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Draft Basic Assessment Report
Upgrading of the Thendele Water Supply Scheme
Mpofana Local Municipality
Umgungundlovu Municipality



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**This report was prepared by EnviroPro Environmental Consulting in terms of
Appendix 1 to GNR 982**

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Executive Summary

The uMgungundlovu Municipality propose to upgrade the existing Thendele Water Supply Scheme to provide a reliable supply of potable water to the community of Thendele. Thendele is located in the foothills of the Kamberg Nature Reserve / Highmoor Reserve within Ward 2 of the Mpofana Local Municipality. Existing water reticulation will be replaced and expanded to include new households, which previously did not have access to a municipal water connection. The pipelines range from 50Ømm diameter HDPE to 140Ømm UPVC pipes.

The long-term water demand for the Thendele community was calculated to be 160kl/day. This water will be supplied by a new borehole, which will be drilled to the south-west of the study area. The scheme will cover an approximate area of 3km² and will include the construction of a reservoir for the storage of water (500KI). Due to the high quality of the groundwater, no further water treatment works is required apart for the use of a filter.

Due to the presence of a perched aquifer, the area is characterised by a number of oxbow lakes and wetland systems. The initial pipeline route has been amended to avoid crossing watercourses where possible however, the preferred layout crosses fifteen watercourses (including drainage lines, streams, rivers and wetlands). Where there is existing infrastructure crossing the watercourses, the pipeline will be tied onto these structures (i.e. culverts). Where there are no existing structures, the pipeline will run under the watercourse (detail engineering designs included in Appendix A). Gabion baskets and/or reno-mattresses will be constructed for additional protection of the crossing structures if required.

The following key impacts and mitigation measures were assessed:

- **Damage to watercourse banks, wetland areas and riparian zones from construction activity:** The watercourse crossings are to be treated as sensitive areas with pipes being tied onto existing infrastructure where possible. No stockpiling is to occur directly adjacent and within 32m of watercourses and any excavation is to be carried out by hand. The trench is to be kept to a minimum width to reduce the disturbance footprint.
- **Pipeline impeding or altering flow of the watercourses:** The pipes within the watercourse will be laid below the level of the river bed and gabions will be used to prevent scouring of the river bed and exposure of the pipe. The gabions will be placed just downstream of the pipe and will be below the level of the river bed in order to maintain the river bed profile.
- **Loss of riparian vegetation during excavation across watercourses:** Vegetation clearing is to be kept to a minimum due to the small size of the pipe and associated trench. The trench is to be dug by hand across the watercourse to prevent unnecessary clearance. The potential for erosion is to be monitored by the Contractor on an ongoing basis during clearing.
- **Encroachment of alien vegetation into areas disturbed during construction:** Since the Thendele area currently has a low level of alien species, invader vegetation within the construction footprint must not be allowed to encroach onto the site and must be continually removed during construction.
- **Damage to surrounding properties & services:** The construction activity could disrupt access to existing services, and residential properties as it is being placed within existing road reserves. All services must be identified prior to construction and members of the community notified prior to construction commencing.
- **Improved access and connectivity:** The water supply scheme will improve service delivery to the rural area providing potable water to a number of households. This is a positive impact.

These impacts can be mitigated by following the recommendations in this report and Environmental Management Program (EMPr). Construction activities will be monitored on a monthly basis by an independent Environmental Control Officer (ECO) and controlled through the implementation of the attached EMPr.

Taking into consideration the above impacts and mitigation measures, it is the EAP's opinion that there are no significant environmental impacts associated with the proposal which cannot be mitigated. Therefore, it is recommended that the preferred Layout Alternative 2 be authorised.

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Section 1: Scope of Work and Location of Activity

1.1 Project Title

Upgrading of the Thendele Water Supply Scheme located within the Mpofana Local Municipality.

1.2 A Description of the Activities to Be Undertaken Including Associated Structure and Infrastructure As per Section 3(d) (ii)

The Umgungundlovu District Municipality propose to upgrade the Thendele Water Supply Scheme within Ward 2 of the Mpofana Local Municipality. Water is currently supplied by a borehole (Figure 1) however, yield has dropped steadily over the past few years. The water from the borehole is pumped to an elevated tank, used by the school, a standpipe used by a few houses and an old reservoir, which supplies the existing reticulation. The existing reticulation is very basic with no bulk pipelines in place. Due to the remote nature of Thendele, a bulk municipal water supply is not possible and therefore a new borehole is proposed to supply the community. The borehole is located at 29°22'46.6"S; 29°40'56.8"E (see Figure 4).

Figure 1: Photograph of the existing borehole supplying a small part of the Thendele community with water (source: Engeolab, 2015)



In order to obtain a 48 hours water storage time, using the long-term calculated demand of 160 kl per day, a 500kl reinforced concrete reservoir will be constructed on top of a hill to the south of the Thendele community (29°22'54.89"S; 29°41'11.03"E). The location of the proposed reservoir is shown in Figure 4 and lies within the boundary of the declared uKhahlamba Drakensberg World Heritage Site.

The existing reticulation and reservoir have a limited capacity and will therefore not be used. There are illogical connections and locations, reducing efficiency. The proposed new water pipes will consist of:

- 50, 75 & 90Ømm HDPE Class 12 pipes,
- 110Ømm uPVC Class 12 pipes, and
- 140Ømm uPVC Rising Main

All the pipes will be dug in trenches approximately 60cm wide and less than 1m deep. Figure 3 below illustrate the locality of the proposed pipeline route however maps showing more details of the watercourse crossings are provided in Appendix A of the report. The scheme will cover an approximate area of 3km².

As far as possible, the new pipeline has been aligned alongside the existing roads and footpaths, with an offset of approximately 3m, to cater for any future road widening or realignments. Where the pipeline crosses a watercourse, it will be placed underground. The trench will lined with a stone bedding allowing water to move underneath and around the pipe (see Appendix A for design drawings). The pipeline crosses various watercourse types, which include drainage lines, perennial streams and wetland area. The crossings have therefore been labelled "Watercourse Crossing 1", WC1, WC2 etc. throughout the report.

The watercourse crossings will result in the infilling / excavation of more than 5m³ of material within a watercourse. The Basic Assessment Report and EMPr therefore focus on these watercourse crossings however, the entire project area was assessed as all new infrastructure lies within 5km of the uKhahlamba Drakensberg World Heritage Site (Kamberg Nature Reserve). Please see Figure 8 below showing the proximity to the World Heritage Site.

The upgrading of Thendele Water Supply Scheme aims to provide a reliable water source to households within the community that previously had no access to water. The project will provide job opportunities and promote health and hygiene awareness in the community. The project will therefore have a positive impact on the community living in this area.

1.3 Description Of Feasible Alternatives As Per Section 3(h)(i)

Site Alternatives

The aim of the project is to supply the Thendele community with a reliable, potable water supply and therefore there are no site alternatives. Two layout alternatives have however been assessed, with Layout Alternative 2 being the preferred layout.

The initial alternative presented to the EAP by the applicant, was purely based on engineering objectives. After consulting a number of maps and conducting a site visit, a number of river and wetland crossings were identified. Various sections of the pipeline route were therefore adjusted to exclude unnecessary watercourse crossings while still supplying all relevant households with a water connection. The route was also amended slightly to increase the buffer zone around a site of heritage importance that was identified by the specialist.

Layout Alternative 1, described below, is the original layout that was proposed which includes all watercourse that were crossed (total of 19) while Layout Alternative 2 is the amended, preferred layout (15 crossings).

Layout Alternatives

Alternative 1

The original pipeline route, as per the drawing marked "Layout Alternative 1" in Appendix A, was a desktop engineering drawing that did not into account environmentally sensitive features. The alternative pipeline is drawn in green in Figure 3 below. The layout included 19 watercourse crossings (rivers and wetlands). A section of the route runs within 6 meters of two orche pits¹, which were identified by the heritage specialist as having a high heritage value. A 20m buffer was recommended by the specialist.

Alternative 2 (Preferred Alternative)

Sections of the pipeline route were amended to reduce the number of watercourses crossed and increase the buffer associated with the orche pits. There are a total of fifteen watercourses crossings in this amended layout. The following amendments have therefore been made compared to Layout Alternative 1:

WC1, WC2, WC3 and WC9 are avoided. Pipelines were originally positioned directly across the watercourses to reach various households however, this could be avoided by extending the pipeline from another sections on the same side of the valley.

Orche Pit buffer increase. The pipeline has been relocated to the other side of the road thereby increasing the distance between the orche pits from 6m to 20m, as recommended by the heritage specialist. Please refer to section 2.4 below for more details on the heritage significance.

Technology Alternatives

There is only one technology alternative as the pipe specifications and reservoirs need to fall within the appropriate designs standards. Water will be supplied a newly proposed borehole.

See Appendix A for Engineering Drawings.

The No Go Alternative

The upgrading of the Thendele Water Supply Scheme will not go ahead and the community will continue to not have access to running water apart from a few standpipes in communal areas. There will be no associated construction activity near the watercourses however without access to potable water the community will continue to place pressure on local rivers and borehole for drinking water as well as for washing and cooking, which ultimately affects the water quality in these rivers.

¹ Orche pits are used by local Zulu women and San descendants for decorating their homes and are living heritage sites.

1.4 All Listed and Specific Activities to Be Triggered and Being Applied For as Per Section 3(d) (i)

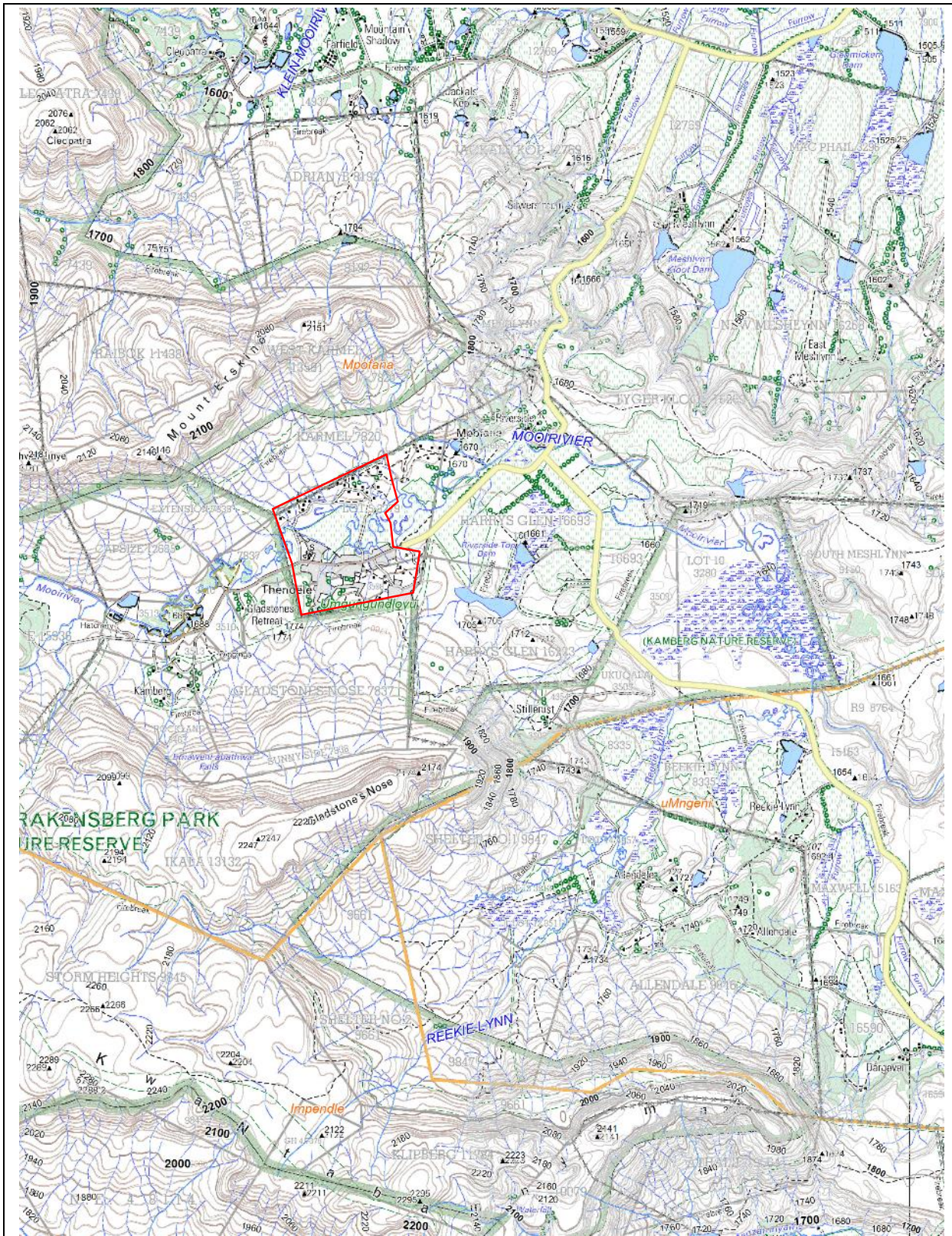
GNR	Activity Number	Activity as per the legislation	Activity as it applies to the proposal
GNR 983 Listing Notice 1; 04 th December 2014	12	<p><i>The development of-</i> <i>(xii) infrastructure or structures with a physical footprint of 100 square metres or more;</i> <i>where such development occurs-</i> <i>(a) within a watercourse; or</i> <i>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</i></p>	<p>The proposed reticulation system will result in more than 100m² of infrastructure being located within 32m of several watercourses associated with the Mooi River.</p>
GNR 983 Listing Notice 1; 04 th December 2014	19.	<p><i>(i):The infilling or depositing of any material of more than 5 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from -</i> <i>(i) A watercourse</i></p>	<p>Where there are no existing structures crossing watercourses, the pipeline will be placed underground and covered with a 150mm layer of 19mm crushed stone. It will be placed inside a trench on stone bedding to allow water to move around and underneath the pipe (see drawings in Appendix A). The excavations to allow pipes to be placed underground will result in more than 5m³ of material being removed and deposited within the various watercourses.</p>
GNR 985 Listing Notice 3; 04 th December 2014	2	<p><i>The development of reservoirs for bulk water supply with a capacity of more than 250 cubic metres;</i> <i>(d) In KZN</i> <i>(iv) World Heritage Sites</i> <i>(vi) In a protected area identified in terms of NEMPAA,</i> <i>(xii) Outside urban areas:</i> <i>(aa) Areas within 10km from a world heritage site or 5km from any other protected area identified in terms of NEMPAA.</i></p>	<p>The capacity of the reservoir is 500kl / 500m³. The reservoir will be placed within the declared boundary of the uKhahlamba Drakensberg Park (Kamberg Nature Reserve). The Drakensberg Park is recognised as a World Heritage Site and a formally protected area.</p>
GNR 985 Listing Notice 3; 04 th December 2014	14	<p><i>The development of-</i> <i>(xii) infrastructure or structures with a physical footprint of 10 square metres or more;</i> <i>where such development occurs-</i> <i>(a) within a watercourse; or</i> <i>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</i> <i>(d) In KZN</i> <i>(iv) A protected area identified in terms of NEMPAA;</i> <i>(v) World Heritage Sites;</i> <i>(x) Outside urban areas:</i> <i>(aa) Areas within 10km from a world heritage site or 5km from any other protected area identified in terms of NEMPAA.</i></p>	<p>The entire water supply scheme is located in the foothills of the uKhahlamba Drakensberg Park (Kamberg Nature Reserve), which is recognised as a World Heritage Site and a formally protected area.</p>







1.5 Location Of Activity As Per Section 3 (b)(i)-(iii)

District Municipality		Umgungundlovu District Municipality.	
Local Municipality		Mpošana Local Municipality.	
Ward		2	
Area / Town / Village		Thendele	
Co-ordinates:		Latitude	Longitude
	Starting point:	29°22'23.79"S	29°41'34.12"E
	End point:	29°21'51.23"S	29°41'47.89"E
	New Borehole	29°22'46.6"S;	29°40'56.8"E
	New Reservoir	29°22'54.89"S;	29°41'11.03"E
Valley Bottom Wetland	WC 1 *:	29°22'51.36"S	29°41'15.87"E
Hillslope Seep Wetland	WC 2 *:	29°22'47.60"S	29°41'27.21"E
Hillslope Seep Wetland	WC 3 *:	29°22'37.33"S	29°41'31.95"E
Drainage Line	WC 4:	29°22'26.07"S	29°41'29.45"E
Drainage Line	WC 5:	29°22'27.92"S	29°41'24.60"E
Perennial Drainage Line	WC 6:	29°22'30.49"S	29°41'18.41"E
Tributary of Mooi River	WC 7:	29°22'46.81"S	29°40'59.79"E
Tributary of Mooi River	WC 8:	29°22'31.83"S	29°41'3.19"E
Tributary of Mooi River	WC 9 *:	29°22'32.19"S	29°41'3.17"E
Drainage Line	WC 10	29°22'38.74"S	29°41'7.49"E
Mooi River	WC 11:	29°22'23.51"S	29°41'14.50"E
Drainage Line	WC 12:	29°22'9.69"S	29°41'2.94"E
Drainage Line	WC 13:	29°22'9.67"S	29°41'1.60"E
Drainage Line	WC 14:	29°22'9.91"S	29°40'58.75"E
Drainage Line	WC 15:	29°22'14.11"S	29°40'49.18"E
Drainage Line	WC 16:	29°22'14.36"S	29°40'45.09"E
Tributary of Mooi River	WC 17:	29°22'8.20"S	29°41'25.80"E
Drainage Line	WC 18:	29°22'3.29"S	29°41'27.74"E
Tributary of Mooi River	WC 19:	29°22'0.65"S	29°41'29.74"E
Property Description:		Parent Farm:	Farm Portion:
		Lot 5 3279	Remainder
		Lot 5 3279	4
		Lot 5 3279	5
		Lot 5 3279	2
		Lot 5 3279	1
		Itendele 3508	Remainder
		Itendele 3508	4
		Itendele 3508	3
		Itendele 3508	2
		Itendele 3508	1
21 Digit Surveyor General's numbers:		N0FS00000000327900000	
		N0FS00000000327900004	
		N0FS00000000327900003	
		N0FS00000000327900002	
		N0FS00000000327900001	
		N0FS00000000350800000	
		N0FS00000000350800004	
		N0FS00000000350800003	
		N0FS00000000350800002	
		N0FS00000000350800001	

* Crossing avoided in Layout Alternative 2 (preferred layout)

Figure 2: 1:50 000 Topographical Map with the Thendele Study Area Outlined in Red (source: PlanetGIS)



Title	Thendele Water Supply Scheme	Legend	
Co-ordinates	29°22'25.19"S; 29°41'15.89"E		Watercourse
Scale	1:50 000		Wetland
Topographical Sheet No.	2929BC		Boundary of Nature Reserve
Drawing No.	Thendele Supply Scheme #01		Contour
Date Prepared	04 th November 2015		Study Area
Prepared By	Stephanie Williams		Urban Areas

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Figure 3: Aerial Photograph Showing an Overview of the Thendele Water Supply Scheme Study Area. Green Lines Indicate the Alternative Pipeline Route (source: Google Earth Pro, 2015).

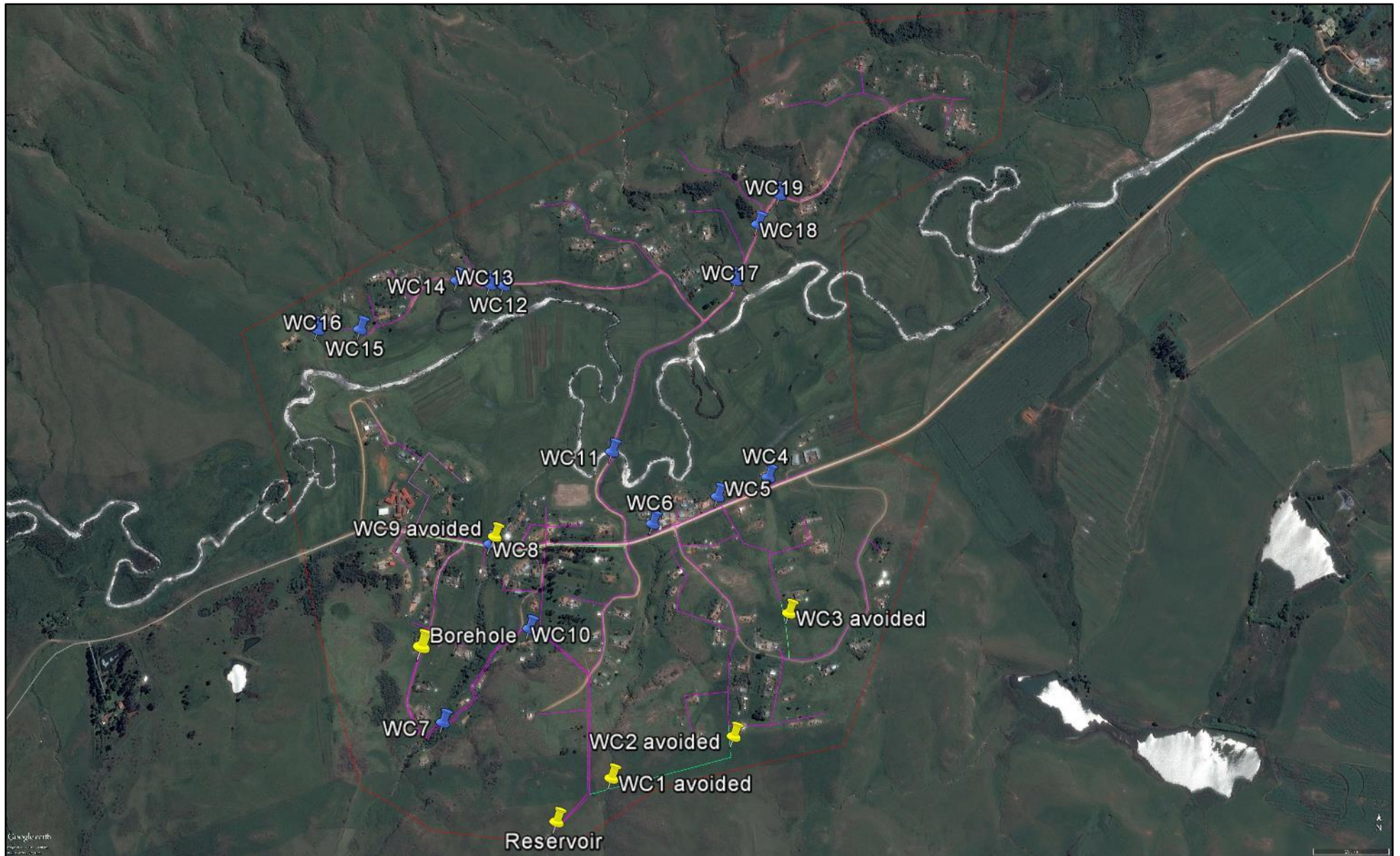


Figure 4: Orthophoto Showing the Location of Proposed Borehole and Reservoir (source: Google Earth Pro, 2015)



Section 2: Site Description and Surrounding Land Use as per section 3(h)(iv) and (k)

Information provided in this section has been extracted from the various specialist reports, which are attached under Appendix B of the BAR.

2.1 Topography and Physical Characteristics of Site

The community of Thendele is located at an elevation of approximately 1680m above mean sea level at the foot of the Drakensberg Mountains. The pipeline extends up the side of the surrounding slopes to reach the higher households however, the gradient increases significantly towards the edge of the project area. The area surrounding the proposed project site is dominated by agricultural and livestock activities as well as rural settlements. Photographs taken within the study area and showing the surrounding topography are included in Figure 5.

The gradient of the site is as follows:

Gradient	Description
Flat	Centre of the site along the main access road.
1:50 – 1:20	North and south of the study site as the slope begins to increase.
1:20 – 1:15	N/A
1:15 – 1:10	N/A
1:10 – 1:7,5	N/A
1:7,5 – 1:5	N/A
Steeper than 1:5	N/A

The topographical features and landforms of the site and surrounding area are as follows:

Topographical Feature	Description
Ridgeline	N/A
Plateau	N/A
Side slope of hill/mountain	The centre of the pipeline runs along the bottom of the valley but extends up the side of the mountain to where higher households are located.
Closed valley	N/A
Open valley	The Thendele Community is situated in between two large mountains, which form part of the Kamberg Nature Reserve.
Plain	N/A
Undulating plain/low hills	N/A
Dune	N/A
Sea-front	N/A

Figure 5: Photographs Showing the Topography and Characteristics of the Thendele Study Area.



(a) Photograph showing the gradient of the southern portion of the project area; **(b)** Photograph taken facing north across the study area.

2.2 Surface Water and Ground Water

Thendele is located within the V20A Quaternary Drainage Region. The project area bisects the upper reaches of the Mooi River. The immediate drainage from the area is in a north-easterly direction towards the Little Mooi River, a tributary of the Mooi River. The activities in the area and local land uses have had little impact on the aquatic system and visible disturbances were minor. The system is therefore regarded as “moderately modified” at a desktop level (section 4.1 of the Aquatic Assessment in Appendix B).

The Thukela Water Management Area (WMA) is situated predominantly in the Kwazulu Natal Province, and corresponds to the Thukela River. Several tributaries drain from the Drakensburg escarpment into the larger rivers which eventuate in the Indian Ocean. The upper reaches are characterised by mountain streams and are located within several important parks and conservation areas, wetlands and vleis. The mean annual precipitation ranges from 600 to 1500 mm. The water resource potential for the WMA is considered one of the greatest in South Africa due to the high mean annual runoff and favourable topography.

There is a perched aquifer associated with the site associated with shallow clayey soils and rock outcrops (section 1.1 of the Geohydrological Report in Appendix 2 of the BAR). These conditions could result in groundwater seeps. A number of wetland hydro-geomorphic (HGM) units were identified because of the high water table. In terms of groundwater quality, the results were reasonably good, except for Turbidity & Total Coliform bacteria levels that are above acceptable, rendering the water suitable for short-term use with filtration, or unsuitable for human consumption without filtration (section 3.0 of the Geohydrological Report).

The preferred pipeline route crosses fifteen watercourse (WC1 - 15) and is situated within 500m of three wetland HGM units.

2.2.1 Watercourses

A number of drainage lines and perennial streams flow down either side of the valley slopes, through the Thendele Community and into the Mooi River. Since the Mooi River runs through the centre of the project area, the proposed pipeline bisects these watercourses on fifteen occasions (preferred layout). More details maps showing aerial imagery of the individual watercourse crossings and corresponding photographs are provided in Appendix A of the BAR.

Where there is existing infrastructure, the pipe will tie onto this infrastructure at the crossing to avoid additional disturbance (see photographs below). Apart from the Mooi River, where the pipe will tie onto the existing culvert, all the other watercourse crossed are considered to be minor crossings. A pipe bridge will be used to cross the perennial streams (e.g. WC 7) with the pipe being placed under the smaller drainage lines. The design drawing showing a typical drainage line crossing is attached under Appendix A.

Figure 6: Photographs Showing Some of the Existing Watercourse Crossings in Thendele

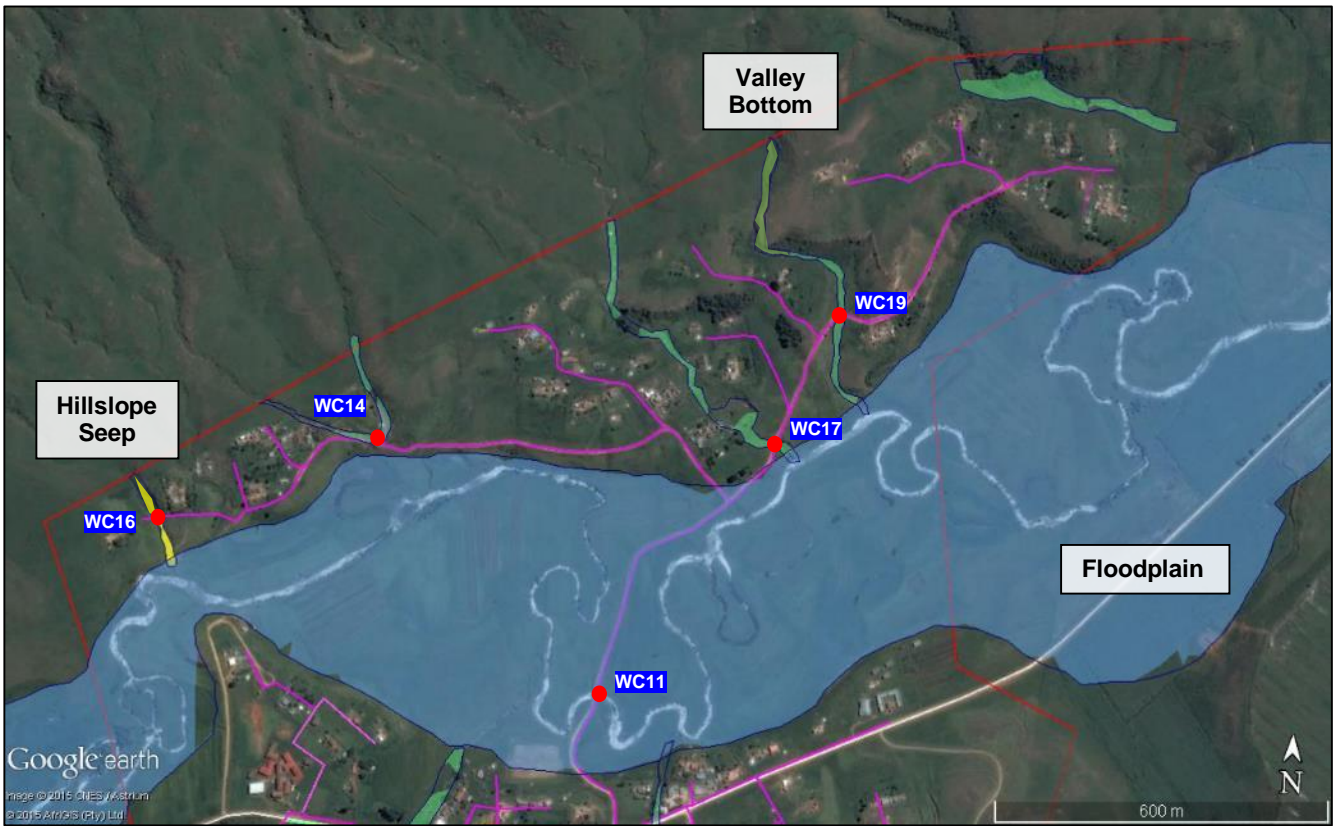


(a): Brick culvert at watercourse crossing 10 **(b):** Pipe directing water underneath main road at watercourse crossing 8 **(c):** The existing culvert across the Mooi River (WC 11). The proposed pipes will be tied to these structures.

2.2.2 Wetlands

Three wetland systems were delineated by the wetland specialist (Figure 7). These include the Mooi River floodplain, unchannelled valley bottom wetlands and hillslope seepage wetlands. The specialist described the state of the wetlands associated with the study area as “modified” largely due to the development of the area and the associated activities (section 7.3 of the Wetland Study). A description of the construction methodology to be used where the pipeline crosses the various wetland HGM units and the services associated with these wetlands is provided below. The information has been abstracted from the Wetland Study attached under Appendix B.

Figure 7: Wetlands Associated with the Northern (Top) and Southern (Bottom) Section of the Study Area (source: Google Earth Pro & The Biodiversity Company)



- Mooi River Floodplain:
 - The pipeline crosses the floodplain on one occasion (WC11).
 - It will be constructed within a road reserve and tie onto an existing culvert to reduce the construction impact.
 - According to the wetland assessment, the most beneficial services provided by the system are associated with the attenuation of floods and the enhancement of water quality (sediment and phosphate trapping).
 - Additional services provided by the system for which the benefit is considered high, include the cultivation of foods, cultural significance, tourism and recreation and also education and research.

- Valley-bottom Wetlands:
 - Seven valley bottom wetlands were identified within the study area.
 - The proposed pipeline route (preferred) crosses the valley bottom wetlands six times (WC6, WC7, WC8, WC14, WC17 & WC19).
 - The pipe will be constructed within existing road reserves reducing the construction impact for all crossings except at WC7, where there is no infrastructure crossing this point.
 - A pipe bridge will be used at WC7, due to the exposed bedrock noted during the site visit.
 - The benefits for the majority of the services provided by the system are considered intermediate with no services considered to have a high benefit.
 - The intermediate benefits are associated with flood attenuation, stream flow regulation and the water quality enhancement services, notably for erosion control and also sediment and phosphate trapping.
 - Valley bottom systems are generally permanently saturated, and generally form narrow bands down the catchment.

- Hillslope:
 - Three hillslope seepage wetlands were identified in the study area.
 - The pipeline crosses a hillslope seep once at WC16.
 - There is no infrastructure crossing this section of the wetland at present. Due to the small size of the hillslope seep, the pipeline will be dug underneath this watercourse (see design drawing in Appendix A).
 - The wetland specialist did not identify any services provided by the system with a high benefit.
 - The ability of the system to attenuate floods, regulate stream flow and enhance water quality was determined to provide intermediate benefits.
 - The most beneficial water quality enhancement services are associated with the removal of nitrates and toxicants, and erosion control.
 - The hillslope areas are generally dominated by shallow soils, with the development of the area encroaching into the hillslope seepage area.

Provided that the mitigation measures provided in the EMP are followed during construction, the project proposal should not have any negative impact or influence on the wetlands associated with the site. Taking into account that this project is for potable water, the significance of any impacts resulting from pipeline leaks and spillages is considered negligible (section 8.0 of the Wetland Study in Appendix B).

2.3 Fauna and Flora

The site is located within a rural area, which is sparsely populated by homesteads and small subsistence farms. The vegetation within Thendele is described as follows with a map provided in Appendix A:

- Ecosystem Type: Drakensberg Foothill Wattled Crane Habitat
 - This ecosystem has been identified by the South African National Biodiversity Institute (SANBI) as “vulnerable”.
 - Ecosystem predominantly confined to the Drakensberg Foothill Moist Grassland (see below).
 - Approximately 3% of the ecosystem is protected in the Umgeni Vlei Nature Reserve, Highmoor State Forest, Kamberg Nature Reserve and Mkhomazi State Forest.

- Vegetation Type: Drakensberg Foothill Moist Grassland (Gs10):
 - Majority of the site falls within this vegetation type.
 - Found in moderately rolling and mountainous areas, much incised by river gorges of drier vegetation types and by forest. Covered in forb-rich grassland dominated by short bunch grasses.
 - The vegetation type is considered least threatened however contains a number of endemic species as well as Drakensberg endemics.

- Found at altitudes of 880–1860m.
- Vegetation Type: Northern Drakensberg Highland Grassland (Gd5):
 - Southern portion of the site (including the reservoir) falls within this vegetation type.
 - This vegetation type is characterised by steep slopes of broad valleys and supporting mainly short, sour grasslands, rich in forbs.
 - In terms of conservation, it is considered “least threatened”.
 - Found at altitudes of 1780–1840m.
- Vegetation noted on site (Figure 8):
 - The vegetation associated with the drainage lines and slopes was pristine with little to no alien invasion noted.
 - Vegetation around the homesteads and in areas across the floodplain has been cleared for subsistence farming and livestock farming.
 - Near the homesteads and road sides, a certain degree of invader species was present (e.g. Bugweed, Black Wattle and other ruderal grass species).

The pipeline has been aligned to follow existing roads and footpaths. Due to the previous disturbance, the areas near the road tend to be more disturbed and invaded by alien species. The small size of the trench (<1m wide) results in very little vegetation, which would require clearing. The contractor must ensure that invasive species do not gain a foothold along the cleared route until the indigenous vegetation has had time to re-establish.

Figure 8: Photographs Showing the Vegetation on Site



(a): Undisturbed grassland in the Northern Drakensberg Highland Vegetation type **(b):** Footpath through Drakensberg Foothill Moist Grassland Vegetation type **(c):** Subsistence farming on the Mooi River floodplain, to the north of the river.

2.4 Heritage and Cultural Aspects

The Thendele Community is located in the foothills of the uKahlamba Drakensberg World Heritage Site with the reservoir located inside the boundary of the formally protected area (see Figure 9). Due to the rural nature of the site and the large study area a Heritage Impact Assessment was carried out to determine any sites or structures of high heritage value.

Sixteen modern grave sites with local significance were located by the heritage specialist. It is proposed that the developer maintain a buffer zone of 10m around each grave site where no development may occur. Three sites older than 60 years were located during the survey, which are all protected by provincial and national heritage legislation. These included a historical homestead and two orche pits that also have living heritage value. In addition a Shembe stone circle “place of worship” was identified as a “living heritage site”. It is proposed that the developer maintain a buffer zone of 20m around each heritage site where no development may occur. Figure 10 shows the location of the various sites with heritage values and the associated recommended buffer.

Construction workers will be cautioned to operate with care on site, in particular during construction of the reservoir inside the world heritage site. Should a culturally sensitive aspect be discovered on site that has not been previously identified, construction activities stop temporarily and the issue assessed and the authorities (AMAFA) notified if need be.

Figure 9: Thendele Water Supply Scheme Proximity to World Heritage Site Hatched in Green (source: SANBI BGIS Land Use Decision Support Tool)



Figure 10: Aerial Photograph of the Southern Portion of the Thendele Water Supply Scheme Showing Sites of Heritage Importance (Yellow Pins) and Respective Buffers (red)

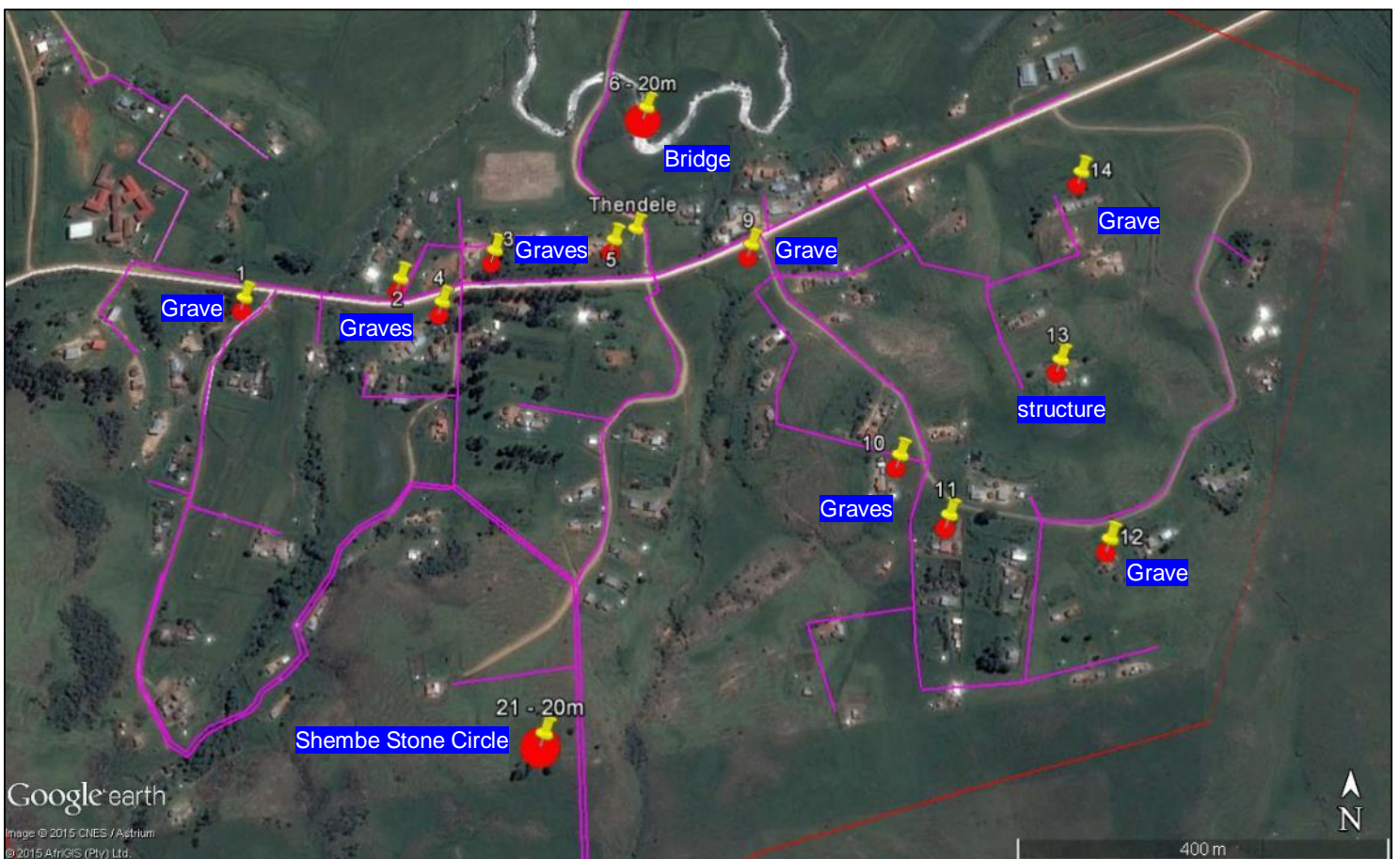
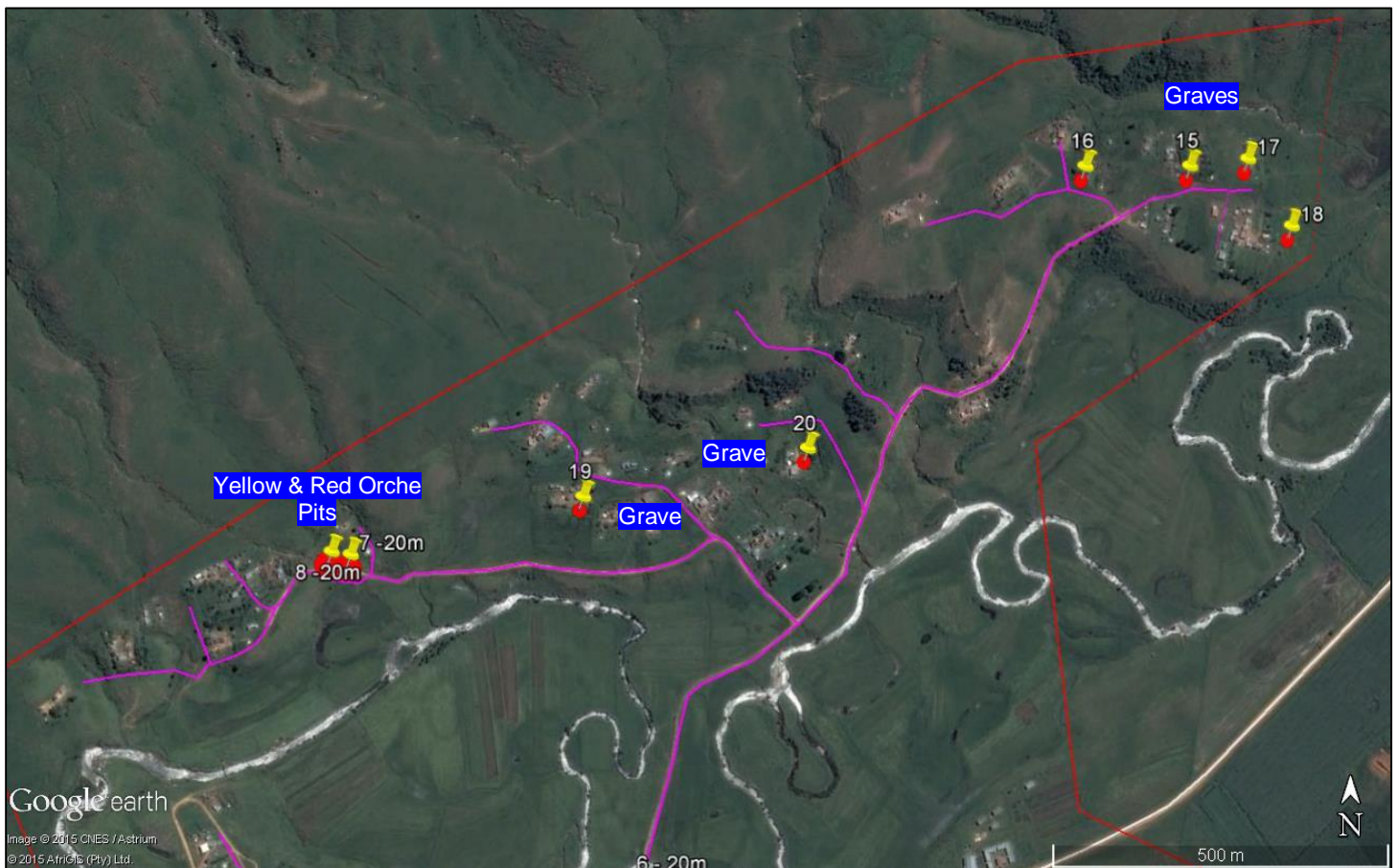


Figure 11: Aerial Photograph of the Northern Portion of the Thendele Water Supply Scheme Showing Sites of Heritage Importance (Yellow Pins) and Respective Buffers (red)



2.5 Socio-Economic Environment

This is a “low income” area. The area is rural in nature and most of these households appear to depend on subsistence farming. The majority of homesteads are located outside the road reserves where construction activity will be taking place. No fences and homestead access roads will require relocation. The local community of Thendele have a fishing program, which contributes to tourism and recreation in the area. The program provides locally guided fishing in the Mooi River. Residents are looking forward to the service delivery upgrade.

2.6 Surrounding Environment and Land Uses

The environment and land uses within the Thendele Community are as follows:

- Located within a rural area.
- The houses within the area are sparse and positioned apart from one another.
- The area is predominantly used as grazing land for livestock and subsistence farming;
- Located in the foothills of the uKahlamba Drakensberg World Heritage site; and
- Local community conservation project associated with the Mooi River.

The surrounding environment and land use will not be negatively affected by the water pipeline as the construction footprint will follow the same alignment as the existing gravel roads and footpaths. The pipeline will be located underground and will therefore not deter from the aesthetics of the area.

Section 3: Policy and Legislative Context

3.1 Identification of all Legislation, Policies, Plans, Guidelines, Spatial Tools, Municipal Development Planning Frameworks and Instruments As Per Section 3(e)(i) and Compliance of Proposed Activity with Legislation and Policy 3(e)(ii)

Legislation	Compliance of Activity
National Environmental Management Act 1998	<p>The National Environmental Management Act (Act 107 of 1998) (NEMA) is South Africa's overarching environmental legislation. It includes a set of principles that govern environmental management and against which all Environmental Management Programmes (EMPs) and actions are measured. These principles include and relate to sustainable development, protection of the natural environment, waste minimisation, public consultation, the right to an environment that is not harmful to one's health or wellbeing, and a general duty of care.</p> <p>The Environmental Impact Assessment (EIA) Regulations, 2014: GN R.982, R.983, and R.985 under Section 24 of the NEMA define the activities that require Environmental Authorisation and the processes to be followed to assess environmental impacts and obtain Environmental Authorisation.</p> <p>Environmental authorisation is required for the construction of the bulk water pipeline across the various watercourses as well as for the entire project area being located in close proximity to a formally protected area. Therefore this application is in line with the requirements of NEMA.</p>
National Water Act 1998	<p>The upgrade will result in alternations to the bed and banks of watercourses. There are also a number of wetland HGM units located within 500m of the pipeline route. A Water Use Authorisation (WUA) will be required as per Section 21 c and i of the National Water Act. The WUA application is running concurrently with the EIA process.</p>
National Waste Management Act 2008	<p>Reforms the law regulating waste management to prevent pollution and ecological degradation.</p> <p>Section 19 allows the Minister to publish a list of activities, which require a Waste Management License. The most recent list is published in Government Gazette 37083 Notice No. 921 dated 29 November 2013. The proposal will not trigger a Waste Management Activity.</p>
Environmental Conservation Act 1996	<p>Makes provisions for the application of general environmental principles for the protection of ecological processes, promotion of sustainable development and the protection of the environment. This Act has mostly been repealed by NEMA.</p>
National Environmental Management Biodiversity Act 2004	<p>To provide the framework, norms, and standards for the conservation, sustainable use and equitable benefit-sharing of South Africa's biological resources. Section 52 allows for the publication of a list of threatened ecosystems in need of protection. The list was published in Government Gazette No. 34809 Notice No. 1002 dated 9 December 2011.</p> <p>This site falls within the Drakensberg Foothill Wattled Crane Habitat ecosystem. This ecosystem type has been identified as 'vulnerable' under the NEMBA and therefore does not require authorisation to clear more than 300m² of vegetation within this ecosystem type.</p>
National Heritage Resources Act 25 of 1999	<p>For the protection of South African Heritage to nurture and conserve communities legacy. The heritage specialist has recommended buffers around the sites of heritage significance. These are to be maintained during construction. No permits are required from the provincial heritage authority, AMAFA.</p>
Municipal Planning Framework	
Umgungundlovu Municipality Integrated Development Framework 2015/2016	<p>This project falls in line with the uMgungundlovu Municipality's development outcome, which is to provide potable water to all communities within the municipality. This forms part of the Municipality's 5 year plan.</p>

Section 4: Motivation, Need and Desirability

4.1 Need and Desirability as Per Section 3(F)

There is an urgent need for safe potable water to be supplied to the growing Thendele Community as the existing network is inefficient with water only being supplied to the school and a few houses. There are a few standpipes where residents have to walk long distances to access these pipes, which are unreliable. An old borehole and reinforced concrete reservoir supply the existing reticulation. There are a number of limitations with the old infrastructure. This includes limited capacity, illogical connections and location of the reticulation and reservoir.

The objective of the project is to provide a sustainable source of water to meet the current demand as well as the long-term water demand of 160kl/day.

4.2 Motivation for Preferred Site, Activity and Technology Alternative

The aim of the project is to supply the Thendele community with a reliable, potable water supply and therefore there are no site alternatives. Apart from providing potable water to the community, the project will uplift the community through job opportunities during construction and through the maintenance life of the project. At present, most of the community does not have ready access to potable water, therefore it is expected that the supply of fresh water will promote health and hygiene awareness in the community.

Although there were are no technological alternatives, two layout alternatives were considered. Since the Thendele area is entwined with watercourses and all existing homesteads are to be provided with a water supply, a large number of watercourse crossings could not be avoided however, Layout Alternative 2 crosses less than the originally proposed Layout Alternative 1.

It is the opinion of the EAP that there are no significant environmental impacts that cannot be mitigated against and that the preferred Alternative Layout be authorised (i.e. Layout Alternative 2).

Section 5: Public Participation

5.1 Notification of Interested and Affected Parties

- 1) *fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of-*
 - i. *the site where the activity to which the application or proposed application relates is or is to be undertaken; and*
 - ii. *any alternative site;*

A noticeboard (in isiZulu and English) in the centre of the study area on the 29th January 2015. The noticeboard detailed uMgungundlovu Municipality's proposed plan to upgrade the water supply scheme, subject to a basic assessment. See Appendix C – Proof of Placement of Notice Board.

- 2) *giving written notice, in any of the manners provided for in section 47D of the Act, to-*
 - i. *the occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;*
 - ii. *the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;*
 - iii. *the municipality which has jurisdiction in the area;*
 - iv. *any organ of state having jurisdiction in respect of any aspect of the activity, and;*
 - v. *any other party as required by the competent authority;*

The project is located within a rural area with strong traditional ties, therefore the public participation method used had to ensure that existing channels of communication were used in order to notify surrounding stakeholders to avoid creating any offense. Surrounding stakeholders rely on direct means of communication through the elected officials, which in this case is the local Ward Councillor. It is important to note that any communication that takes place with community members without working through the elected officials is seen as disrespectful and to a point irrelevant as the Ward Councillor has been elected to facilitate such communications.

A meeting was held with the Ward Councillor for this area and the various landowners in order for information to be relayed to the community. A number of stakeholders and authorities were also tracked down electronically and information has been provided to them via email.

The following steps were followed during the public participation process.

- A meeting was held with the Ward Councillor and various members of the committee at the site on the 29th January 2015.
- The Ward Councillor indicated a willingness to engage with the community, agreeing that this was the best procedure for notification.
- The Ward Councillor was provided with pamphlets for distribution within the community, which provide details about the proposed project.
- A signboard detailing the upgrade was erected at the center of the scheme.
- An additional meeting was held at the Thendele Community Centre with the Ward Councillor and respective landowners on the 03rd February 2015.
- Meeting minutes from both meetings are available in Appendix D.
- The Ward Councillor will be given opportunity to review complete copies of the Basic Assessment report and relay information back to the community.
- With regards to authority communications, all relevant authorities have been notified of the application and have been provided with copies of this BAR.

See Appendix D – Proof of Notification.

- i. *owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;*

The Ward Councillor and members of the ward committee indicated a willingness to engage the members of the community occupying the land. Signboards were also placed in the centre of the site along a main road. Email notifications to all I&APs were sent out on the 21st October 2015. See Appendix D – Proof of Notification.

- 3) *placing an advertisement in-*
 - i. *one local newspaper; or*
 - ii. *any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;*
- 4) *placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii);and*

An advert was placed in the Ilanga local newspaper on the 23rd August 2015 detailing the proposed project, Basic Assessment process and providing contact details of EnviroPro should anyone wish to register as an I&AP. See Appendix E – Proof of Advert Placement.

5.2 Registered Interested and Affected Parties

42. *A proponent or applicant must ensure the opening and maintenance of a register of interested and affected parties and submit such a register to the competent authority, which register must contain the names, contact details and addresses of-*
 - (a) *all persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;*
 - (b) *all persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and*
 - (c) *all organs of state which have jurisdiction in respect of the activity to which the application relates.*

The contact details of all I&APs that have registered have been provided in the Registered I&AP list in Appendix F.

5.3 Comments

Comments of interested and affected parties to be recorded in reports and plans 44.

- 1) *The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.*
- 2) *Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to-*
 - i. *a lack of skills to read or write;*
 - ii. *disability; or*
 - iii. *any other disadvantage;*
 - iv. *reasonable alternative methods of recording comments must be provided for.*

All comments received from I&APs have been recorded in the comments and response table. The original comments provided have been provided together with the comments and response table. This report has been provided to the Mpofana Local Municipality, uMgungundlovu District Municipality, the South African Heritage Resources Agency (SAHRA) and the Department of Water & Sanitation and KZN Wildlife for comment.

See Appendix G – Comments and Response table and Comments received to date.

Section 6: Impact Assessment

6.1 Methodology To Determine And Rank Significance And Consequences Of Impacts Associated With All Alternative As Per Section 3(h)(vi)

Impacts are assessed qualitatively and quantitatively, looking at the duration / frequency of the activity and likely impacts associated with that activity during both construction and operation. If the activity happens frequently, the risk of the associated impact occurring is much higher than if the activity happens less frequently. The geographical extent of the impact is assessed i.e. will the impact be restricted to the point of occurrence or will it have a local or regional effect. Impacts are also reviewed looking at severity levels and consequences should the impact occur i.e. will the severity be low, medium or high and then probability of the impact occurring is taken into account.

Whether or not the impact can be mitigated and the extent to which it can be avoided, managed, mitigated or reversed is assessed i.e. the probability of occurrence after mitigation has been applied. This also takes into account likelihood of human error based on construction and operational auditing experience i.e. even though spills can be completely mitigated against and prevented, there is always a small chance that spills will still occur (residual risk). Based on all of these factors, the impact is then rated to determine its significance. For example an impact can have a regional affect with severe environmental implications, however the probability of it occurring is very low and the implementation of the proposed mitigation measures means that the ultimate rating is medium or low.

Please see below a description of the scoring. The full impact scoring tables detailing how the significance rating was calculated can be found in Appendix H.

Scoring of Impacts	
Duration / Frequency of activity likely to cause impact	0 = No impact 1 = short term / once off 2 = medium term / during operation 3 = long term / permanent
Geographical Extent	0 = No impact 1 = point of impact / restricted to site 2 = local / surrounding area 3 = regional
Severity (level of damage caused) if impact were to occur	0 = No impact 1 = minor 3 = medium 5 = major
Probability of impact without mitigation	1 - 5 = low. 6 -10 = medium. 11 -14 = high.
Significance before application of Mitigation Measures	A score of between 1 and 5 is rated as low. A score of between 6 and 10 is rated as medium. A score of between 11 and 14 is rated as high.
Will activity cause irreplaceable loss of resources?	10 = Yes 0 = No
Mitigation measures	0 = No impact - 5 = can be fully mitigated - 3 = can be partially mitigated -1 = unable to be mitigated
Probability of impact after mitigation	0 = No impact 1 = Low 2 = Medium 3 = High
Significance after application of Mitigation Measures	A score of between 1 and 5 is rated as low. A score of between 6 and 10 is rated as medium. A score of between 11 and 14 is rated as high.

6.2 Preferred Site and Layout Alternative

See Appendix H for the full impacts scoring matrix, which assesses the impacts on the above system. The below impacts relates to the site location and preferred layout (i.e. Layout Alternative 2).

Table 1: Impacts and mitigation measures associated with the preferred layout

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
Construction			
1. Dusty conditions generated during construction and by construction vehicles travelling over the gravel roads.	4 (low)	<p>There will be dust generated during the construction phase; however this will be temporary i.e. the site will be worked continuously for a few months until construction is completed. Further to this:</p> <ul style="list-style-type: none"> • Vehicle speed limits must be reduced to 40km/hr to reduce the amount of dust raised along the gravel roads to and from the site. • Water carts must be used on site should dust levels elevate to a nuisance level. • Water cart will be utilised to dampen dusty surfaces and suppress dust from the road surface. • Shade cloth is to be utilised for stockpiled materials where required. <p>This impact can be managed and mitigated to a large degree with the implementation of the EMPr. The applicant must comply with the National Dust Regulations (Government Notice R827, 2013) with regards to dust levels produced on site.</p>	2 (low)
2. Generation of emissions from construction vehicles.	5 (low)	<p>Due to the rural location of the study site and to enhance the employment opportunities, it is likely that the trench will be dug by hand. All construction vehicles will however be fitted with the appropriate silencers and exhausts. Emissions generated from these vehicles will be negligible and are not expected to significantly affect the surrounding Thendele Community. This impact can be managed and mitigated.</p>	0 (low)
3. Impact on existing services i.e. power lines, water pipes, infrastructure, etc.	5 (low)	<p>As standard construction practice the engineer and contractor will identify all existing services that may be affected along the route prior to construction. Any infrastructure that is removed must be replaced and any damage caused from construction must be repaired.</p> <p>This impact can be managed and mitigated.</p>	1 (low)
4. Damage to properties, fencing and subsistence farming plots during laying of pipework.	6 (med)	<p>For the most part the pipeline will be laid within the road reserves however if any properties or crops are likely to be affected, the contractor will liaise with the community. The pipeline trenches will be 600-800mm wide (1m at the most) and 1m deep at the most and for the most part will be dug by</p>	4 (low)

² See Appendix H for more details.

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		hand in order to allow employment for local unskilled labour, thereby limiting the area of the excavation and damage that could be caused by large vehicles. This impact can be avoided and mitigated.	
5. Erosion of exposed soil prior to the rehabilitation of the construction area.	7 (med)	The area is characteristic of watercourses and high rainfall. Exposed soil is therefore very susceptible to erosion. Erosion control is critical, especially around the watercourses. Exposed areas will be rehabilitated and re-vegetated as soon as possible during construction. Cleared areas may not be left exposed for long periods of time and should be re-vegetated in stages on completion of a section of the pipework. Small inspection holes may be left open along the route but the rest of the trench must be closed once the pipe has been laid. In certain steeper sections where homesteads being supplied are more inaccessible, additional precautions to manage erosion will be required (e.g. sand bags or gabions). This impact is to be monitored and can be mitigated.	5 (low)
6. Excavation of trenches resulting in large areas of land being cleared and at risk of erosion.	6 (med)	Only the minimum area required for the trench may be cleared. Trench size should not need to be more than 1m wide at most, therefore the most suitably sized equipment must be used to excavate the trench. It is recommended that the trenches be dug by hand to reduce unnecessary clearance and disturbance. As stated above, trenches are may not be left exposed for long periods of time and should be re-vegetated in stages on completion of a section of the pipework. This impact can be managed and mitigated.	2 (low)
7. Trenches remaining open for long periods of time, causing them to collapse, creating an erosion and safety hazard.	7 (med)	Trenches must not remain open indefinitely. Trench work must be completed in sections and then closed once the pipe has been laid in that section. Small inspection holes may be left open along the route but the rest of the trench must be closed. Cleared areas may not be left exposed for long periods of time and must be re-vegetated as each stage of pipework is completed. Trenches must not remain open during building shut down periods i.e. over Christmas and Easter. Trench work must be planned so that trenches are closed before these shut down periods as there is a risk that the trenches will either collapse or fill with water if left unattended and this can create a hazard for children and animals. Trenches must be demarcated since all pipelines are near homes, the local school and pedestrian walking areas.	2 (low)

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
<p>8. Incorrect filling of trenches on completion creating points of erosion, especially on slopes and near watercourses.</p>	<p>6 (med)</p>	<p>This impact can be avoided.</p> <p>Care must be taken to ensure that when closing trenches, soil is compacted sufficiently and left so that the level of the trench is slightly higher than the surrounding land, to allow settling. Should soil settle below the level of the surrounding land, it will leave a depression along which water will travel and this could create a focal point for erosion. This can be especially problematic on sloped sections where water will follow the depression along the pipeline route, building up speed down steeper sections and creating furrows. If this occurs near watercourses, it will erode the river banks and cause them to collapse. Rehabilitation through replanting of indigenous grass species soon after closure will aid in stabilising soil and preventing erosion and will assist in controlling dust release.</p> <p>This impact can be avoided and mitigated.</p>	<p>4 (low)</p>
<p>9. Deposition of eroded material into water bodies when laying pipe across the watercourses impacting water quality (increased turbidity, reduction of dissolved oxygen).</p>	<p>8 (med)</p>	<p>Caution needs to be exercised when working near the watercourse crossings (WC1 – WC19). The following mitigation measures will be carried out and are included in the EMP:</p> <ul style="list-style-type: none"> • All construction activities occurring within the watercourses must be done with extreme care to avoid damage to the watercourse. • No heavy vehicles will be permitted to work in any watercourse. Pipework around these sensitive areas will be laid by hand. • No storage of materials will be permitted within these areas or within 15m of these areas, which will be agreed on and demarcated before construction begins on each section. • The proposed preferred route has been planned so as to avoid streams, however, watercourse crossings cannot be avoided entirely. Where stream crossings are required, the pipe will be laid underground with the pipe being placed on a stone bedding to allow water to move around and underneath the pipeline. It is likely that soft material will be encountered at the watercourse crossings. The pipeline will therefore be laid below the level of the river bed and gabions / reno-matresses will be used to prevent scouring of the river bed and exposure of the pipe. The gabions will be placed just downstream of the pipe and will be below the level of the river 	<p>4 (low)</p>

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		<p>bed in order to maintain the river bed profile.</p> <ul style="list-style-type: none"> The contractor will ensure that stream bed work is carried out in the dry season when flow rates are low to non-existent. It is unlikely that any stream will need to be temporarily diverted however if this is the case, a suitably qualified contractor will be appointed to handle the temporary stream diversion work to ensure that the flow rate and stream morphology are taken into account. In order to prevent long-term deposition of material into the watercourses, areas exposed to erosion must be protected through the use of sand bags, berms and efficient construction processes i.e.: limiting the extent (footprint) and duration period that areas are exposed. <p>This impact can be managed and mitigated to a degree.</p>	
<p>10. Damage to watercourses further downstream due to temporary stream diversions during stream crossings.</p>	<p>5 (low)</p>	<p>The majority of the watercourses crossed are non-perennial or drainage lines, which only become evident during rainfall events. Existing structures are also in place for the pipeline to tie onto. The need for temporary diversions is therefore unlikely and may only be applicable to the larger watercourses (e.g. WC7). It is preferable to carry out work in stream beds during winter when flow rates are lower. Where relevant, a suitably qualified contractor will be appointed to handle the temporary stream diversion work. Care must be taken to manage potential erosion and introduction of sediment into the stream. This can be managed by using appropriate materials for the stream diversion and using sediment traps to capture dislodged sediment. Soft material gabions are to be used instead of concrete encasement. These will be placed just downstream of the pipe in order to mitigate potential impacts while working in the stream beds. Stream diversions must be removed as soon as the work is complete and may not be left in place indefinitely.</p> <p>This impact can be avoided, managed and mitigated.</p>	<p>1 (low)</p>
<p>11. Physical damage to wetlands during excavation within the wetland and siltation.</p>	<p>7 (med)</p>	<p>Construction activities are to adhere to the pipeline route and construction camp area. The rest of the Thendele Community must be demarcated as 'no-go areas' to prevent workers from unintentionally encroaching into wet areas, which are scattered throughout the study area. Furthermore:</p> <ul style="list-style-type: none"> The pipeline is to run as close to the existing roads and footpaths as 	<p>5 (low)</p>

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		<p>possible to reduce the disturbance footprint.</p> <ul style="list-style-type: none"> • The pipe must be tied to existing structures at the watercourse, where feasible to reduce the amount of construction activities within the watercourse (e.g. WC11). • No traffic, vehicles or storage is permitted within the wetland areas; • No construction vehicles may drive off the existing gravel roads as they are likely to drive into wetland area. • No dumping of material or waste may occur within these areas. All material and waste must be taken back to the construction camp at the end of the day. • Designated stockpile storage areas must be established within the construction site camp. <p>This impact has been avoided, where the preferred pipeline route has been re-aligned to avoid wetlands (e.g. WC1- WC3) and can be mitigated during construction through the implementation of the EMPr.</p>	
<p>12. Clearing of vegetation from the pristine Drakensberg Foothill Wattled Crane Habitat during laying of the pipeline route and temporary access points resulting in a loss of indigenous vegetation and exposure of soil to erosion.</p>	<p>5 (low)</p>	<p>The vegetation in the area is characterized by grassland with little to no tree cover. The project runs through the Thendele Community, which means that the study area has been disturbed by infrastructure, homesteads and associated gardens. The pipeline route follows the reserve of existing roads in most places, except where the shortest or best route requires it to move away from the road to reach homesteads.</p> <ul style="list-style-type: none"> • The relatively small trench size should result in the loss of only a narrow strip of vegetated area, which must then be revegetated on completion. • Clearing of vegetation and excavating of the trench in close proximity to the watercourses will need to be done by hand as vehicle access will be restricted as there is a higher risk of damage and disturbance to surrounding vegetation. • Due to previous disturbance, the areas near the road tend to be more disturbed and invaded by alien species. Therefore where possible, the route will follow close to the road. • Local labour will also be used to dig the trenches by hand reducing the impact on the indigenous vegetation. • The contractor must ensure that invasive species do not gain a foothold along the cleared route until 	<p>3 (low)</p>

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		<p>the indigenous vegetation has had time to re-establish.</p> <p>This impact can be managed and mitigated.</p>	
13. Encroachment of alien vegetation into disturbed areas during construction.	5 (low)	<p>There is currently limited alien vegetation located within the surrounding area and therefore this needs to be tightly controlled.</p> <ul style="list-style-type: none"> • Alien vegetation within the construction footprint must not be allowed to encroach onto the site and must be continually removed during construction. <p>This impact can be managed and mitigated.</p>	3 (low)
14. Loss of riparian vegetation during excavation for pipework crossings on watercourses, leading to erosion and damage to stream banks.	8 (med)	<p>At most of the watercourses being crossed, there are already existing gravel roads or footpath crossings, which have disturbed and transformed the watercourse. Furthermore, the drainage lines have little riparian vegetation due to the non-perennial nature of the system. Where clearing of riparian vegetation is required (e.g. WC16 & WC7), it will be kept to a minimum due to the small size of the pipe and associated trench (<1m), which will be dug by hand reducing the area of impact. The key impact that requires attention is the potential for erosion, which is to be monitored by the Contractor on an ongoing basis. Erosion can be reduced by keeping any vegetation associated with the watercourses intact.</p> <p>This impact can be avoided and managed.</p>	4 (low)
15. Temporary increase in waste and litter due to the construction process.	6 (med)	<p>The construction phase of the project will see an increase in workers on site and therefore an increase in waste in the area.</p> <ul style="list-style-type: none"> • Littering will not be permitted in the study area; • Designated waste storage areas with appropriate waste receptacles must be set up within the construction site camp; • Waste will be removed from site and disposed of at a registered waste disposal site; • Safe disposal slips for the disposal of all waste must be obtained and kept on site as proof of safe disposal. • Workers are to be made aware of the close proximity to the World Heritage Site and the pristine nature of this area. <p>Waste management will be controlled through the implementation of the EMP. This impact can be managed and mitigated.</p>	2 (low)
16. Insufficient number of toilet facilities on site resulting in the contamination of the environment.	4 (med)	<p>The increase of construction personnel during the construction phase will require an appropriate number of toilet facilities for the site.</p>	4 (low)

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		<ul style="list-style-type: none"> • Appropriate and sufficient toilet facilities (1 toilet per 15 employees) must be provided by the contractor; • All toilet facilities must be checked on a daily basis; • All toilet facilities must be emptied and cleaned on a weekly basis. • A registered waste removal contractor must remove effluent waste from site or effluent waste must be disposed of at a permitted Waste Water Treatment Site; • Safe disposal slips for the disposal of effluent waste must be obtained and kept on site as proof of safe disposal. <p>This impact can be managed and mitigated.</p>	
17. Contamination of the receiving environment due to inappropriate storage and usage of hazardous materials and substances (cement, fuel etc.).	6 (med)	<p>It is unlikely that there will be many hazardous materials used during construction however any potentially hazardous substances (including cement and paint) will be stored within a secured area in the construction camp. No storage of material is to occur within 32m of any watercourse. The storage area will be a hard surfaced, bunded and covered area. Cement mixing must be done on a hard surface that is protected from stormwater runoff.</p> <p>This impact can be prevented by managing the storage.</p>	2 (low)
18. Speeding construction vehicles creating unsafe working conditions and putting pedestrians and livestock at risk.	5 (low)	<p>The pipeline runs in close proximity to a school, the community centre and various homesteads. Speed limits will be obeyed and enforced by the contractor. A complaints register will be kept on site in the environmental file.</p> <p>This impact can be avoided and managed.</p>	1 (low)
19. Damage to the cultural features including graves, the Shembe site and other structures identified by the heritage specialist.	8 (med)	<p>This impact is unlikely since the preferred pipeline route does not encroach into the specialists recommended buffers (10m for graves and 20m for structures and Shembe site). This impact has been prevented by the re-alignment of the pipeline. Workers are also to be trained on the location and local importance of the heritage features as stated in the attached EMPr.</p>	4 (low)
Operation			
20. Provision of potable water to the local community	0	This is a positive impact.	0
21. Erosion around watercourses and damage to watercourse banks where pipe crossings have been placed.	8 (med)	<p>Where new watercourse crossings have occurred (i.e. WC15), gabions will be strategically placed along the stream banks to protect the pipeline and stabilize the banks and prevent erosion. It must also be ensured that trench rehabilitation has been effectively carried out before contractors leave the site. Soil in the trenches must be compacted effectively to the same level or</p>	4 (low)

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
		<p>slightly higher than the surrounding land to prevent settling which could create depressions for water to travel along, creating erosion funnels and exposing the pipeline. It must be ensured that indigenous vegetation is planted after the soil has been compacted and that this vegetation has taken successfully before contractors leave the site.</p> <p>This impact can be avoided during the construction phase.</p>	
22.Placement of pipes in the beds of watercourses impacting the flow regime of the Mooi River.	6 (med)	<p>Due to the small size of the pipes and drainage lines, the construction will not impact the flow regime of the Mooi River. The pipes will be tied to existing structures or placed underneath the streambed. The pipe will be laid and surrounded by a stone layer allowing water movement around the pipe. Please refer to drawing in Appendix A. This impact can be prevented during the construction phase.</p>	2 (low)
23.Water pipes bursting resulting in localised flooding and erosion.	6 (med)	<p>The design criteria was developed using guidelines from “The Red Book – The Human Settlement, Planning and Design”. Various measures to ensure pipe integrity will be implemented including:</p> <ul style="list-style-type: none"> • Scour valves to control the supply of water. They are used to stop supply when any repairs are carried out on a section of pipeline. • Non-Return Valves (spring loaded) will be placed along the pipeline length which effectively break the line into smaller sections thereby decreasing the overpressures. These valves have been designed for placement on long pump mains (over and above the mandatory placing at pump stations). Double purpose (RBX) air valves would be installed either side of the valve. • Vacuum Breaker / Air Release Valves designed to accommodate air intake and release during normal operation and in the event that the pump trips or the line is being filled or scoured. These valves will be installed at apexes along the pipelines at distances of not more than 600m and also before and after isolation valves and non-return valves. • Bulk water meters to be placed at the reservoir located within manholes to monitor the volume of water in and out of the reservoir. <p>This impact can be prevented and mitigated.</p>	1 (low)

Nature and Consequences of impact	Significance rating of impacts ² :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
24. Illegal connections resulting in damage to pipework, flooding, erosion and loss of water supply.	7 (med)	The pipeline will be laid in such a way so as to deter illegal connections. The bulk pipelines will be encased in a steel layer to make it difficult to puncture. The trench will also be dug deeper than normal to deter illegal connections. A key element in mitigating this risk is community participation and provision of information in order that the community may be aware that illegal connections could compromise the water supply for the entire community. This impact can be prevented and managed.	5 (low)
Decommissioning			
25. Rubble, soil and material left on site and in close proximity to the watercourses.	5 (low)	It is unlikely that the pipeline and reservoir will be decommissioned however should this be required, all rubble and pipework area to be removed from the site and disposed of at a registered landfill site. This impact can be managed and mitigated.	1 (low)
Cumulative			
26. Cumulative impact of ground water abstraction on groundwater in the area providing the water for the Water Supply Scheme.	9 (med)	Excessive abstraction from a water resource (including ground water) can lead to a reduction in flow which can impact on the ecological reserve of the water resource and impact on aquatic life. It is therefore important to ensure that cumulative water abstraction from the proposed borehole does not exceed the ecological reserve of the Mooi River system (i.e. Quaternary Catchment V20A). A Geohydrological Study was carried out by Engeolab cc who found that the borehole can deliver up to 192.4kl/day however must be left to recover for a period of at least 4 hours. A timer is therefore to be installed to affect pumping and recovery times. This impact can be managed.	5 (low)
27. Improved service delivery to the Thendele Community.	0	This is a positive impact.	0

6.3 Layout Alternative 1

The below impacts relate to the originally proposed layout, which is an *alternative* to the preferred layout described above (i.e. Table below associated with Layout Alternative 1).

The original route required an additional four watercourse crossings (WC1, WC2, WC3 and WC9). The preferred route alternative adjusts the route so that these crossings are avoided. The buffer associated with two culturally significant sites, to the north of the study area, was also avoided in the preferred layout alternative (assessed above).

Table 2: Impacts and mitigation measures associated with the *alternative* layout.

Nature and Consequences of impact	Significance rating of impacts ³ :	Proposed mitigation and Extent to which impact can be reversed / avoided, managed or mitigated:	Significance rating of impacts after mitigation:
Construction			
1. Construction impacts 1 – 18 remain the same as those discussed in the previous section for Layout Alternative 1 however there will be an increase in the number of watercourse crossings (including wetlands).	9 (med)	Mitigation measures for construction impacts 1 – 19 remain the same as the preferred alternative. WC1, WC2, WC3 and WC9 must be included in the number of watercourse crossings requiring erosion and sediment control measures.	7 (med)
2. Damage to the cultural features including graves, the Shembe site and other structures identified by the heritage specialist.	9 (med)	The original pipeline route was located in close proximity (i.e. ~6m) to two orche pits which were identified by the specialist as “living heritage sites”. The specialist recommended that a 20m buffer be kept around these sites. Due to the close proximity of the proposed route, workers may disturb the orche pit, which are used by local Zulu women and San descendants for decorating their homes. This impact could be avoided through re-routing the pipeline away from the heritage sites (as per Layout Alternative 2 – the preferred layout).	8 (med)
Operation			
3. Operational impacts will be the same as those discussed in the previous section for Layout Alternative 1.		Mitigation measures will be the same as those discussed in the previous section for Layout Alternative 1.	
Decommissioning			
4. Impacts remain the same as those listed in the previous section for the preferred layout.		Mitigation measures remain the same as per the previous section.	
Cumulative			
5. Impacts remain the same as those listed in the previous section for the preferred layout.		Mitigation measures remain the same as per the previous section.	

6.4 Environmental Impact Statement as per section (I)

The key impacts associated with the upgrading of the Thendele Water Supply Scheme relate to those during the construction period. Issues such as indigenous vegetation clearing, physical damage to the watercourses and wetlands and managing erosion need to be addressed by the contractor. This can be best managed by demarcating the area requiring clearing (i.e. width of the trench), treating the watercourses as sensitive areas where no vehicles are allowed to excavate near and implementing effective erosion control measures at the crossings (i.e. gabions or reno-matresses). All construction activity is to be confined to the side of existing gravel roads and footpaths. All vehicles must use the existing roads and operate within the existing route. No ad hoc roads/ turning circles may be used. Construction workers are to take cognisance of the World Heritage Site. There is to be a minimal footprint in the Reserve with waste removed on a daily basis.

Once construction is complete there should be no significant impacts related to the operation of the water pipeline. Taking into consideration the above impacts and mitigation measures, it is the EAP’s opinion that the upgrade of the Thendele Water Supply Scheme be authorised.

³ See Appendix H for more details.

6.5 Impact Management Objectives and Outcomes for the Development for Inclusion in the EMP as Per Section 3(m)

The following objectives and outcomes must be considered for this project:

- Objectives:
 - For there to be no lasting negative impacts on the environment once construction is complete, specifically within the watercourse.
 - To practice responsible construction, 'best practice' with regards to housekeeping on site during construction (outlined within the EMPr) and enforce the polluter pays principle. The applicant / contractor must be responsible for their actions on site during construction and the rehabilitation of the site post construction.
- Outcomes:
 - To promote sustainable development. Create infrastructure and an environment that is healthy and sustainable for future generations to come.

6.6 Assumptions, Uncertainties and Gaps in Knowledge Relating to the Assessment and Mitigation Measures Proposed as Per Section 3(o)

The information in this report is based on findings of the aquatic, wetland, heritage and geohydrological investigations. The design drawings and typical cross sections through the watercourses, have been provided to the EAP by the engineer. The EAP is therefore satisfied that there are no gaps in knowledge relating to this assessment.

6.7 Period for Which Authorization is Required, Proposed Monitoring & Auditing and Post Construction Requirement's

Environmental authorisation is required for the construction of the water scheme towards the end of 2017 or 2018. It is therefore recommended that the authorization be valid for a period of five years, within which time construction would need to commence.

Given the nature of this project, it is recommended that **monthly** ECO audits be carried out for the duration of the construction phase of this project. One post construction audit should be conducted once construction is complete.

The EMPr details the post construction, rehabilitation and closure objectives, which will be monitored by the ECO and compliance authorities.

6.8 Financial Provisions as Per Section 3(s)

No upfront financial provision is required for this project. The applicant and contractor is, however responsible for and must ensure that the site has been rehabilitated in full before leaving the site.

6.9 EAP Opinion on Whether or Not to Authorize Activity and Recommendations & Conditions for Authorisation as Per Section 3(n) and (p)

With respect to the layout alternatives, it is recommended that preferred Layout Alternative 2 be authorised. The alternative layout crosses more watercourses and therefore increase the level of disturbance to the Thendele area. Impacts associated with the construction and operation of the pipeline have been rated as 'low' however the following conditions are recommended for including in the authorisation:

Stakeholders, Properties & Services

- As standard construction practice the engineer and contractor should identify all existing services that may be affected prior to construction.
- The contractor should liaise with the Ward Councillor prior to construction, who will notify the community on the construction phases.
- Where fences or structures have encroached into the road reserve, property owners will be notified and these may need to be removed. This will however be negotiated before any activity occurs. The contractor will work with the local representatives to ensure that land owners are aware of where their fence lines encroach into the road reserve.
- It is suggested that any structures that need to be removed, should be replaced and any damage repaired.
- The route should run adjacent to existing roads and footpaths wherever feasible.

Traffic & Construction Vehicles

- The contractor must take into consideration the potential movements of the surrounding community, in particular, the school.

- Appropriate signage and trench demarcation must be used to cordon off construction areas.
- All construction vehicles should be fitted with the appropriate silencers and exhausts.
- Speed limits must be obeyed.
- Existing roads must be used with no ad hoc roads being created.

Housekeeping, waste management, storage and materials handling

- Littering must not be permitted on site.
- All hazardous materials and substances should be stored within a secured area in the construction camp. The storage area should be a hard surfaced, bunded and covered area.
- Cement mixing must be done on a hard surface that is protected from stormwater runoff.
- Appropriate and sufficient toilet facilities must be provided by the contractor.
- Toilet facilities must be provided by a registered company and all sewage must be disposed of at an appropriate facility. Safe disposal certificates must be kept on record.
- Toilet facilities must not be located within 32m of any watercourses.

Dust and erosion control

- A water cart should be available to dampen dusty surfaces and suppress dust, if necessary.
- Exposed areas should be rehabilitated and re-vegetated as soon as possible during construction.
- Areas exposed to erosion must be protected through the use of sand bags, berms and efficient construction processes i.e.: limiting the extent (footprint) and duration period that areas are exposed.

Stormwater management and protection of watercourses

- The engineer/contractor must ensure that only clean storm water runoff enters the environment. Any contaminated run off must be collected and disposed of.
- All watercourses must be identified and demarcated at the start of construction.
- No excavated material or fill material may be stored within 10m directly adjacent to the watercourses.
- Only the area directly in the path of the trench may be cleared of vegetation.
- The contractor must ensure that invasive species do not gain a foothold along the cleared route until the indigenous vegetation has had time to re-establish itself.
- Heavy vehicles should avoid working near the watercourses as much as possible. Trenches to preferably be dug by hand.
- Once construction is complete, it must be ensured that no material whatsoever is left in the stream channels or near the banks where it may be washed into the watercourses in a high flood event. It is recommended this material be removed from site entirely if it is not used in the construction process.

Trenching

- Only the minimum area required for the trench may be cleared.
- Trenches must not remain open indefinitely.
- Trench work must be completed in sections and then closed once the pipe has been laid in that section.
- Cleared areas may not be left exposed for long periods of time and must be re vegetated as each stage of pipework is completed.
- Trenches must not remain open during building shut down periods i.e. over Christmas and Easter.
- Soil in the trenches must be compacted effectively to the same level or higher than the surrounding land to prevent settling which could create depressions for water to travel along, creating erosion funnels and exposing the pipeline.
- Indigenous grasses must be replanted after the soil has been compacted and that this vegetation has taken successfully before contractors leave the site.
- Trench rehabilitation must be effectively carried out before contractors leave the site, especially where approaching the watercourse crossings and on steeper hills.

Watercourse crossings

- Work in stream beds should preferably be carried out during winter when flow rates are lower.
- Erosion protection features must be installed at the watercourse crossings if there are no existing structures.
- Pipework must be laid in the river bed flush with the bedrock or the stream bed so as not to create a point for erosion.

Protection of Heritage Resources

- Attention is drawn to the South African Heritage Resources Act, 1999 and the KwaZulu-Natal Heritage Act which, requires that operations that expose archaeological or historical remains should cease immediately, pending evaluation by the provincial heritage agency.
- Should the developer decide to move any of the proposed pipelines closer than 10m (graves) or 20m (orche pits), identified by the heritage specialist, a second phase heritage impact assessment should be initiated.
- Apart from construction of the reservoir and associated bulk pipeline, there is to be no further activity in the World Heritage Site.

Appendix A: Engineering Drawings & Maps

Appendix B: Specialist Reports

Appendix C: Proof of Placement of Notice Board

Appendix D: Proof of Notification

Appendix E: Advert

Appendix F: Registered I &Aps

Appendix G: Comments and Response Table and Comments Received

Appendix H: Impacts Scoring Matrix

Appendix I: EAP declaration and Curriculum Vitae

Appendix J: Environmental Management Program