Yes
What threats: water pipeline

RECORDING:
Graphic record: Yes
Digital pictures: x Tracings : Re-drawings:

Recorder/Informant: Name: Gavin Anderson
Address: PO Box 102532, Meerensee, 3901
Date: May 2011
Owner: Inanda Farm
References: Heritage Survey Of The Proposed Northern Aqueduct Augmentation Pipeline

Description of site and artefactual content.

Site consists of ephemeral scatter of medium thick pottery probably Late Iron Age.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)
Stone Age:
Early Iron Age:
Late Iron Age
Historical Period:

Recorder's Site No.: NAA02
Official Name: Inanda 818 FT
Local Name: Inanda Farm
Map Sheet: 2930DB Inanda
GPS reading: 29°36'48.42"S 30°55'56.22"E

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION.

From NAA01 turnoff continue for ~200m to the farm road turnoff on right hand side. Sherds visible in the cutting.

SITE DESCRIPTION:

Type of Site: Open
Merits conservation: No
Threats: Yes
What threats: Pipeline

RECORDING:
Graphic record: Yes
Digital pictures: x Tracings : Re-drawings:

Recorder/Informant: Name: Gavin Anderson
Address: PO Box 102532, Meerensee, 3901
Date: may 2011
Owner: Inanada Farm
References: Heritage Survey Of The Proposed Northern Aquaduct Augmentation Pipeline

Description of site and artefactual content.

Site consists of ephemeral scatter of medium thick pottery although these sherds are more weathered than NAA01, and may be Early Iron Age.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)
Late Stone Age: x
Early Iron Age:
Late Iron Age
Historical Period:

Recorder's Site No.: NAA03
Official Name:
Local Name:
Map Sheet: 2930DB Inanda
GPS reading: 29°36'53.03"S 30°54'44.25"E

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION

From NAA02, continue along the road, and take right turn at D33 Y-junction. Pass the Ekukhanyeni Mission. After the school on the right, is a dirt track/road. Artefacts occur along this track, and thus over general area.

SITE DESCRIPTION:

Type of Site: Open
Merits conservation: No
Threats: Yes
What threats: Pipeline

RECORDING:
Graphic record: Yes
Digital pictures: x Tracings: Re-drawings:

Recorder/Informant: Name: Gavin Anderson
Address: PO Box 102532, Meerensee, 3901
Date: May 2011
Owner: State
References: Heritage Survey Of The Proposed Northern Aqueduct Augmentation Pipeline

Description of site and artefactual content

Site consists of an ephemeral scatter of LSA stone tools.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)
Stone Age:
Early Iron Age:
Late Iron Age
Historical Period: OTHER

Recorder's Site No.: NAA04
Official Name: Inanda
Local Name:
Map Sheet: 2930DB Inanda
GPS reading: 29°38'1.05"S 30°54'4.34"E

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION

From NA003 continue with D33 until the Y-junction with the P100. Take left and drive downhill. Cross the New River, and site is clearly visible on the left.

SITE DESCRIPTION:

Type of Site: Place of worship
Merits conservation: Not for this project
Threats: No
What threats: None

RECORDING:
Graphic record: Yes
Digital pictures: x Tracings: Re-drawings:

Recorder/Informant: Name: Gavin Anderson
Address: PO Box 102532, Meerensee, 3901
Date: May 2011
Owner: State?
References: Heritage Survey Of The Proposed Northern Aqueduct Augmentation Pipeline

Description of site and artefactual content

Site consists of a Church of Nazareth worship area. Has the circle of white stones and a circular bricked structure.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)
Stone Age:
Early Iron Age:
Late Iron Age
Historical Period:

Recorder's Site No.: NAA05
Official Name: Lot 4579 FT
Local Name:
Map Sheet: 2930DB Inanda
GPS reading: 29°38'22.28"S 30°53'43.48"E

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION

From NAA04 continue along the P100 southwards. At the next bridge crossing, along the southern banks, and left side, is a stone cairn.

SITE DESCRIPTION:

Type of Site: grave/field clearance
Merits conservation: Only if a grave
Threats: Not for this project
What threats: None

RECORDING:
Graphic record: Yes
Digital pictures: x Tracings: Re-drawings:

Recorder/Informant: Name: Gavin and Louise Anderson
Address: PO Box 102532, Meerensee, 3901
Date:
Owner:
References: Heritage Survey Of The Proposed Northern Aqueduct Augmentation Pipeline

Description of site and artefactual content

Site consists of a stone cairn that is either a grave or field clearance.

UMLANDO ARCHAEOLOGICAL SITE RECORD FORM

SITE CATEGORY: (X where applicable)
Stone Age:
Early Iron Age:
Late Iron Age
Historical Period:

Recorder's Site No.: NAA06
Official Name: Lot 20 1557 FU, Lot 20 1543 FU
Local Name: Blackburn Estate
Map Sheet:2931CA Verulam
GPS reading: 29°41'31.27"S 31° 3'0.07"E

DIRECTIONS TO SITE: SKETCH OR DESCRIPTION
From R102, Take M41 off-ramp and follow signs to Blackburn Estate. Site is ~750 north of the estate on the top of the hill. Area is very overgrown, however palm trees are visible.

SITE DESCRIPTION:

Type of Site: Historical ruin
Merits conservation: No
Threats: Yes:
What threats: Blackburn reservoir

RECORDING:
Graphic record: Not yet
Digital pictures: x Tracings: Re-drawings:

Recorder/Informant: Name: Gavin Anderson
Address: PO Box 102532, Meerensee, 3901
References: Heritage Survey Of The Proposed Northern Aqueduct Augmentation Pipeline

Description of site and artefactual content

Site is hidden by dense bushes however a perimeter wall is partially visible. Buildings occur on the 1937 aerial photographs, and 1942 topographical in same area. Photographs will be taken during vegetation clearance.