

HERITAGE IMPACT ASSESSMENT

THE PROPOSED KALAHARI-EAST BULK WATER SUPPLY SCHEME PHASE 1A ASKHAM TO PHILANDERSBRON, NORTHERN CAPE

Assessment conducted under Section 38 (8) of the
National Heritage Resources Act 25 of 1999

Prepared for:

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Executive summary

ACRM was appointed to conduct a Heritage Impact Assessment (HIA) for the proposed Kalahari-East Bulk Water Supply Scheme Phase 1A Askham to Philandersbron, in the Northern Cape Province.

The HIA forms part of a Basic Assessment process that is being conducted by EnviroAfrica.

The proposed Kalahari-East Bulk Water Supply Scheme was finalised in 1994 and currently supplies 76 litres of water p/s to communities and farms in the region through more than 1200 kms of connecting pipelines.

It is proposed that the scheme be extended to the north eastern portion of the region, which will entail the construction of a 150 km long pipeline between the existing Kalahari East Bulk Water Supply pipeline (A-line), through Remainder Farm Vischgat 201 and Portion 0 of Farm Cramond 202, via the R31 to Askham, along the R360 to Rietfontein, and along the Namibia Road to Philandersbron.

The majority of the pipeline will be located within the road reserve of the R31, R360 and Namibia Road.

The R360 and Namibia Road are both tarred roads, while the R31 is a gravel road.

The proposed project includes the construction of an earth reservoir/dam near Hakskeenpan (alongside the R360), on Portion 130 of Farm Mier 585. The footprint area required for construction of the earth dam is 3.3 ha.

The aim of the study is to locate and map archaeological remains that may be impacted by the proposed project, to assess the significance of the potential impacts and to propose measures to mitigate the impacts.

The receiving environment for the pipeline comprises endless sections of road reserve that are covered in tall, dry winter grass (R31 & R360), and thick scrub, grass and trees (Namibia Road), resulting in low archaeological visibility.

Long sections of the road reserve have been graded and scraped.

It should be noted that calcrete was used (as a sub-base material) to prepare the road during construction of the R31 and R360, and much of the road reserve is covered in a thin layer of this imported gravel (eight borrow pits were counted alongside the R31 between Askham and Crammond).

For most of its 150km length, the affected terrain (i. e. the road reserve) constitutes a fairly severely degraded environment.

The development site for the proposed earth reservoir is a level piece of ground located alongside the R360 near Hakskeenpan. The receiving environment comprises shrub and grass on a substrate of red windblown (aeolian) sands. There is no surface stone on the proposed dam site and there are no natural sources of water such as streams, springs or drainage channels in the 3.3 ha footprint area.

Heritage Impact Assessment proposed Kalahari East Bulk Water Supply Scheme Phase 1A
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A vehicle and foot survey of the proposed pipeline route was undertaken by ACRM in June, 2014 in which the following observations were made:

- A handful of Middle Stone Age (MSA) lithics (mainly flakes & chunks) were found in a severely disturbed area between the existing concrete reservoir at Philandersbron and the Namibia Road, at the southern entrance to the town.
- A small number of MSA implements were encountered in the road reserve (Namibia Road) between Philandersbron and Rietfontein.
- Several MSA flakes were recorded on eroded and sheet washed gravels outside the road reserve (Namibia Road) near the entrance to the town of Rietfontein.
- A few MSA flakes and chunks were found near the intersection of the Namibia Road and the R360.
- A few MSA tools were recorded on a gravel ridge in the road reserve (R360) between Rietfontein and Askham.
- Three Christian graves were located in the road reserve (R360) between Rietfontein and Andriesvale/Askham. Burials have a high local significance and are protected under Section 36 of the National Heritage Resources Act (Act No. 25 of 1999).
- A single flaked chunk/minimal core was found in the road reserve (R31) between Askham and Crammond.
- No rock engravings were found alongside the road where several outcroppings of dolerite in the road reserve (R360) near Klein Mier were noted.
- The footprint area for the proposed earth dam was not inspected. At the time the archaeological study was undertaken, the location site for the reservoir had not yet been finalised. It is however maintained, that the proposed site is not a sensitive or vulnerable archaeological landscape.

Significance of the archaeological finds

The very small numbers, isolated and disturbed context in which they were found means that the archaeological remains recorded during the study are rated as having low (3C) local significance.

MSA implements encountered during the study are the same as the tools described and illustrated in several HIA's for social housing projects in Askham and small towns in the region.

Conclusions

The results of the study indicate that the proposed Kalahari-East Bulk Water Supply Pipeline Phase 1A Askham to Philandersbron will not impact on significant archaeological heritage.

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Graves alongside the road (R360) between Rietfontein and Askham are protected under Section 36 of the National Heritage Resources Act (No. 25 of 1999), and have been rated as having high local significance.

The following recommendations are made

1. No archaeological mitigation is required, as the samples recorded are very small and occur in a degraded context.
2. Should any unmarked human burials/remains or ostrich eggshell water flask caches, for example, be uncovered during excavations for the pipeline, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or Ms Mariagrazia Galimberti at the South African Heritage Resources Agency (021 462 4502). Burials must not be removed or disturbed until inspected by the archaeologist.
3. The graves in the R360 road reserve between Rietfontein and Andriesvale/Askham must be avoided during construction of the pipeline. The graves must be taped off and clearly demarcated prior to construction work commencing, and should not be disturbed in any way. The Environmental Control Officer must be responsible for ensuring the graves are protected during the entire construction phase of the project.

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1. INTRODUCTION

1.1 Background and brief

ACRM was appointed by EnviroAfrica to conduct a Heritage Impact Assessment (HIA) for the proposed Kalahari-East Bulk Water Supply Scheme Phase 1A Askham to Philandersbron, in the Northern Cape (Figure 1).

The HIA forms part of the Basic Assessment process being conducted by EnviroAfrica.

The proposed Kalahari-East Bulk Water Supply Scheme was finalised in 1994 and currently supplies 76 litres of water p/s to communities and farms in the region through more than 1200 kms of connecting pipelines.

It is proposed that the scheme be extended to the north eastern portion of the region. This will entail the construction of a 150 km long pipeline between the existing Kalahari East Bulk Water Supply pipeline (A-line), through Remainder Farm Vischgat 201 and Portion 0 of Farm Crammond 202, via the R31 to Askham, along the R360 to Rietfontein, and along the Namibia Road to Philandersbron (Figure 2).

The majority of the pipeline will be located within the road reserve of the R31, R360 and Namibia Road (Rietfontein to Philandersbron).

The proposed project includes the construction of an earth reservoir/dam with a floating roof near Haksteenpan alongside the R360, on Portion 130 of Farm Mier 585. The footprint area required for the proposed reservoir is 3.3 ha.



Figure 1. Locality map indicating towns along the pipeline route

Heritage Impact Assessment proposed Kalahari East Bulk Water Supply Scheme Phase 1A
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Figure 2. Google Aerial photograph indicating the towns along the proposed pipeline route. The location site for the proposed earth reservoir (red star) is also indicated.

2. HERITAGE LEGISLATION

The National Heritage Resources Act (Act No. 25 of 1999) makes provision for a compulsory Heritage Impact Assessment (HIA) when an area exceeding 5000 m² is being developed. This is to determine if the area contains heritage sites and to take the necessary steps to ensure that they are not damaged or destroyed during development

Section 38 (1) (a) of the National Heritage Resources Act (No. 25 of 1999) also indicates that any person constructing a powerline, pipeline or road, or similar linear development or barrier exceeding 300m in length is required to notify the responsible heritage resources authority, who will in turn advise whether an impact assessment report is needed before development can take place.

The NHRA provides protection for the following categories of heritage resources:

- Landscapes, cultural or natural (Section 3 (3))
- Buildings or structures older than 60 years (Section 34);
- Archaeological sites, palaeontological material and meteorites (Section 35);

- Burial grounds and graves (Section 36);
- Public monuments and memorials (Section 37);
- Living heritage (defined in the Act as including cultural tradition, oral history, performance, ritual, popular memory, skills and techniques, indigenous knowledge systems and the holistic approach to nature, society and social relationships) (Section 2 (d) (xxi)).

3. TERMS OF REFERENCE

The terms of reference for the study were to:

- Determine whether there are likely to be any important archaeological remains that may be impacted by the proposed activities;
- Recommend any further mitigation action.

4. DESCRIPTION OF THE RECEIVING ENVIRONMENT

4.1 Proposed pipeline

A series of photographs showing the pipeline route is illustrated in Figures 23-68 (refer to Appendix I). The receiving environment is the existing road reserve, which includes the Namibia Road (Philandersbron to Rietfontein), the R360 (Rietfontein to Askham) and the R31 (Askham till Crammond). The R31 is a gravel surface road, while the R360 and Namibia Road are both tarred roads.

Endless sections of the R31 and R360 road reserve are covered in tall, dry winter grass, while long sections of the Namibia Road between Philandersbron and Rietfontein is infested with thick scrub, grass and trees. The first 2-3kms of the road reserve outside Philandersbron have also been graded and scraped.

It should be noted that calcrete was used (as a sub-base material) to prepare the road during construction of the R31 and R360, and much of the road reserve is covered in a thin layer of this imported gravel (eight borrow pits were counted alongside the R31 between Askham and Crammond).

Long sections of the road reserve have also been graded and scraped.

For most of its 150km length, the affected terrain (i. e. the road reserve) constitutes a fairly severely degraded environment.

The proposed pipeline (A-line) through Remainder of Farm Vischgat 201 and Farm Crammond 202/0 till the R31 is located directly alongside the fence line on the game farm. The receiving environment comprises red windblown sands and undulating dunes (refer to Figures 64-68 in Appendix I).

4.2 Proposed earth reservoir

The footprint area for the proposed earth reservoir is a level piece of ground located alongside the R360 near Hakskeenpan (refer to Figure 2). The receiving environment comprises shrub and grass on a substrate of red windblown (aeolian) sands (Figures 3-10). Several Kameeldoring trees occur in places. There is no surface stone on the proposed dam site and there are no natural sources of water such as streams, springs or drainage channels in the 3.3 ha footprint area. According to the environmental assessment practitioner, the physical footprint area required for the reservoir is 1.7 ha, while a further 1.6 ha will be used as source material (mainly sand) for construction of the earth dam wall. Figures 69-72 illustrate examples of an earth dam in the region.



Figure 3. Site for proposed earth dam.



Figure 5. Site for proposed earth dam



Figure 4. Site for proposed earth dam¹



Figure 6. Site for proposed earth dam

¹ Photographs kindly made available by the Environmental Assessment Practitioner

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Figure 7. Site for proposed earth dam



Figure 9. Site for proposed earth dam



Figure 8. Site for proposed earth dam



Figure 10. Site for proposed earth dam

5. STUDY APPROACH

5.1 Method of survey

The entire length of the proposed pipeline, from the existing reservoir at Philandersbron, till km 150 alongside the R31 at Crammond Game Farm, was surveyed on foot and by vehicle. In line with the biophysical study, the approach followed was to stop every 5 kms along the proposed route, and survey the road reserve for an average of 15 minutes.

Cuttings and stream crossings along the route were also inspected for archaeological heritage while a cluster of dolerite boulders in the road reserve (R360) at Klein Mier were searched for rock engravings.

The proposed route alongside the game fence of Crammond Farm, till the R31 was driven by 4 x 4, vehicle. It was clear that no archaeological heritage would be located alongside the route which comprises fine windblown red sands with no surface stone.

Archaeological remains recorded were mapped using a hand held GPS device set on the map datum WGS 84.

A track path of the survey was captured (refer to Figures 11-13).

A desk top study was also done.

5.2 Constraints and limitations

Endless sections of the road reserve between Rietfontein and Askham (R360) and between Askham and Crammond Farm (R31) are covered in tall dry winter grass, resulting in low archaeological visibility.

Long stretches along the nearly 10 km section of the Namibia Road, between Philandersbron and Rietfontein are covered in thick bush, grass and trees which limited access and visibility.

5.3 Identification of potential risks

Based on the results of the study, there are no archaeological risks associated with the proposed project. The water supply pipeline will be located in the road reserve and impacts are therefore expected to be limited.

Graves alongside the R360 between Rietfontein and Andriesvale/Askham are protected under Section 36 of the National Heritage Resources Act (NHRA), and must be avoided during construction of the pipeline.

5.4 Results of the desk top study

Until recently, very little archaeological work had been done in Askham and the small towns in the study area, but in the last few years several HIA's have been done, as part of the EIA process. Studies have shown that archaeological remains comprise mostly thin surface scatters of tools of LSA, MSA and ESA origin, although there have been exceptions where larger scatters do occur.

Beaumont (2006) found only two stone flakes during a HIA for the construction of several chalets on a game farm a few kilometres north east of Askham, while in Askham no archaeological heritage was encountered by van Pletzen-Vos and Rust (2013a) during a HIA for a proposed low cost housing project, although several informal graves were encountered.

At Rietfontein, ephemeral surface scatters of Later Stone Age (LSA) implements and pottery have been encountered on deflated dune surfaces, and around small dry pans in the surrounding area (Smith 1995). Low density scatters of ESA, MSA and LSA tools were also recorded by Engelbrecht (2013) during a HIA for a low cost housing development in the town, while Engelbrecht (2013) also notes the presence of LSA sites with pottery and stone tools on several farms in the surrounding area. Van Pletzen-Vos and Rust (2013b) documented diffuse scatters of LSA tools and ostrich eggshell near Rooipan and Witpan north east of Rietfontein.

Van Pletzen-Vos and Rust (2013b) recorded low density scatters of both ESA, MSA and LSA implements during an HIA for a proposed low cost housing development at Groot Mier north of the R31 between Rietfontein and Askham.

At Loubos, however, north east of Rietfontein, several large clusters of MSA flakes and cores were recorded by Van Pletzen-Vos & Rust (2013c) during a HIA for another low cost housing project, while at Noenieput, about 50kms south of Askham, large numbers of MSA tools including flakes and cores were counted during a HIA for an affordable housing project (Van Pletzen-Vos & Rust 2013d). The presence of a small spring on the proposed housing development site at Loubos may have been the primary attraction to the area by Stone Age hunter-gatherers.

Thin, surface scatters of LSA flake tools, pottery and ostrich eggshell have also been recorded among the red sand dunes in the Twee Rivieren area, on the Malopo Road to the Kgalagadi National Park (Smith 1995).

6. FINDINGS

6.1 Archaeology

A spreadsheet of waypoints and a description of the archaeological finds are presented in Table 1.

6.1.1 Namibia Road

A handful of stone implements (Sites 001-003), including several MSA quartzite and indurated shale flakes, chunks, and a quartzite disc/prepared core were found in a severely degraded area between the existing reservoir at Philandersbron and the Namibia Road (Figures 14 & 15).

Isolated tools (Sites 004-012) were encountered in the road reserve between Philandersbron and Rietfontein (Namibia Road). These included a jasperlite flake, MSA quartzite flakes, chunks, flaked cobbles and a single round core (Figure 16). Wide open gravels characterize the surrounding environment beyond the road reserve/fence.

Several MSA quartzite flakes were recorded on eroded and sheet washed gravels (Site 013) outside the road reserve near the entrance to the town of Rietfontein (Figures 17 & 18). A chunk/minimal core (Site 014), a flaked cobble (015) and a broken indurated shale MSA flake (Site 016) were also found near the intersection with the R360.

6.1.2 R360

Two MSA quartzite flakes (Sites 017 & 019), several highly weathered and partially retouched indurated shale MSA flakes (Site 018), and a chunky weathered, retouched indurated shale 'knife' was recorded in the road reserve (R360) between Rietfontein and Askham (Figures 19 & 20). The tools were all found on a raised terrace covered in loose weathered indurated shale gravels.

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6.1.3 R31

One (possible) minimal chunk/core (Site 022) was found in the road reserve (R31) between Askham and Crammond (Figure 21).

Site	Name of Farm	Lat/Long	Description of finds	Grade	Mitigation
	Namibia Road				
001		S26 48.987 E20 05.577	Quartzite flake cobble/minimal core	3C	None required
002		S26 48.949 E20 05.659	Two MSA quartzite flakes & a chunk	3C	None required
003		S26 48.912 E20 05.658	Quartzite and weathered indurated shale MSA flakes, quartzite MSA disc core in severely degraded area alongside road – earthworks related to construction of the reservoir at Philandersbron	3C	None required
004		S26 47.017 E20 04.128	Broken, utilized jasperlite flake – dry river/stream bed occurs over the fence line	3C	None required
005		S26 47.020 E20 04.133	Flaked indurated shale cobble/cortex	3C	None required
006		S26 46.966 E20 04.064	Quartzite chunk	3C	None required
007		S26 46.906 E20 03.989	Weathered MSA quartzite flake/cortex	3C	None required
008		S26 46.815 E20 03.877	Broken quartzite chunk	3C	None required
009		S26 46.804 E20 03.862	Broken quartzite MSA blade	3C	None required
010		S26 46.777 E20 03.829	Weathered quartzite MSA flake with retouch	3C	None required
011		S26 45.937 E20 02.779	Broken quartzite MSA flake	3C	None required
012		S26 45.913 E20 02.757	Snapped quartzite flake (tip)	3C	None required
013		S26 44.963 E20 01.802	Diffuse scatter of a few quartzite MSA flakes on sheet washed, highly eroded gravels/sand alongside road reserve just before town of Rietfontein	3C	None required
014		S26 44.959 E20 01.813	Weathered indurated shale chunk/minimal core	3C	None required
015		S26 44.959 E20 01.813	Split quartzite cobble	3C	None required
016		S26 44.959 E20 01.813	Weathered, chunky broken indurated shale MSA flake	3C	None required
	R360				
017		S26 44.306 E20 06.891	Quartzite MSA flake	3C	None required
018		S26 44.302 E20 06.915	Broken, weathered partially retouched MSA indurated shale flake	3C	None required
019		S26 44.298 E20 06.933	Broken MSA quartzite flake	3C	None required
020		S26 44.295 E20 06.956	Large, chunky weathered, indurated shale MSA retouched piece. The above occurs on a raised terrace covered in loose, weathered indurated shale gravels.	3C	None required
	R31				
022		S 2659 608 E20 49.597	Flaked chalcedony chunk/minimal core	3C	None required

Table 1. Spreadsheet of waypoints and description of archaeological finds

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Askham to Philandersbron



Figure 11. Location of archaeological occurrences recorded along the proposed pipeline route



Figure 12. Location site of burial recorded along the proposed pipeline route.

Heritage Impact Assessment proposed Kalahari East Bulk Water Supply Scheme Phase 1A
Askham to Philandersbron

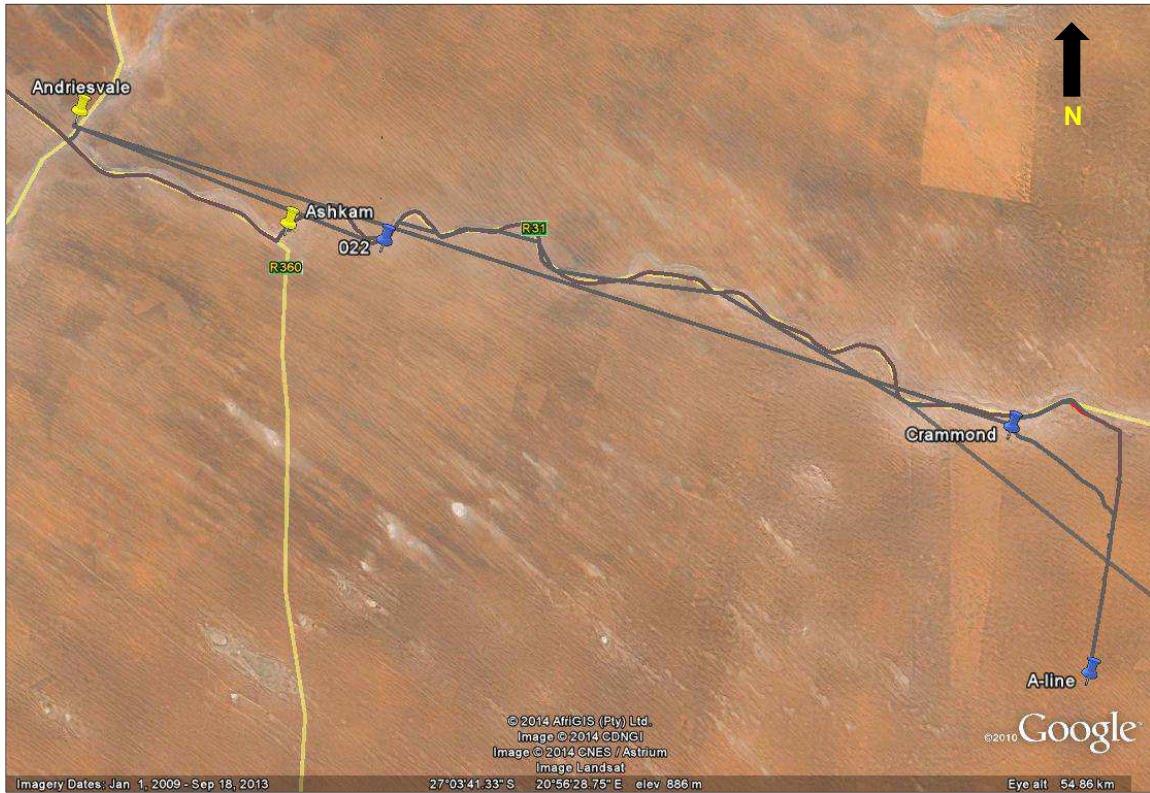


Figure 13. Location of archaeological occurrences recorded along the proposed pipeline route



Figure 14. Site 001. Scale in cm.



Figure 15. Sites 002 & 003. Scale in cm.

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Figure 16. Sites 004-012. Scale in cm.



Figure 19. Site 017-020. Scale in cm.



Figure 17. Site 013. Sheet-washed gravels near entrance to Rietfontein. Note the bakkie alongside the road.



Figure 20. Site 020. Scale in cm.



Figure 18. Site 013. Scale in cm.



Figure 21. Site 022. Scale in cm.

6.1.4 Proposed earth reservoir

The 3.3 ha footprint area for the proposed earth reservoir alongside the R360 near Hakskeenpan was not inspected for archaeological heritage. At the time of writing, the location site for the reservoir had not yet been finalised by the engineers. It is however maintained, that the proposed site is not a sensitive, vulnerable or threatened archaeological landscape. The level site is covered in dry winter grass on a substrate of red windblown sands (refer to Figures 3-11). There are no significant landscape features on the proposed development site.

6.2 Significance of the archaeological remains

The very small numbers, isolated and disturbed context in which they were found means that the archaeological remains recorded during the study are rated as having low (3C) local significance.

Most of the MSA tools encountered during the study are comparable to implements illustrated by Van Pletzen-Vos and Rust (2013a, b, c, d), during the course of several HIA's for low cost housing developments in the surrounding area. However, no ESA tools were found during the current study.

6.3 Graves

Three Christian graves (S 26 53 03.3 E 20 32 48.2) were encountered in the road reserve (R360) between Rietfontein and Andriesvale/Askham (Figure 22). The photograph and GPS co-ordinates for the graves were supplied by the biophysical consultant.

Graves (including unmarked graves and burials) have a high local significance and are protected under Section 36 of the NHRA.



Figure 22. Graves in the road reserve alongside the 360

6.4 Rock engravings

No rock engravings were found alongside the road (R360) where several outcroppings of dolerite occur in the road reserve near Klein Mier (refer to Figures 41 & 42).

6.5. Structures

No ruins, old buildings or structures occur within the proposed route alignment².

² The archaeologist would like to report that the Church in Rietfontein (a declared National Monument/Provincial Heritage Site), is in a serious state of disrepair. Photographs can be supplied on request.

7. CONCLUSION

The results of the study indicate that the proposed Kalahari-East Bulk Water Supply Pipeline Phase 1A Askham till Philandersbron, will not impact on significant archaeological heritage. The entire pipeline route will be located within the road reserve, which constitutes a fairly severely degraded and transformed landscape.

Graves located in the R360 road reserve between Rietfontein and Andriesvale must be avoided during construction of the pipeline. Graves are protected under Section 36 of the NHRA and have a high local significance.

It is maintained that the proposed site for the earth reservoir is not a sensitive, vulnerable or threatened archaeological landscape.

8. RECOMMENDATIONS

With regard to the proposed Kalahari-East Bulk Water Supply Pipeline Phase 1A Askham till Philandersbron, the following recommendations are made

1. No archaeological mitigation is required.
2. Should any unmarked human burials/remains or ostrich eggshell water flask caches for example be uncovered, or exposed during construction activities, these must immediately be reported to the archaeologist (Jonathan Kaplan 082 321 0172), or Ms Mariagrazia Galimberti at the South African Heritage Resources Agency (021 462 4502). Burials or caches of ostrich eggshell must not be removed or disturbed until inspected by the archaeologist.
3. Graves in the R360 road reserve between Rietfontein and Andriesvale must be avoided during construction of the pipeline. The graves must be taped off and clearly demarcated prior to construction work commencing, and should not be disturbed in any way. The Environmental Control Officer must be responsible for ensuring the graves are protected during the entire construction phase of the project.

9. REFERENCES

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Heritage Impact Assessment proposed Kalahari East Bulk Water Supply Scheme Phase 1A
Askham to Philandersbron

Appendix I

Photographs of the proposed pipeline route

Heritage Impact Assessment proposed Kalahari East Bulk Water Supply Scheme Phase 1A
Askham to Philandersbron



Figure 23. Reservoir at Philandersbron



Figure 26. Philandersbron/Namibia Road



Figure 24. View from the Philandersbron Reservoir to the Namibia Road.



Figure 27. Philandersbron/Namibia Road



Figure 25. View from the Namibia Road to the Philandersbron reservoir (red arrow)



Figure 28. Namibia Road to Rietfontein

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Figure 29. Namibia Road to Rietfontein



Figure 32. Approaching Rietfontein from Namibia Road



Figure 30. Namibia Road to Rietfontein



Figure 33. 360 Rietfontein to Askam



Figure 31. Namibia Road to Rietfontein



Figure 34. 360 Rietfontein to Askam

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Figure 35. 360 Rietfontein to Askam.



Figure 38. 360 Rietfontein to Askam

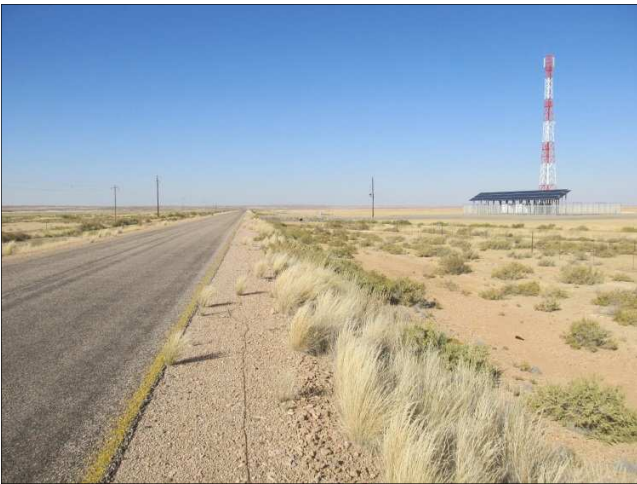


Figure 36. 360 Rietfontein to Askam



Figure 39. 360 Rietfontein to Askam



Figure 37. 360 Rietfontein to Askam. Koopan is to the right of the plate

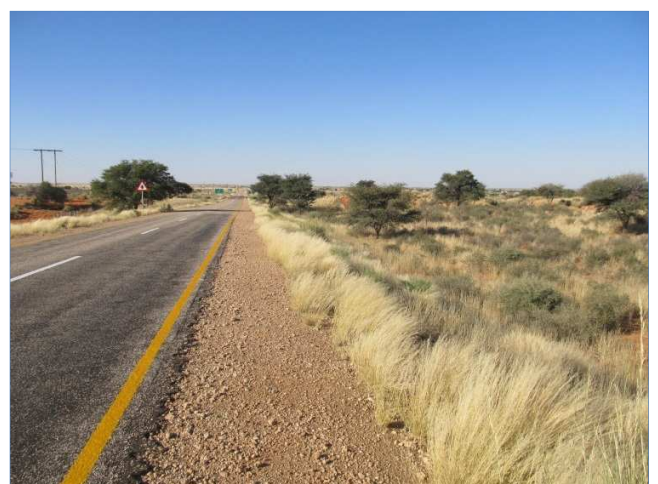


Figure 40. 360 Rietfontein to Askam

Heritage Impact Assessment proposed Kalahari East Bulk Water Supply Scheme Phase 1A
Askham to Philandersbron



Figure 41. 360 North approaching Klein Meir. Note dolerite boulders alongside the fence line



Figure 44. 360 Rietfontein to Askham, approaching Haksteenpan



Figure 42. 360 North. Dolerite boulders in road reserve



Figure 45. 360 North, Haksteenpan

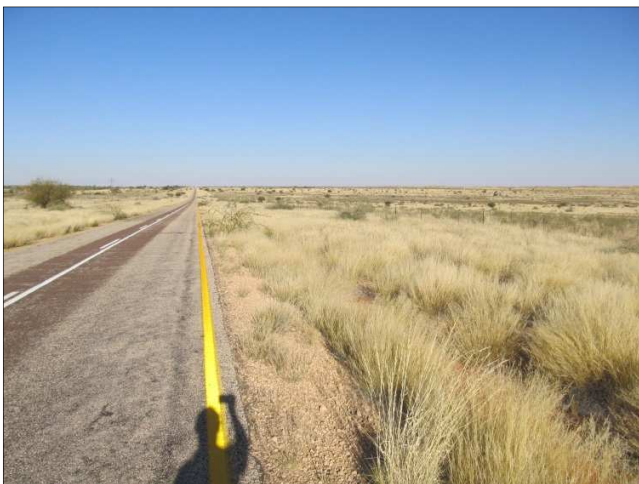


Figure 43. 360 Rietfontein to Askam



Figure 46. 360 Rietfontein to Askham

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Figure 47. 360 Approaching turnoff to Andriesvale



Figure 50. 360, turnoff to Askham



Figure 48. 360 Andriesvale to Askham



Figure 51. R31 Askham to Crammond Farm



Figure 49. 360, Andriesvale to Askham

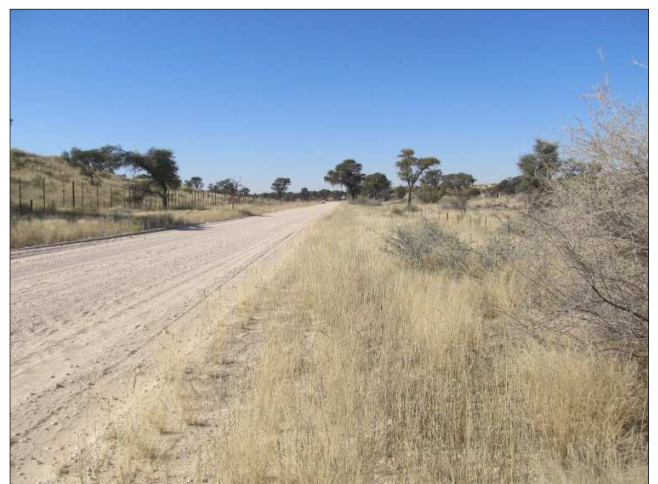


Figure 52. R31 Askham to Crammond Farm

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Figure 53. R31 Askham to Crammond Farm



Figure 56. R31 Askham to Crammond Farm



Figure 54. R31 Askham to Crammond Farm



Figure 57. R31 Askham to Crammond Farm



Figure 55. R31 Askham to Crammond Farm



Figure 58. R31, entrance to Crammond Farm

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Figure 59. R31 Askham to Crammond Farm



Figure 62. R31, pipeline connects at this point adjacent the bakkie on Crammond Farm



Figure 60. R31 Askham to Crammond Farm.



Figure 63. A- Line on the farm Farm Vischgat 201



Figure 61. R31 Askham to Crammond Farm



Figure 64. Farm Crammond 202/0. View north from the A-line

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Figure 65. Proposed route alongside fence, Crammond Farm. View south



Figure 67. Proposed route alongside fence, Crammond Farm. View south



Figure 66. Proposed route alongside fence, Crammond Farm. View south



Figure 68. Proposed route alongside fence, Crammond Farm. View south

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Figure 69. Example of an earth dam in the northern Cape



Figure 71. Example of an earth dam in the Northern Cape



Figure 70. Example of an earth dam in the Northern Cape



Figure 72. Example of an earth dam in the Northern Cape

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