

- 7 April 2015 -

Attention:

Sello Mokhanya (Eastern Cape Provincial Heritage Resources Authority – EC PHRA, APM Unit)

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Louise Palmer (Aurecon South Africa)

E-mail: Louise.Palmer@aurecongroup.com; Tel: 041 503 3900; Postal Address: P.O. Box 5328, Walmer, Port Elizabeth, 6065

RE : Basic Heritage Impact Assessment (HIA) - The Bende Bulk Water Supply Scheme, Amathole District Municipality, Eastern Cape

The basic Heritage Impact Assessment (HIA) for the proposed Bende Bulk Water Supply Scheme, Amathole District Municipality, Eastern Cape, was commissioned by Aurecon to meet the Eastern Cape Provincial Heritage Resources Authority's (EC PHRA) HIA requirements as per Section 38 – Heritage Resources Management, of the National Heritage Resources Act, No 25 of 1999 (NHRA 1999).

The basic HIA for the above mentioned development comprises a:

- Phase 1 Archaeological Impact Assessment (AIA) – Karen van Ryneveld [MSc Archaeology], ArchaeoMaps cc;
- Desktop Palaeontological Assessment (PIA) – John Almond [PhD Palaeontology], Natura Viva cc; and a
- Heritage Protocol for Incidental Finds during the Construction Phase.

Yours faithfully,



Karen van Ryneveld

ArchaeoMaps

(E-mail: kvanryneveld@gmail.com / Cell: 084 871 1064)

Archaeology

The Bende Bulk Water Supply Scheme, Amathole District Municipality, Eastern Cape

- 7 April 2015 -

Report to:

Sello Mokhanya (Eastern Cape Provincial Heritage Resources Authority – EC PHRA, APM Unit)

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Louise Palmer (Aurecon South Africa)

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Prepared by:

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Specialist Declaration of Interest

I, Karen van Ryneveld (Company – ArchaeoMaps; Qualification – MSc Archaeology), declare that:

- I am suitably qualified and accredited to act as independent specialist in this application;
- I do not have any financial or personal interest in the application, its' proponent or any subsidiaries, aside from fair remuneration for specialist services rendered; and
- That work conducted has been done in an objective manner – and that any circumstances that may have compromised objectivity have been reported on transparently.



Signature –

- 7 April 2015 -

The Bende Bulk Water Supply Scheme, Amathole District Municipality, Eastern Cape

Executive Summary

Terms of Reference –

Aurecon have been appointed as independent EAP by the project engineers, Sontinga, on behalf of the project proponent, the ADM, to apply for EA, including a BAR and EMPr report, to the EC DEDEAT for the proposed *Bende Bulk Water Supply Scheme*, ADM area, Eastern Cape. The *Bende Bulk Water Supply Scheme* is situated at general development co-ordinate S32°08'53.7"; E28°26'49.3" (Bende Village), approximately 15km east south-east of Idutywa. Development will entail the construction of approximately 25km bulk pipelines and 6 service reservoirs.

ArchaeoMaps was appointed by Aurecon to coordinate the basic HIA for the development. The basic HIA comprises a Phase 1 AIA, a desktop PIA and a protocol for heritage finds during the construction phase of the development. This report represents the Phase 1 AIA only, with findings and recommendations thereof to be included in the BAR and EMPr.

The Phase 1 Archaeological Impact Assessment –

Project Area: *Bende Bulk Water Supply Scheme*, ADM area, Eastern Cape, including an approximate 25km bulk pipeline alignment and 6 service reservoirs [1:50,000 Map Ref – 3228AB].

Coverage & Gap Analysis: Pre-feasibility and field assessment.

Field Methodology: Two (2) day field assessment; GPS co-ordinates – Garmin GPSmap 62s; Photographic documentation – Pentax K20D. Site significance assessment – SAHRA 2007 system.

Summary:

- No archaeological or cultural heritage developmental ‘fatal flaws’ identified;
- Eighteen (18) archaeological or cultural heritage resources [Sites BWS-01 to BWS18], as defined and protected by the NHRA 1999, were identified during fieldwork. Three (3) of the identified sites constitute Colonial Period sites, 14 are LIA sites and 1 probable site is of uncertain Colonial Period – LIA cultural affinity.
- Of the identified 18 sites 14 will be conserved through either existing conservation measures or by virtue of proximity from the proposed development alignment. Four (4) sites situated in direct proximity to the development alignment [Sites BWS-05, BWS-10, BWS-11 and BWS-18] can safely be conserved within the current development layout by ensuring that temporary conservation measures are in place at the time of construction impact (see table on next page): The current development layout can thus be described as ‘safe’ with reference to the conservation of archaeological and cultural heritage resources for purposes of development.
- [Should any incidental archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, be encountered during the course of development the process described in the ‘Heritage Protocol for Incidental Finds during the Construction Phase’ should be followed.]

Recommendations –

With reference to archaeological and cultural heritage compliance, as per the requirements of the NHRA 1999, it is recommended that the proposed *Bende Bulk Water Supply Scheme*, ADM area, Eastern Cape, proceeds as applied for provided the developer comply with the listed heritage management recommendations (see table on next page).

The EC PHRA (APM Unit) HIA Comment will state legal requirements for development to proceed, or reasons why, from a heritage perspective, development may not be further considered.

Map Code	Site	Co-ordinates	Recommendations
Bende Bulk Water Supply Scheme, ADM area, Eastern Cape			
Res 2	Bende – Reservoir 2	S32°09'10.4"; E28°27'37.6"	N/A
BWS-01	Colonial Period – Store Remains	S32°09'07.3"; E28°27'31.2"	N/A
BWS-02	Colonial Period – Residence	S32°09'06.2"; E28°27'30.1"	N/A
BWS-03	Later Iron Age – Residence	S32°08'00.5"; E28°26'26.6"	N/A
BWS-04	Colonial Period – Trade Centre	S32°07'37.3"; E28°26'02.2"	N/A
BWS-05	Colonial Period / Later Iron Age – Grave (?)	S32°07'37.5"; E28°25'59.1"	Phase 2 testing and mitigation (social consultation, exhumation & reburial); OR Temporary conservation
Res 1	Bende – Reservoir 1	S32°07'39.2"; E28°24'42.4"	N/A
BWS-06	Later Iron Age – Grave	S32°07'30.3"; E28°23'56.7"	N/A
BWS-07	Later Iron Age – Cemetery	S32°08'09.2"; E28°23'45.7"	N/A
BWS-08	Later Iron Age – Graves	S32°08'15.2"; E28°23'45.3"	N/A
Res 3	Bende – Reservoir 3	S32°08'26.6"; E28°23'34.2"	(See Site BWS-09)
BWS-09	Later Iron Age – Graves	S32°08'27.1"; E28°23'28.6"	N/A
BWS-10	Later Iron Age – Homestead with Graves	S32°08'30.2"; E28°23'26.8"	Phase 2 site mitigation and grave relocation (social consultation, exhumation and reburial); OR Temporary conservation
BWS-11	Later Iron Age – Residence	S32°08'35.6"; E28°23'19.9"	Site destruction under EC PHRA BE Unit permit; OR Temporary conservation
BWS-12	Later Iron Age – Graves	S32°09'16.7"; E28°23'06.0"	N/A
BWS-13	Later Iron Age – Residence	S32°09'24.5"; E28°23'17.2"	N/A
BWS-14	Later Iron Age – Graves	S32°09'35.4"; E28°23'13.1"	N/A
BWS-15	Later Iron Age – Grave	S32°10'33.8"; E28°22'39.7"	N/A [Caution]
BWS-16	Later Iron Age – Graves	S32°10'34.6"; E28°22'40.5"	N/A [Caution]
BWS-17	Later Iron Age – Graves	S32°10'35.3"; E28°22'40.6"	N/A [Caution]
Res 4	Bende – Reservoir 4	S32°10'43.2"; E28°21'57.4"	N/A
Res 5	Bende – Reservoir 5	S32°11'27.9"; E28°23'00.5"	N/A
Res 6	Bende – Reservoir 6	S32°13'21.5"; E28°26'40.9"	(See Site BWS-18)
BWS-18	Later Iron Age – Structure feature	S32°13'23.5"; E28°26'42.3"	Phase 2 site mitigation; OR Temporary conservation

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1 - Terms of Reference

Aurecon South Africa (Pty) Ltd (Aurecon) have been appointed as independent Environmental Assessment Practitioner (EAP) by the project engineers, Sontinga Consulting (Sontinga), on behalf of the project proponent, the Amathole District Municipality (ADM), to apply for Environmental Authorization (EA), including a Basic Assessment (BAR) and Environmental Management Plan (EMPr) report, to the Eastern Cape Department of Economic Development, Environmental Affairs and Tourism (EC DEDEAT) for the proposed *Bende Bulk Water Supply Scheme*, ADM area, Eastern Cape. The *Bende Bulk Water Supply Scheme* is situated at general development co-ordinate S32°08'53.7"; E28°26'49.3" (Bende Village), approximately 15km east south-east of Idutywa. Development will entail the construction of approximately 25km bulk pipelines and 6 service reservoirs.

ArchaeoMaps cc (ArchaeoMaps) was appointed by Aurecon to coordinate the basic Heritage Impact Assessment (HIA) for the development. The basic HIA comprises a Phase 1 Archaeological Impact Assessment (AIA), a desktop Palaeontological Impact Assessment (PIA) and a protocol for heritage finds during the construction phase of the development.

This report represents the Phase 1 AIA only, with findings and recommendations thereof to be included in the BAR and EMPr. Terms of Reference (ToR) for the Phase 1 AIA, with specific reference to archaeological and basic cultural heritage compliance requirements are summarized as:

- Undertake a desktop study and field assessment to identify important archaeological and cultural heritage resources in the area. In particular identify:
 - Potential sites of archaeological and cultural heritage significance (GPS co-ordinates to be provided for planning purposes);
- Identify any potential 'fatal flaws' linked to the proposed development;
- Describe the findings of the study and their potential implications for the proposed project. This should include a description and assessment of the significance of the impacts of the proposed activities on the heritage resources; and
- Provide detailed guideline measures to manage any impacts, particularly during the construction phase but including the implementation phase, and an assessment of their likely effectiveness.

1.1.1) Development Location, Details and Impact

The proposed *Bende Bulk Water Supply Scheme* is situated at general development co-ordinate S32°08'53.7"; E28°26'49.3" (Bende Village), approximately 15km east south-east of Idutywa and 15km north-west of Willowvale in the Amathole District Municipal (ADM) area of the Eastern Cape [1:50,000 Map Ref – 3228AB].

The ADM has identified the Bende area community as not being served with sustainable water infrastructure. The Bende area can be defined as situated between the Mbashe North Water Supply Scheme (WSS), which will gravitate treated water from the Mgwali River, in the vicinity of Clarkebury Mission, via the existing Mgwali North and Dutywa East WSS's. Construction for the bulk infrastructure of the Mbashe North WSS has been completed, while bulk pipelines of the Mgwali North WSS is currently under construction. The Dutywa East WSS will directly connect pipelines and provide connection for the proposed Bende WSS. It is estimated that it will take approximately 2 years before bulk water becomes available to the Bende community, comprising an approximate 24 rural villages with an estimated population of 15,273 (Aurecon 2015).

The primary objective of the proposed development is to provide bulk domestic water to the communities of the Bende area at Reconstruction and Development Programme (RDP) standards. Development will entail the construction of approximately 25km bulk pipelines and 6 service reservoirs, further defined as (Aurecon 2015):

1. Supply of bulk water via a bulk supply line from the existing Dutywa East WSS:
 - 110mm diameter uPVC pipeline 3,1km long;
2. Construction of bulk supply lines between Service Reservoirs:

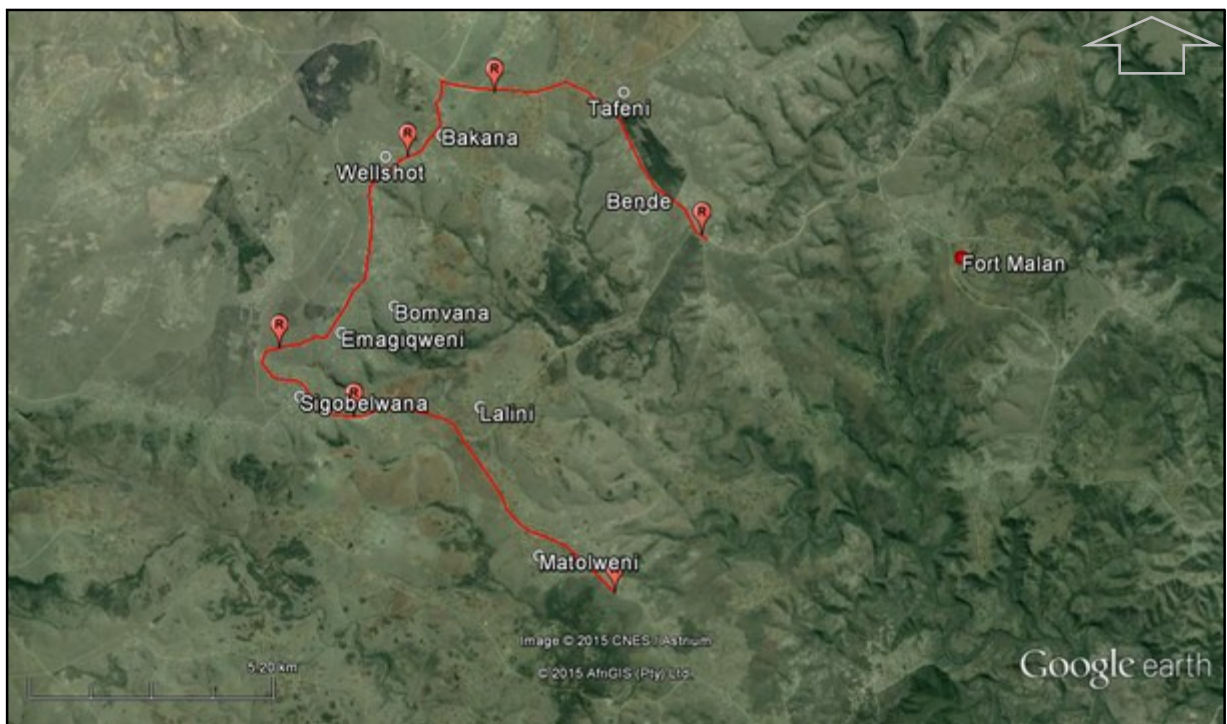
- 50-110mm diameter uPVC and steel pipelines 23,32km long;
 - 3. Construction of Service Reservoirs:
 - Six (6) reinforced concrete reservoirs ranging from 20-110kl in size.
- Reservoir sizes can be summarized as (Pers. Comm.: Tim Wood, Sontinga):

- Res 1: 4 x 2.2x2.2m bases;
- Res 2: 9.2m dia. x 3.9m high;
- Res 3: 4 x 3.5x3.5m bases;
- Res 4: 14.2m dia. x 4.5m high;
- Res 5: 11.8m dia. x 3.9m high; and
- Res 6: 9.2m dia. x 2.6m high;

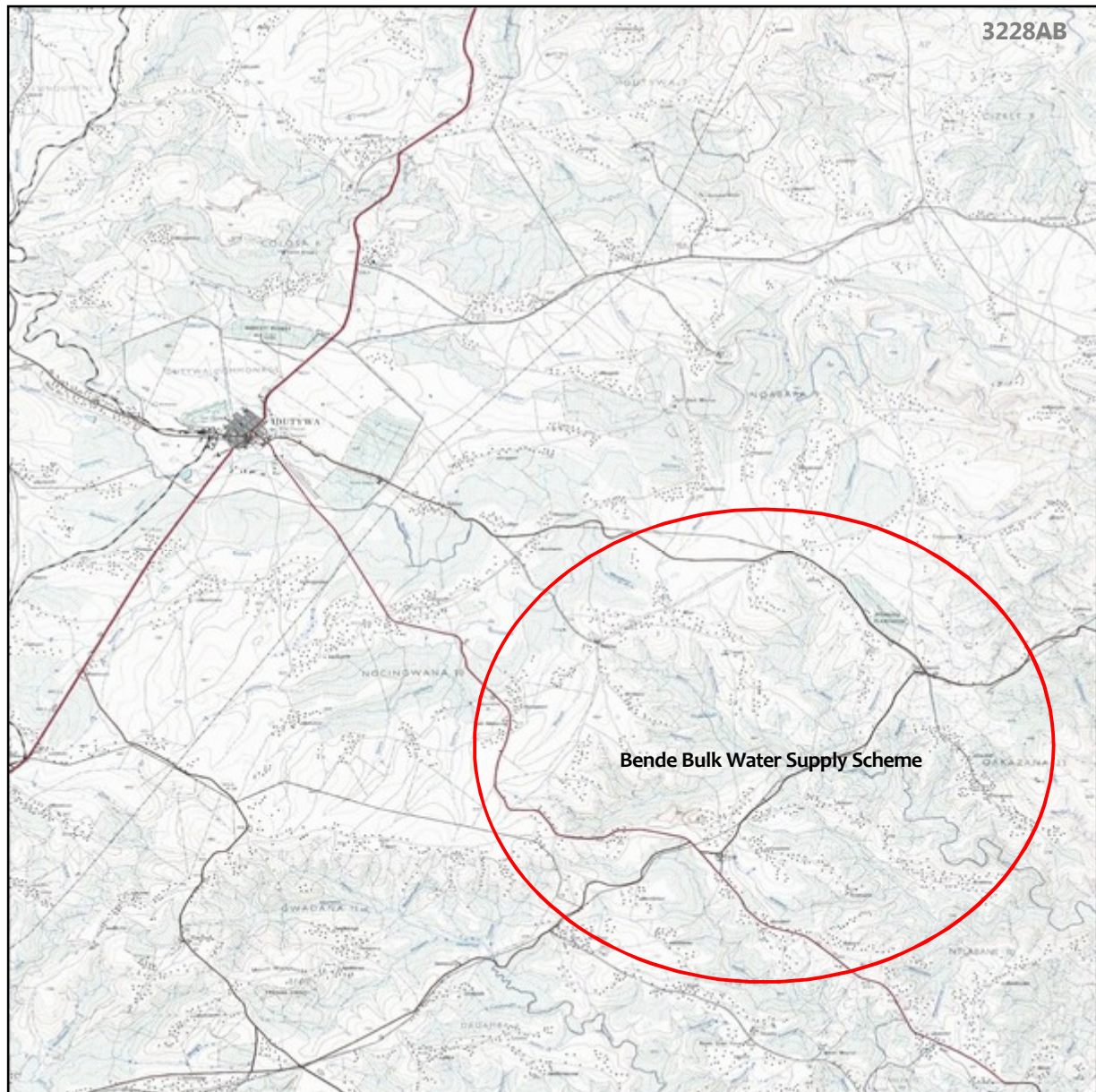
At present depth of excavation for purposes of reservoir construction have not been finalized – but is not expected to exceed 1.5m in depth.



Map 1: General locality of the proposed Bende Bulk Water Supply Scheme, near Idutywa, ADM, Eastern Cape [1]



Map 2: General locality of the proposed Bende Bulk Water Supply Scheme, near Idutywa, ADM, Eastern Cape [2]



Map 3: Locality of the Bende Bulk Water Supply Scheme, near Idutywa, ADM, Eastern Cape [1:50,000 Map Ref – 3228AB]

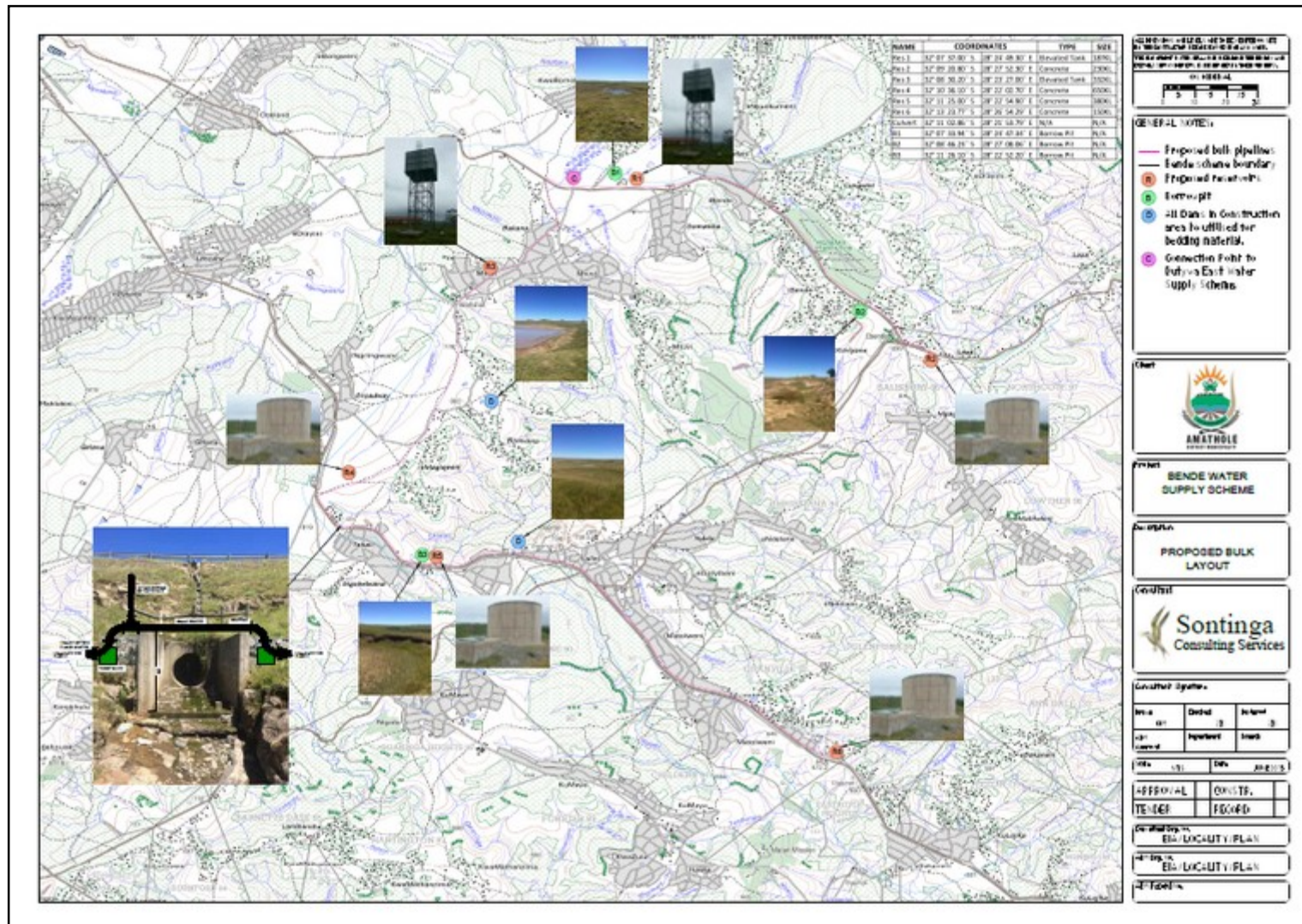


Figure 1: Layout of the proposed Bende Bulk Water Supply Scheme, ADM, Eastern Cape (courtesy Sontinga)

2 - The Phase 1 Archaeological Impact Assessment

2.1.1) Archaeological Legislative Compliance

The Phase 1 Archaeological Impact Assessment (AIA) for the proposed *Bende Bulk Water Supply Scheme*, ADM area, Eastern Cape, was requested to meet the Eastern Cape Provincial Heritage Resources Authority's (EC PHRA) requirements with reference to archaeological and basic cultural heritage resources in terms of the National Heritage Resources Act, No 25 of 1999 (NHRA 1999), with specific reference to Section 38(1)(a).

NHRA 1999, Section 38	
1)	Subject to the provisions of subsections 7), 8) and 9), any person who intends to undertake a development categorized as –
a)	the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
b)	the construction of a bridge or similar structure exceeding 50 m in length;
c)	any development or other activity which will change the character of a site –
	i. exceeding 5 000 m ² in extent; or
	ii. involving three or more existing erven or subdivisions thereof; or
	iii. involving three or more erven or subdivisions thereof which have been consolidated within the past five years; or
	iv. the costs which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
d)	the rezoning of a site exceeding 10 000 m ² in extent; or
e)	any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority,
	must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Table 1: Extracts from the NHRA 1999, Section 38

The Phase 1 AIA aimed to locate, identify and assess the significance of cultural heritage resources, inclusive of archaeological deposits / sites, built structures older than 60 years, burial grounds and graves, graves of victims of conflict and basic cultural landscapes or views as defined and protected by the NHRA 1999, that may be affected by the development.

This report comprises a Phase 1 AIA, including a basic pre-feasibility study and field assessment only.

Additional relevant legislation pertaining to the Phase 1 AIA is listed as:

- o National Environmental Management Act, No 107 of 1998 (NEMA 1998) and associated Regulations (2014).

2.1.2) Methodology & Gap Analysis

The Phase 1 AIA includes a basic pre-feasibility study and field assessment:

- o The pre-feasibility assessment is based on the Appendices A and B introductory archaeological literature. In addition the SAHRA 2009 Mapping Project Database (MPD), SAHRIS and the SAHRA Database on declared Provincial Heritage Sites (PHS) – Eastern Cape, were consulted. The study excludes consultation of museum and university databases.
- o The field assessment was done over a 2 day period (2015-03-31 to 04-01) with fieldwork conducted by the author and assisted by Julius Nkoma. The assessment was done by foot and off-road vehicle and limited to a Phase 1 surface survey. GPS co-ordinates were taken with a Garmin GPSmap 62s (Datum: WGS84). Photographic documentation was done with a Pentax K20D camera. A combination of Garmap and Google Earth software was used in the display of spatial information.

Archaeological and cultural heritage site significance assessment and associated mitigation recommendations were done according to the system prescribed by SAHRA (2007).

SAHRA Archaeological and Cultural Heritage Site Significance Assessment			
Site Significance	Field Rating	Grade	Recommended Mitigation
High Significance	National Significance	Grade I	Site conservation / Site development
High Significance	Provincial Significance	Grade II	Site conservation / Site development
High Significance	Local Significance	Grade III-A	Site conservation or extensive mitigation prior to development / destruction
High Significance	Local Significance	Grade III-B	Site conservation or extensive mitigation prior to development / destruction
High / Medium Significance	Generally Protected A	Grade IV-A	Site conservation or mitigation prior to development / destruction
Medium Significance	Generally Protected B	Grade IV-B	Site conservation or mitigation / test excavation / systematic sampling / monitoring prior to or during development / destruction
Low Significance	Generally Protected C	Grade IV-C	On-site sampling, monitoring or no archaeological mitigation required prior to or during development / destruction

Table 2: SAHRA archaeological and cultural heritage site significance assessment ratings and associated mitigation recommendations

2.1.3) Assessor Accreditation

Karen van Ryneveld (ArchaeoMaps):

- Qualification: MSc Archaeology (2003) WITS University, Johannesburg / Certificate GIS (2007) NMMU University, Port Elizabeth.
- Accreditation: Association of Southern African Professional Archaeologists (ASAPA) accredited Cultural Resources Management (CRM) practitioner [member nr – 163]
 1. 2004 – Association of Southern African Professional Archaeologists (ASAPA) – Professional Member.
 2. 2005 – ASAPA CRM Section: Accreditation – Field Director (Stone Age, Iron Age, Colonial Period).
 3. 2010 – ASAPA CRM Section: Accreditation – Principle Investigator (Stone Age).

Karen van Ryneveld is a SAHRA / AMAFA / EC PHRA / HWC listed CRM archaeologist.

Karen has been involved in CRM archaeology since 2003 and has been the author (including selected co-authored reports) of more than 300 Phase 1 AIA studies. Phase 1 AIA work is centered in South Africa, focusing on the Northern and Eastern Cape provinces and the Free State. She has also conducted Phase 1 work in Botswana (2006/2007). In 2007 she started ArchaeoMaps, an independent archaeological and heritage consultancy. In 2010 she was awarded ASAPA CRM Principle Investigator (PI) status based on large scale Phase 2 Stone Age mitigation work (De Beers Consolidated Mines – Rooipoort, Northern Cape – 2008/2009) and has also been involved in a number of other Phase 2 projects including Stone Age, Shell Middens, Grave / Cemetery projects and Iron Age sites.

In addition to CRM archaeology she has been involved in research, including the international collaborations at Maloney's Kloof and Grootkloof, Ghaap plateau, Northern Cape (2005/2006). Archaeological compliance experience includes her position as Head of the Archaeology, Palaeontology and Meteorites (APM) Unit at AMAFA aKwa-Zulu Natali (2004).

2.2.1) Pre-feasibility Summary

Based on a basic introductory literature assessment of South African archaeology (See Appendices A and B) and background heritage database research, the probability of archaeological and cultural heritage sites situated within or in direct proximity to the Bende Bulk Water Supply Scheme study site, ADM, Eastern Cape, can briefly be described as:

Archaeological and Basic Cultural Probability Assessment – Bende Bulk Water Supply Scheme, ADM, Eastern Cape			
Primary Type / Period	Sub-Period	Sub-Period Type Site	Probability
EARLY HOMININ / HOMINID	-	-	None
	Graves / Human remains: High scientific significance		
STONE AGE	Earlier Stone Age (ESA)		None-Low
	Middle Stone Age (MSA)		None-Low
	Later Stone Age (LSA)		Low
		Rock Art	Low
		Shell Middens	None
	Graves / Human remains: ESA & MSA – High scientific significance; LSA – High scientific & social significance		
IRON AGE	Early Iron Age (EIA)		Low
	Middle Iron Age (MIA)		None
	Later Iron Age (LIA)		High
	Graves & Human remains: EIA – High scientific & medium social significance; MIA & LIA: High scientific & social significance		
COLONIAL PERIOD	Colonial Period		Low-Medium
		LSA – Colonial Period Contact	None-Low
		LIA – Colonial Period Contact	Medium
		Industrial Revolution	None
		Apartheid & Struggle	Medium-High
	Graves / Human Remains: Medium-high scientific & high social significance		

Table 3: Archaeological and basic cultural probability assessment

2.2.2) The SAHRA 2009 MPD & SAHRIS

A limited number of archaeological Cultural Resources Management (CRM) reports are recorded in the SAHRA 2009 Mapping Project Database (MPD), situated within an approximate 60km radius from the Bende Bulk Water Supply Scheme study site, listed as:

- Van Schalkwyk, L.O. (eThembeni). 2008. *Heritage Impact Assessment of the Proposed N2 Wild Coast Toll Highway*.
- Van Schalkwyk, L.O. & Wahl, E. (eThembeni). 2008. *Heritage Impact Assessment of the Zithulele Borrow Pits and Quarry, Coffee Bay, Eastern Cape*.

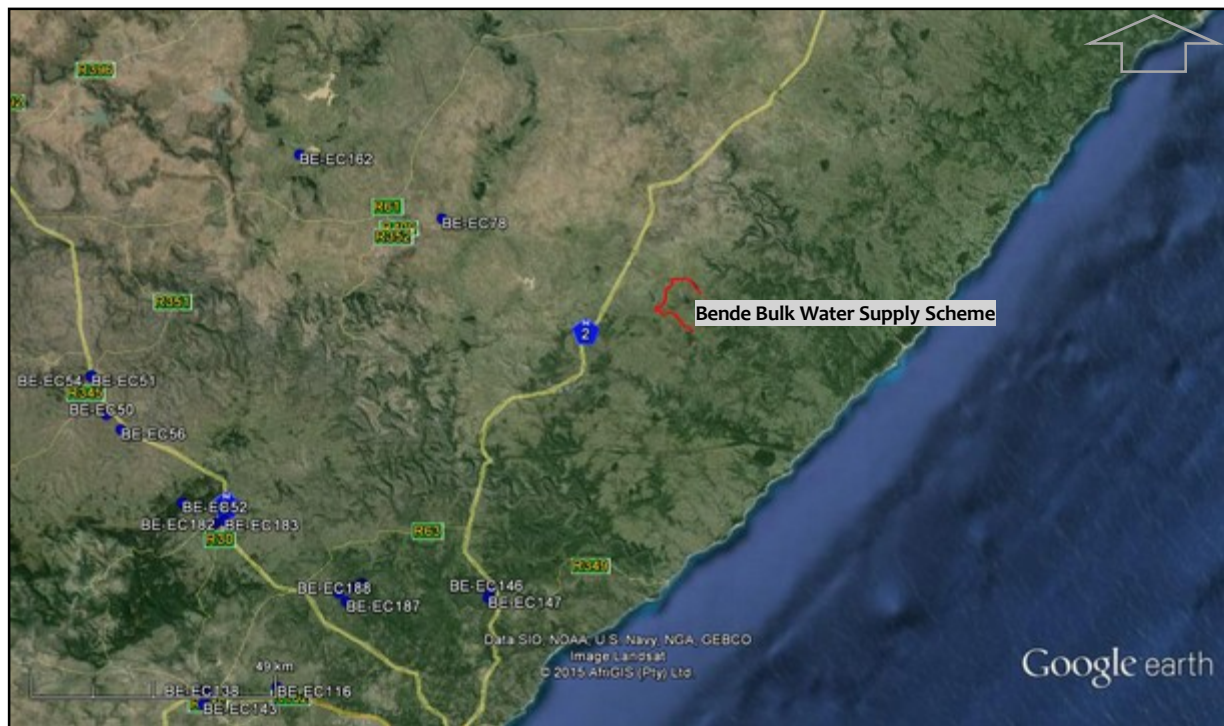
A number of additional cases are recorded on SAHRIS, situated within an approximate 20km radius from the Bende Bulk Water Supply Scheme study site, reflecting also on a noticeable increase in the number of developments in the general area. Associated archaeological CRM reports can be listed as:

- Binneman, J. (Albany Museum). 2002. *Archaeological Heritage Sensitivity Survey*. [SAHRIS CaseID 219].
- Fourie, W. (PGS). 2012. *Proposed Mgwali South Water Supply, iDutywa, Mbhashe Municipality, Amathole District Municipality, Eastern Cape*. [SAHRIS CaseID 570].
- Meyer, A. (Private). 2012. *N2 Wild Coast Toll Highway Supplementary Archaeological Survey. Field Survey Conducted from 24-28 October 2011. Final Report December 2012*. [SAHRIS CaseID 219].
- Van Ryneveld, K. (ArchaeoMaps). 2010. *Phase 1 Archaeological Impact Assessment – Mzamomhle Township Establishment, iDutywa Commonage, Dutywa, Eastern Cape, South Africa*. [SAHRIS CaseID 1936].

- Van Ryneveld, K. (ArchaeoMaps). 2011. *Phase 1 Archaeological Impact Assessment – Utilization of Borrow Pits, Amathole District Municipality, Eastern Cape, South Africa*. [SAHRIS CaseID's 1139, 1161, 1162, 1165 and 1182].
- Van Ryneveld, K. (ArchaeoMaps). 2013. *Phase 1 Archaeological Impact Assessment – Willowvale-Dwesa Borrow Pits Project, Amathole District Municipality, Eastern Cape, South Africa*. [SAHRIS CaseID 1532].
- Van Schalkwyk, L.O. & Wahl, E. (eThembeni). 2012. *Phase 1 Heritage Impact Assessment Report. Proposed Eskom Dutywa-Gatyana 132kV Power Line and Construction of Gatyana Substation, Mbhashe Local Municipality, Amathole District Municipality, Eastern Cape*. [SAHRIS CaseID 289].

2.2.3) SAHRA Provincial Heritage Site Database – Eastern Cape

Only 1 georeferenced declared Provincial Heritage Sites (PHS) is recorded in the SAHRA – Eastern Cape database, situated within an approximate 60km radius from the Bende Bulk water Supply Scheme study site, spatially displayed and listed as (en.wikipedia.org/wiki/List_of_heritage_sites_in_Eastern_Cape):



Map 4: Spatial distribution of geo-referenced PHS in the Eastern Cape in relation to the Bende Bulk Water Supply Scheme study site

Declared Provincial Heritage Sites – Eastern Cape					
Map Ref	Identifier	Site Name	Town	NHRA status	Coordinates
BE-EC78	9/2/026/0013	Cuthbert's Building, 110 Oxford Street, East London [Architectural style: Victorian neo-Classical. Designed – 1895. Designed by architects Parker & Forsyth of Cape Town and erected in 1901 for W.M. Cuthbert.]	East London	Provincial Heritage Site	S32°00'54"; E27°54'12" [Erroneous listing]

Table 4: Declared Provincial Heritage Sites in relation to the study site

2.2.4) General Discussion

No Earlier (ESA) or Middle Stone Age (MSA) sites or occurrences have been reported on in any of the consulted archaeological CRM studies. Four (4) rock shelters, some with shell midden deposits, and on occasion containing rock art have been reported on from along the N2 alignment. Shelter sites are ascribed to the Later Stone Age (LSA), including use by hunter-gatherer or pastoralist groups, but not necessarily excluding a Later Iron Age (LIA) origin, or at least usage of certain of the sites (Binneman 2002; Van Schalkwyk 2008). Binneman (2002) also reported on 4 'Izivivane', stone cairn markers that may again be associated with Khoe LSA practice or with the LIA.

Although Earlier Iron Age (EIA) site distribution has been recorded to as far south as the general East London area (Nogwaza 1994), Feely & Bell-Cross (2011) indicates recorded sites in the greater area as situated east of the proposed *Bende Bulk Water Supply Scheme* study site. Iron Age sites identified in archaeological CRM reports are all classed as Later Iron Age (LIA): LIA homestead sites that may well predate 60 years of age, often found in association with grave and cemetery sites form the primary category of sites reported on (Van Schalkwyk & Wahl 2008, 2012). Van Ryneveld (2010) reported on 4 LIA homestead sites, some of which may contain graves near Idutywa and of probable significance with reference to early LIA settlement and establishment of the town. Binneman (2002) reported on at least 2 scatters of LIA ceramics and Meyer (2012) on an additional LIA homestead site and 2 potentially sensitive areas. Fourie (2012) documented a LIA stone walled site and recorded no less than 53 LIA grave and cemetery sites during his survey for the Mgwali-South water scheme.

Records of Colonial Period sites are noticeably less in the general area. Binneman (2002) recorded the Castello trading store, constructed in 1901, while Meyer (2012) reported an additional Colonial Period homestead.



Map 5: Idutywa, situated between former Fingoland, Thembuland and Gcalekaland, circa 1830
(commons.wikimedia.org/wiki/File:Thembuland_Eastern_Cape_map-1830.PNG)

Idutywa (Dutywa) was founded in 1858 as a military fort, situated strategically between Fingoland, Gcalekaland and Thembuland. In 1884 the Idutywa settlement was laid out, and declared a municipality in 1913. 'Idutywa', appropriate with reference to its history means 'place of disorder' in Xhosa (en.wikipedia.org/wiki/Dutywa).

The Fingo or Mfengu (meaning 'wanderers') is essentially a Zulu people who, left landless by Shaka's Mfecane (1815-1840), increasingly entered Xhosa territory. By 1830 a centre of Fingo settlement was established around the Methodist Mission Station near Butterworth. In 1835, and after some years of oppression by the Gcaleka, they formed an alliance with Sir Benjamin d'Urban and under the 'Fingo Oath' were not only granted land but also became British subjects. During the early Frontier Wars (1835-1856) the Fingo were notable allies of the Cape Colony and won several victories over the Xhosa, particularly the Gcaleka. The Fingo did not partake in the *Cattle Killing* (1856-1858); instead they bought cattle from the Xhosa and resold them, in cases for noticeable profit. A decade of relative peace and economic development pursued, but was brought to an abrupt halt by a series of devastating draughts during the mid-latter part of the 1870's, in turn resulting in increasing tribal tension and ultimately culminating in the 1877 Fingo-Gcaleka festival fight which concluded in a full-blown inter-tribal war. The same year, 1877, witnessed the 9th Frontier War (1877-1879) and the last of the major wars fought by the Fingo. Fingo Captain Veldtman Bikitsa (1829-1912) was appointed leader of the Cape forces by Prime Minister John Molteno, and won a series of victories over, amongst others, the Gcaleka (en.wikipedia.org/wiki/Fengu_people).

Sarili ka Hinsta (circa 1810-1892), oldest son of Hinsta ka Khawuta, or 'Hinsta the Great' was the 5th Chief of the Gcaleka and Paramount Chief of the Xhosa (House of Phalo) from 1835 onwards. His reign is characterized by the never ending tussles against the expanding British Empire. Aid to the Ngqika resulted in his Kingdom being invaded by the British in 1853. A true believer in the prophecies of the young Nongqawuse he adamantly partook in the *Cattle Killing* (1856-1858), resulting in the deaths of many of his people, their cattle and increasing hatred in while opinion. Exiled from Gcalekaland Sarili returned in 1865 only to find that the Fingo had settled on much of his land. Despite the fact that the Cape Colony had signed a treaty recognizing Gcalekaland's territorial integrity in 1872, tribal conflict between Sarili and the Thembu resulted yet again in British intervention and again another of Sarili's opponents were offered British protection. Droughts of the mid-late 1870's resulted in increasing tribal tensions between the Fingo, Thembu and Gcaleka and ultimately in the Fingo-Gcaleka War (1877-1879). Both the Cape Colony and British forces turned against Sarili, but it was the involvement of the British Empire, particularly Sir Bartle Frere that finally resulted in Gcalekaland, the last of the independent Xhosa Kingdoms, to finally in 1885 became annexed to the Cape Colony. Sarili died in exile, 1892 (en.wikipedia.org/wiki/Sarili_kaHinstsa).

In 1858 the Idutywa Reserve was created to house the 'fragments' of *Umhala's Clan*. In 1864 it was merged into British Kaffraria (www.worldstatesmen.org/South_Africa.html). Umhala, or Chief *Mhala* (circa 1800-1875), was the elected tribal Chief of the Ndlambe (1828), of the Rharabe Xhosa of the House of Phalo. Umhala took part in the 6th Frontier War (1834-1835) after which he signed a treaty with Andries Stockenstrom and was settled in the area between the Kei and Nxavune Rivers. In 1846 he joined looting parties into the Colony and inevitably became involved in the 7th Frontier War (1847-1848), but when the war ended kept his land. Umhala remained neutral during the 8th Frontier War (1850-1853), though he supported his subjects' part in it, while taking care of their cattle and war booty. In 1856 he followed Sarili's example and formed part of the *Cattle Killing* (1856-1858): Three quarters of his tribe perished and many fled. From then onwards Umhala left the life of a bandit, but was captured, tried and imprisoned on Robben Island in 1859. His territory was confiscated and part of his tribe settled at Idutywa. He was released in 1864 and returned to his people, among whom he lived without power or influence until his death (archiver.rootsweb.ancestry.com/read/south-africa/2005-09/1127633708).

Ngubengcuka Vusani aNdaba ruled from 1800-1830 and is known for having consolidated the abaThembu Kingdom. At his death Joyi aNgubengcuka acted as regent of the Kingdom (www.geni.com/people/Ngubengcuka). When Mtirara (Mtikrakra a Ngubencuka) came of age he took his rightful place as Thembu King and at his death in 1849 was succeeded by his son Ngangelizwe Qeya aMtikrakra (1846-1884), the 6th and last independent Paramount Chief of the abaThembu. Ngangelizwe ruled from 1863-1884. Conflict between Ngangelizwe and Sarili were never ending and Ngangelizwe increasingly turned to the British for support and appealed to the Cape Colony for 'protection'. In 1875 the Cape Colony granted his application on the condition that Ngangelizwe abdicate. He was however reinstated the following year (www.geni.com/people/Ngangelizwe). Annexation of Thembuland proceeded according to the 'Tembuland Annexation Act' of 1876. In 1878 the British overthrew the Cape Colonial government, interrupting the implementation of Thembuland

annexation, with this only finally completed in 1885 (en.wikipedia.org/wiki/Thembuland).

Military Forts: Fort Bowker, situated approximately 32km from Idutywa and north-east of the *Bende Bulk Water Supply Scheme* study site was constructed in 1860 with the primary aim of keeping the Gcaleka east of the Mbhashe River. The fort was named after Commandant J.H. Bowker. Today only ruins of the site remain. Fort Malan, situated more or less 30km from Idutywa and east of the Bende study site was constructed during the 9th Frontier War (1877-1878) and named after Major C.H. Malan, commander of the Gordon Highlanders (Hummel 1989).

Willowvale, also established as a military post in 1879, was named after its location on a streambed with willow trees (en.wikipedia.org/wiki/Willowvale,_Eastern_Cape).

The greater Idutywa area is today commonly referred to as Thembuland, with the contemporary Thembu Great Place of Chief Buyelekhaya (Zwlibanzi) Dalindyebo (en.wikipedia.org/wiki/Thembu_people) situated east of the N2 near Idutywa. Significant South African personalities from the area include Thabo (Mvuyelwa) Mbeki, former president of South Africa, born in Idutywa, 18 June 1942 (en.wikipedia.org/wiki/Thabo_Mbeki).

2.3.1) Field Assessment Results

Eighteen (18) archaeological and cultural heritage resources [Sites BWS-01 to BWS-18], as defined and protected by the NHRA 1999, were identified during the archaeological field assessment for the *Bende Bulk Water Supply Scheme*. Of the 18 identified sites 3 comprise Colonial Period sites, 14 Later Iron Age (LIA) sites and 1 probable site is of unknown cultural affinity, being either a Colonial Period or LIA resource, reflecting a clear dominance of LIA sites. Identified Colonial Period sites [Sites BWS-01, BWS-02 and BWS-04] all comprise of built environment sites, or structures older than 60 years of age. None of the identified Colonial Period sites will be impacted by development. In all cases sufficient conservation measures for purposes of development are in place. LIA sites are grouped in 2 categories, including LIA built environment sites [Sites BWS-04, BWS-11, BWS-13 and BWS-18] and LIA grave and cemetery sites [Sites BWS-06, BWS-07, BWS-08, BWS-09, BWS-12, BWS-14, BWS-15, BWS-16 and BWS-17]. Site BWS-10 constitutes a LIA homestead site with associated graves, while Site BWS-05, a probable grave site, may be of either Colonial Period or LIA cultural affinity. In all cases sites will be conserved either through existing conservation measures or proximity from the proposed development alignment, aside from Sites BWS-05, BWS-10, BWS-11 and BWS-18. At all 4 sites additional temporary conservation measures during the course of development will suffice to ensure the conservation of these site rather than consideration of Phase 2 archaeological mitigation thereof.

Site distribution across the *Bende Bulk Water Supply Scheme* study site can briefly be described as:

Res 2: S32°09'10.4"; E28°27'37.6"

- No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, identified at the Res 2 study site.
[Line route alignment – Res 2 to Res 1: See Sites BWS-01, BWS-02, BWS-03, BWS-04 and BWS-05].

Res 1: S32°07'39.2"; E28°24'42.4" (former bulk reservoir locality)

- No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, identified at the Res 1 study site.
[Line route alignment – Res 1 to Res 3: See Sites BWS-06, BWS-07 and BWS-08].

Res 3: S32°08'26.6"; E28°23'34.2"

- No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, identified at the Res 3 study site. Site BWS-09 is situated in close proximity to the study site.
[Line route alignment – Res 3 to Res 4: See Site BWS-09, BWS-10, BWS-11, BWS-12, BWS-13, BWS-14, BWS-15, BWS-16 and BWS-17].

Res 4: S32°10'43.2"; E28°21'57.4"

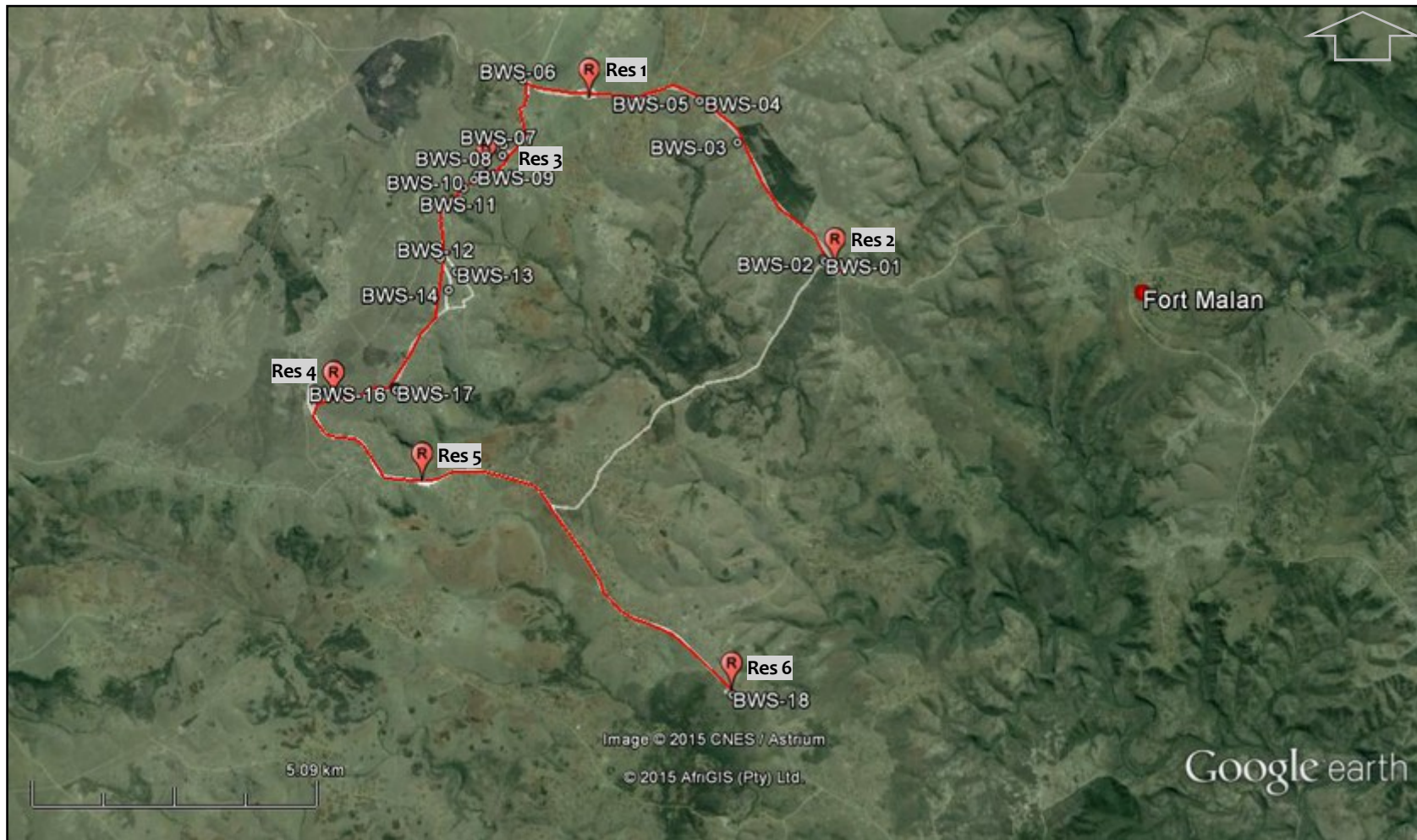
- No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, identified at the Res 4 study site.
[Line route alignment – Res 4 to Res 5: N/A].

Res 5: S32°11'27.9"; E28°23'00.5"

- No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, identified at the Res 5 study site.
[Line route alignment – Res 5 to Res 6: N/A].

Res 6: S32°13'21.5"; E28°26'40.9"

- No archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, identified at the Res 6 study site. Site BWS-18 is situated in close proximity to the study site.
[End of line route].



Map 6: Results of the field assessment (tracklog – white)



Map 7: Archaeological and cultural heritage site distribution between Res 2 and Res 1



Map 8: Archaeological and cultural heritage site distribution between Res 1 and Res 3



Map 9: Archaeological and cultural heritage site distribution between Res 3 and Res 4



Map 10: Archaeological and cultural heritage site distribution between Res 4, Res 5 and Res 6



Plate 1: View of the Res 2 study site



Plate 3: View of the Res 1 study site



Plate 2: Line route between Res 2 and Res 1 – with infrequent old stone farm beacons present along the alignment



Plate 4: General view of the line route alignment between Res 1 and Res 3



Plate 5: View of the Res 3 study site



Plate 7: General view of the study site between Res 3 and Res 4[2]



Plate 6: General view of the study site between Res 3 and Res 4[1]



Plate 8: View of the Res 4 study site



Plate 9: General view of the study site between Res 4 and Res 5



Plate 11: General view of the study site between Res 5 and Res 6



Plate 10: View of the Res 5 study site



Plate 12: View of the Res 6 study site

2.3.2) Site Descriptions

2.3.2.1) Site BWS-01 – Colonial Period – Store Remains (S32°09'07.3"; E28°27'31.2"):

Site BWS-01 comprises the built environment remains of an old Colonial Period shop. Date of construction is unknown, but the vernacular structure can reasonably be inferred to date to at least the early 1900's; thus pre-dating 60 years of age and formally protected by the NHRA 1999. The site is at present formally fenced with an access gate. Existing formal conservation measures comply with SAHRA / EC PHRA Minimum Site Conservation Standards, but also prohibiting access to the site for further inspection. From the fence it was evident that further Colonial Period structures may add to the site description and a small outbuilding and water tank were observed within the property boundary. The shop is no longer in use; the site is structurally fairly badly decayed with only the walls of the original building still standing and with vegetation having taken a negative toll on the conservation thereof. Site BWS-01 is situated approximately 50m from the line route alignment and will not be impacted by development.

- Site Significance Assignment and Recommendations: Site BWS-01 comprises a Colonial Period built environment site, pre-dating 60 years of age and formally protected by the NHRA 1999. The site receives automatic SAHRA / EC PHRA protection as a site of *High Significance* with a *Provincial Grade II Field Rating*. However, from a general archaeological and cultural heritage point of view the site is ascribed a SAHRA / EC PHRA *Low Significance* with a *Generally Protected IV-C Field Rating*. The site is situated approximately 50m from the line route alignment and will not be impacted on by development. Permanent conservation measures at the site (permanent fence with access gate) comply with SAHRA / EC PHRA Minimum Site Conservation Standards.

It is recommended that development in the vicinity of Site BWS-01 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.2) Site BWS-02 – Colonial Period – Residence (S32°09'06.2"; E28°27'30.1"):

Site BWS-02 comprises an old Colonial Period residence. Date of construction is unknown, but the vernacular residence can, based on architectural style, be dated to at least the early 1900's. The residence thus pre-dates 60 years of age and is formally protected by the NHRA 1999. The site is at present formally fenced with an access gate, with current conservation measures complying with SAHRA / EC PHRA Minimum Site Conservation Standards. Again existing conservation measures prohibited direct access to the site for site inspection purposes, but additional time period site features could be observed from the property boundary, including old ruined wall remains towards the back of the residence. The Site BWS-02 residence is still occupied and fairly well preserved and maintained. The site is situated approximately 70m from the proposed line route alignment and will not be directly impacted by development.

- Site Significance Assignment and Recommendations: Site BWS-02 comprises a Colonial Period built environment site, pre-dating 60 years of age and formally protected by the NHRA 1999. The site receives automatic SAHRA / EC PHRA protection as a site of *High Significance* with a *Provincial Grade II Field Rating*. From a general archaeological and cultural heritage point of view the site is ascribed a SAHRA / EC PHRA *Medium Significance* with a *Generally Protected IV-B Field Rating*. The site is situated approximately 70m from the line route alignment and will not be impacted on by development. Permanent conservation measures at the site (permanent fence with access gate) comply with SAHRA / EC PHRA Minimum Site Conservation Standards.

It is recommended that development in the vicinity of Site BWS-02 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.3) Site BWS-03 – Later Iron Age – Residence (S32°08'00.5"; E28°26'26.6"):

Site BWS-03 comprises the ruined wall remains of a Later Iron Age (LIA) hut. Date of construction is unknown but the site can reasonably be inferred to pre-date 60 years of age. Site BWS-03 is formally fenced with an access gate, with current conservation measures complying with SAHRA / EC PHRA Minimum Site Conservation Standards, but again prohibiting actual site inspection. Cognizance need to be taken that additional site features may well include grave or informal cemetery remains, in line with traditional LIA settlement practices. The site is situated approximately 50m from the proposed development alignment and will not be impacted by development.

- *Site Significance Assignment and Recommendations:* Site BWS-03 comprises a LIA built environment site, pre-dating 60 years of age and formally protected by the NHRA 1999. The site receives automatic SAHRA / EC PHRA protection as a site of *High Significance* with a *Provincial Grade II Field Rating*. Physical site inspection, based primarily on inferred associated site features may however well ascertain a SAHRA / EC PHRA *Medium to High Significance* with a *Generally Protected IV-A Field Rating*. The site is situated approximately 50m from the line route alignment and will not be impacted on by development. Permanent conservation measures at the site (permanent fence with access gate) comply with SAHRA / EC PHRA Minimum Site Conservation Standards.

It is recommended that development in the vicinity of Site BWS-03 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.4) Site BWS-04 – Colonial Period – Trade Centre (S32°07'37.3"; E28°26'02.2"):

Site BWS-04 designates the locality of an old Colonial Period structure, inferred to have been an early trade centre and may well still be in use for said purposes. The site is situated within approximately 30-40m from the proposed development alignment. The site will not be impacted on by development: Site BWS-04 is at present formally fenced with an access gate, with conservation measures complying with SAHRA / EC PHRA Minimum Site Conservation Standards. Additional Colonial Period resources are present towards the north of Site BWS-04, including a Colonial Period residence that may temporally be directly associated with the trade centre, this however being situated even further away from the development impact area and was not recorded for purposes of this report. The presence of additional Colonial Period structures does serve to further describe Colonial Period activity and former associated intercultural relationships in the general Bende area. Date of construction of the vernacular Site BWS-04 structure is unknown, but the site can reasonably be inferred to date at least to the early 1900's, thus older than 60 years of age and formally protected by the NHRA 1999.

- *Site Significance Assignment and Recommendations:* Site BWS-04 comprises a Colonial Period built environment site, pre-dating 60 years of age and formally protected by the NHRA 1999. The site receives automatic SAHRA / EC PHRA protection as a site of *High Significance* with a *Provincial Grade II Field Rating*. From a general archaeological and cultural heritage point of view the site is ascribed a SAHRA / EC PHRA *Low Significance* with a *Generally Protected IV-C Field Rating*. The site is situated approximately 30-40 from the line route alignment and will not be impacted on by development. Permanent conservation measures at the site (permanent fence with access gate) comply with SAHRA / EC PHRA Minimum Site Conservation Standards.

It is recommended that development in the vicinity of Site BWS-04 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.5) Site BWS-05 – Colonial Period / Later Iron Age – Grave (?) (S32°07'37.5"; E28°25'59.1"):

The Site BWS-05 locality designates the position of a single stone marker. The stone marker is reminiscent of grave stone, but could not be verified as such. Should the stone marker indicate the position of a grave, the cultural affinity thereof remains uncertain: It may be either of Colonial Period cultural designation, associated with the Site BWS-04 trade centre

and residence situated north-east thereof. The stone marker may however also be of Later Iron Age (LIA) designation and associated with general LIA occupation of the area. The possibility that the stone marker is merely an old farm post cannot be overruled; further stone farm boundary posts are present in the general area. Green, red and white contemporary but weathered painted graffiti characterize the stone marker. The stone marker is situated immediately south of the access road.

- Site Significance Assignment and Recommendations: Should Site BWS-05 represent the locality of a grave then the site will be designated a *Medium to High Significance* with a *Generally Protected IV-A Field Rating*. However, should testing at the site indicate that the stone marker does not represent a grave then the marker, a stone farm post, would not be of protected cultural heritage significance and a heritage site significance assignment would not apply.

Two (2) heritage management options are available to the developer:

- 1) Phase 2 mitigation test excavations to verify the site identity. Should Site BWS-05 prove to be a grave then the site should be mitigated according to the EC PHRA grave relocation process, including social consultation, exhumation and reburial. OR
- 2) The developer should ensure that the site be conserved during the course of development in the area. A temporary conservation fence of construction netting should be erected around the site with an approximate 3m conservation buffer between the site and the conservation boundary. Temporary signage indicating the site as a 'No entry – Heritage sensitive zone' should be attached to the conservation fence. All temporary conservation measures should be removed after construction has been completed.

It is recommended that conservation of Site BWS-05 be prioritized as heritage management option for purposes of development.

2.3.2.6) Site BWS-06 – Later Iron Age – Grave (S32°07'30.3"; E28°23'56.7"):

Site BWS-06 comprises a single modern style Later Iron Age (LIA) grave situated in an agricultural field which is permanently fenced. Current conservation measures comply with SAHRA / EC PHRA Minimum Site Conservation Standards. Site BWS-06 is situated approximately 80m from the proposed development alignment.

- Site Significance Assignment and Recommendations: Site BWS-06 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA *Medium to High Significance* and a *Generally Protected IV-A Field Rating*. The site is situated approximately 80m from the development alignment, with formal conservation measures in place and will not be impacted by development.

It is recommended that development in the vicinity of Site BWS-06 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.7) Site BWS-07 – Later Iron Age – Cemetery (S32°08'09.2"; E28°23'45.7"):

Site BWS-07 constitutes a small informal Later Iron Age (LIA) cemetery, comprising of 26 verifiable graves. Grave demarcations at the site vary significantly, ranging from individually fenced, modern style graves with inscribed headstones to modern style graves, of fair temporal significance where inscriptions on headstones have weathered away in totality, to traditional style graves marked primarily only with a stone headstone and often quite difficult to discern. One (1) grave is characterized by a scattered pile of stone, heavily overgrown. It can, based on varying grave style, be inferred that the cemetery have been in use for an extensive period of time and the majority of graves at the site may well pre-date 60 years of age. Evidence of a collapsed fence is visible in the vicinity of the cemetery, but not inferred to have been a cemetery fence, perhaps rather a general property boundary fence. The Site BWS-07 cemetery is situated in the region of 200m from the proposed line route alignment and will not be impacted on by development. Based on proximity from the development

alignment additional heritage conservation measures for purposes of development is not applicable to the site. However, the presence of the site does serve as testimony to the general LIA cultural significance of the general Bende landscape.

- *Site Significance Assignment and Recommendations:* Site BWS-07 comprises a LIA cemetery site. The site is ascribed a SAHRA / EC PHRA *Medium to High Significance* and a *Generally Protected IV-A Field Rating*. The site is situated more or less 200m from the proposed development alignment and will not be impacted on by development. Based on proximity from the line route alignment recommendations for site conservation during the course of development do not apply.

It is recommended that development along the line route portion in the vicinity of Site BWS-07 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.8) Site BWS-08 – Later Iron Age – Graves (S32°08'15.2"; E28°23'45.3"):

Site BWS-08 comprises 2 modern style Later Iron Age (LIA) graves situated in an agricultural field. The agricultural field is permanently fenced with a general property access gate: Current conservation measures comply with SAHRA / EC PHRA Minimum Site Conservation Standards. Site BWS-08 is situated approximately 80m from the proposed development alignment.

- *Site Significance Assignment and Recommendations:* Site BWS-08 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA *Medium to High Significance* and a *Generally Protected IV-A Field Rating*. The site is situated approximately 80m from the development alignment and will not be impacted by development.

It is recommended that development in the vicinity of Site BWS-08 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.9) Site BWS-09 – Later Iron Age – Graves (S32°08'27.1"; E28°23'28.6"):

The Site BWS-09 locality designates the locale of 2 modern style Later Iron Age (LIA) graves situated in an agricultural field adjacent to the proposed Res 3 study site. The agricultural field is permanently fenced with an access gate. Existing conservation measures comply with SAHRA / EC PHRA Minimum Site Conservation Standards.

- *Site Significance Assignment and Recommendations:* Site BWS-09 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA *Medium to High Significance* and a *Generally Protected IV-A Field Rating*. The site is situated in a permanently fenced agricultural field adjacent to the Res 3 study site and will not be impacted by development.

It is recommended that construction of Res 3 and general line route development in the vicinity of Site BWS-09 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.10) Site BWS-10 – Later Iron Age – Homestead with Graves (S32°08'30.2"; E28°23'26.8"):

Site BWS-10 constitutes a Later Iron Age (LIA) homestead site. Site features comprise the foundation and low rising wall remains of an approximate 9x5m rectangular structure (Site co-ordinate – S32°08'30.2"; E28°23'26.8"), inferred to be residential remains. Old cement brick and plastered wall remains are standing to approximately 20-30cm high and wall remains indicate at least 1 interior partial partition. Towards the south-west of this feature, and spatially distributed roughly parallel to the access gravel road are further features, including the circular hut foundation remnants of an approximate 4m in diameter structure, mainly characterized by changing vegetation, followed further south-west by the foundation remains of a small, approximate 4x5m in size rectangular structure, heavily overgrown but with portions of original brick walling

visible in the grass. Approximately 30m north-east of the main residential remains are 2 graves (S32°08'29.3"; E28°23'36.2"). Graves are identifiable by overgrown earth mounds only, without headstone or any other form of identifiable grave demarcation, making them hardly discernable in thick grass cover. Site BWS-10 is situated immediately adjacent to the gravel access road and thus the proposed development alignment. Date of origin of the site remains unknown, but the site can reasonably be inferred to be older than 60 years of age.

- Site Significance Assignment and Recommendations: Site BWS-10 comprises a LIA homestead site with graves. Structure remains at the site designates the site as a resource that receives automatic SAHRA / EC PHRA protection as a site of *High Significance* with a *Provincial Grade II Field Rating*. The site is however ascribed a general archaeological and cultural heritage site significance rating of a SAHRA / EC PHRA *Medium to High Significance* with a *Generally Protected IV-A Field Rating*. The site is situated immediately adjacent to the gravel access road and thus the development alignment. No conservation measures are in place.

Two (2) heritage management options are available to the developer:

- 1) Phase 2 mitigation excavations and grave relocation prior to development impact. Phase 2 mitigation should focus on detailed site recording and test pitting at site features and possible midden areas and include the grave mitigation process, including social consultation, exhumation and reburial of the graves prior to development impact in the vicinity of the site. OR
- 2) The developer should ensure that the site be conserved during the course of development in the area. A temporary conservation fence should be constructed along the southern boundary of the property along the gravel access road. Temporary signage indicating the site as a 'No entry – Heritage sensitive zone' should be attached to the conservation fence. All temporary conservation measures should be removed after construction has been completed.

It is recommended that conservation of Site BWS-10 be prioritized as heritage management option for purposes of development.

2.3.2.11) Site BWS-11 – Later Iron Age – Residence (S32°08'35.6"; E28°23'19.9"):

Site BWS-11 comprises the cement casted brick wall remains of an approximate 6x9m in size rectangular structure. Structure walls are standing to more or less 30-40cm in height. The structure, inferred to be the remains of a Later Iron Age (LIA) residential structure, is vernacular in nature; and based on the old method of brick casting dated to be older than 60 years of age. The site is situated immediately adjacent to the gravel access road and proposed line route alignment. No conservation measures are in place.

- Site Significance Assignment and Recommendations: Site BWS-11 comprises the ruined remains of a LIA built environment site, predating 60 years of age. The site receives automatic SAHRA / EC PHRA protection as a site of *High Significance* with a *Provincial Grade II Field Rating*. The site is however ascribed a general archaeological and cultural heritage site significance rating of a SAHRA / EC PHRA *Low Significance* with a *Generally Protected IV-C Field Rating*. The site is situated immediately adjacent to the gravel access road and thus the development alignment. No conservation measures are in place.

Two (2) heritage management options are available to the developer:

- 1) The developer should apply to the EC PHRA Built Environment (BE) Unit for a site destruction permit. Upon the issue of a permit the site may legally be demolished after which construction of the line route can proceed across the site locale. OR
- 2) The developer should ensure that the site be conserved during the course of development in the area. A temporary conservation fence should be constructed along the southern boundary of the property along the gravel access road. Temporary signage indicating the site as a 'No entry – Heritage sensitive zone' should be attached to the conservation fence. All temporary conservation measures should be removed after construction has been completed.

It is recommended that conservation of Site BWS-11 be prioritized as heritage management option for purposes of development.

2.3.2.12) Site BWS-12 – Later Iron Age – Graves (S32°09'16.7"; E28°23'06.0"):

Site BWS-12 comprises of 2 modern style Later Iron Age (LIA) graves situated within a fenced private property boundary, more or less 50m from the proposed development alignment. Current conservation measures comply with SAHRA / EC PHRA Minimum Site Conservation Standards.

- Site Significance Assignment and Recommendations: Site BWS-12 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA *Medium to High Significance* with a *Generally Protected IV-A Field Rating*. The site is situated within a permanently fenced private property boundary and will not be impacted by development.

It is recommended that development in the vicinity of Site BWS-12 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.13) Site BWS-13 – Later Iron Age – Residence (S32°09'24.5"; E28°23'17.2"):

The Site BWS-13 Later Iron Age (LIA) residential remains constitutes the low rising cement casted brick walls of an approximate 11x13m in size rectangular structure. Interior partition walls indicate at least 5 rooms. Wall remains are standing to an average height of approximately 30-40cm in height, but up to more or less 60-70cm in places. The site can within LIA tradition be inferred to be vernacular in nature. Method of brick casting indicates a probable date of older than 60 years. No conservation measures are in place. Site BWS-13 is situated roughly 250m from the proposed development alignment. The site will not be impacted by development and based on proximity of the site from the proposed line route alignment no recommendations for additional conservation or mitigation of the site for purposes of development are necessary.

- Site Significance Assignment and Recommendations: Site BWS-13 comprises the ruined remains of a LIA built environment site, predating 60 years of age. The site receives automatic SAHRA / EC PHRA protection as a site of *High Significance* with a *Provincial Grade II Field Rating*. The site is however ascribed a general archaeological and cultural heritage site significance rating of a SAHRA / EC PHRA *Low Significance* and a *Generally Protected IV-C Field Rating*. The site is situated more or less 250m from the proposed development alignment and will not be impacted by development. Based on proximity of the site from the proposed development alignment additional recommendations for conservation do not apply.

It is recommended that development in the vicinity of Site BWS-13 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.14) Site BWS-14 – Later Iron Age – Graves (S32°09'35.4"; E28°23'13.1"):

Site BWS-14 comprises of at least 2 modern style Later Iron Age (LIA) graves situated within a fenced private property boundary. Formal conservation at the site prohibited access for actual site inspection, but it seems that a number of additional graves may well be present in the area, less visible from the property boundary. Current conservation measures comply with SAHRA / EC PHRA Minimum Site Conservation Standards. The Site BWS-14 grave site is situated roughly 150m from the proposed line route alignment. The site will not be impacted by development.

- Site Significance Assignment and Recommendations: Site BWS-14 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA Medium to High Significance with a Generally Protected IV-A Field Rating. The site is situated within a permanently fenced private property boundary and will not be impacted by development.

It is recommended that development in the vicinity of Site BWS-14 proceed without the developer having to comply with additional heritage compliance requirements.

2.3.2.15) Site BWS-15 – Later Iron Age – Grave (S32°10'33.8"; E28°22'39.7"):

The Site BWS-15 locality indicates a single modern style Later Iron Age (LIA) grave. The grave is individually fenced but with the fence being dilapidated and rusted. The BWS-15 grave is situated roughly 100m from the proposed development alignment. Based on proximity of the site from the line route alignment additional conservation measures are not recommended, but caution should be taken at the time of development in the general vicinity of the site.

- Site Significance Assignment and Recommendations: Site BWS-15 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA Medium to High Significance with a Generally Protected IV-A Field Rating. No conservation measures are in place, but based on proximity from the proposed development alignment additional recommendations for purposes of development do not apply.

It is recommended that development in the vicinity of Site BWS-15 proceed without the developer having to comply with additional heritage compliance requirements. Caution should however be taken when work proceed in the general vicinity of the site.

2.3.2.16) Site BWS-16 – Later Iron Age – Graves (S32°10'34.6"; E28°22'40.5"):

Site BWS-16 comprises of a cluster of 4 Later Iron Age (LIA) graves, 3 being modern style graves with inscribed headstones, 1 of which has fallen over and the 4th being a traditional style grave characterized by a stone cairn. The cluster of graves were formerly fenced, but with the fence having collapsed in the interim. Site BWS-16 is situated approximately 120m from the proposed Bende water line alignment and more or less 30m south-east of Site BWS-15. The site will not be impacted by development and based on proximity from the development alignment is not subject to additional conservation requirements for purposes of development.

- Site Significance Assignment and Recommendations: Site BWS-16 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA Medium to High Significance with a Generally Protected IV-A Field Rating. No conservation measures are in place; based on proximity from the proposed development alignment additional recommendations for purposes of development do not apply.

It is recommended that development in the vicinity of Site BWS-16 proceed without the developer having to comply with additional heritage compliance requirements. Caution should be taken when work proceed in the general vicinity of the site.

2.3.2.17) Site BWS-17 – Later Iron Age – Graves (S32°10'35.3"; E28°22'40.6"):

Site BWS-17 comprises of 2 Later Iron Age (LIA) graves situated in close proximity to 1 another. The 1st of the graves is identifiable by a stone headstone, without inscription and the 2nd comprises an old earth-mound grave. The grave site can reasonably be inferred to be the oldest of the cluster of Site BWS-15, BWS-16 and BWS-17 sites and assumed to well pre-date 60 years of age; testimony to significant temporal depth of LIA occupation in the area. Neither of the graves is fenced and specifically the 2nd of the Site BWS-17 graves is particularly difficult to discern. The 2 Site BWS-17 graves are situated roughly

140m from the proposed development alignment and more or less 20m south of Site BWS-16. The site will not be impacted by development. Based on proximity from the proposed line route no additional conservation measures apply for purposes of development.

- Site Significance Assignment and Recommendations: Site BWS-17 comprises a LIA grave site. The site is ascribed a SAHRA / EC PHRA *Medium to High Significance* with a *Generally Protected IV-A Field Rating*. No conservation measures are in place; based on proximity from the proposed development alignment additional recommendations for purposes of development do not apply.

It is recommended that development in the vicinity of Site BWS-17 proceed without the developer having to comply with additional heritage compliance requirements. Caution should be taken when work proceed in the general vicinity of the site.

2.3.2.18) Site BWS-18 – Later Iron Age – Structure Feature (S32°13'23.5"; E28°26'42.3"):

The Site BWS-18 structure feature comprises an approximate 2.5x1.5m rectangular stone outlined feature. The feature is identifiable by stone foundation outlines only. Towards the southern perimeter of the feature an approximate 0.75-1m in diameter, half circular feature extension is visible. The identity of the feature is unknown; it can however reasonably be inferred not to be a grave site. The site is preliminary inferred to pre-date 60 years of age, and at present unfenced or with no heritage conservation measures in place. The Site BWS-18 feature is situated in close proximity to the Res 6 study site and directly underneath the existing Eskom power line. The site will not be impacted on by development. However, based on close proximity to the proposed Res 6 study site, it is recommended that the developer ensures temporary conservation measures to be in place at the time of construction impact.

- Site Significance Assignment and Recommendations: Site BWS-18 comprises a LIA built environment site. The site receives automatic SAHRA / EC PHRA protection status as a site of *High Significance* with a *Provincial Grade II Field Rating*. From a general archaeological and cultural heritage perspective the site is however assigned a SAHRA / EC PHRA *Low Significance* with a *Generally Protected IV-C Field Rating*. The site is situated in close proximity to the Res 6 study site, and directly underneath the existing Eskom power line. The site will not be directly impacted by development. However, based on proximity to the Res 6 study site it is recommended that the developer ensures temporary conservation measures to be in place for the tenure of construction activities in the vicinity of the site.

Two (2) heritage management options are available to the developer:

- 1) Phase 2 mitigation test excavations to verify site identity. Test excavations should precede development impact in the vicinity of the site. OR
- 2) The developer should ensure that the site be conserved during the course of development in the area. A temporary conservation fence of construction netting should be erected around the site with a 3-5m conservation buffer between the site and the conservation boundary. Temporary signage indicating the site as a 'No entry – Heritage sensitive zone' should be attached to the conservation fence. All temporary conservation measures should be removed after construction has been completed.

It is recommended that conservation of Site BWS-18 be prioritized as heritage management option for purposes of development.



Plate 13: View of Site BSW-01



Plate 15: View of the Site BWS-03 LIA residential remains



Plate 14: View of the Site BWS-02 Colonial Period residence



Plate 16: View of Site BWS-04



Plate 17: View of the Site BWS-05 stone marker



Plate 19: General view of Site BWS-07



Plate 18: View of Site BWS-06



Plate 20: An individually fenced modern style grave of contemporary origin with inscribed headstone at Site BWS-07



Plate 21: Modern style graves at Site BWS-07 some with inscribed headstones, some of which possible inscriptions have weathered away



Plate 22: A grave at the Site BWS-07 cemetery marked with a stone headstone



Plate 23: An inscribed weathered grave stone marker at Site BWS-07



Plate 24: A weathered grave from Site BWS-07 characterized only by a cluster of overgrown stones



Plate 25: View of Site BWS-08



Plate 27: View of the main residential feature remains – Site BWS-10



Plate 26: View of Site BWS-09



Plate 28: Circular hut remains at Site BWS-10



Plate 29: Small rectangular structure remains at Site BWS-10



Plate 31: View of Site BWS-11



Plate 30: Overgrown earth-mound graves at Site BWS-10



Plate 32: View of Site BWS-12



Plate 33: View of Site BWS-13 [1]



Plate 35: View of Site BWS-14



Plate 34: View of Site BWS-13 [2]



Plate 36: View of Site BWS-15



Plate 37: View of Site BWS-16



Plate 39: View of the 2nd grave comprising Site BWS-17



Plate 38: View of the 1st grave comprising Site BWS-17

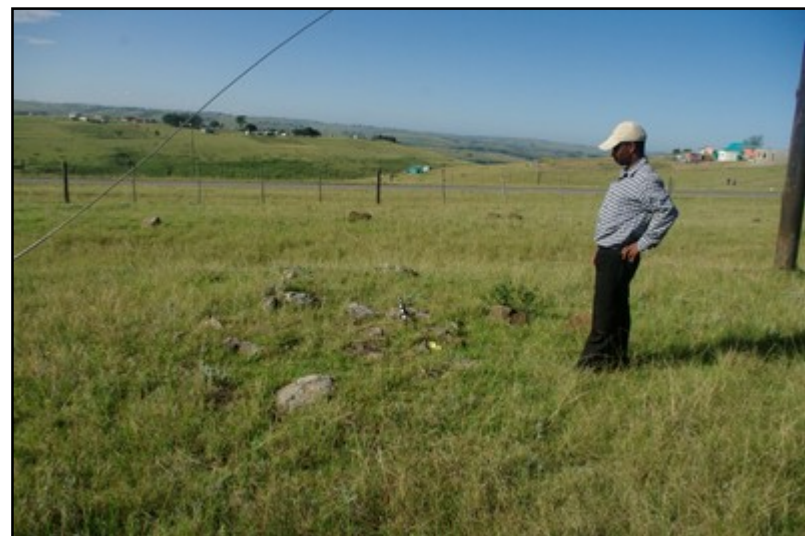


Plate 40: View of the Site BWS-18 structure remains

3 - Environmental Impact Assessment Rating

Identified archaeological and cultural heritage sites are ascribed an Environmental Impact Assessment (EIA) rating, based on the extent or spatial scale of the impact [E] (0 = None, 1 = Site specific, 2 = Local, 3 = Regional, 4 = National and 5 = International), the magnitude of the impact, positive or negative [M+ / M-] (0 = Zero, 2 = Very low, 4 = Low, 8 = High and 10 = Very high), the duration of the impact [D] (1 = Immediate, 2 = Short term, 3 = Medium term, 4 = Long term and 5 = Permanent), the probability of the occurrence [P] (1 = Improbable, 2 = Low probability, 3 = Medium probability, 4 = High probability and 5 = Definite), the irreplaceable loss of resources [I] (0 = None; 1 = Very low, 2 = Low, 3 = Moderate, 4 = High, 5 = Definite), the reversibility of potential impacts [R] (0 = No impact, 1 = Impact will be reversible; 2 = High potential for reversibility; 3 = Moderate potential for reversibility; 4 = Low potential for reversibility; 5 = Impact cannot be reversed) and cumulative impact (None, Low, Medium and High). A site significance point [SP] is assigned as follows:

- $SP = (M + D + E + I + R) \times P$.

A maximum of 150 SP can be assigned to an impact. Environmental Significance [S] is assigned based on the SP as follows:

- <40 = Low [L];
- $40-74$ = Medium [M];
- $75-99$ = Medium-High [MH];
- $100-124$ = High [H]; and
- $125-150$ = Very High [H].

The significance can be either positive [+] or negative [-]. An impact of low [L] is likely to contribute to either + or – decisions about whether or not to proceed with the development, with little real effect and is unlikely to have an influence on project design or alternative motivation. An impact of M implies that if unmanaged could influence a decision on whether or not to proceed with development. An impact of MH is similar to M, with caution to mitigation options and alternative mitigation options should be investigated where possible. An impact of H could influence a decision about whether or not to proceed with development, regardless of available mitigation options and an impact of VH implies that a project cannot proceed and that impacts are irreversible, regardless of available mitigation options.

Environmental impact assessment ratings are grouped per sites with the same basic recommendation per site type or type of impact, with cognizance to the fact that impacts on heritage sites are as a norm irreversible (heritage sites are non-renewable resources) and with reference to the SAHRA (2007) prescribed mitigation options per site significance rating, weighed against development / possible natural impact.

Environmental Impact	Site Number	Environmental Significance																	
		Before Mitigation									After mitigation								
		M	D	E	I	R	P	SP	S	C	M	D	E	I	R	P	SP	S	C
Conservation without additional measures	Sites: Sites BWS-01, BWS-02, BWS-03, BWS-04 and BWS-13	+2	2	1	1	1	1	7	L	+L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comment: Colonial Period and LIA built environment sites that will be conserved by development (current conservation measures and proximity)																			
Summary of mitigation points: N/A																			

Table 5: Colonial Period and LIA built environment sites that will be conserved by development (current conservation measures and proximity)

Environmental Impact	Site Number	Environmental Significance																	
		Before Mitigation									After mitigation								
		M	D	E	I	R	P	SP	S	C	M	D	E	I	R	P	SP	S	C
Conservation without additional measures	Sites: Sites BWS-06, BWS-07, BWS-08, BWS-09, BWS-12, BWS-14, BWS-15, BWS-16 and BWS-17	+4	3	2	4	5	1	18	L	+L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Comment: LIA grave and cemetery sites that will be conserved by development (current conservation measures and proximity)																			
Summary of mitigation points: N/A																			

Table 6: LIA grave and cemetery sites that will be conserved by development (current conservation measures and proximity)

Environmental Impact	Site Number	Environmental Significance																	
		Before Mitigation									After mitigation								
		M	D	E	I	R	P	SP	S	C	M	D	E	I	R	P	SP	S	C
Conservation with additional measures	Sites: Sites BWS-11 and BWS-18	+2	2	1	1	1	1	7	L	+L	+4	4	1	2	2	3	39	L	+L
Comment: LIA built environment sites that will be conserved by development through additional temporary conservation measures during the course of construction																			
Summary of mitigation points: Temporary conservation fences and temporary sign posting																			

Table 7: LIA built environment sites that will be conserved by development through additional temporary conservation measures during the course of construction

Environmental Impact	Site Number	Environmental Significance																	
		Before Mitigation									After mitigation								
		M	D	E	I	R	P	SP	S	C	M	D	E	I	R	P	SP	S	C
Conservation with additional measures	Sites: Sites BWS-05 and BWS-10	+4	3	2	4	5	1	18	L	+L	+8	4	2	4	5	3	69	M	+M
Comment: LIA built environment with grave sites and grave sites of uncertain cultural affinity that will be conserved by development through additional temporary conservation measures during the course of construction																			
Summary of mitigation points: Temporary conservation fences and temporary sign posting																			

Table 8: LIA built environment with grave sites and grave sites of uncertain cultural affinity that will be conserved by development through additional temporary conservation measures during the course of construction

4 - Recommendations

With reference to archaeological and cultural heritage compliance, as per the requirements of the NHRA 1999, it is recommended that the proposed *Bende Bulk Water Supply Scheme*, ADM area, Eastern Cape, proceeds as applied for provided the developer comply with the below listed heritage management recommendations:

- No archaeological or cultural heritage developmental 'fatal flaws' identified;
- Eighteen (18) archaeological or cultural heritage resources [Sites BWS-01 to BWS-18], as defined and protected by the NHRA 1999, were identified during fieldwork. Three (3) of the identified sites constitute Colonial Period sites, 14 are LIA sites and 1 probable site is of uncertain Colonial Period – LIA cultural affinity.
- Of the identified 18 sites 14 will be conserved through either existing conservation measures or by virtue of proximity from the proposed development alignment. Four (4) sites situated in direct proximity to the development alignment [Sites BWS-05, BWS-10, BWS-11 and BWS-18] can safely be conserved within the current development layout by ensuring that temporary conservation measures are in place at the time of construction impact: The current development layout can thus be described as 'safe' with reference to the conservation of archaeological and cultural heritage resources for purposes of development.
- [Should any incidental archaeological or cultural heritage resources, as defined and protected by the NHRA 1999, be encountered during the course of development the process described in the 'Heritage Protocol for Incidental Finds during the Construction Phase' should be followed.]

The EC PHRA (APM Unit) HIA Comment will state legal requirements for development to proceed, or reasons why, from a heritage perspective, development may not be further considered.

Bende Bulk Water Supply Scheme, (near Idutywa), Amathole District Municipality, EC			
Map Code	Site	Co-ordinates	Recommendations
Bende Bulk Water Supply Scheme, ADM area, Eastern Cape			
Res 2	Bende – Reservoir 2	S32°09'10.4"; E28°27'37.6"	N/A
BWS-01	Colonial Period – Store Remains	S32°09'07.3"; E28°27'31.2"	N/A
BWS-02	Colonial Period – Residence	S32°09'06.2"; E28°27'30.1"	N/A
BWS-03	Later Iron Age – Residence	S32°08'00.5"; E28°26'26.6"	N/A
BWS-04	Colonial Period – Trade Centre	S32°07'37.3"; E28°26'02.2"	N/A
BWS-05	Colonial Period / Later Iron Age – Grave (?)	S32°07'37.5"; E28°25'59.1"	Phase 2 testing and mitigation (social consultation, exhumation & reburial); OR Temporary conservation
Res 1	Bende – Reservoir 1	S32°07'39.2"; E28°24'42.4"	N/A
BWS-06	Later Iron Age – Grave	S32°07'30.3"; E28°23'56.7"	N/A
BWS-07	Later Iron Age – Cemetery	S32°08'09.2"; E28°23'45.7"	N/A
BWS-08	Later Iron Age – Graves	S32°08'15.2"; E28°23'45.3"	N/A
Res 3	Bende – Reservoir 3	S32°08'26.6"; E28°23'34.2"	(See Site BWS-09)
BWS-09	Later Iron Age – Graves	S32°08'27.1"; E28°23'28.6"	N/A
BWS-10	Later Iron Age – Homestead with Graves	S32°08'30.2"; E28°23'26.8"	Phase 2 site mitigation and grave relocation (social consultation, exhumation and reburial); OR Temporary conservation
BWS-11	Later Iron Age – Residence	S32°08'35.6"; E28°23'19.9"	Site destruction under EC PHRA BE Unit permit; OR Temporary conservation
BWS-12	Later Iron Age – Graves	S32°09'16.7"; E28°23'06.0"	N/A
BWS-13	Later Iron Age – Residence	S32°09'24.5"; E28°23'17.2"	N/A
BWS-14	Later Iron Age – Graves	S32°09'35.4"; E28°23'13.1"	N/A
BWS-15	Later Iron Age – Grave	S32°10'33.8"; E28°22'39.7"	N/A [Caution]
BWS-16	Later Iron Age – Graves	S32°10'34.6"; E28°22'40.5"	N/A [Caution]
BWS-17	Later Iron Age – Graves	S32°10'35.3"; E28°22'40.6"	N/A [Caution]

Res 4	Bende – Reservoir 4	S32°10'43.2"; E28°21'57.4"	N/A
Res 5	Bende – Reservoir 5	S32°11'27.9"; E28°23'00.5"	N/A
BWS-18	Later Iron Age – Structure feature	S32°13'23.5"; E28°26'42.3"	Phase 2 site mitigation; OR Temporary conservation

Table 9: Archaeological and cultural heritage compliance summary for the proposed Bende Bulk Water Supply Scheme, ADM, Eastern Cape

Notes:

- Should any registered Interested & Affected Party (I&AP) wish to be consulted in terms of Section 38(3)(e) of the NHRA 1999 (Socio-cultural consultation / SAHRA SIA) it is recommended that the developer / EAP ensures that the consultation be prioritized within the timeframe of the environmental assessment process.

Simplified guide to the identification of archaeological sites:

- ❖ **Stone Age** – Knapped stone display flakes that appear unnatural and may result in similar type ‘shaped’ stones often concentrated in clusters or forming a distinct layer in the geological stratigraphy. ESA shapes may represent ‘pear’ or oval shaped stones, often in the region of 10cm in length or larger. Typical MSA types include blade-like or triangular shaped stones often associated with randomly shaped stones that display use or edge-wear around the rim of the artefact. LSA types may well be small, informally shaped stones, often associated with bone, pieces of charcoal and in cases ceramic shards.
Rock Art – Includes both painted and engraves images.
Shell Middens – Include compact shell lenses that may be quite extensive in size or small ephemeral scatters of shell food remains, often associated with LSA artefact remains, but may also be of MSA and Iron Age cultural association.
- ❖ **Iron Age** – Iron Age sites are often characterized by stone features, i.e. the remains of former livestock enclosures or typical household remains, huts are often identified by either mound or depression hollows. Typical artefacts include ceramic remains, farming equipment, beads and trade goods, metal artefacts (including jewelry) etc. Remains of the ‘Struggle’ – events, histories and landmarks associated therewith are often, based on cultural association, classed as part of the Iron Age heritage of South Africa.
- ❖ **Colonial Period** – Built environment remains, either urban or rural, are of a western cultural affiliation with typical artefacts representing early western culture, including typical household remains, trade and manufactured goods, such as old bottles, porcelain and metal artefacts. War memorial remains including the vast array of associated graves and the history of the Industrial Revolution form important parts of South Africa’s Colonial Period heritage.

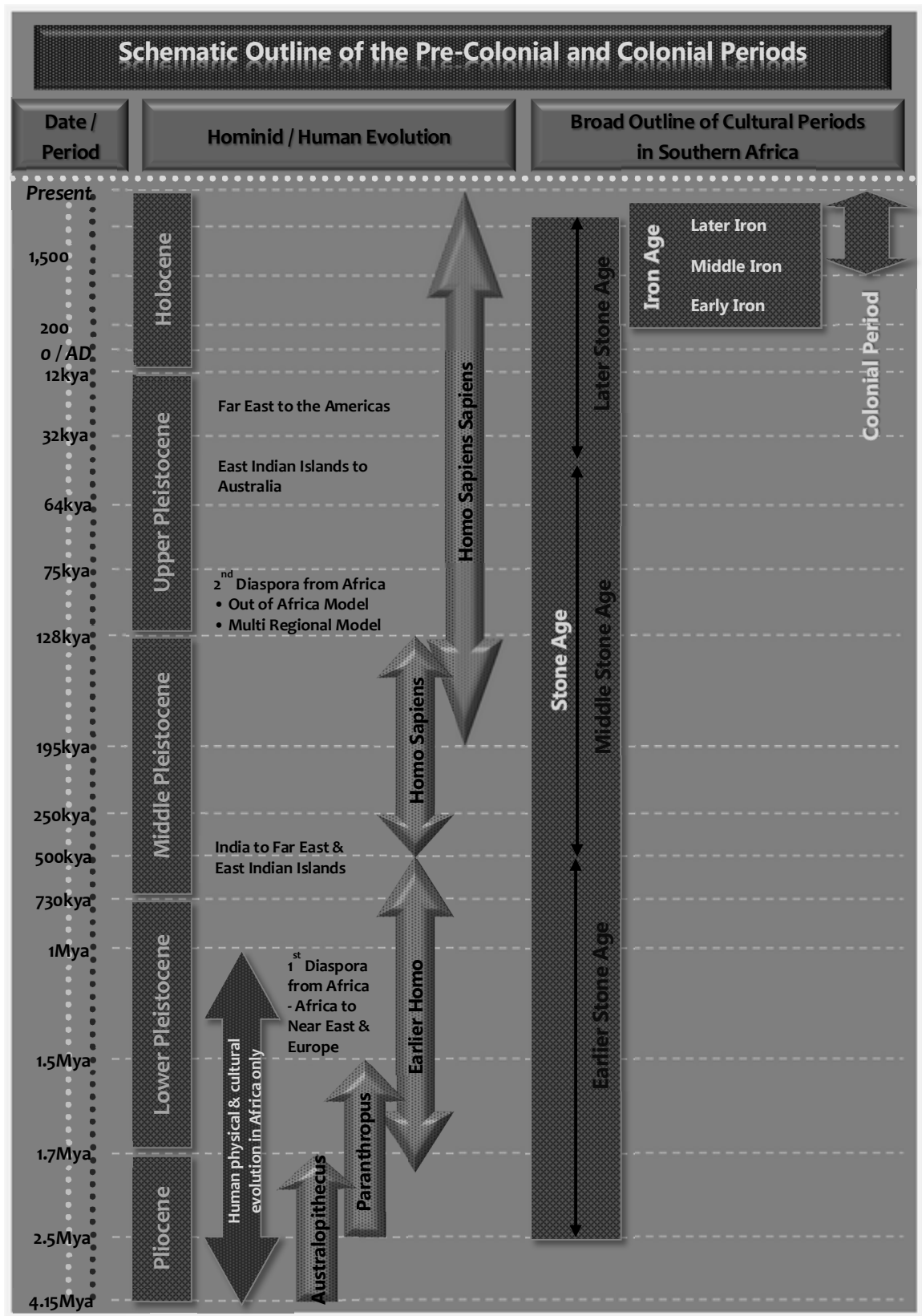
5 - Acronyms and Abbreviations

AD	: Anno Domini (the year o.)
AIA	: Archaeological Impact Assessment
AMAFA	: Amafa aKwaZulu-Natali
ASAPA	: Association of Southern African Professional Archaeologists
BAR	: Basic Assessment Report
BC	: Before the Birth of Christ (the year o.)
BCE	: Before the Common Era (the year o.)
BIA	: Basic Impact Assessment
BID	: Background Information Document
BP	: Before the Present (the year 1950.)
cm	: Centimeter
CRM	: Cultural Resources Management
DAC	: Department of Arts and Culture
DEAT	: Department of Environmental Affairs and Tourism
DEDEAT	: Department of Economic Development, Environmental Affairs and Tourism
DME	: Department of Minerals and Energy
DSACR	: Department of Sport, Arts, Culture and Recreation
ECO	: Environmental Control Officer
EAP	: Environmental Assessment Practitioner
EC PHRA	: Eastern Cape Provincial Heritage Resources Authority
EIA	: Environmental Impact Assessment
EIA ₁	: Early Iron Age
EMPr	: Environmental Management Plan report
ESA	: Earlier Stone Age
ha	: Hectare
HIA	: Heritage Impact Assessment
HWC	: Heritage Western Cape
HCMP	: Heritage Conservation Management Plan
ICOMOS	: International Council on Monuments and Sites
IEM	: Integrated Environmental Management
km	: Kilometer
Kya	: Thousands of years ago
LIA	: Later Iron Age
LSA	: Later Stone Age
m	: Meter
m ²	: Square Meter
MIA	: Middle Iron Age
mm	: Millimeter
MPRDA (2002)	: Mineral and Petroleum Resources Development Act, No 28 of 2002
MSA	: Middle Stone Age
Mya	: Millions of years ago
NEMA (1998)	: National Environmental Management Act, No 107 of 1998
NHRA (1999)	: National Heritage Resources Act, No 25 of 1999
PIA	: Palaeontological Impact Assessment
PHRA	: Provincial Heritage Resources Authority
PSSA	: Palaeontological Society of South Africa
PPP	: Public Participation Process
SAHRA	: South African Heritage Resources Agency
SAHRIS	: South African Heritage Resources Information System
ScIA	: Socio-cultural Impact Assessment
SIA	: Social Impact Assessment

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Appendix A:



Appendix B:

Introduction to the Archaeology of South Africa

Archaeologically the southern African cultural environment is roughly divided into the Stone Age, the Iron Age and the Colonial Period, including its subsequent Industrial component. This cultural division has a rough temporal association beginning with the Stone Age, followed by the Iron Age and the Colonial Period. The division is based on the identified primary technology used. The hunter-gatherer lifestyle of the Stone Age is identified in the archaeological record through stone being the primary raw material used to produce tools. Iron Age people, known for their skill to work iron and other metal, also practiced agriculture and animal husbandry. Kingdoms and civilizations associated with the Iron Age are indicative of a complex social hierarchy. The Colonial Period is marked by the advent of writing, in southern Africa primarily associated with the first European travelers (Mitchell 2002).

During the latter part of the Later Stone Age (LSA) hunter-gatherers shared their cultural landscape with both pastoralists and Iron Age people, while the advent of the Colonial Period in South Africa is marked by a complex cultural mosaic of people; including LSA hunter-gatherers, pastoralists, Later Iron Age farming communities and Colonial occupation.

1) Early Hominin Evolution

DNA studies indicate that humans and chimpanzees shared a common ancestor between 6-8Mya (Sibley & Ahlquist 1984). By 4Mya, based on fossil evidence from Ethiopia and Kenya, hominins (humans and their immediate fossil ancestors and relatives) had already evolved. The earliest fossils are ascribed to *Ardipithecus ramidus* (4.4Mya), succeeded by *Australopithecus anamensis* (4.2-3.9Mya). These fossils are inferred to lie at the base from which all other hominins evolved (Leakey *et al.* 1995; White *et al.* 1994).

In South Africa the later hominins are classed into 3 groups or distinct genera; *Australopithecus* (gracile australopithecines), *Paranthropus* (robust australopithecines) and *Homo*. South Africa has 3 major hominin sites: Taung in the North-West Province, where Raymond Dart identified the first *Australopithecus* fossil in 1924 (Dart 1925); The Cradle of Humankind (Sterkfontein Valley) sites in Gauteng, the most prolific hominin locality in the world for the period dating 3.5-1.5Mya which have yielded numerous *Australopithecus*, *Paranthropus* and limited *Homo* fossils (Keyser *et al.* 2000; Tobias 2000); and Makapansgat in the Limpopo Province, where several more specimens believed to be older than most of the Cradle specimens were discovered (Klein 1999).

A. africanus, represented at all 3 sites are believed to have been present on the South African landscape from about 3Mya. From approximately 2.8Mya they shared, at least in the Cradle area, the landscape with *P. robustus* and from roughly 2.3Mya with early forms of *Homo* (Clarke 1999). Global climatic cooling around 2.5Mya may have stimulated a burst of species turnover amongst hominins (Vrba 1992); the approximate contemporary appearance of the first stone tools suggests that this was a critical stage in human evolution. But exactly which early hominin population is to be accredited as the ancestor of *Homo* remains elusive.

H. ergaster is present in the African palaeo-anthropological record from around 1.8Mya and shortly thereafter the first exodus from Africa is evidenced by *H. erectus* specimens from China, Indonesia and even Europe (Klein 1999).

2) The Stone Age

2.1) The Earlier Stone Age

In South Africa the only Earlier Stone Age (ESA) Oldowan lithic assemblage comes from Sterkfontein Cave. The predominant quartz assemblage is technologically very simple, highly informal and inferred to comprise exclusively of multi-purpose tools (Kuman *et al.* 1997). The latter part of the ESA is characterized by the Acheulean Industrial Complex, present in the archaeological record from at least 1.5Mya. Both *H. ergaster* and *P. robustus* may be accredited with the production of these tools. The association between stone tools and increased access to meat and marrow supporting the greater dietary breadth of *Homo* may have been vital to *Homo*'s evolutionary success; and the eventual extinction of the robust australopithecines (Klein 1999).

Probably the longest lasting artefact tradition ever created by hominins, the Acheulean is found from Cape Town to north-western Europe and India, occurring widely in South Africa. Despite the many sites it is still considered a 'prehistoric dark age' by many archaeologists, encompassing one of the most critical periods in human evolution; the transition from *H. ergaster* to archaic forms of *H. Sapiens* (Klein 1999).

The Acheulean industry is characterized by handaxes and cleavers as *folies directeurs* (signatory artefact types), in association with cores and flakes. Handaxes and cleavers were multi-purpose tools used to work both meat and plant matter (Binneman & Beaumont 1992). Later Acheulean flaking techniques involved a degree of core preparation that allowed a single large flake of predetermined shape and size to be produced. This *Victoria West technique* indicates an origin within the Acheulean for the *Levallois technique* of the Middle Stone Age (Noble & Davidson 1966). The lithic artefact component was supplemented by wood and other organic material (Deacon 1970).

2.2) The Middle Stone Age

The Middle Stone Age (MSA), dating from approximately 500kya to 40-27/23kya is interpreted as an intermediate technology between the Acheulean and the Later Stone Age (LSA) (Goodwin & van Riet Lowe 1929). The MSA is typologically characterized by the absence of handaxes and cleavers, the use of prepared core techniques and the production of blades, triangular and convergent flakes, with convergent dorsal scars and faceted striking platforms, often produced by means of the *Levallois technique* (Volman 1984). The widespread occurrence of MSA technology across Africa and its spread into much of Eurasia in Oxygen Isotope Stage (OIS) 7 is viewed as part of a process of population dispersal associated with both the ancestors of the later Neanderthals in Europe and anatomically modern humans in Africa (Foley & Lahr 1997).

After the riches offered by the Cradle sites and Makapansgat, southern Africa's Middle Pleistocene fossil record is comparatively poor. Early Middle Pleistocene fossil evidence suggests an archaic appearance and fossils are often assigned to *H. heidelbergensis* and *H. sapiens rhodesiensis* (Rightmire 1976). Modern looking remains, primarily from Border Cave (KwaZulu-Natal) and Klasies River Mouth (Eastern Cape) raised the possibility that anatomically modern humans had, by 120kya, originated south of the Sahara before spreading to other parts of the world (Brauer 1982; Stringer 1985). Subsequent studies of modern DNA indicated that African populations are genetically more diverse and probably older than those elsewhere (Cann *et al.* 1994). Combined, the fossil and genetic evidence underpins the so-called Out of Africa 2 model (arguing that gene flow and natural selection led regional hominin populations along distinct evolutionary trajectories after *Homo*'s expansion from Africa in the Lower Pleistocene Out of Africa 1 model) of modern human origins and the continuing debate as to whether it should be preferred to its *Multiregional* alternative (arguing that modern humans evolved more or less simultaneously right across the Old World) (Mellars & Stringer 1989; Aitken *et al.* 1993; Nitecki & Nitecki 1994).

Persuasive evidence of ritual activity or bodily decoration is evidenced by the widespread presence of red ochre at particularly MSA 2 sites (after Volman's 1984 MSA 1-4 model; Hensilwood & Sealy 1997), while evidence from Lion Cave, Swaziland, indicates that specularite may have been mined as early as 100kya (Beaumont 1973). Evidence for symbolic behavioral activity is largely absent; no evidence for rock art or formal burial practices exists.

2.3) The Later Stone Age

Artefacts characteristic of the Later Stone Age (LSA) appear in the archaeological record from 40/27-23kya and incorporates microlithic as well as macrolithic assemblages. Artefacts were produced by modern *H. sapien* or *H. sapien sapien*, who subsisted on a hunter-gatherer way of life (Deacon 1984; Mitchell 2002).

According to Deacon (1984) the LSA can temporally be divided into 4 broad units directly associated with climatic, technological and subsistence changes:

1. Late Pleistocene microlithic assemblages (40-12kya);
2. Terminal Pleistocene / early Holocene non-microlithic assemblages (12-8kya);
3. Holocene microlithic assemblages (8kya to the Historic Period); and
4. Holocene assemblages with pottery (2kya to the Historic Period) closely associated with the influx of pastoralist communities into South Africa (Mitchell 2002).

Elements of material culture characteristic of the LSA reflect modern behavior. Deacon (1984) summarizes these as:

1. Symbolic and representational art (paintings and engravings);
2. Items of personal adornment such as decorated ostrich eggshell, decorated bone tools and beads, pendants and amulets of ostrich eggshell, marine and freshwater shells;
3. Specialized hunting and fishing equipment in the form of bows and arrows, fish hooks and sinkers;
4. A greater variety of specialized tools including bone needles and awls and bone skin-working tools;
5. Specialized food gathering tools and containers such as bored stone digging stick weights, carrying bags of leather and netting, ostrich eggshell water containers, tortoiseshell bowls and scoops and later pottery and stone bowls;
6. Formal burial of the dead in graves (sometimes covered with painted stones or grindstones and accompanied by grave goods);
7. The miniaturization of selected stone tools linked to the practice of hafting for composite tools production; and
8. A characteristic range of specialized tools designed for making some of the items listed above.

➤ Rock Art

Rock Art is one of the most visible and informative components of South Africa's archaeological record. Research into LSA ethnography (as KhoiSan history) has revolutionized our understanding of both painted and engraved (petroglyph) images, resulting in a paradigm shift in Stone Age archaeology (Deacon & Dowson 2001). Paintings are concentrated in the Drakensberg / Maluti mountains, the eastern Free State, the Cape Fold Mountains, the Waterberg Plateau and the Soutpansberg mountains. Engravings on the other hand are found throughout the Karoo, the western Free State and North-West Province (Mitchell 2002). Both forms of LSA art drew upon a common stock of motifs, derived from widely shared beliefs and include a restricted range of naturalistically depicted animals, geometric imagery, human body postures and non-realistic combinations of human and animal figures (anthropomorphic figurines). LSA Rock Art is closely associated with spiritual or magical significance (Lewis-Williams & Dowson 1999).

Aside from LSA or KhoiSan Rock Art, thus art produced by both hunter-gatherer and pastoralist and agro-pastoralist groups, Rock Art produced by Iron Age populations are known to be present towards the north of the country.

➤ Shell Middens ('Strandloper' Cultures)

South Africa's nearly 3,000km coastline is dotted by thousands of shell middens, situated between the high water mark and approximately 5km inland, bearing witness to long-term exploitation of shellfish mainly over the past 12,000 years. These LSA shell middens are easily distinguishable from natural accumulations of shells and deposits can include bones of animals eaten such as shellfish, turtles and seabirds, crustaceans like crabs and crayfish and marine mammal remains of seals, dolphins and occasionally whales. Artefacts and hearth and cooking remains are often found in shell midden deposits. Evidence exist that fish were speared, collected by hand, reed baskets and by means of stone fish traps in tidal pools (Mitchell 2002).

Shell midden remains were in the past erroneously assigned to 'Strandloper cultures'. Deacon & Deacon (1999) explain that 'no biological or cultural group had exclusive rights to coastal resources.' Some LSA groups visited the coast periodically while others stayed year round and it is misleading to call them all by the same name. Two primary sources of archaeological enquiry serves to shed more light on the lifestyles of people who accumulated shell middens, one being the analysis of food remains in the middens itself and the other being the analysis of LSA human skeletal remains of people buried either in shell middens or within reasonable proximity to the coast.

Shell middens vary in character ranging from large sites tens of meters in extent and with considerable depositional depth to fairly small ephemeral collections, easily exposed and destroyed by shifting dune action. Shell middens are also found inland, along rivers where fresh water mussels occur. These middens are often fairly small and less common; in the Eastern Cape often dated to within the past 3,000 years (Deacon & Deacon 1999).

In addition shell middens are not exclusively assigned to LSA cultures; shellfish were exploited during the Last Interglacial, indicating that the practice was most probably continuous for the past 120,000 years (MSA shell middens). Along the coast of KwaZulu-Natal evidence exist for the exploitation of marine food resources by Iron Age communities. These shell middens are easily distinguished from Stone Age middens by particularly rich, often decorated ceramic artefact content. Colonial Period shell middens are quite rare and extremely ephemeral in character; primarily the result of European shipwreck survivors and reported on along the coast of KwaZulu-Natal and the Transkei, Eastern Cape.

3) The Iron Age

For close to 2 millennia people combining cereal agriculture with stock keeping have occupied most of southern Africa's summer rainfall zone. The rapid spread of farming, distinctive ceramics and metallurgy is understood as the expansion of a Bantu-speaking population, in archaeological terms referred to as the Iron Age.

3.1) The Early Iron Age

Ceramic typology is central to current discussions of the expansion of iron using farming communities. The most widely used approach is that of Huffman (1980), who employs a multidimensional analysis (vessel profile, decoration layout and motif) to reconstruct different ceramic types. Huffman (1998) argues that ceramics can be used to trace the movements of people, though not necessarily of specific social or political groupings. Huffman's Urewe Tradition coincides largely with Phillipson's (1977) Eastern Stream. A combined Urewe Tradition / Eastern Stream model for the Early Iron Age can be summarized as:

1. The Kwale branch (extending along the coast from Kenya to KwaZulu-Natal);
2. The Nkope branch (located inland and reaching from southern Tanzania through Malawi and eastern Zambia into Zimbabwe); and
3. The Kalundu branch (stretching from Angola through western Zambia, Botswana and Zimbabwe into South Africa).

In southern Africa, recent work distinguishes two phases of the Kwale branch: The earlier Silver Leaves facies (250-430AD) occurring as far south as the Northern Province. The later expression or Mzonjani facies (420-580AD) occurs in the Northern Province as well as along the KwaZulu-Natal coastal belt (Huffman 1998). Since the Silver Leaves facies is only slightly younger than the Kwale type site in Kenya, very rapid movement along the coast, perhaps partly by boat, is inferred (Klapwijk 1974). Subsequently (550-650AD) people making Mzonjani derived ceramics settled more widely in the interior of South Africa.

Assemblages attributable to the Nkope branch appear south of the Zambezi but north of South Africa from the 5th Century. Ziwa represents an early facies, with Gokomere deriving jointly from Ziwa and Bambata. A subsequent phase is represented by the Zhizo facies of the Shashe-Limpopo basin, and by Taukome (Huffman 1994). Related sites occur in the Kruger National Park (Meyer 1988). Zhizo (7th – 10th Century) is ancestral to the Toutswe tradition which persisted in eastern Botswana into the 13th Century.

Kalundu origins need further investigation; its subsequent development is however better understood. A post Bambata phase is represented by the 5th – 7th Century sites of Happy Rest, Klein Africa and Maunatana in the Northern Province and Mpumalanga (Prinsloo 1974, 1989). Later phases are present at the Lydenburg Heads site (Whitelaw & Moon 1996) and by the succession of Mzuluzi, Ndondonwane and Ntshekane in KwaZulu-Natal (7th – 10th Centuries) (Prins & Grainger 1993). Later Kalundu facies include Klingbeil and Eiland in the northern part of the country (Evers 1980) with Kgopolwe being a lowveld variant in Mpumalanga (10th – 12th Century). Broadhurst and other sites indicate a still later survival in Botswana (Campbell 1991).

Despite the importance accorded to iron agricultural implements in expanding the spread of farming and frequent finds of production debris, metal objects are rare. Metal techniques were simple, with no particular sign of casting, wire drawing or hot working. Jewelry (bangles, beads, pendants etc.) constitute by far the largest number of finds but arrows, adzes, chisels, points and spatulae are known (Miller 1996).

Early Iron Age people were limited to the Miombo and Savannah biomes; excluded from much of the continent's western half by aridity and confined in the south during the 1st millennium to bushveld areas of the old Transvaal. Declining summer rainfall restricted occupation to a diminishing belt close to the East Coast and north of S33° (Maggs 1994); sites such as Canasta Place (800AD), Eastern Cape, mark the southern-most limit of Early Iron Age settlement (Nogwaza 1994).

➤ The Central Cattle Pattern

The Central Cattle Pattern (CCP) was the main cognitive pattern since the Early Iron Age (Huffman 1986). The system can be summarized as opposition between male pastoralism and female agriculture; ancestors and descendants; rulers and subjects; and men and women. Cattle served as the primary means of transaction; they represented symbols exchanged for the fertility of wives, legitimacy of children and appeasement of ancestors. Cattle were also used as tribute to rulers confirming sub-ordination and redistribution as loan cattle by the ruler to gain political support. Cattle represented healing and fertilizing qualities (Huffman 1998; Kuper 1980).

This cognitive and conceptual structure underlies all cultural behavior, including the placement of features in a settlement. The oppositions of male and female, pastoralism and agriculture, ancestors and descendants, rulers and subjects, cool and hot are represented in spatial oppositions, either concentric or diametric (Huffman 1986).

A typical CCP village comprise of a central cattle enclosure (byre) where men are buried. The *Kgotla* (men's meeting place / court) is situated adjacent to the cattle enclosure. Surrounding the enclosure is an arc of houses, occupied according to seniority. Around the outer perimeter of the houses is an arc of granaries where women keep their pots and grinding stones (Huffman 1986). The model varies per ethnic group which helps to distinguish ethnicity throughout the Iron Age, but more studies are required to recognize the patterns.

3.2) The Middle Iron Age

The hiatus of South African Middle Iron Age activity was centered in the Shashe-Limpopo Valley and characterized by the 5-tier hierarchical Mapungubwe State spanning some 30,000km². By the 1st millennium ivory and skins were already exported overseas, with sites like Sofala and Chibueni, Mozambique, interfacing between interior and transoceanic traders. Exotic glass beads, cloth and Middle Eastern ceramics present at southern African sites mark the beginning of the regions incorporation into the expanding economic system that, partly tied together with maritime trading links across the Indian Ocean, increasingly united Africa, Asia and Europe long before Da Gama or Columbus (Eloff & Meyer 1981; Meyer 1998).

Occupation was initially focused at Bambandanyalo and K2. The Bambandanyalo main midden (1030-1220AD) stands out above the surrounding area, reaching more than 6m in places and covering more than 8ha the site may have housed as many as 2,000 people (Meyer 1998). The CCP was not strictly followed; whether this is ideologically significant or merely a reflection of local typography remains unclear. The midden, the size of which may reflect the status of the settlement's ruler, engulfed the byre around 1060-1080AD, necessitating relocation of the cattle previously kept there. The re-organization of space and worldview implied suggests profound social changes even before the sites' abandonment in the early 13th century, when the focus of occupation moved to Mapungubwe Hill, 1 km away (Huffman 1998).

Excavations at Mapungubwe Hill, though only occupied for a few decades (1220-1290AD), yielded a deep succession of gravel floors and house debris (Eloff & Meyer 1981). Huffman (1998) suggests that the suddenness with which Mapungubwe was occupied may imply a deliberate decision to give spatial expression to a new social order in which leaders physically removed themselves from ordinary people by moving onto more inaccessible, higher elevations behind the stone walls demarcating elite residential areas. Social and settlement changes speak of considerable centralization of power and perhaps the elaboration of new ways of linking leaders and subjects.

At Bambandanyalo and Mapungubwe elite burial grave goods include copper, bone, ivory and golden ornaments and beads. Social significance of cattle is reinforced by their importance among the many human and animal ceramic figurines and at least 6 'beast burials' (Meyer 1998).

Today the drought prone Shashe-Limpopo Valley receives less than 350mm of rainfall per annum, making cereal cultivation virtually impossible. The shift to drier conditions in the late 1200's across the Shashe-Limpopo basin and the eastern Kalahari may have been pivotal in the break-up of the Mapungubwe polity, the collapse of Botswana's Toutswe tradition and the emergence of Great Zimbabwe (1220-1550AD), southern Africa's best known and largest (720ha) archaeological site (Meyer 1998).

South of the Limpopo and north of the Soutpansberg, Mapungubwe derived communities survived into the 14th Century, contemporary with the establishment of Sotho-speaking makers of Maloko pottery.

3.3) The Later Iron Age

South African farming communities of the 2nd millennium experienced increased specialization of production and exchange, the development of more nucleated settlement patterns and growing political centralization, albeit not to the same extent as those participating in the Zimbabwe tradition. However, together they form the background to the cataclysmic events of the late 18th / early 19th Century *Mfecane* (Mitchell 2002).

Archaeological evidence of settlement pattern, social organization and ritual practice often differ from those recorded ethnographically. The Moloko ceramic tradition seems to be ancestral to modern Sotho-Tswana speakers (Evers 1980) and from about 1,100AD a second tradition, the Blackburn tradition, appears along South Africa's eastern coastline. Blackburn produced mostly undecorated pottery (Davies 1971), while Mpambanyoni assemblages, reaching as far south as Transkei, includes examples of rim notching, incised lines and burnished ochre slip (Robey 1980). At present, no contemporary farming sites are known further inland in KwaZulu-Natal or the Eastern Cape.

Huffman (1989) argues that similarities between Blackburn and early Maloko wares imply a related origin, presumably in the Chifumbaze of Zambia or the Ivuna of Tanzania, which contains a range of ceramic attributes important in the Blackburn as well as beehive grass huts similar to those made by the Nguni. This is one of the few suggestions of contact between Sotho-Tswana and Nguni speakers on the one hand and farming communities who, if Huffman is correct, were already long established south of the Limpopo. Both ethnographic and archaeological data demonstrate that Sotho-Tswana and Nguni are patrilineal and organize their settlements according to the CCP (Kuper 1980).

From 1,300AD there is increasing evidence for the beginning of agro-pastoralist expansion considerably beyond the area of previous occupation. It is also to this time that the genealogies of several contemporary Bantu speaking groups can be traced (Wilson & Thompson 1969). Associated with this expansion was the regular employment of stone, rather than wood, as building material, an adaptation that has greatly facilitated the discovery and identification of settlements. Maggs (1976) describes 4 basic settlement types all characterized by the use of semi weathered dolomite to produce hard binding *daga* for house floors and a wall building tradition employing larger more regular stones for the inner and outer faces and smaller rubble for the infill. As with the more dispersed homesteads of KwaZulu-Natal and the Eastern Cape, sites tend to be in locally elevated situations, reflecting a deep seated Sotho and Nguni preference for benign higher places rather than supernaturally dangerous riverside localities; another important contrast to both 1st millennium (Maggs 1976) and later Zulu Kingdom settlement patterns (Hall & Maggs 1979).

The lack of evidence for iron production in the interior and eastern part of South Africa emphasize exchange relationships between various groups and associated more centralized polities. By the 19th Century iron production in KwaZulu-Natal was concentrated in particular clans and lineages and associated with a range of social and religious taboos (Maggs 1992). South of Durban comparatively few smelting sites are known (Whitelaw 1991), a trend even more apparent in Transkei (Feely 1987). However, metal remained the most important and archaeologically evident item traded between later farming communities. (Other recorded trade items include glass and ostrich eggshell beads; Indian Ocean seashells; siltstone pipes; *dagga*, and later on tobacco; pigments including ochre, graphite and specularite; hides and salt.)

Rising polity settlements are particularly evident in the north of the country and dated to the 17th Century, including Molokwane, capital of the Bakwena chiefdom (Pistorius 1994) and Kaditshwene, capital of a major section of the Hurutshe, whose population of 20,000 in 1820 almost equals contemporary Cape Town in size (Boeyens 2000). The agglomeration of Tswana settlements in the north of the country was fuelled by both population growth and conflict over access to elephant herds for ivory and long distance trade with the East Coast. During this period ceramic decoration became blander and more standardized than the earlier elaborate decoration that included red ochre and graphite coloring.

The *Mfecane* refers to the wars and population movements of the early 19th Century which culminated in the establishment of the Zulu Kingdom and came to affect much of the interior, even beyond the Zambezi. The late 18th Century was marked by increasing demands for ivory (and slaves) on the part of European traders at Delagoa Bay; as many as 50 tons of ivory were exported annually from 1750-1790. As elephant populations declined, competition increased both for them and for the post 1790 supply of food to European and American whalers calling at Delagoa Bay (Smith 1970). Cattle raiding, conflict over land and changes in climatic and subsistence strategies characterized much of the cultural landscape of the time.

Competition for access to overseas trade encouraged some leaders to replace locally organized circumcision schools and age-sets with more permanently maintained military regiments. These were now used to gain access through warfare to land, cattle and stored food. By 1810 three groups, the Mthethwa, Ndwandwe and Ngwane dominated northern KwaZulu-Natal (Wright 1995). The Mthethwa paramountcy was undermined by the killing of its leader Dingiswayo in circa 1818, which led to a brief period of Ndwandwe dominance. In consequence one of Dingiswayo's former tributaries, Shaka, established often forceful alliances with chiefdoms further south. Shaka's Zulu dominated coalition resisted the Ndwandwe who in return fled to Mozambique. As the Zulu polity expanded it consolidated its control over large areas, incorporating many communities into it. Others sought refuge from political instability by moving south of the Thukela River, precipitating a further *domino effect* as far as the Cape Colony's eastern border (Wright 1995).

4) The Colonial Period

In the 15th Century Admiral Zheng He and his subordinates impressed the power of the Ming Dynasty rulers in a series of voyages as far afield as Java, Sri Lanka, southern Arabia and along the East African coast, collecting exotic animals *en route*. But nothing more came of his expeditions and China never pursued opportunities for trade or colonization (Mote 1991).

Portuguese maritime expansion began around the time of Zheng He's voyages; motivated by a desire to establish a sea route to the riches of the Far East. By 1485 Diogo Cao had reached Cape Cross, 3 years later Bartolomeu Dias rounded the Cape of Good Hope and less than a decade later Vasco da Gama called at several places along South Africa's coast, trading with Khoekhoen (Khoi) at Mossel Bay before reaching Mozambique and crossing the ocean to India. His voyage initiated subsequent Portuguese bases from China to Iraq. In Africa interest was focused on seizing important coastal trading towns such as Sofala and gaining access to the gold of Zimbabwe. Following the 1510 Portuguese-Khoekhoen battle at Table Bay, in which the viceroy of India was killed, Portuguese ships ceased to call along the South African coast (Elphick 1985).

A number of shipwrecks, primarily along the eastern coast attest to Portuguese activity including the Sao Joao, wrecked in 1552 near Port Edward and the Sao Bento, destroyed in 1554 off the Transkei coast. Survivors' accounts provided the 1st detailed information on Africa's inhabitants (Auret & Maggs 1982).

By the late 1500's Portuguese supremacy of the Indian Ocean was threatened. From 1591 numerous Dutch and English ships called at Table Bay and in 1652 the Dutch East India Company (VOC) established a permanent base, with the intent to provide fresh food and water to VOC ships. In an attempt to improve the food supply a few settlers (free burghers) were allowed to establish farms. The establishment of an intensive mixed farming economy failed due to shortages of capital and labor, and free burghers turned to wheat cultivation and livestock farming. While the population grew slowly the area of settlement expanded rapidly with new administrative centers established at Stellenbosch (1676), Swellendam (1743) and Graaf-Reinet (1785). By the 1960's the Colony's frontier was too long to be effectively policed by VOC officials (Elphick 1985).

From the 1700's many settlers expanded inland over the Cape Fold Mountain Belt. The high cost of overland transport constrained the ability to sell their produce while settlement of the interior was increasingly made difficult by resident KhoiSan groups, contributing due to a lack of VOC military support to growing Company opposition in the years before British control of the Cape (1795 / 1806) (Davenport & Saunders 2000).

In 1820 a major British settlement was implanted on the eastern frontier of the Cape Colony, resulting in large numbers of the community moving into the interior, initially to KwaZulu-Natal, and then after Britain annexed Natal (1843), further into the interior to beyond the Vaal River. Disruptions of the *Mfecane* eased their takeover of African lands and the Boers (farmers) established several Republics. A few years later the 2nd South African War saw both the South African and Orange Free State Republics annexed by Britain, a move largely motivated by British desire to control the goldfields of the Witwatersrand. With adjacent regions of the sub-continent also falling, directly or indirectly, under British rule and German colonization of Namibia, European control of the whole of southern Africa was firmly established before the 1st World War (Davenport & Saunders 2000).

➤ Xhosa Iron Age Cultures meets Colonists in the Eastern Cape

From the late 1600's conflict between migrants from the Cape (predominantly Boers) and Xhosa people in the region of the Fish River were strife, ultimately resulting in a series of 9 Frontier Wars (1702-1878) (Milton 1983). Both cultures were heavily based and reliant on agriculture and cattle farming. As more Cape migrants, and later settlers from Britain (1820) and elsewhere arrived, population pressures and competition over land, cattle and good grazing became intense. Cattle raiding became endemic on all sides, with retaliatory raids launched in response. As missionaries arrived with evangelical messages, confrontations with hostile chiefs who saw them as undermining traditional Xhosa ways of life resulted in conflicts which flared into wars.

As pressures between the European settlers and the Xhosa grew, settlers organized themselves into local militia, counteracted by Xhosa warring skills: But both sides were limited by the demands of seasonal farming and the need for labor during harvest. Wars between the Boers and the Xhosa resulted in shifting borders, from the Fish to the Sundays River, but it was only after the British annexed the Cape in 1806 that authorities turned their attention to the Eastern

regions and petitions by the settlers about Xhosa raids. British expeditions, in particular under Colonel John Graham in 1811 and later Harry Smith in 1834, were sent not only to secure the frontier against the Xhosa, but also to impose British authority on the settlers, with the aim to establish a permanent British presence. Military forts were built and permanently manned. Over time the British came to dominate the area both militarily and through occupation with the introduction of British settlers. The imposition of British authority led to confrontations not only with the Xhosa but also with disaffected Boers and other settlers, and other native groups such as the Khoikhoi, the Griqua and the Mpondo. The frontier wars continued over a period of about 150 years; from the 1st arrival of the Cape settlers, and with the intervention of the British military ultimately ending in the subjugation of the Xhosa people. Fighting ended on the Eastern Cape frontier in June 1878 with the annexation of the western areas of the Transkei and administration under the authority of the Cape Colony (Milton 1983).

► The Industrial Revolution

The Industrial Revolution refers roughly to the period between the 18th - 19th Centuries, typified by major changes in agriculture, manufacturing, mining, transport, and technology. Changing industry had a profound effect on socio-economic and socio-cultural conditions across the world: The Industrial Revolution marks a major turning point in human history; almost every aspect of daily life was eventually influenced in some way. Average income and population size began to exhibit unprecedented growth; in the two centuries following 1800 the world's population increased over 6-fold, associated with increasing urbanization and demand of resources. Starting in the latter part of the 18th century, the transition from manual labor towards machine-based manufacturing changed the face of economic activity; including the mechanization of the textile industries, the development of iron-making techniques and the increased use of refined coal. Trade expansion was enabled by the introduction of canals, improved roads and railways. The introduction of steam power fuelled primarily by coal and powered machinery was underpinned by dramatic increases in production capacity. The development of all-metal machine tools in the first two decades of the 19th century facilitated the manufacture of more production machines in other industries (More 2000).

Effects of the Industrial Revolution were widespread across the world, with its enormous impact of change on society, a process that continues today as 'industrialization'.

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Palaeontology

Proposed Bende Bulk Water Supply Scheme near Dutywa, Amatole District Municipality, Eastern Cape

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EXECUTIVE SUMMARY

The Bende Water Supply Scheme proposed by the Amathole District Municipality will be located to the east of the R408 between Dutywa and Willowvale, Eastern Cape. It will comprise a bulk water supply line, bulk storage reservoir (1 ML) as well as six small service reservoirs (20 – 110 kl).

As far as can be determined on the basis of the available satellite images and 1: 250 000 geological maps, all except one of the proposed service reservoirs as well as the bulk storage reservoir will be excavated into Late Permian sedimentary rocks of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). The southwestern-most service reservoir site overlies Karoo dolerite. Likewise, the majority of the bulk water pipeline route overlies Adelaide Subgroup sediments, with sectors in the north and south traversing dolerite (See map Fig. 2). Thick deposits of ancient alluvium are unlikely to be affected by the proposed development.

The Adelaide Subgroup is well known for its rich fossil assemblages of latest Permian vertebrates, plants and trace fossils elsewhere in the Main Karoo Basin. However, the Beaufort Group bedrocks in the study region are generally deeply weathered and mantled in unfossiliferous superficial sediments (e.g. soils, younger alluvium). Furthermore, their original fossil content has locally been compromised by thermal metamorphism (baking) during dolerite intrusion. So far major vertebrate fossil finds are unknown from the study area, although recent impact studies in the region suggest this may be partially due to insufficient palaeontological research. Those sectors of the pipeline route that traverse Karoo dolerite outcrops are of no palaeontological significance.

Significant impacts on local fossil heritage are therefore not anticipated during the construction phase of the Bende WSS development, especially given the comparatively small scale of the bedrock excavations envisaged. Pending the discovery of significant new fossil material (e.g. vertebrate teeth, bones) on site before or during construction, no further specialist palaeontological studies or mitigation are recommended for this project.

The Environmental Control Officer (ECO) for the Bende WSS development should be alerted to the potential for, and scientific significance of, new fossil finds during the construction phase of the development, however. Should substantial fossil remains such as vertebrate bones and teeth, plant-rich fossil lenses or dense fossil burrow assemblages, be exposed during construction a chance-find procedure should be implemented. The ECO should take the appropriate action, which includes:

- Stopping work in the immediate vicinity and fencing off the area with tape to prevent further access;
- Reporting the discovery to the provincial heritage agency, ECPHRA (*i.e.* The Eastern Cape Provincial Heritage Resources Authority. Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za);

- Appointing a palaeontological specialist to inspect, record and (if warranted) sample or collect the fossil remains;
- Implementing any further mitigation measures proposed by the palaeontologist; and
- Allowing work to resume only once clearance is given in writing by the relevant authorities.

The mitigation measures proposed here should be incorporated into the Environmental Management Plan (EMPr) for the Bende WSS project. The palaeontologist concerned with mitigation work would need a valid collection permit from ECPHRA. All work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere to the minimum standards for Phase 2 palaeontological studies recently published by SAHRA (2013).

1. INTRODUCTION

1.1. Outline and location of the proposed development

Amathole District Municipality is proposing to provide a bulk domestic water supply to several rural communities in the area of Bende, situated in the former Transkei area near Dutywa, Eastern Cape (Fig. 1). The supply of bulk water for the proposed Bende Water Supply Scheme (WSS) will be from the existing Dutywa East Water Supply Scheme. The study area is located to the east of the R408 between Dutywa and Willowvale.

The main infrastructural activities concerned in the Bende WSS are as follows (See Fig. 1):

- Construction of a bulk supply line from the Dutywa East Water Supply Scheme to a Bulk Storage Reservoir (110mm diameter uPV pipeline 3100 m long).
- Construction of a Bulk Storage Reservoir (1ML capacity).
- Construction of bulk supply lines between Service Reservoirs (50 mm to 110 mm diameter uPVC and steel pipelines 23 319 m long).
- Construction of Service Reservoirs (6 reinforced concrete reservoirs ranging from 20 kl to 110 kl in size).

Excavations for the reservoirs are unlikely to be more than 1.5 m deep.

The development footprint of the proposed Bende Water Supply Scheme overlies potentially fossiliferous sedimentary rocks of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup) of Late Permian age as well as Early Jurassic dolerite intrusions. A desktop basic assessment study of the potential impact on palaeontological heritage has therefore been commissioned on behalf of Aurecon and the developer by Ms Karen van Ryneveld of ArchaeoMaps - Archaeological and Heritage Consultancy (Contact details: Postnet Suite 239, Private Bag X3, Beacon Bay, 5205. Cell: 084 871 1064. E-mail: kvanryneveld@gmail.com) as part of a broader-ranging HIA, in accordance with the requirements of the National Heritage Resources Act, 1999.

1.2. Legislative context for palaeontological assessment studies

The present desktop palaeontological heritage report falls under Sections 35 and 38 (Heritage Resources Management) of the South African Heritage Resources Act (Act No. 25 of 1999), and it will also inform the Environmental Management Plan for this project.

The proposed development is located in an area that is underlain by potentially fossil-rich sedimentary rocks of Late Permian age as well as Early Jurassic intrusive dolerites and Late Caenozoic superficial sediments (Sections 2 and 3). The construction phase will entail substantial excavations into the superficial sediment cover and in some cases also into the Permian bedrocks. These developments may adversely affect known or potential fossil heritage at or beneath the surface of the ground within the study area by destroying, disturbing or sealing-in fossils that are then no longer available for scientific research or other public good.

The various categories of heritage resources recognised as part of the National Estate in Section 3 of the National Heritage Resources Act include, among others:

- geological sites of scientific or cultural importance;
- palaeontological sites;
- palaeontological objects and material, meteorites and rare geological specimens.

According to Section 35 of the National Heritage Resources Act, dealing with archaeology, palaeontology and meteorites:

(1) The protection of archaeological and palaeontological sites and material and meteorites is the responsibility of a provincial heritage resources authority.

(2) All archaeological objects, palaeontological material and meteorites are the property of the State.

(3) Any person who discovers archaeological or palaeontological objects or material or a meteorite in the course of development or agricultural activity must immediately report the find to the responsible heritage resources authority, or to the nearest local authority offices or museum, which must immediately notify such heritage resources authority.

(4) No person may, without a permit issued by the responsible heritage resources authority—

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites.

(5) When the responsible heritage resources authority has reasonable cause to believe that any activity or development which will destroy, damage or alter any archaeological or palaeontological site is under way, and where no application for a permit has been submitted and no heritage resources management procedure in terms of section 38 has been followed, it may—

(a) serve on the owner or occupier of the site or on the person undertaking such development an order for the development to cease immediately for such period as is specified in the order;

(b) carry out an investigation for the purpose of obtaining information on whether or not an archaeological or palaeontological site exists and whether mitigation is necessary;

(c) if mitigation is deemed by the heritage resources authority to be necessary, assist the person on whom the order has been served under paragraph (a) to apply for a permit as required in subsection

(4); and

(d) recover the costs of such investigation from the owner or occupier of the land on which it is believed an archaeological or palaeontological site is located or from the person proposing to undertake the development if no application for a permit is received within two weeks of the order being served.

Minimum standards for the palaeontological component of heritage impact assessment reports (PIAs) have recently been published by SAHRA (2013).

1.3. Approach to the desktop study

This palaeontological specialist report provides an assessment of the observed or inferred palaeontological heritage within the study area, with recommendations for further specialist

palaeontological input where this is considered necessary. The information used in this desktop study was based on the following:

1. A short project outline (BID) by Aurecon and additional background information kindly supplied by ArchaeoMaps - Archaeological and Heritage Consultancy;
2. A review of the relevant scientific literature, including published geological maps and accompanying sheet explanations, satellite images as well as a previous palaeontological desktop study for the Dutywa region by Almond (2012);
3. The author's previous field experience with the formations concerned and their palaeontological heritage;
4. A review of Eastern Cape fossil heritage produced for SAHRA by Almond *et al.* (2008).

In preparing a palaeontological desktop study the potentially fossiliferous rock units (groups, formations *etc*) represented within the study area are determined from geological maps. The known fossil heritage within each rock unit is inventoried from the published scientific literature, previous palaeontological impact studies in the same region, and the author's field experience (Consultation with professional colleagues as well as examination of institutional fossil collections may play a role here, or later following field assessment during the compilation of the final report). This data is then used to assess the palaeontological sensitivity of each rock unit to development (Provisional tabulations of palaeontological sensitivity of all formations in the Western, Eastern and Northern Cape have already been compiled by J. Almond and colleagues; *e.g.* Almond *et al.* 2008). The likely impact of the proposed development on local fossil heritage is then determined on the basis of (1) the palaeontological sensitivity of the rock units concerned and (2) the nature and scale of the development itself, most significantly the extent of fresh bedrock excavation envisaged. When rock units of moderate to high palaeontological sensitivity are present within the development footprint, a Phase 1 field assessment study by a professional palaeontologist is usually warranted to identify any palaeontological hotspots and make specific recommendations for any mitigation required before or during the construction phase of the development.

On the basis of the desktop and Phase 1 field assessment studies, the likely impact of the proposed development on local fossil heritage and any need for specialist mitigation are then determined. Adverse palaeontological impacts normally occur during the construction rather than the operational or decommissioning phase. Phase 2 mitigation by a professional palaeontologist – normally involving the recording and sampling of fossil material and associated geological information (*e.g.* sedimentological data) may be required (a) in the pre-construction phase where important fossils are already exposed at or near the land surface and / or (b) during the construction phase when fresh fossiliferous bedrock has been exposed by excavations. To carry out mitigation, the palaeontologist involved will need to apply for a palaeontological collection permit from the relevant heritage management authority *e.g.* ECPHRA for the Eastern Cape (Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; Email: smokhanya@ecphra.org.zaso). It should be emphasized that, *providing appropriate mitigation is carried out*, the majority of developments involving bedrock excavation can make a *positive* contribution to our understanding of local palaeontological heritage.

1.4. Assumptions & limitations

The accuracy and reliability of palaeontological specialist studies as components of heritage impact assessments are generally limited by the following constraints:

1. Inadequate database for fossil heritage for much of the RSA, given the large size of the country and the small number of professional palaeontologists carrying out fieldwork here. Most development study areas have never been surveyed by a palaeontologist.

2. Variable accuracy of geological maps which underpin these desktop studies. For large areas of terrain these maps are largely based on aerial photographs alone, without ground-truthing. The maps generally depict only significant (“mappable”) bedrock units as well as major areas of superficial “drift” deposits (alluvium, colluvium) but for most regions give little or no idea of the level of bedrock outcrop, depth of superficial cover (soil *etc*), degree of bedrock weathering or levels of small-scale tectonic deformation, such as cleavage. All of these factors may have a major influence on the impact significance of a given development on fossil heritage and can only be reliably assessed in the field.
3. Inadequate sheet explanations for geological maps, with little or no attention paid to palaeontological issues in many cases, including poor locality information;
4. The extensive relevant palaeontological “grey literature” - in the form of unpublished university theses, impact studies and other reports (*e.g.* of commercial mining companies) - that is not readily available for desktop studies;
5. Absence of a comprehensive computerized database of fossil collections in major RSA institutions which can be consulted for impact studies. A Karoo fossil vertebrate database is now accessible for impact study work.

In the case of palaeontological desktop studies without supporting Phase 1 field assessments these limitations may variously lead to either:

(a) *underestimation* of the palaeontological significance of a given study area due to ignorance of significant recorded or unrecorded fossils preserved there, or

(b) *overestimation* of the palaeontological sensitivity of a study area, for example when originally rich fossil assemblages inferred from geological maps have in fact been destroyed by tectonism or weathering, or are buried beneath a thick mantle of unfossiliferous “drift” (soil, alluvium *etc*).

Since most areas of the RSA have not been studied palaeontologically, a palaeontological desktop study usually entails *inferring* the presence of buried fossil heritage within the study area from relevant fossil data collected from similar or the same rock units elsewhere, sometimes at localities far away. Where substantial exposures of bedrocks or potentially fossiliferous superficial sediments are present in the study area, the reliability of a palaeontological impact assessment may be significantly enhanced through field assessment by a professional palaeontologist.

In the present case, useful data on local field conditions in the Dutywa area was kindly provided by Ethembeni Cultural Heritage who have previously conducted field assessments in the area (*cf* Almond 2012). As anticipated, bedrock exposure in the area is very limited and bedrocks are highly weathered. For these reasons, a separate palaeontological field assessment was considered unnecessary by the author, since little would be achieved by it.



Fig. 1: Google earth© satellite image of the Bende WSS study area to the southeast of Dutywa, Eastern Cape. The proposed routes of the bulk water supply lines are indicated in red, for the most part following existing roads. The proposed locations of the 6 small service reservoirs are indicated by red symbols ® and the 1 ML bulk storage reservoir by the red square. Reddish-brown areas are underlain by dolerite intrusions.

2. GEOLOGY OF THE STUDY AREA

As seen on satellite images, the study area between Dutywa and Willowvale is situated on the south-eastern side of the N2 trunk road some 30 km northeast of Butterworth, Eastern Cape (Fig. 1). The terrain is rolling hilly country, dissected by tributaries of the meandering Mbashe River in the north and the Qora River in the south, that is largely occupied by farmland and numerous small human settlements, with denser vegetation along river courses. Inland, near Dutywa the rolling landscape lies at around 800 to 600m amsl, while the lower-lying coastal sector north of Willowvale is much more dissected by innumerable small dendritic drainage systems. The Bende WSS development footprint lies at around 650 to 800 m amsl. Bedrock exposure here is generally very poor indeed, and probably largely confined to the banks of more deeply incised river courses. Locally cultivated areas and areas of donga erosion show reddish-brown soils suggesting extensive subtropical lateritic weathering of dolerites and other bedrocks (Fig. 1).

The geology of the Dutywa –Willowvale study area is shown on the 1: 250 000 geology sheet 3228 Kei Mouth published by the Council for Geoscience, Pretoria (Fig. 2). A very brief sheet explanation for this map has been published by Johnson & Caston (1979). The study area is largely underlain by continental (fluvial) sediments of the **Lower Beaufort Group (Adelaide Subgroup)** of Late Permian age (Pa). Slightly younger, Early Triassic sediments of the Katberg Formation (Tarkstad Subgroup / Upper Beaufort Group) near Dutywa itself will not be directly affected by the proposed WSS development and are not treated further here.

These Karoo Supergroup sediments are extensively intruded and baked by large dolerite sills of Early Jurassic age (**Karoo Dolerite Suite**, Jd). Close to Dutywa, but outside the present study area, the Palaeozoic bedrocks are overlain by substantial **alluvial deposits** of probable Late Caenozoic (Quaternary – Recent) age, shown in pale yellow on the geological map. Smaller scale alluvial deposits are also expected within the study area itself, but are not mapped here at 1: 250 000 scale.

As far as can be determined on the basis of the available satellite images and 1: 250 000 geological maps (Figs. 1 & 2), all except one of the proposed service reservoirs as well as the bulk storage reservoir will be excavated into Adelaide Subgroup sediments (The southwestern-most service reservoir site overlies dolerite). Likewise, the majority of the bulk water pipeline route overlies Adelaide Subgroup sediments, with sectors in the north south traversing dolerite.

The main geological units represented within the broader Dutywa –Willowvale study area are briefly described here, paying special attention to those formations that may be of palaeontological heritage significance.

2.1. Beaufort Group

The continental (mainly fluvial and lacustrine) sediments of the Beaufort Group range in age from Late Permian to Early Triassic, generally increasing in age across the study area as one moves from the northwest towards the southeast. A useful overview of this internationally famous rock succession has been given by Johnson *et al.* (2006). Due to the absence of unambiguous sandstone marker horizons, the Adelaide Subgroup is not subdivided into individual formations on the Kei Mouth sheet (Johnson & Caston 1979). It is apparent from biostratigraphic (*i.e.* fossil-based) mapping, however, that only the upper, Late Permian portion of the Adelaide Subgroup is present within the study area, corresponding to the **Dicynodon Assemblage Zone** (Rubidge 2005, Van der Walt *et al.* 2010; see also Fig. 3 and Section 3 below). The succession here is therefore broadly equivalent to the **Balfour Formation** that is recognised at the top of the Adelaide Subgroup succession within the Main Karoo Basin to the east of 24° East (Rubidge 2005, Johnson *et al.* 2006).

Geological and palaeoenvironmental analyses of the Lower Beaufort Group sediments in the Great Karoo region have been conducted by a number of workers. Key references within an extensive scientific literature include various papers by Roger Smith (*e.g.* Smith 1979, 1980, 1986, 1987,

1988, 1989, 1990, 1993a, 1993b, Stear 1978, 1980), as well as several informative field guides (e.g. Smith *et al.* 2002, Cole & Smith 2008). In brief, these thick successions of clastic sediments were laid down by a series of large, meandering rivers within a subsiding basin over a period of some ten or more million years within the Late Permian Period (c. 265-251 Ma). Sinuous sandstone bodies of lenticular cross-section represent ancient channel infills, while thin (<1.5m), laterally-extensive sandstone beds were deposited by crevasse splays during occasional overbank floods. The bulk of the Beaufort sediments are greyish-green to reddish-brown or purplish mudrocks ("mudstones" = fine-grained claystones and slightly coarser siltstones) that were deposited over the floodplains during major floods. Thin-bedded, fine-grained playa lake deposits also accumulated locally where water ponded-up in floodplain depressions and are associated with distinctive fossil assemblages (e.g. fish, amphibians, coprolites or fossil droppings, arthropod, vertebrate and other trace fossils).

Frequent development of fine-grained pedogenic (soil) limestone or calcrete as nodules and more continuous banks indicates that semi-arid, highly seasonal climates prevailed in the Late Permian Karoo. This is also indicated by the frequent occurrence of sand-infilled mudcracks and silicified gypsum "desert roses" (Smith 1980, 1990, 1993a, 1993b). Highly continental climates can be expected from the palaeogeographic setting of the Karoo Basin at the time – embedded deep within the interior of the Supercontinent Pangaea and in the rainshadow of the developing Gondwanide Mountain Belt. Fluctuating water tables and redox processes in the alluvial plain soil and subsoil are indicated by interbedded mudrock horizons of contrasting colours. Reddish-brown to purplish mudrocks probably developed during drier, more oxidising conditions associated with lowered water tables, while greenish-grey mudrocks reflect reducing conditions in waterlogged soils during periods of raised water tables. However, diagenetic (post-burial) processes also greatly influence predominant mudrock colour (Smith 1990).

2.2. Karoo Dolerite Suite

The Permo-Triassic Beaufort Group sediments across the study area are extensively intruded and thermally metamorphosed (baked) by subhorizontal sills and steeply inclined dykes of the **Karoo Dolerite Suite** (Jd). These Early Jurassic (c. 183 Ma) basic intrusions were emplaced during crustal doming and stretching that preceded the break-up of Gondwana (Duncan and Marsh 2006). The hot dolerite magma baked adjacent Beaufort Group mudrocks and sandstones to form splintery hornfels and quartzites respectively. Blocky colluvium and corestones released by weathering and erosion of the dolerites blanket many mountain slopes, often obscuring the underlying fossiliferous Beaufort Group sediments. Reddish-brown soils seen in the study area in satellite images (Fig. 1) may well reflect lateritic weathering of doleritic bedrocks.

2.3. Superficial deposits

Various types of **superficial deposits** ("drift") of Late Caenozoic (largely Quaternary to Recent) age occur widely throughout the Karoo region, including in the study area. They include pedocretes (e.g. calcretes or soil limestones), colluvial slope deposits (sandstone and dolerite scree, downwasted gravels *etc*), sheet wash, river channel alluvium and terrace gravels, as well as spring and pan sediments (Johnson & Keyser 1979, Le Roux & Keyser 1988, Cole *et al.*, 2004, Partridge *et al.* 2006). Only the larger tracts of Quaternary to Recent **alluvium** overlying the Beaufort Group bedrock that are associated with the larger drainage courses are shown on the 1:250 000 geological maps (e.g. alluvial deposits near Dutywa). The levels of potentially fossiliferous bedrock outcrop *versus* superficial sediment cover within the study area cannot be accurately estimated on the basis of the satellite images available; they can only be determined through fieldwork. According to archaeologists of Ethembeni Cultural Heritage, however, superficial sediment cover within the study region is very high (Almond 2012).

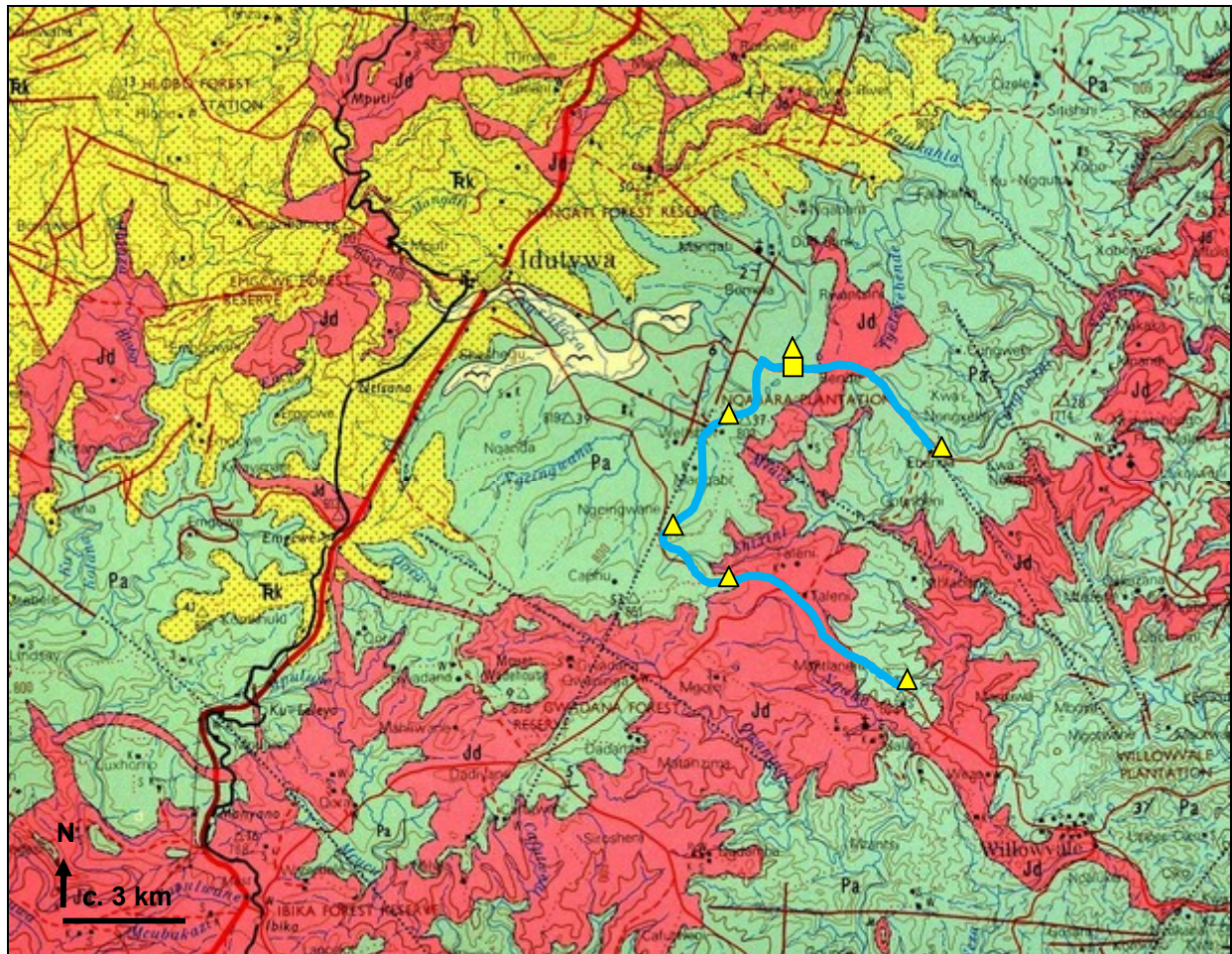


Fig. 2. Extract from 1: 250 000 geology sheet 3228 Kei Mouth (Council for Geoscience, Pretoria) covering the Bende WSS study area to the southeast of Dutywa (blue line = bulk water pipeline). The proposed locations of the 6 small service reservoirs are indicated by yellow triangles and the 1 ML bulk storage reservoir by the yellow square.

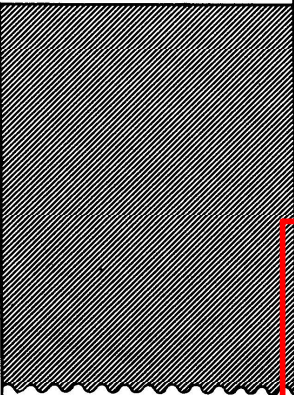
Rock units represented within the study area include:

Late Permian Adelaide Subgroup (Beaufort Group, Karoo Supergroup) (Pa, green)

Early Jurassic Karoo Dolerite Suite (Jd, pink)

Late Caenozoic superficial deposits such as alluvium are not mapped at this scale in the study area but are shown closer to Dutywa (pale yellow with flying bird symbol).

Black dotted lines indicate linear structures identified on Landsat satellite images.

			WEST OF 24°E	EAST OF 24°E	NORTHERN OFS	ASSEMBLAGE ZONE	
PERMIAN	BEAUFORT GROUP	TARKASTAD SUBGROUP		MOLTENO F.	MOLTENO F.		
				BURGERSDORP F.	DRIEKOPPEN F.	<i>Cynognathus</i>	
				KATBERG F.	VERKYKERSKOP F.	<i>Lystrosaurus</i>	
				Palingkloof M.	Harrismith M.	<i>Dicynodon</i>	
				Elandsberg M.	Schoondraai M.		
	Barberskrans M.						
	ECCA GROUP	ADELAIDE SUBGROUP	TEEKLOOF F.	BALFOUR F.	Daggaboersnek M.	NORMANDIEN F.	
					Oudeberg M.	Rooinekke M.	
					Steenkampsvlakte M.	Frankfort M.	
					Oukloof M.		<i>Cistecephalus</i>
Hoedemaker M.					MIDDLETON F.	<i>Tropidostoma</i>	
Poortjie M.		<i>Pristerognathus</i>					
ABRAHAMSKRAAL F.	KOONAP F.	VOLKSRUST F.	<i>Tapinocephalus</i>				
KOEDOESBERG F./ WATERFORD F.	WATERFORD F./ FORT BROWN F.		<i>Eodicynodon</i>				


 Sandstone-rich unit

Fig. 3: Chart showing the lithostratigraphic (rock-based) and biostratigraphic (fossil-based) subdivisions of the Beaufort Group with rock units and fossil assemblage zones that are most likely to be relevant to the present study area outlined in red (Modified from Rubidge 1995). The precise horizon and fossil assemblages within the area remain uncertain due to lack of field data.

3. PALAEONTOLOGICAL HERITAGE

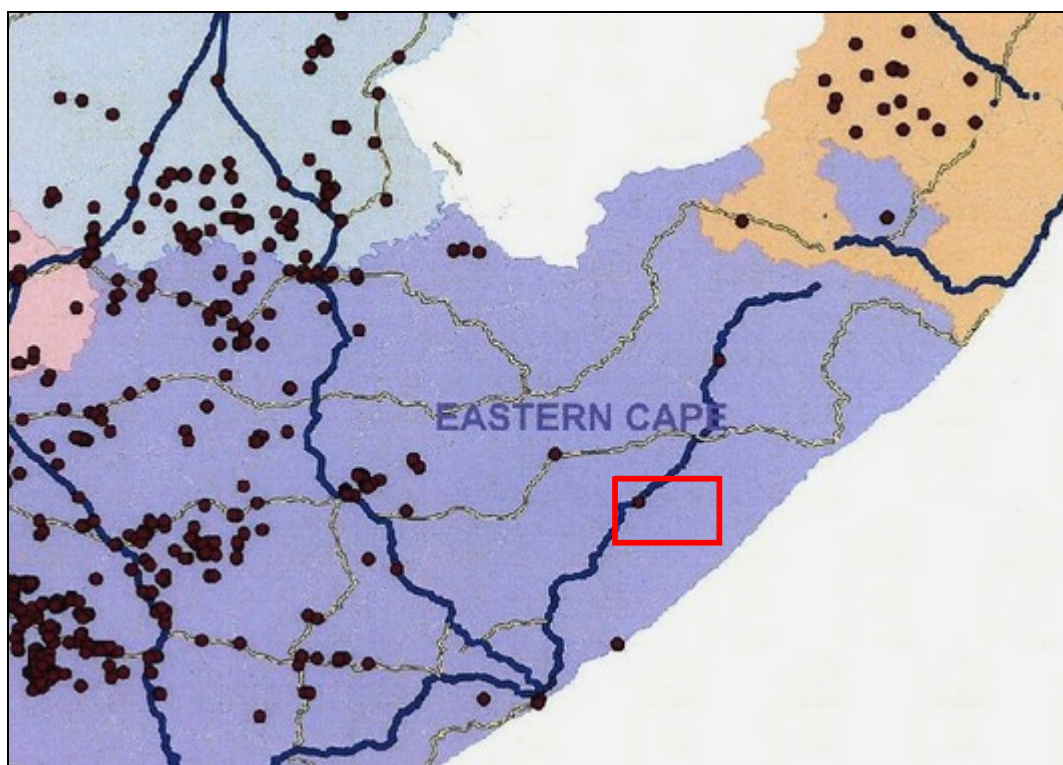


Fig. 4 : Plot of known Beaufort Group fossil localities within the eastern portion of the Eastern Cape (Modified from Nicolas 2007). Note paucity of fossil sites in the entire region, including the present study area (red rectangle) with the exception of one site near Dutywa (probably in the Early Triassic Katberg Formation).

3.1. Fossils within the Adelaide Subgroup

The overall palaeontological sensitivity of the Beaufort Group sediments is high to very high (Almond *et al.* 2008). These continental sediments have yielded one of the richest fossil records of land-dwelling plants and animals of Permo-Triassic age anywhere in the world (MacRae 1999, Rubidge 2005, McCarthy & Rubidge 2005, Smith *et al.* 2012). Bones and teeth of Late Permian tetrapods have been collected in the Great Karoo region since at least the 1820s and this region remains a major focus of palaeontological research in South Africa.

Middle Permian to earliest Triassic vertebrate fossil assemblages of the lower Beaufort Group are dominated by a variety of small to large true reptiles and – more especially – by a wide range of therapsids. This last group of animals are also commonly, but misleadingly, known as “mammal-like reptiles” or protomammals (*e.g.* Cluver 1978, Rubidge 1995, MacRae 1999). By far the most abundant group among the Late Permian therapsids are the dicynodonts, an extinct group of two-tusked herbivorous therapsids. Other important therapsid subgroups are the dinocephalians, gorgonopsians, therocephalians and cynodonts. Aquatic animals include large, crocodile-like temnospondyl amphibians and various primitive bony fish (palaeoniscoids).

A high proportion of the tetrapod (*i.e.* four-limbed, terrestrial vertebrate) fossils from the Beaufort Group are found within the overbank mudrocks. They are very commonly encased within calcrete or pedogenic limestone that often obscures their anatomy and makes such fossils difficult to recognise in the field, even for experienced palaeontologists (Smith 1993a,b). Rarer fossil specimens preserved within the Beaufort Group sandstones are usually disarticulated and fragmentary due to extensive, pre-burial transport. Occasionally vertebrate fossils are found

embedded within baked (thermally metamorphosed) mudrocks or hornfels in the vicinity of dolerite intrusions. However, such fossils are extremely difficult to prepare out in the laboratory and so are generally of limited scientific value.

Key studies on the taphonomy (pre-burial history) of Late Permian vertebrate remains in the Great Karoo have been carried out in the Beaufort West area and have yielded a wealth of fascinating data on Late Permian terrestrial wildlife and palaeoenvironments (e.g. Smith 1980, 1993a). Therapsid fossils are most abundant and best preserved (well-articulated) within muddy and silty overbank sediments deposited on the proximal floodplain (i.e. close to the river channel). Here they are often associated with scoured surfaces and mature palaeosols (ancient soils), these last indicated by abundant calcrete nodules. In the distal floodplain sediments, far from water courses, fossils are rarer and mostly disarticulated. Channel bank sediments usually contain few fossils, mostly disarticulated, but occasionally rich concentrations of calcrete-encrusted remains, some well-articulated, are found. These dense bone assemblages may have accumulated in swale fills or chute channels which served as persistent water holes after floods (Smith 1993a). Such detailed interdisciplinary field studies re-emphasise how essential it is that fossil collecting be undertaken by experienced professionals with a good grasp of relevant sedimentology as well as palaeontology, lest invaluable scientific data be lost in the process.

Plant fossils in the lower Beaufort Group are poorly represented and often very fragmentary (cf. Anderson & Anderson 1985, dealing primarily with material from the eastern Karoo Basin, Gastaldo *et al.* 2005, dealing with Permo-Triassic boundary floras in the Main Karoo Basin). They belong to the *Glossopteris* Flora that is typical of Permian Gondwana and include reedy sphenophytes or “horsetails” (Arthrophyta, now recognised as a fern subgroup) and distinctive tongue-shaped leaves of the primitive, tree-sized gymnosperm *Glossopteris*. Well-preserved petrified wood (“*Dadoxylon*”) occurs widely and may prove of biostratigraphic and palaeoecological value in future (e.g. Bamford 1999, 2004). Elongate plant root casts or *rhizoliths* are frequently found associated with calcrete nodule horizons. Transported plant debris preserved within channel sandstones is often associated with secondary iron (“*koffieklip*”) and uranium mineralization (Cole & Smith 2008 and refs. therein).

Mid to Late Permian invertebrate fossils from the western Karoo Basin comprise almost exclusively relatively featureless, thin-shelled freshwater bivalves, while fairly low diversity insect faunas are recorded from plant-rich horizons further east. The most prominent vertebrate trace fossils in the Lower Beaufort Group are well-preserved tetrapod trackways attributed to various groups of reptiles and therapsids (Smith 1993a), as well as substantial, inclined to helical scratch burrows that were probably constructed by smaller therapsids as an adaptation to the highly seasonal, and occasionally extreme, continental climates at high palaeolatitudes of 60-70° S. (Smith 1987). Invertebrate trace fossils include the locally abundant scratch burrows of the ichnogenus *Scoyenia* that are generally attributed to infaunal arthropods such as insects or even earthworms. Diverse freshwater ichnofaunas (trace fossil assemblages) with trails, burrows and trackways generated by fish, snails, arthropods, worms and other animals have been recorded by Smith (1993a, Smith & Almond 1998).

A recent plot of Beaufort Group fossil sites recorded within the Main Karoo Basin by Nicolas (2007) shows a marked absence of localities within the eastern portion of the Eastern Cape Province (Fig. 4 herein). No specific fossil occurrences are noted for the Kei Mouth sheet area by Johnson and Caston (1979). This is probably due mainly to the very low levels of bedrock exposure here (due to extensive vegetation and soil cover) as well as the high levels of bedrock weathering under warm, moist climatic conditions since Late Cretaceous times.

Furthermore, as a consequence of their proximity to large dolerite intrusions, the Beaufort Group sediments in the study region have often been thermally metamorphosed or “baked” (i.e. recrystallised, impregnated with secondary minerals). Embedded fossil material of phosphatic composition, such as bones and teeth, is frequently altered by baking and may be very difficult to extract from the hard matrix by mechanical preparation (Smith & Keyser, p. 23 in Rubidge 1995). Thermal metamorphism by dolerite intrusions therefore tends to reduce the palaeontological heritage potential of Beaufort Group sediments.

It should be noted, however, that recent palaeontological impact studies in the former Transkei region have begun to yield important new fossil remains from the Beaufort Group (Dr R. Gess, pers. comm., 2012). It appears that previous lack of attention from research scientists has probably been a major limiting factor in limiting our understanding of the Karoo palaeontology of this region.

A chronological series of mappable fossil biozones or assemblage zones (AZ), defined mainly on their characteristic tetrapod faunas, has been established for the Main Karoo Basin of South Africa (Rubidge 1995, 2005, Smith *et al.* 2012) (Fig. 3). Maps showing the distribution of the Beaufort assemblage zones within the Main Karoo Basin have been provided by Kitching (1977), Keyser and Smith (1977-78) and Rubidge (1995, 2005). An updated version based on a comprehensive GIS fossil database is now available (Nicolas 2007, Van der Walt *et al.* 2010). According to the most recent Karoo Supergroup biozone map (Van der Walt, in press), the Lower Beaufort Group sediments in the study area belong to the latest Permian *Dicynodon* Assemblage Zone.

3.1.1. The *Dicynodon* Assemblage Zone

A Lower Beaufort sediments close to the Katberg sandstone outcrop area near Dutywa can be equated with the upper part of the Balfour Formation to the southwest, the greater part of which is characterised by Late Permian fossil biotas of the ***Dicynodon* Assemblage Zone**. This biozone has been assigned to the Changhsingian Stage (= Late Tartarian) right at the end of the Permian Period, with an approximate age range of 253.8-251.4 million years (Rubidge 1995, 2005). Good accounts, with detailed faunal lists, of the fossil biotas of the *Dicynodon* Assemblage Zone have been given by Kitching (*in* Rubidge 1995), Cole *et al.* (2004) and Smith *et al.* (2012). See also the reviews by Cluver (1978), MacRae (1999), McCarthy & Rubidge (2005) and Almond *et al.* (2008). In general, the following broad categories of fossils might be expected within the Balfour Formation:

- isolated petrified bones as well as articulated skeletons of terrestrial vertebrates such as true **reptiles** (notably large pareiasaurs, small millerettids) and **therapsids** (diverse dicynodonts such as *Dicynodon* and the much smaller *Diictodon*, gorgonopsians, therocephalians such as *Therapsognathus*, primitive cynodonts like *Procynosuchus*, and biarmosuchians) (See Fig. 5 herein);
- aquatic vertebrates such as large temnospondyl **amphibians** like *Rhinesuchus* (usually disarticulated), and palaeoniscoid **bony fish** (*Atherstonia*, *Namaichthys*);
- freshwater **bivalves**;
- **trace fossils** such as worm, arthropod and tetrapod burrows and trackways, coprolites;
- **vascular plant remains** including leaves, twigs, roots and petrified woods ("*Dadoxylon*") of the *Glossopteris* Flora (usually sparse, fragmentary), especially glossopterids and arthropytes (horsetails).

From a palaeontological viewpoint, these diverse *Dicynodon* Assemblage Zone biotas are of extraordinary interest in that they provide some of the best available evidence for the last flowering of ecologically-complex terrestrial ecosystems immediately preceding the catastrophic end-Permian mass extinction (e.g. Smith & Ward, 2001, Rubidge 2005, Retallack *et al.*, 2006, Smith & Botha 2005, Botha & Smith 2006, 2007).

As far as the biostratigraphically important tetrapod remains are concerned, the best fossil material is generally found within overbank mudrocks, whereas fossils preserved within channel sandstones tend to be fragmentary and water-worn (Rubidge 1995, Smith 1993). Many fossils are found in association with ancient soils (palaeosol horizons) that can usually be recognised by bedding-parallel concentrations of calcrete nodules. The abundance and variety of fossils within the *Dicynodon* Assemblage Zone decreases towards the top of the succession (Cole *et al.*, 2004).

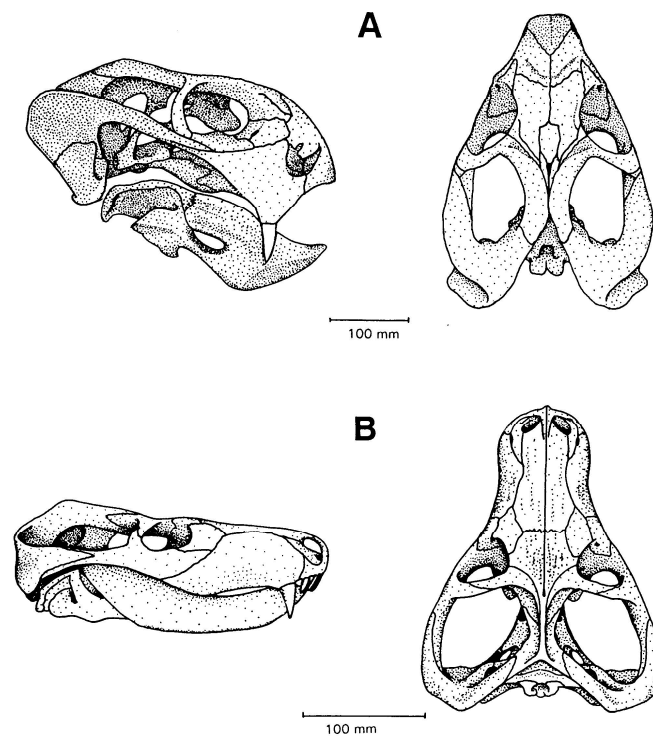


Fig. 5: Skulls of key therapsids (“mammal-like reptiles”) from the Late Permian *Dicynodon* Assemblage Zone: the dicynodont *Dicynodon* and the therocephalian *Theriognathus* (From Kitching in Rubidge 1995).

3.2. Fossils in the Karoo Dolerite Suite

Dolerite outcrops within the study area are in themselves of no palaeontological significance since these are high temperature igneous rocks emplaced at depth within the Earth’s crust. However, as a consequence of their proximity to large dolerite intrusions the adjacent Lower Beaufort Group sediments have often been thermally metamorphosed or “baked” (*i.e.* recrystallised, impregnated with secondary minerals). Embedded fossil material of phosphatic composition, such as bones and teeth, was frequently altered by baking. Bones may become blackened and they can be very difficult to extract from the hard matrix by mechanical preparation (Smith & Keyser 1995b). Thermal metamorphism by dolerite intrusions therefore tends to *reduce* the palaeontological heritage potential of adjacent Beaufort Group sediments.

3.3. Fossils in Late Caenozoic superficial sediments

The Karoo “drift” deposits have been comparatively neglected in palaeontological terms for the most part. However, they may occasionally contain important fossil biotas, notably the bones, teeth and horn cores of mammals (*e.g.* Pleistocene mammal faunas at Florisbad, Cornelia and Erfkroon, Free State and elsewhere; Wells & Cooke 1942, Cooke 1974, Skead 1980, Klein 1984, Brink, J.S. 1987, Bousman *et al.* 1988, Bender & Brink 1992, Brink *et al.* 1995, MacRae 1999, Churchill *et al.* 2000 Partridge & Scott 2000) including skeletal remains of early humans (Grine *et al.* 2007). Other late Caenozoic fossil biotas from these superficial deposits include non-marine molluscs (bivalves, gastropods), ostrich egg shells, trace fossils (*e.g.* calcretised termitaria, coprolites), and plant remains such as palynomorphs in organic-rich alluvial horizons (Scott 2000) and diatoms in pan sediments.

4. CONCLUSIONS & RECOMMENDATIONS

As far as can be determined on the basis of the available satellite images and 1: 250 000 geological maps, all except one of the proposed service reservoirs as well as the bulk storage reservoir will be excavated into Late Permian sedimentary rocks of the Adelaide Subgroup (Beaufort Group, Karoo Supergroup). The southwestern-most service reservoir site overlies Karoo dolerite. Likewise, the majority of the bulk water pipeline route overlies Adelaide Subgroup sediments, with sectors in the north and south traversing dolerite (See map Fig. 2). Thick deposits of ancient alluvium are unlikely to be affected by the proposed development.

The Adelaide Subgroup is well known for its rich fossil assemblages of latest Permian vertebrates, plants and trace fossils elsewhere in the Main Karoo Basin. However, the Beaufort Group bedrocks in the study region are generally deeply weathered and mantled in unfossiliferous superficial sediments (e.g. soils, younger alluvium). Furthermore, their original fossil content has locally been compromised by thermal metamorphism (baking) during dolerite intrusion. So far major vertebrate fossil finds are unknown from the study area, although recent impact studies in the region suggest this may be partially due to insufficient palaeontological research. Those sectors of the pipeline route that traverse Karoo dolerite outcrops are of no palaeontological significance.

Significant impacts on local fossil heritage are therefore not anticipated during the construction phase of the Bende WSS development, especially given the comparatively small scale of the bedrock excavations envisaged. Pending the discovery of significant new fossil material (e.g. vertebrate teeth, bones) on site before or during construction, no further specialist palaeontological studies or mitigation are recommended for this project.

The Environmental Control Officer (ECO) for the Bende WSS development should be alerted to the potential for, and scientific significance of, new fossil finds during the construction phase of the development, however. Should substantial fossil remains such as vertebrate bones and teeth, plant-rich fossil lenses or dense fossil burrow assemblages, be exposed during construction a chance-find procedure should be implemented. The ECO should take the appropriate action, which includes:

- Stopping work in the immediate vicinity and fencing off the area with tape to prevent further access;
- Reporting the discovery to the provincial heritage agency, ECPHRA (*i.e.* The Eastern Cape Provincial Heritage Resources Authority. Contact details: Mr Sello Mokhanya, 74 Alexander Road, King Williams Town 5600; smokhanya@ecphra.org.za);
- Appointing a palaeontological specialist to inspect, record and (if warranted) sample or collect the fossil remains;
- Implementing any further mitigation measures proposed by the palaeontologist; and
- Allowing work to resume only once clearance is given in writing by the relevant authorities.

The mitigation measures proposed here should be incorporated into the Environmental Management Plan (EMPr) for the Bende WSS project. The palaeontologist concerned with mitigation work would need a valid collection permit from ECPHRA. All work would have to conform to international best practice for palaeontological fieldwork and the study (e.g. data recording fossil collection and curation, final report) should adhere to the minimum standards for Phase 2 palaeontological studies recently published by SAHRA (2013).

5. ACKNOWLEDGEMENTS

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7. QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Dr John Almond has an Honours Degree in Natural Sciences (Zoology) as well as a PhD in Palaeontology from the University of Cambridge, UK. He has been awarded post-doctoral research fellowships at Cambridge University and in Germany, and has carried out palaeontological research in Europe, North America, the Middle East as well as North and South Africa. For eight years he was a scientific officer (palaeontologist) for the Geological Survey / Council for Geoscience in the RSA. His current palaeontological research focuses on fossil record of the Precambrian - Cambrian boundary and the Cape Supergroup of South Africa. He has recently written palaeontological reviews for several 1: 250 000 geological maps published by the Council for Geoscience and has contributed educational material on fossils and evolution for new school textbooks in the RSA.

Since 2002 Dr Almond has also carried out palaeontological impact assessments for developments and conservation areas in the Western, Eastern and Northern Cape under the aegis of his Cape Town-based company *Natura Viva cc*. He is a long-standing member of the Archaeology, Palaeontology and Meteorites Committee for Heritage Western Cape (HWC) and an advisor on palaeontological conservation and management issues for the Palaeontological Society of South Africa (PSSA), HWC and SAHRA. He is currently compiling technical reports on the provincial palaeontological heritage of Western, Northern and Eastern Cape for SAHRA and HWC. Dr Almond is an accredited member of PSSA and APHAP (Association of Professional Heritage Assessment Practitioners – Western Cape).

Declaration of Independence

I, John E. Almond, declare that I am an independent consultant and have no business, financial, personal or other interest in the proposed development project, application or appeal in respect of which I was appointed other than fair remuneration for work performed in connection with the activity, application or appeal. There are no circumstances that compromise the objectivity of my performing such work.



Dr John E. Almond
Palaeontologist
Natura Viva cc

Heritage Protocol for Finds

Heritage Impact Assessment (HIA) – The Bende Bulk Water Supply Scheme, Amathole District Municipality, Eastern Cape

Heritage Protocol for Incidental Finds during the Construction Phase

Should any palaeontological, archaeological or cultural heritage resources, including human remains / graves, as defined and protected by the NHRA 1999, be identified during the construction phase of development (including as a norm during vegetation clearing, surface scraping, trenching and excavation phases), it is recommended that the process described below be followed.

➤ On-site Reporting Process:

1. The identifier should immediately notify his / her supervisor of the find.
2. The identifier's supervisor should immediately (and within 24 hours after reporting by the identifier) report the incident to the on-site SHE / SHEQ officer.
3. The on-site SHE / SHEQ officer should immediately (and within 24 hours after reporting by the relevant supervisor) report the incident to the appointed ECO / ELO officer. [Should the find relate to human remains the SHE / SHEQ officer should immediately notify the nearest SAPS station informing them of the find].
4. The ECO / ELO officer should ensure that the find is within 72 hours after the SHE / SHEQ officers report reported on SAHRIS and that a relevant heritage specialist is contacted to make arrangements for a heritage site inspection. [Should the find relate to human remains the ECO / ELO officer should ensure that the archaeological site inspection coincides with a SAPS site inspection, to verify if the find is of forensic, authentic (informal / older than 60 years), or archaeological (older than 100 years) origin].
5. The appointed heritage specialist should compile a 'heritage site inspection' report based on the site specific findings. The site inspection report should make recommendations for the destruction, conservation or mitigation of the find and prescribe a recommended way forward for development. The 'heritage site inspection' report should be submitted to the ECO / ELO, who should ensure submission thereof on SAHRIS.
6. SAHRA / the relevant PHRA will state legal requirements for development to proceed in the SAHRA / PHRA Comment on the 'heritage site inspection' report.
7. The developer should proceed with implementation of the SAHRA / PHRA Comment requirements. SAHRA / PHRA Comment requirements may well stipulate permit specifications for development to proceed.
 - Should permit specifications stipulate further Phase 2 archaeological investigation (including grave mitigation) a suitably accredited heritage specialist should be appointed to conduct the work according to the applicable SAHRA / PHRA process. The heritage specialist should apply for the permit. Upon issue of the SAHRA / PHRA permit the Phase 2 heritage mitigation program may commence.
 - Should permit specifications stipulate destruction of the find under a SAHRA / PHRA permit the developer should immediately proceed with the permit application. Upon the issue of the SAHRA / PHRA permit the developer may legally proceed with destruction of the palaeontological, archaeological or cultural heritage resource.
 - Upon completion of the Phase 2 heritage mitigation program the heritage specialist will submit a Phase 2 report to the ECO / ELO, who should in turn ensure submission thereof on SAHRIS. Report recommendations may include that the remainder of a heritage site be destroyed under a SAHRA / PHRA permit.
 - Should the find relate to human remains of forensic origin the matter will be directly addressed by the SAPS: A SAHRA / PHRA permit will not be applicable.

NOTE: Note that SAHRA / PHRA permit and process requirements relating to the mitigation of human remains requires suitable advertising of the find, a consultation, mitigation and re-interment / deposition process.

➤ **Duties of the Supervisor:**

1. The supervisor should immediately upon reporting by the identifier ensure that all work in the vicinity of the find is ceased.
2. The supervisor should ensure that the location of the find is immediately secured (and within 12 hours of reporting by the identifier), by means of a temporary conservation fence (construction netting) allowing for a 5-10m heritage conservation buffer zone around the find. The temporary conserved area should be sign-posted as a 'No Entry – Heritage Site' zone.
3. Where development has impacted on the resource, no attempt should be made to remove artefacts / objects / remains further from their context, and artefacts / objects / remains that have been removed should be collected and placed within the conservation area or kept for safekeeping with the SHE / SHEQ officer. It is imperative that where development has impacted on palaeontological, archaeological and cultural heritage resources the context of the find be preserved as good as possible for interpretive and sample testing purposes.
4. The supervisor should record the name, company and capacity of the identifier and compile a brief report describing the events surrounding the find. The report should be submitted to the SHE / SHEQ officer at the time of the incident report.

➤ **Duties of the SHE / SHEQ Officer:**

1. The SHE / SHEQ officer should ensure that the location of the find is recorded with a GPS. A photographic record of the find (including implementation of temporary conservation measures) should be compiled. Where relevant a scale bar or object that can indicate scale should be inserted in photographs for interpretive purposes.
2. The SHE / SHEQ officer should ensure that the supervisors report, GPS co-ordinate and photographic record of the find be submitted to the ECO / ELO officer. [Should the find relate to human remains the SHE / SHEQ officer should ensure that the mentioned reporting be made available to the SAPS at the time of the incident report].
3. Any retrieved artefacts / objects / remains should, in consultation with the ECO / ELO officer, be deposited in a safe place (preferably on-site) for safekeeping.

➤ **Duties of the ECO / ELO officer:**

1. The ECO / ELO officer should ensure that the incident is reported on SAHRIS. (The ECO / ELO officer should ensure that he / she is registered on the relevant SAHRIS case with SAHRIS authorship to the case at the time of appointment to enable heritage reporting).
2. The ECO / ELO officer should ensure that the incident report is forwarded to the heritage specialist for interpretive purposes at his / her soonest opportunity and prior to the heritage site inspection.
3. The ECO / ELO officer should facilitate appointment of the heritage specialist by the developer / construction consultant for the heritage site inspection.
4. The ECO / ELO officer should facilitate access by the heritage specialist to any retrieved artefacts / objects / remains that have been kept in safekeeping.
5. The ECO / ELO officer should facilitate coordination of the heritage site inspection and the SAPS site inspection in the event of a human remains incident report.
6. The ECO / ELO officer should facilitate heritage reporting and heritage compliance requirements by SAHRA / the relevant PHRA, between the developer / construction consultant, the heritage specialist, the SHE / SHEQ officer (where relevant) and the SAPS (where relevant).

➤ **Duties of the Developer / Construction Consultant:**

The developer / construction consultant should ensure that an adequate heritage contingency budget is accommodated within the project budget to facilitate and streamline the heritage compliance process in the event of identification of incidental palaeontological, archaeological and cultural heritage resources during the course of development, including as a norm during vegetation clearing, surface scraping, trenching and excavation phases, when resources not visible at the time of the surface assessment may well be exposed.