



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

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Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

The proposed hydropower station and associated infrastructure at Boegoeberg Dam on the Orange River, near Groblershoop, Northern Cape

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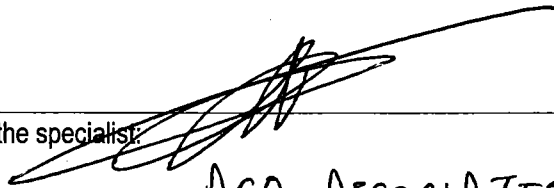
4.2 The specialist appointed in terms of the Regulations_

I, JAYSON ORTON , declare that --

General declaration:

- I act as the independent specialist in this application
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:



ACO ASSOCIATES cc

Name of company (if applicable):

29th JULY 2013

Date:

HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED BOEGOEBERG HYDROPOWER STATION NEAR GROBLERSHOOP, NORTHERN CAPE

(Assessment conducted under Section 38 (8) of the
National Heritage Resources Act (No. 25 of 1999) as part of an EIA)

Prepared for

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Final report: 27th November 2013



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EXECUTIVE SUMMARY

ACO Associates cc was appointed by Aurecon South Africa (Pty) Ltd to assess the potential impacts to heritage resources that might occur as a result of the proposed construction of the Boegoeberg Hydropower Station close to Groblershoop on the Orange River, Northern Cape. The project would have a capacity of 11 MW and be constructed on the farm Zeekoebaart 306/2, 306/3 and Farm 1.

The power station site is immediately alongside the existing Boegoeberg weir. The canal would be excavated into the nearby cliff with the turbine hall and tailrace being sited just downstream on the silty floodplain. The general surroundings are quite arid and vegetation cover is very sparse. The ground surface is generally rocky throughout the study area.

Archaeological artefacts are widespread throughout Bushmanland and the Karoo and generally comprise what is commonly referred to as background scatter. Other aspects of heritage encountered in the region from time to time include rock art, historical buildings and ruins and graves.

The survey recorded stone artefacts in a number of places but only in one area was a dense concentration of any significance found. This scatter occurs immediately above the cliff at the weir and can be easily mitigated. A grave is known to occur below the weir but, despite a headstone and stone cairn in different places, the precise location of the human remains cannot be confirmed. A historical graveyard along one of the access roads to the area was also found.

Impacts to archaeological resources would likely be of medium significance but these can be reduced to low through mitigation. If grave sites are avoided then impacts to them are of low significance but should any be disturbed then that would constitute an impact of high significance.

Since the impacts can be easily mitigated or managed, it is recommended that the project be allowed to proceed. The following recommendations should be adhered to (and should be included in the EMP for the project):

- The gravestone (ZKB2013/003) and stone cairn (ZKB2013/002) immediately downstream of the power station site should be cordoned off for the duration of the construction phase and carefully avoided throughout construction work;
- Excavation in the silts immediately below the weir should be carefully monitored by the ECO just in case there are other burials, or the cement headstone has been washed downstream from another location during floods;
- If the road passing the graveyard at ZKB2013/004 is to be used for access to the transmission route then the graves must be cordoned off and avoided during and after development (due to its generally sensitive location, erection of a permanent fence around this graveyard could be considered);
- Archaeological mitigation should be carried out at site ZKB2013/001 on the platform at the top of the cliff prior to construction; and
- The stone structures at BDW2013/001, specifically the one near the road, should be avoided during and after construction. Careful placement of pylons will be required to ensure that these structures are spanned but care should be taken to avoid damage to them during construction.

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1. INTRODUCTION

ACO Associates cc was appointed by Aurecon South Africa (Pty) Ltd to assess the potential impacts to heritage resources that might occur as a result of the proposed construction of the Boegoeberg Hydropower Station close to Groblershoop on the Orange River, Northern Cape (Figure 1). The project would have a capacity of 15 MW and be constructed on the farm Zeekoebaart 306/2, 306/3 and Farm 1.

The proposed project would entail construction of the following components:

- An off-take structure above the existing Boegoeberg weir to facilitate the abstraction of water;
- A temporary upstream caisson (cofferdam) will be required in the weir pool to exclude water from the works.
- Water conveyance infrastructure comprising a combination of either an open canal , a pipeline and/or culverts or a tunnel to convey the water to the head pond;
- A head pond;
- Steel (or other suitable pipeline material) penstocks to transfer the water to the power chamber;
- A power chamber to house the turbines and generation equipment;
- Outlet channel (tailrace) to return the abstracted water back into the river; downstream of the power chamber;
- A switchroom and transformer yard;
- A high voltage (HV) distribution line to evacuate the power to a nearby Fibre Substation; and
- Access roads to the site.

1.1. Terms of reference

ACO Associates cc was asked to:

- Conduct a detailed desktop level investigation to identify known archaeological, cultural and historic sites in the proposed development area;
- Undertake field work to verify the results of the desktop investigation;
- Document (GPS coordinates and map) all sites, objects and structures identified;
- Compile a report which would include:
 - Identify archaeological, cultural and historic sites within the proposed development area;
 - Assess the sensitivity and significance of all heritage remains on the site;
 - Evaluate the potential impacts, including cumulative impacts, of construction, operation and maintenance of the proposed development on heritage resources, in terms of the scale of impact (local, regional, national), magnitude of impact (low, medium or high) and the duration of the impact (construction, up to 10 years after construction (medium term), more than 10 years after construction (long term));
 - Recommend mitigation measures to ameliorate any negative impacts on areas of heritage importance;
 - Consider any relevant guidelines and take cognisance must be taken of the Department of Environmental Affairs and Development Planning guideline: “Guideline for involving heritage specialists in EIA processes” (Winter & Baumann 2005).

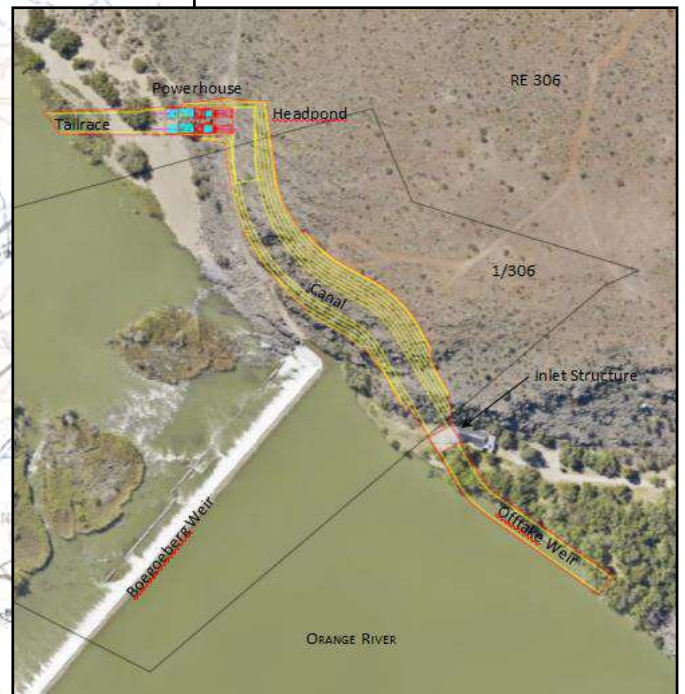
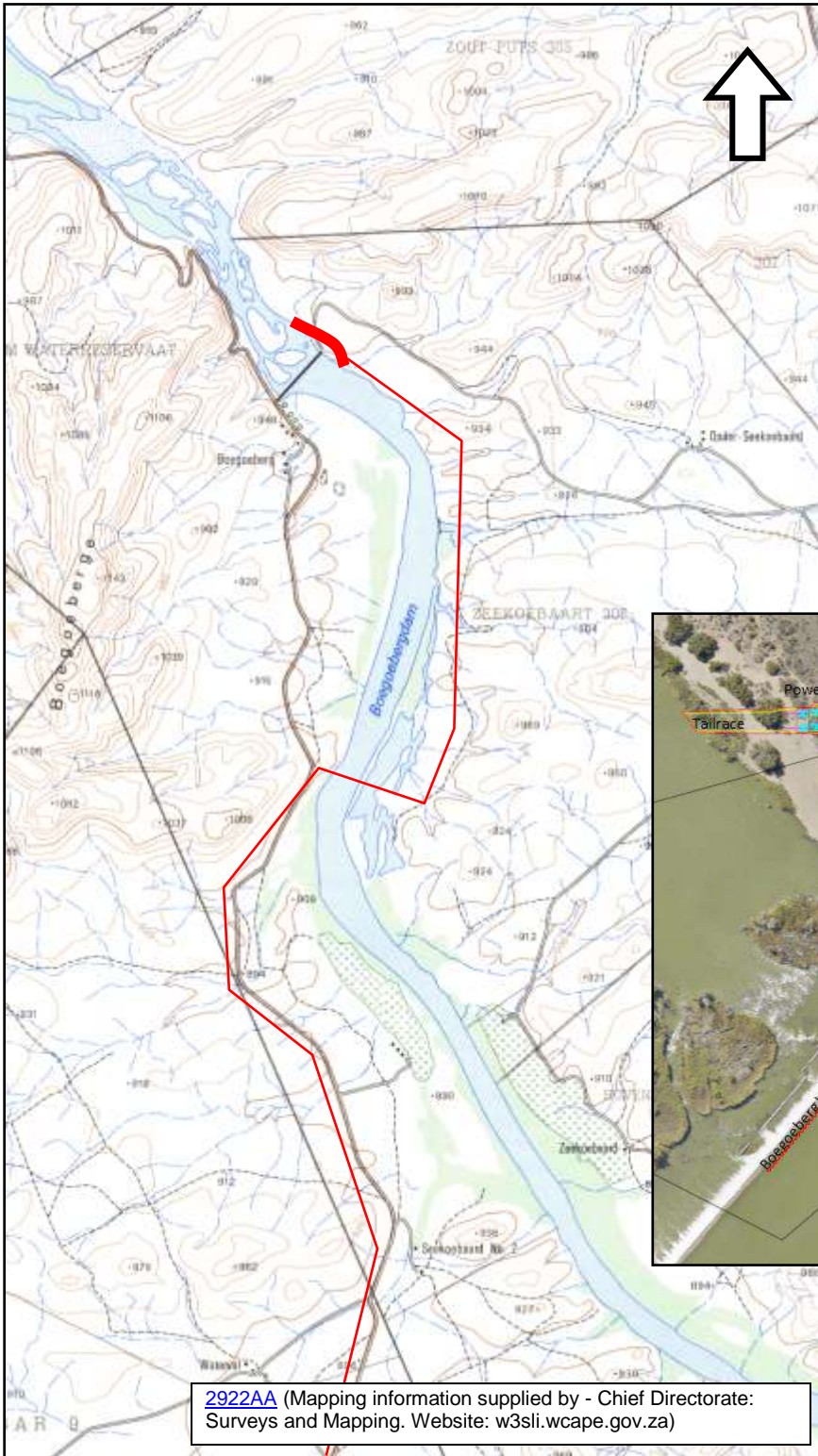


Figure 1: Map showing the location of the proposed project. The thick red line denotes the position of the canal and turbines while the thin line represents the transmission line which would continue southwards to the Fibre Substation just north of Marydale. The inset shows a site plan (Source: Aurecon 2013).

1.2. The authors

Dr Jayson Orton has a D.Phil in archaeology (Oxford, UK, 2013) and has been conducting Heritage Impact Assessments in the region since 2004. He has also conducted research on aspects of the Later Stone Age in the Northern and Western Cape and published widely on the topic. He is accredited with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #233).

Dr Lita Webley has a PhD in archaeology (UCT, 1992) and has been conducting Heritage Impact Assessments in the region since 1996. She has also conducted research on aspects of the Later Stone Age in the Northern and Eastern Cape and published widely on the topic. She is accredited with the Association of Southern African Professional Archaeologists (ASAPA) CRM section (Member #175).

2. HERITAGE LEGISLATION

The National Heritage Resources Act (NHRA) No. 25 of 1999 protects a variety of heritage resources including palaeontological, prehistoric and historical material (including ruins) more than 100 years old (Section 35), human remains older than 60 years and located outside of a formal cemetery administered by a local authority (Section 36) and non-ruined structures older than 60 years (Section 34). Landscapes with cultural significance are also protected under the definition of the National Estate (Section 3 (3.2d)). Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted. The South African Heritage Resources Agency (SAHRA) has requested such an assessment and this report fulfils that requirement.

Since the project is subject to an Environmental Impact Assessment, SAHRA and Heritage Northern Cape are required to provide comment on the proposed project in order to facilitate final decision making by the Department of Environmental Affairs (DEA).

3. METHODS

3.1. Literature survey

A survey of available literature was carried out to assess the general heritage context into which the development was to be set. This literature included published material, unpublished commercial reports and online material.

3.2. Field survey

The power station site was subjected to a detailed foot survey, while the authors drove along the transmission line route identifying and physically examining potentially sensitive areas. The site and surrounding area was examined on 09th September 2013. During the surveys the positions of finds were recorded on a hand-held GPS receiver set to the WGS84 datum. Photographs were taken at times in order to capture representative samples of both the affected heritage and the landscape setting of the proposed development. Site names are allocated according to farm and year such that in the case of ZKB2013/001 this is the first site recorded on Zeekoebaart in 2013.

3.3. Impact assessment

For consistency, the impact assessment ratings were done using a scale supplied by Aurecon.

3.4. Limitations and assumptions

Due to the great length of the power line it was not possible to physically walk along the entire route. However, based on the accumulated field experience of the authors, it is assumed that archaeological resources would be uncommon in the landscape and all other heritage resources would generally be easily visible from the road. Although no location for the construction camp has been provided, it is assumed that the area immediately above the site and/or the present camping area would be used.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

Due to the large area of the footprint, the study area was variable in character. At the Boegoeberg Dam the Orange River is about 500 m wide and islands of silt and reeds occur immediately downstream (Figure 2). The power station and associated pipelines and/or canals would be placed at the foot of a small cliff at the north-eastern end of the weir (Figure 3). The very limited floodplain upstream (to the southeast) is grassed and used as a campsite (Figure 4), while that downstream is sandy with riverine vegetation (Figures 5 & 6). Figures 2 to 10 give an indication of the environment in which the project is proposed.



Figure 2: View from above the Boegoeberg weir showing the character of the river valley at this point. The photograph is taken from the top of the small cliff below which the power station would be built.



Figure 3: View of the small cliff at the north-eastern end of the weir.



Figure 4: Part of the grassed floodplain just upstream of the weir.



Figure 5: The cliff and sandy floodplain below the weir which is visible in the background.



Figure 6: Vegetation on the sandy floodplain.

The power line would run along the river for the first part, encountering similar environments, but then it would cross the river and follow a local road moving away from the river and through the arid far eastern Bushmanland. In these areas the substrate is generally rocky and vegetation cover very limited.



Figure 7: The point where the power line would cross the river alongside an existing line.



Figure 8: Existing power line along the proposed new power line route.



Figure 9: Arid grasslands away from the Orange River.



Figure 10: Arid grasslands, Acacia trees and old prickly pear trees away from the Orange River.

5. HERITAGE CONTEXT

Little archaeological work has been carried out along the Orange River with the only two areas well researched being the Richtersveld far to the west and the Middle Orange River area far to the southeast, between Hopetown and Colesburg. A few other heritage studies have been carried out in the area though, and these provide some context for the present project.

Most writers report finding widely scattered stone artefacts pertaining to the Early (ESA) and Middle (MSA) Stone Ages (e.g. Dreyer 2006, 2012; Morris 2006, 2007, 2012; Van Rhyneveld 2007; Webley 2013). It is relevant to note a statement in Beaumont et al. (1995:240): “Thousands of square kilometres of Bushmanland are covered by a low density lithic scatter.” They note that collections of artefacts generally contain moderately to well weathered items ascribable to the ESA and less or even unweathered artefacts pertaining to the MSA. Morris (2012), commenting on artefacts found to the east of Groblershoop says: “Preservation context is poor – these are essentially lag deposits on eroding surfaces and hence of low significance”. This statement is applicable to much of what we commonly find in Bushmanland. Later Stone Age (LSA) material is occasionally noted, particularly in dune areas (e.g. Morris 2012), but these are uncommon. However, it should be noted that sites very similar to those recorded along the river banks in the Richtersveld (Orton 2007; Smith *et al.* 2001; Webley 1997) have also been found recently in similar contexts at Augrabies (Orton & Webley 2013) and could certainly be expected elsewhere along the Orange River.

Because of its distance from the Cape Colony, this arid part of South Africa’s interior was generally not colonised until fairly late. Most land grants date to the late 19th or early 20th centuries. The first farmers to arrive in the Groblershoop area did so in about 1870. As a result, historical material is likely to be relatively scarce, while farm buildings are usually 20th century. A local website (www.boegoebergcoroute.co.za 2013) states that a hydro-electric generator and pump were built in the area by A.J. Litchfield, while Charles Newberry built a water turbine on the farm Winstead in 1913. Seven soldiers are buried on this same farm, 25 km east of Groblershoop and a short distance to the north of the present study area. The graves relate to the Boer Rebellion of 1914 (Figure 11).

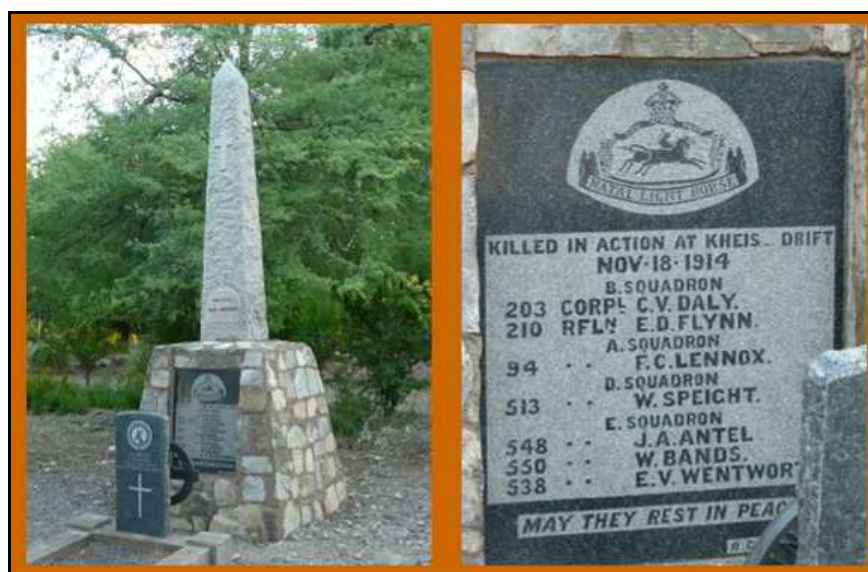


Figure 11: The memorial erected to the memory of the seven Boer soldiers buried at Winstead (Source: www.boegoebergcoroute.co.za).

6. FINDINGS

6.1. Archaeology

Few archaeological resources were found. A list of the heritage resources found is provided in Appendix A and maps showing location of the findings is provided in Appendix B.

Above the cliff at the Boegoeberg Weir an extensive scatter of stone artefacts was recorded (site ZKB2013/001). Most are likely to be MSA in age (Figure 12 & 13) but a few grindstones (Figure 14 & 15) and other isolated flaked artefacts are probably LSA. There is no obvious occupation site but the position offers an excellent view over the valley and was no doubt repeatedly used for short periods. One area of this scatter (point 014) was particularly dense. Similar, but less dense and more weathered material was recorded on the hill where the proposed transmission line would cross the river (point 076).



Figure 12: Banded ironstone artefacts from ZKB2013/001.



Figure 13: Typical MSA blade from ZKB2013/001.



Figures 14 & 15: Two quartzite lower grindstones from ZKB2013/001.

On the sandy floodplain just downstream of the weir was a small and very ephemeral archaeological site (site ZKB2013/006). It consists of a scatter of rocks that may well have been used to anchor a hut (Figure 16). Just two artefacts and one fragment of ostrich

eggshell were associated with the stones. No other signs of occupation were seen anywhere else on the sandy floodplain.



Figures 16: The scatter of rocks at ZKB2013/006.

The most interesting archaeological site was a cluster of low stone walls on the south side of the river and on the mountain slope close to the power line crossing point. A total of twelve features were recorded at the site, named BDW2013/001 (points 24, 52-62). The features included straight walls, semi-circles, L-shapes and small mounds of rocks (Figures 17-21). Only one flaked stone artefact was found associated and this was within the semi-circle at point 024. It was a banded ironstone flake. These stone walls are fairly typical of pre-colonial walling from the Karoo (Hart 1989; Sampson 1984, 1985) and some may have been hunting blinds – that they face down towards the river valley offers further support for this.



Figures 17: The L-shaped stone walling at BDW2013/001 (point 052).



Figure 18: A semi-circular stone feature at BDW2013/001 (point 057).



Figures 19: The L-shaped stone walling at BDW2013/001 (point 062).



Figure 20: A stone mound at BDW2013/001 (point 057).

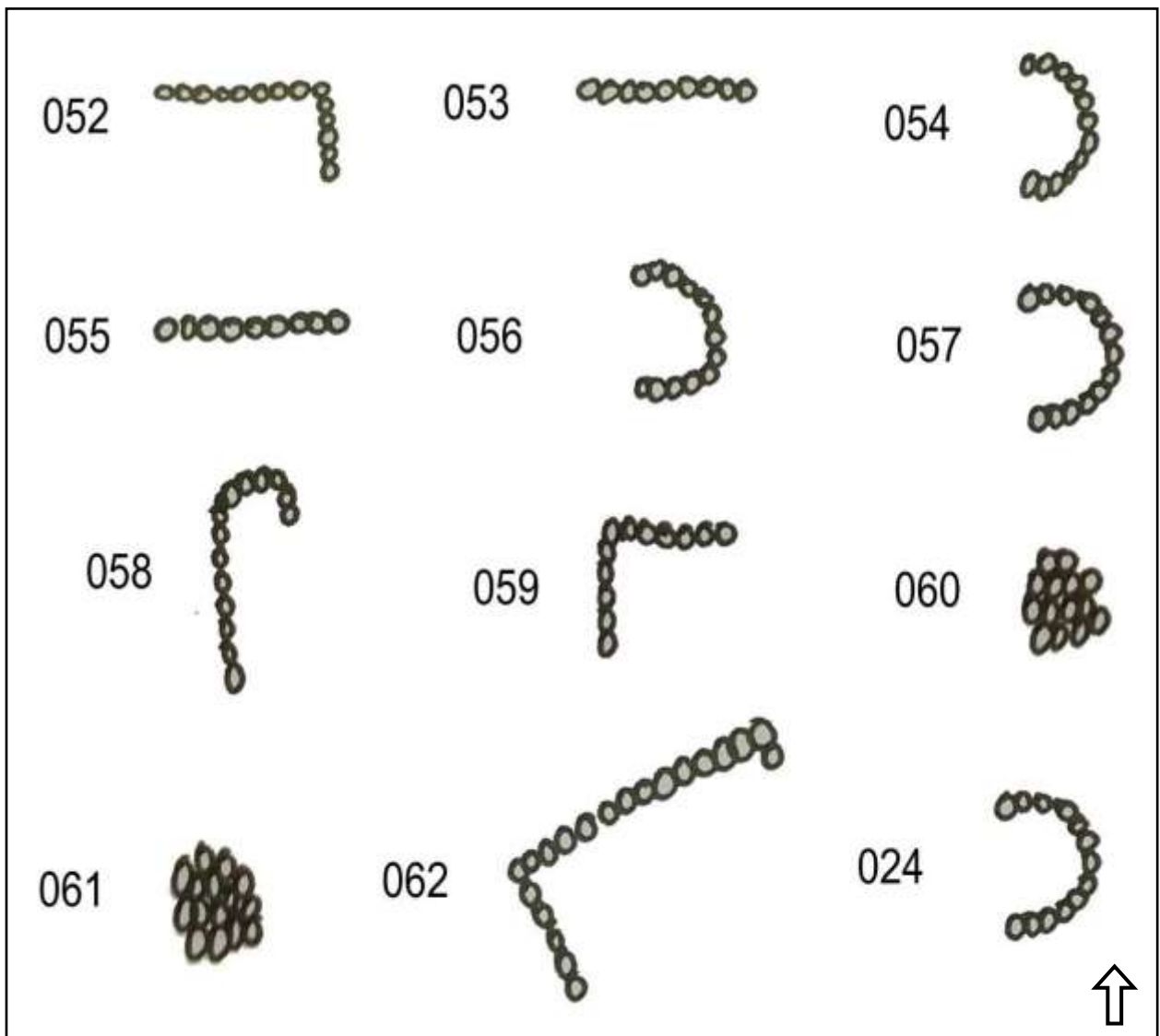


Figure 21: Schematic plans of all the stone features at BDW2013/001. Scales vary, GPS points as labelled, the arrow indicates north.

Another archaeological aspect is rock art. Although none was seen during the survey, there is said to be a rock art site in the mountains near the start of the access road to the farm. We did not locate this during our survey.

6.2. Graves

One informal graveyard and two isolated graves/probable graves were located. The graveyard lies alongside the access road to Zeekoebaart and one grave is within about one metre of the edge of the road (Figure 22). There are at least eight graves all placed in a single row. They are aligned east west. In the sandy floodplain just downstream of the cliff where the weir is are two possible graves – the authors are confident that at least one of them will be a grave. One is a cement headstone seemingly propped up in the sand (Figures 23 & 24). Its caption reads: “Rus in vrede Gert Peters oorlede die 10 April 1953, 62 jaar, die seun van die mens.” The authors were told by the land owner that the person had drowned upstream but had been buried on the spot where his body washed up. It is possible that this headstone is out of position and might even have been moved downstream from another location in the approximately 130 m of silts between it and the weir. Nearby, some 50 m to the northwest, is a stone cairn that seems very much like a burial cairn (Figure 25). Whether the cement headstone in fact belongs with this cairn is unknown, but it is possible that two graves are represented. Many people died during construction of the Boegoeberg Weir (see below) but it is not known where they were buried.



Figure 22: Graves at ZKB2013/004. The circle of rocks on the right is the grave lying closest to the road. The line of graves extends into the bush on the left.



Figures 23 & 24: Headstone at ZKB2013/003.



Figure 25: Stone cairn at ZKB2013/002.

6.3. Built environment

No built environment will be directly affected by the proposed project but a few farm buildings are located in close proximity to the project. At the Boegoeberg Dam there is a modern building at the campsite. It has no heritage significance. During construction of the weir a school and hospital were apparently built (see below) but the whereabouts of these is not known. However, on the road leading to the farm there is a house dating to the late 19th or early 20th century and which can be said to have high heritage significance (Figure 26). It is about 15 m from the access road so will not be impacted at all but it is a very good example of vernacular architecture which was found to be generally rare in the study area. Elsewhere the transmission line would pass close to a small stone kraal at BFT2013/001 (point 022; Figure 27). This farm, labelled Greeffsput on the topographic map, also has a vernacular

pitched roof structure with more recent additions (Figure 28). Just a few hundred meters to the north, Poupan has a set of vernacular structures that seem to be disused and partly in ruin (Figures 29-31).



Figure 26: Vernacular house on the road into Zeekoebaart.



Figure 27: Small stone kraal at BFT2013/001.



Figure 28: Farm structure close to BFT2013/001.



Figure 29: Farm building close to BFT2013/001.



Figure 30: Farm building close to BFT2013/001.



Figure 31: Ruin close to BFT2013/001.

Further north, at point 023, was the remains of a house that had been intentionally demolished (Figure 32). Much rubble was piled nearby. Interestingly, this house was built of traditional materials (sun-dried bricks and mud mortar) but was plastered with modern cement, seemingly in 1956 judging by the date placed on the front of the entrance steps. It is unknown whether it was an old house that got refurbished in the mid-20th century or if it was built in the mid-20th century of traditional materials to save money with just the outer face finished in proper cement. This latter does seem likely. The ruin is about 90 m from the proposed transmission line and will not be directly affected.



Figure 32: Ruin at BFT2013/002. Inset shows the date on the front of the steps.

The Boegoeberg Weir itself is a heritage structure since it was built between 1929 and 1933. The dam has a long history. The following account is taken from an article by Van Vuuren (2009) who draws information from a book on the dam (“Boegoebergdam se mense: 'n flukse draai van die wiel” by Lokkie van Zyl, 2007) and a report on the Proposed Buchuberg Canal (“Buchuberg Irrigation Works on Orange River, Prieska” by Mr W.B. Gordon).

The weir was proposed in the late 1920s as a job creation project for poor Afrikaaners in the region. The idea of a weir and irrigation canal was, however, being considered as early as 1872. The first plan put together was only in 1895 but it was considered too costly and was shelved. The idea was frequently discussed in parliament until in 1906 the scheme was revived but in a different and cheaper configuration. Work began in 1906 using black labour but stopped in 1907 as the costs were deemed to be too high.

Then, in 1929 when the Great Depression hit the world and there was a severe drought in South Africa, the government suddenly ordered construction of the Boegoeberg Weir to provide labour for poor whites. Although built by the Department of Irrigation, the funding was supplied by the Department of Labour. The weir and canal were treated as separate developments and the construction camp for the weir was on Zeekoebaart (the exact location of this camp is unknown but there are no such remains obviously evident close to the power station area). Cofferdams were made from sandbags and all work on these and the main weir was carried out by hand. Although people of colour were not allowed to work on the project, white children as young as nine years old were at times employed. A school and hospital were also built. Approximately 50 people (including 38 children) are said to have died during construction of the project.

Although the weir had proceeded far enough to begin supplying the canal by 1932, it was only in 1934 that the 121 km long canal was completed.

Figures 33 and 34 show historical photographs of the weir under construction.

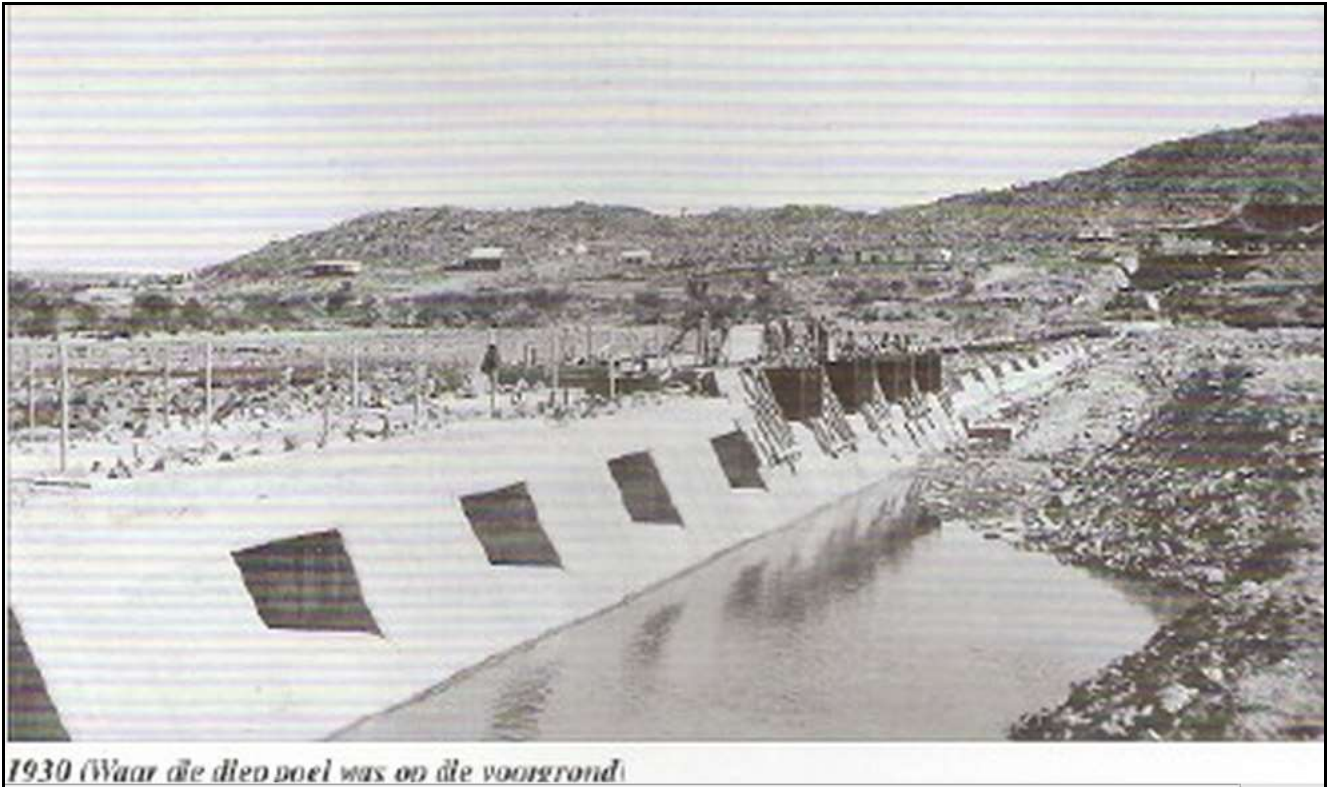


Figure 33: Boegoeberg Weir during construction in 1930. Source: www.boegoebergecoroute.co.za.

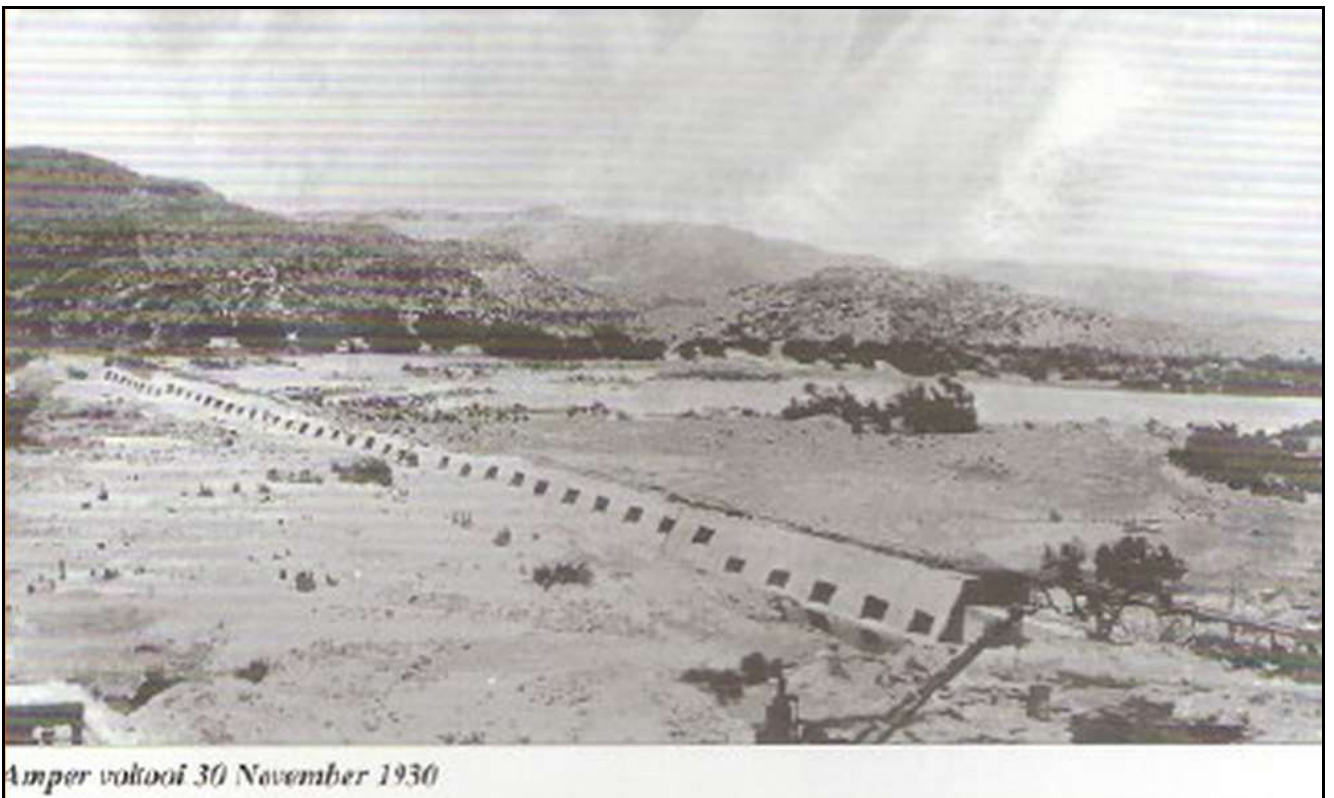


Figure 34: Boegoeberg Weir during construction in 1930. Source: www.boegoebergecoroute.co.za.

6.4. Cultural landscapes and scenic routes

There are no significant cultural landscapes in the study area. It is generally remote and the gravel roads through the study area receive little traffic. None of the roads within proximity of the site can be regarded as a scenic route.

6.5. Living heritage

A song entitled “Boegoeberg se dam” was written but no further information on this could be found. The song has been produced by various artists over the years so it is certainly part of Afrikaner heritage. Eve Boswell (mid-20th century) and Die Van Wyk Broers (2004) both sang the song. Although it is possible that the song was written during construction of the weir, as implied by a post on the website www.boerevryheid.co.za (2007), the veracity of this claim cannot be ascertained.

7. ASSESSMENT OF IMPACTS

In general very little heritage will be impacted by the proposed project. The only potential impacts of any significance are those to archaeological artefacts and graves. Although other aspects of heritage do occur in the vicinity, these will not be directly affected and can easily be avoided during the development. Note that the weir itself will not be directly impacted. Damage and/or destruction of archaeological resources at the power station area, through both canal and road construction, is likely to be of far higher magnitude than that along the transmission line route. As such, mitigation will be required above the cliff but there is little to be concerned about along the transmission line where only small holes would be excavated and the general disturbance footprint is substantially smaller. Tables 1 and 2 formally assess the impacts to archaeological heritage resources and graves respectively. Note that all impacts would take place at the construction phase and (assuming that the graves continue to be avoided) no new impacts would occur during operation and decommissioning.

The suggested archaeological mitigation will involve establishing a sampling grid over the flat area at the top of the cliff and excavating/collecting artefacts from various areas. It should be borne in mind that the scatter is likely to extend well beyond the area inspected during this survey. The site should also be carefully examined to determine if any spatial patterning is evident. It can be very easily mapped using a hand-held GPS. This area is particularly vulnerable since it is likely that much machinery would be brought in here and that work on blasting the cliff for the canal would largely occur from this point.

For graves, mitigation will involve temporary fencing and complete avoidance of all known and possible graves. Since the small graveyard is in such a vulnerable position immediately alongside a gravel access road, a permanent fence and gate could be considered there. Detailed recommendations are provided in Section 9.

Cumulative impacts are not very easy to assess, since archaeological resources, in particular, are point-specific. Each is unique and, while the general locations of archaeological sites could often be predicted, there is no guarantee that a site would be found in an expected location. For this reason one cannot be sure how many archaeological sites would be lost relative to the number and type of sites occurring in the local and wider regions. It is considered that the MSA and LSA material found surrounding Boegoeberg Dam is fairly typical of the wider area and that the significance of any cumulative impacts would be very low.

Table 1: Assessment of archaeological impacts.

| | Project | Key impacts | Extent | Magnitude | Duration | SIGNIFICANCE (Without mitigation) | SIGNIFICANCE (With Mitigation) | Probability | Confidence | Reversibility |
|--------------------|--------------------|--|--------|-----------|-----------|-----------------------------------|--------------------------------|-------------|------------|---------------|
| Construction phase | Layout (preferred) | Destruction of archaeological stone artefact scatters on the cliff above the weir. | Local | Medium | Long term | Medium | Low | Definite | Certain | Irreversible |
| | Roads | | Local | Medium | Long term | Medium | Low | Definite | Certain | Irreversible |
| | Transmission Route | | Local | Low | Long term | Low | Low | Probable | Certain | Irreversible |
| No-Go Option | | Disturbance of archaeological artefacts through natural erosion. | Local | Very low | Long term | Very low | Very low | Probable | Certain | Irreversible |

Table 1: Assessment of impacts to graves.

| | Project | Key impacts | Extent | Magnitude | Duration | SIGNIFICANCE (Without mitigation) | SIGNIFICANCE (With Mitigation) | Probability | Confidence | Reversibility |
|--------------------|--------------------|---|--------|-----------|-----------|-----------------------------------|--------------------------------|-------------|------------|---------------|
| Construction phase | Layout (preferred) | Disturbance or destruction of graves below the weir and/or along the access road. | Local | High | Long term | High | Low | Unlikely | Certain | Irreversible |
| | Roads | | Local | High | Long term | High | Low | Probable | Certain | Irreversible |
| | Transmission Route | | Local | Low | Long term | Low | Low | Unlikely | Certain | Irreversible |
| No-Go Option | | Disturbance of graves through natural erosion. | Local | Very low | Long term | Very low | Very low | Probable | Certain | Irreversible |

8. CONCLUSIONS

This assessment has shown that should the recommendations in Section 9 be implemented, impacts to heritage resources are limited, those that occur are likely to be of medium significance and that these could be reduced to low significance through mitigation. It is thus deemed appropriate that the project should continue as planned.

9. RECOMMENDATIONS

It is recommended that the project be allowed to proceed. The following recommendations should be adhered to (and should be included in the EMP for the project):

- The gravestone (ZKB2013/003) and stone cairn (ZKB2013/002) immediately downstream of the power station site should be temporarily cordoned off and carefully avoided throughout construction work;
- Excavation in the silts immediately below the weir should be carefully monitored by the ECO just in case there are other burials, or the cement headstone has been washed downstream from another location during floods;
- If the road passing the graveyard at ZKB2013/004 is to be used for access to the transmission route then the graves must be cordoned off and avoided during and after development (due to its generally sensitive location, erection of a permanent fence around this graveyard could be considered);
- Archaeological mitigation should be carried out at site ZKB2013/001 on the platform at the top of the cliff prior to construction; and
- The stone structures at BDW2013/001, specifically the one near the road, should be avoided during and after construction. Careful placement of pylons will be required to ensure that these structures are spanned but care should be taken to avoid damage to them during construction.

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APPENDIX 1: List of heritage sites

| Field Number | Site Name | Co-ordinates | Description | Significance / Mitigation |
|--------------|-------------|----------------------------|---|---|
| 013 | ZKB2013/001 | S29 02 22.5 E22 12 15.9 | Two grindstones and a wide spread of banded ironstone artefacts, probably MSA. A few with retouch. At least one artefact per square metre. | Low |
| 014 | | S29 02 23.4 E22 12 14.4 | Very dense distribution of artefacts, all banded ironstone. At least 10 artefacts per square metre. This spot is worthy of mitigation for its high density, but other spots should also be considered during mitigation. | Medium 8 hours mitigation (incl. wide area here) |
| 015 | | S29 02 23.4 E22 12 11.8 | More of the same MSA on banded ironstone, all along the escarpment overlooking the river. Nice MSA flake/blade with faceted platform. | Low |
| 016 | ZKB2013/002 | S29 02 17.3 E22 12 05.4 | A stone cairn, about 1.5m in diameter, roughly round, no headstone. | High Avoid / test |
| 017 | ZKB2013/003 | S29 02 18.8 E22 12 06.5 | A headstone in the loose river sand which reads: "Rus in vrede Gert Peters oorlede die 10 April 1953, 62 jaar, die seun van die mens ...". According to Mr Fourie, this was someone who had died/drowned upriver and whose body had washed down river. He was buried where found on the river banks. | High Avoid / test / exhume & relocate |
| 018 | n/a | S29 02 15.7 E22 12 06.1 | Very light background scatter of banded ironstone artefacts on the slopes of the hill. | Low |
| 019 | ZKB2013/004 | S29 03 23.0 E22 12 55.1 | At least 8 graves right next to the road, on the way to Susara Geldenhuys home. They are clearly graves, arranged in a row, the closest about 1m from the road. Susara says that as long as she can remember, they have been there. Her grandfather bought the farm, and her father and mother have been there at least 50 years. | High Avoid |
| 020 | ZKB2013/005 | S29 03 59.0 E22 12 52.4 | Possibly background scatter but fairly high density and located on a little koppie. | Low |
| 048 | ZKB2013/06 | S29 02 16.7 E22 12 05.6 | Scatter of rocks (?hut base). One banded ironstone flake and one OES fragment here and a quartz flake a few metres away. | Low |
| 021 | n/a | S29 16 52.6 E22 11 08.7 | Difficult to get close to the line, but near the road a background scatter of artefacts, very weathered. More quartzite than banded ironstone. | Low |
| 022 | BFT2013/001 | S29 16 46.9 E22 10 56.2 | Line passes close to a farmhouse, the nearest structure to the line will be a little stone kraal attached to a small structure. | Low |
| 023 | BFT2013/002 | S29 11 42.8 E22 11 43.0 | Ruins of an old demolished mud brick house but with cement pointing and a date of 1956. | Low |

| | | | | |
|---------|-------------|----------------------------|---|-------------------------|
| 049 | BFT2013/003 | S29 16 53.7 E22 11 06.4 | Scatter of fresh quartz artefacts. | Low |
| 050 | n/a | S29 14 45.3 E22 11 26.9 | Ephemeral background scatter of quartz and quartzite on red sand. | Low |
| 051 | n/a | S29 13 44.5 E22 11 44.3 | Unlikely cairn and ephemeral background scatter of quartzite on a hill. | Low |
| 052 | BDW2013/001 | S29 04 26.8 E22 12 04.5 | Stone-packed L-shaped wall on top of a bedrock ridge. | Medium Avoid |
| 053 | | S29 04 26.3 E22 12 04.4 | Short straight section of stone walling. | |
| 054 | | S29 04 26.0 E22 12 04.3 | Semi-circle of walling in open area. | |
| 055 | | S29 04 25.4 E22 12 04.8 | Section of walling. | |
| 056 | | S29 04 23.1 E22 12 05.9 | Semi-circle of walling. | |
| 057 | | S29 04 23.2 E22 12 06.1 | Semi-circle of walling. | |
| 058 | | S29 04 23.2 E22 12 06.5 | Semi-circle of walling but with one end extended. | |
| 059 | | S29 04 23.0 E22 12 06.8 | L-shaped stone wall. | |
| 060 | | S29 04 23.7 E22 12 06.3 | Stone mound. | |
| 061 | | S29 04 23.9 E22 12 06.4 | Stone mound. | |
| 062 | | S29 04 27.1 E22 12 05.3 | L-shaped stone wall but with top end slightly extended out. c. 10 m long. | |
| 024 | | S29 04 26.8 E22 12 06.8 | Semi-circle of roughly packed unformed stones, against the side of a rocky koppie, making use of the natural rock which projects out. About 5m x 7m? A single banded ironstone flake in the middle. | |
| 063-294 | | BDW2013/002 | S29 04 23.0 E22 12 13.0 | |
| 076 | n/a | S29 04 24.9 E22 12 12.9 | Background scatter of banded ironstone and some quartzite including a radial core. MSA. | Low |

APPENDIX 2: Mapping

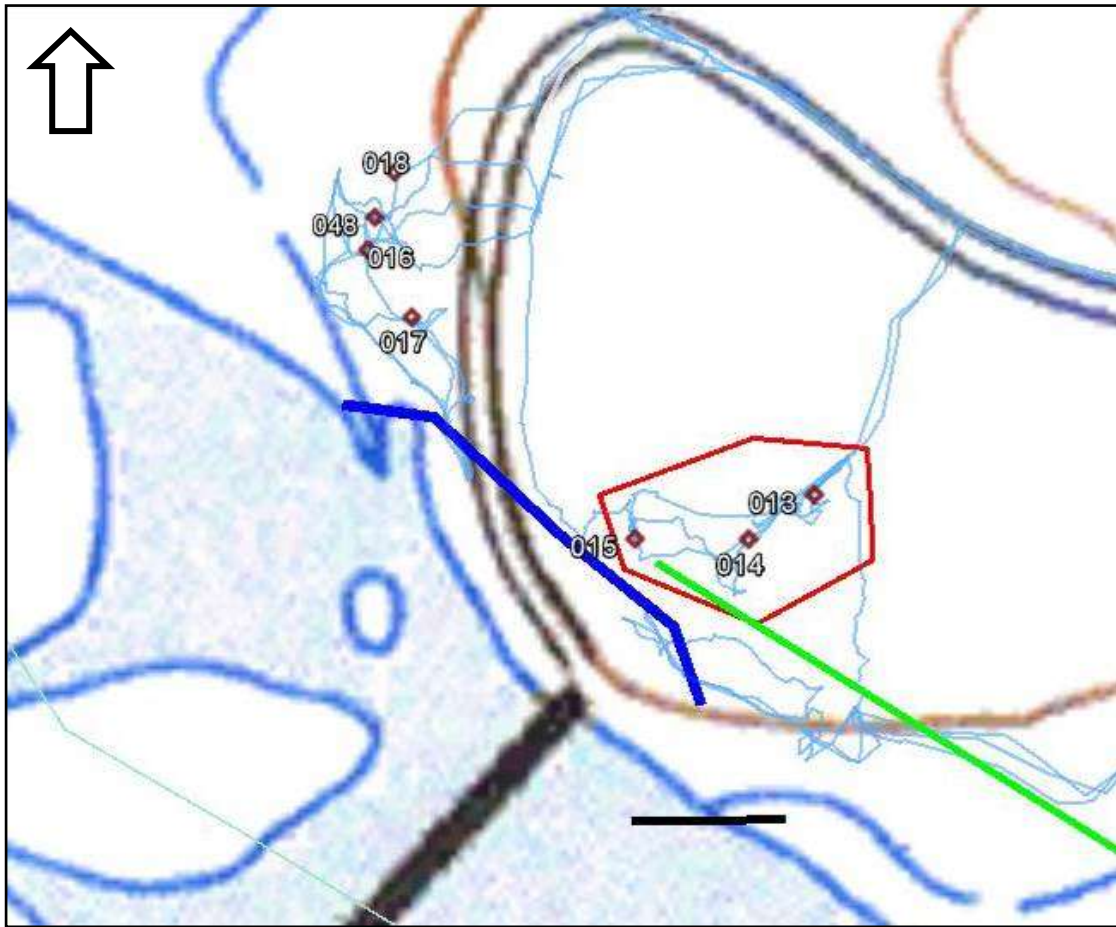


Figure A1: Map showing the location of heritage resources in the vicinity of the canals and power station. Black scale bar = 100m.

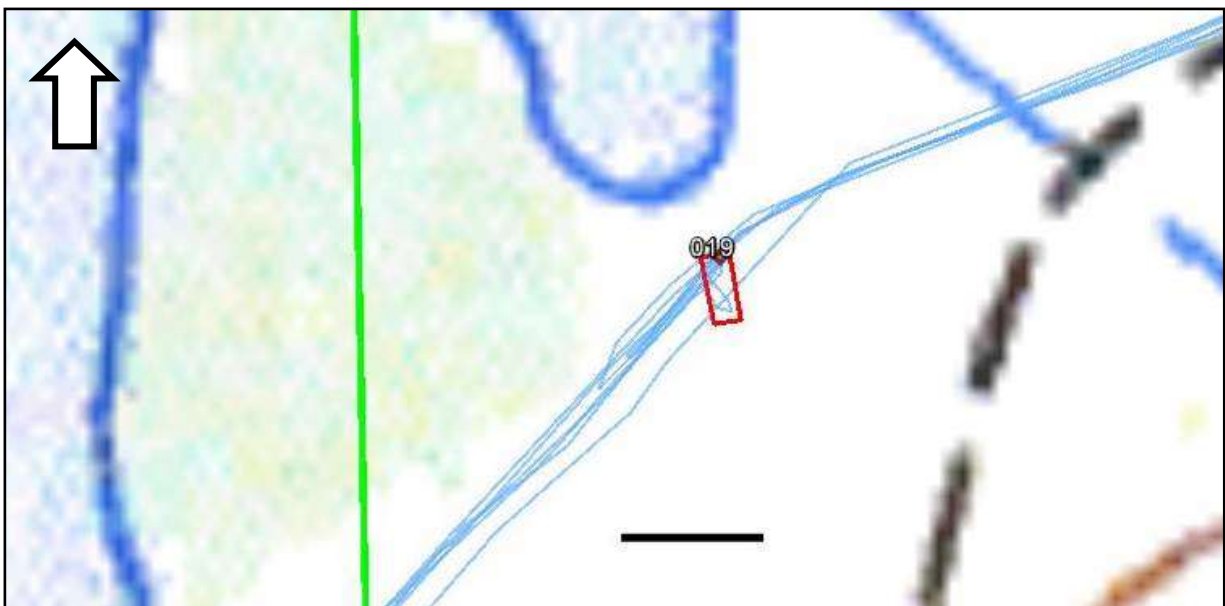


Figure A2: Map showing the location of heritage resources (ZKB2013/004) in the vicinity of the canals and power station. Black scale bar = 50m.

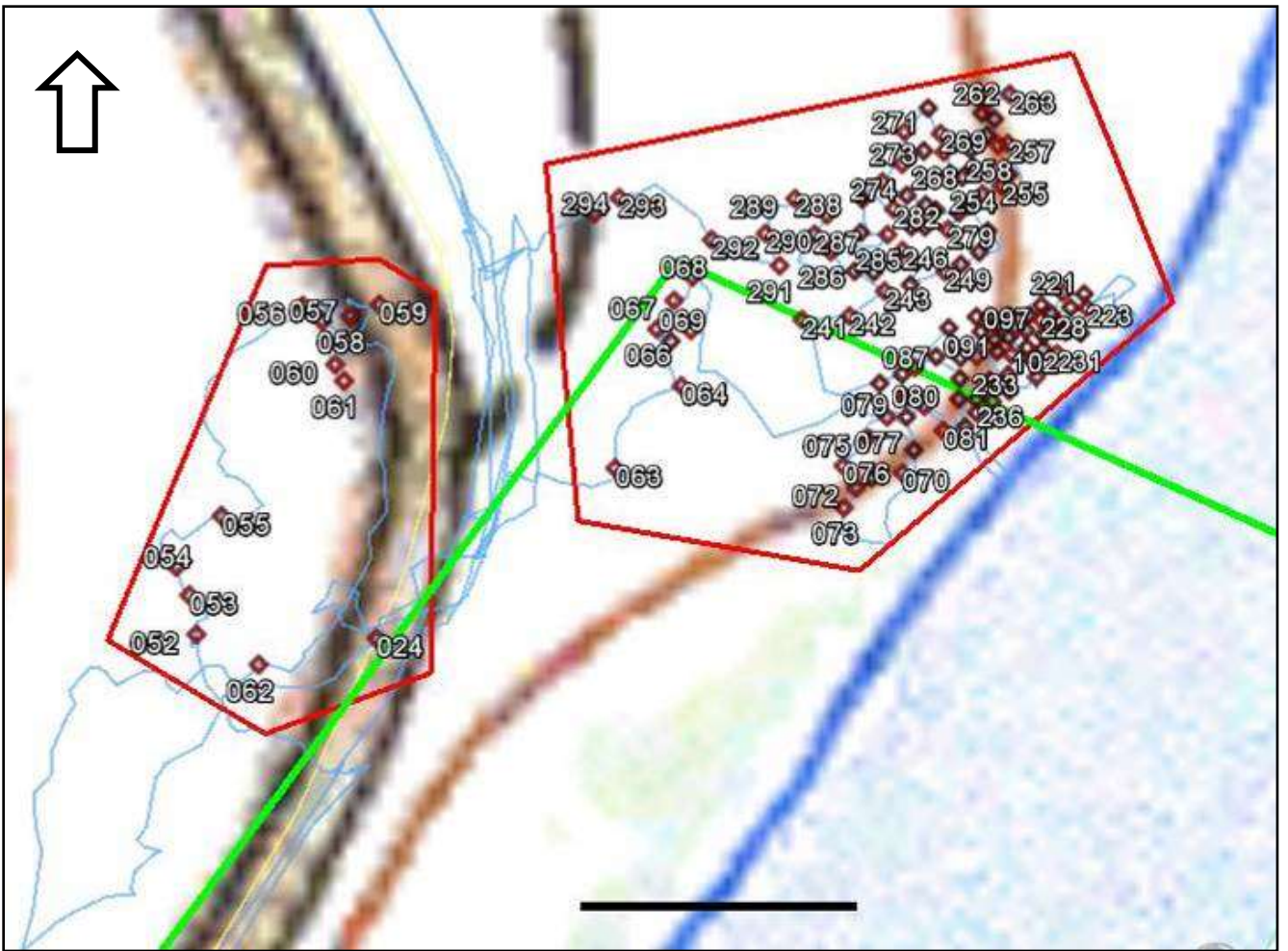


Figure A3: Map showing the location of heritage resources (BDW2013/001 on the left and BDW2013/002 on the right) in the area where the transmission line crosses the river. Black scale bar = 100m.

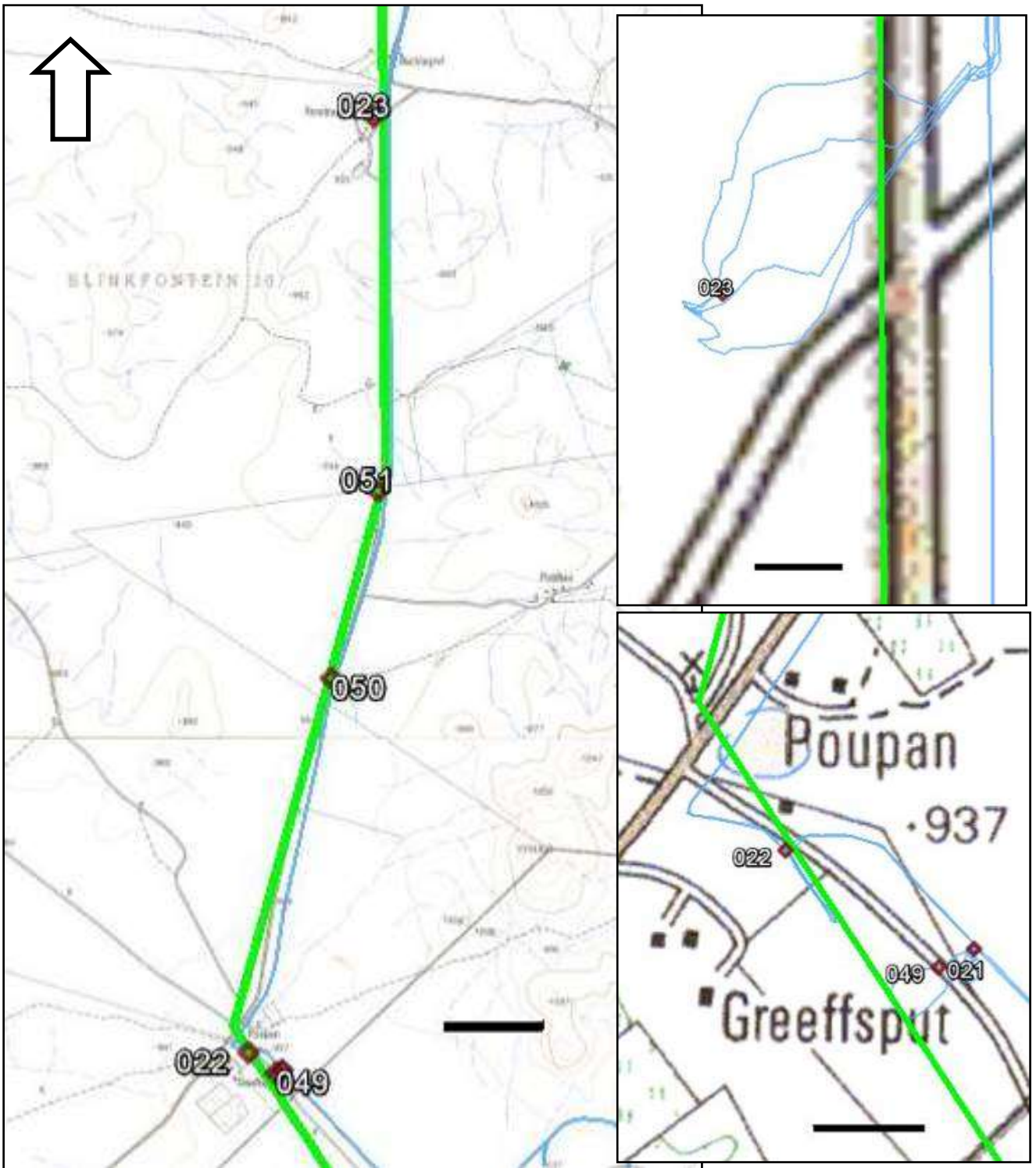


Figure A4: Map showing the location of heritage resources in the southern part of the study area. Main map black scale bar = 1km, upper inset scale = 50m, lower inset scale = 200m.

APPENDIX 3: Other proposed activities

After completion of the heritage study two further aspects requiring consideration were introduced. These are briefly discussed and assessed at the desktop level in this appendix.

A3.1 Silt storage areas

The Boegoeberg Dam will require dredging in order to maintain the water supply to the agricultural canals. At present this silt is scoured through sluice gates but this activity would have a negative effect on the feasibility of the hydropower station due to the large amount of water 'lost' during this action. It is thus proposed to dredge the silt, store it to allow the water to drain off, and sell it on to an appropriate third party. Three storage areas have been identified immediately north of the proposed hydro-electric generator (Figure A3.1). The site walk paths crossed through the southernmost site but the other two remain unsearched. Based on observations it is not believed that any significant archaeological impacts are likely in any of these three locations. However, there is a concern that the draining water might result in erosion of the margins of the floodplain where archaeological sites might be found (only one ephemeral site was noted in the survey just downslope of the storage areas) and where the known grave lies. It has been proposed that the draining water could be conveyed back to the river through pipes and, if this is done, then there should not be any further heritage concerns regarding this aspect of the project.



Figure A3.1: Aerial photograph with the three proposed silt storage areas indicated in yellow.

A3.2 Borrow pits

Two existing borrow pits are located in the area (Figure A3.2). These will be reused during the course of the proposed project but it is not certain whether expansion of the surface area of each will be required or not. However, it was deemed prudent to consider the possibility here. Based on observations in the general area the chances of finding archaeological or other heritage resources in these locations is extremely small. Both are close to stream beds which means that erosion could have revealed isolated stone artefacts.



Figure A3.2: Map showing the two existing borrow pits in orange along the southern side of the access road to the hydro-electric site. Their maximum dimensions are currently 90 m and 70 m respectively.

A3.3 Revetment

It is proposed to reuse the spoils from the tunnel excavations around the edges of agricultural fields to the north of the hydroelectric scheme. Several centre-pivot agricultural fields have been established in this area and a retaining berm or revetment has been constructed in order to allow the land to be levelled. The rock from the tunnel excavations would be added to this structure to strengthen it. No impacts to heritage resources are envisaged here.

A3.4 Construction camp

The location of the proposed construction camp is now also available. This will be in the valley on the way in to the campsite that lies at the northeast end of the weir. Much of this area has been transformed and it is not likely that significant heritage resources will be present there.

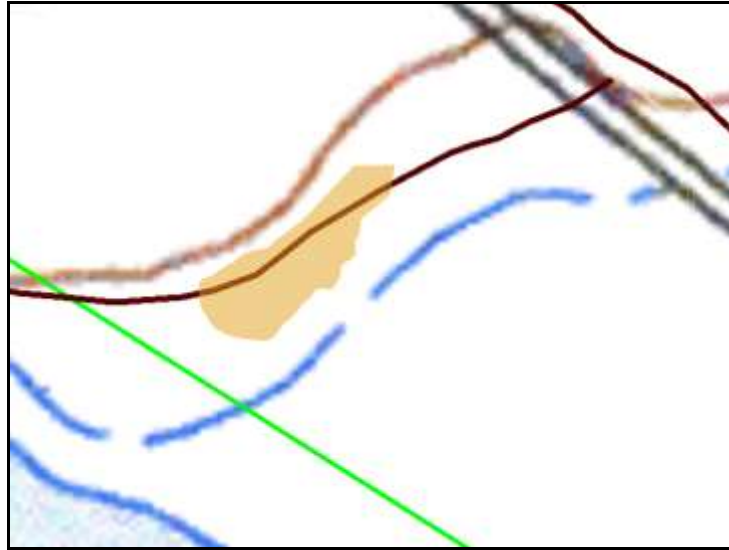


Figure A3.3: Map showing the location of the proposed construction camp in orange. It is 170 m long.

A3.5 Recommendation

Since mitigation measures can be implemented for the silt storage areas and the chances of finding significant heritage resources both there and at the borrow pits and construction camp is extremely slim, it is recommended that development of these areas be allowed to continue. The only requirement is that the proposed pipes to carry draining water from the silt storage areas to the river must be installed and that these pipes should avoid the already identified heritage resources in the area.