

BIODIVERSITY SURVEY: EXTENSION OF THE GOUE AKKER CEMETERY, BEAUFORT WEST

April 2020



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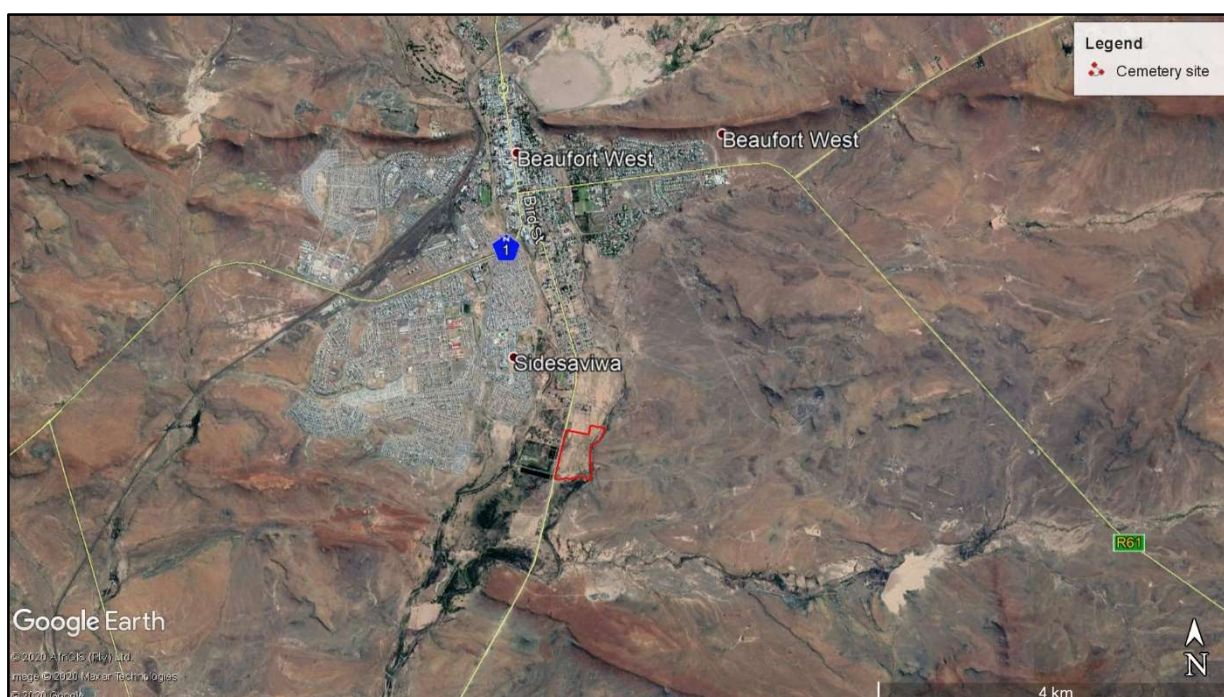
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1 INTRODUCTION

This report investigates the biodiversity aspects of a site (± 10 ha) on the southern side of Beaufort West earmarked for the extension of the Goue Akker cemetery (see Map 1). Goue Akker cemetery is located directly north of the site. The aim of the study, which was requested by Sharples Environmental Services (EAP), is to determine the biodiversity value of the site and to identify mitigation measures to ameliorate the impact. The site is located inside Southern Karoo Riviere (i.e. low-lying saline areas associated with watercourses), with Gamka Karoo vegetation found to the east of the bypassing Kuilsrivier.



Map 1 Satellite photo showing the position of the site (outlined in red) on the southern side of Beaufort West.

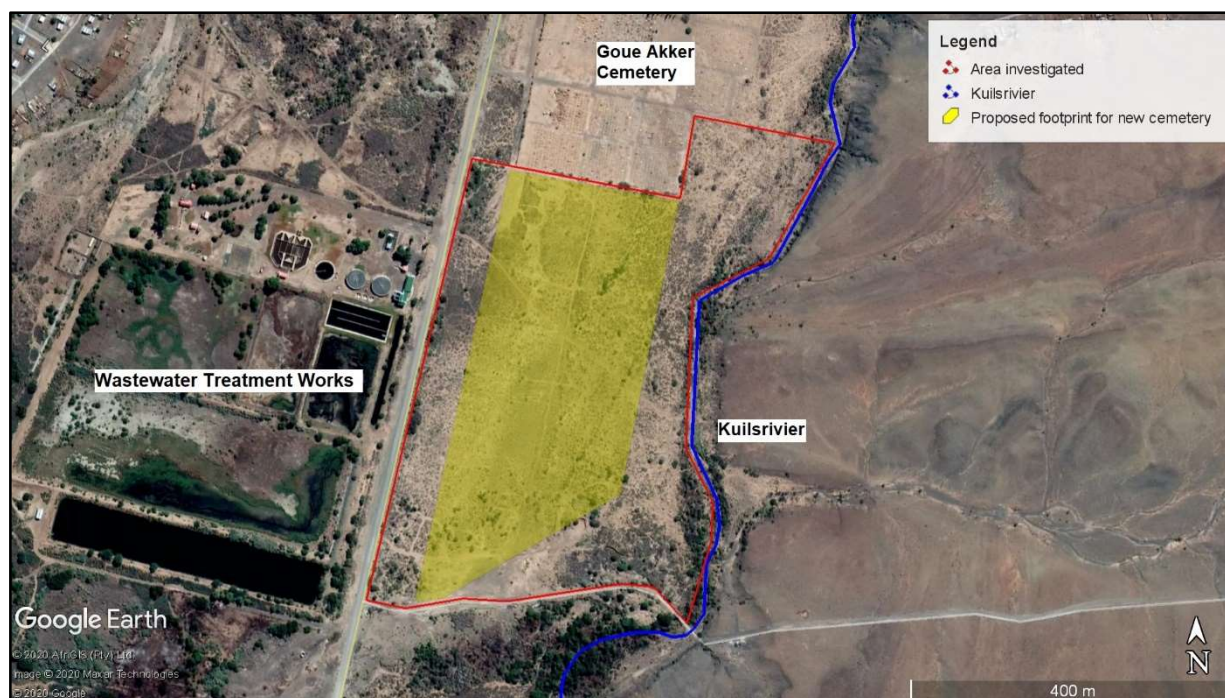
2 PROPOSED PROJECT

The project entails the establishment of a new ± 10 ha cemetery directly next to the Goue Akker cemetery on the southern side of Beaufort West (see Map 2). It is directly accessible from the bypassing Blyth Street, with the Kuilsrivier skirting the eastern side. No further details are available.

3 TERMS OF REFERENCE

- Identify and describe biodiversity patterns at a community and ecosystem level (main vegetation type, plant communities and threatened/vulnerable ecosystems), at species level (Species of Conservation Concern, protected species, presence of alien species) and in terms of significant landscape features;

- Describe the sensitivity of the site and its immediate surroundings;
- Map the distribution and infestation levels of invasive alien plants;
- Identify the botanical constraints and potential development opportunities of the site;
- Review the relevant biodiversity plans compiled in terms of the National Environmental Management Biodiversity Act (Act 10 of 2004);
- Adhere to the Department of Environmental Affairs & Development Planning (DEA&DP) and CapeNature guidelines for biodiversity studies in the Western Cape.



Map 2 Satellite photo showing the position of the study area and proposed footprint for the cemetery.

4 METHODOLOGY

A botanical survey of the site was undertaken on 19 March 2020 by Mark Berry (see CV attached). A qualitative assessment of the type and condition of affected vegetation on site, disturbance, and presence of alien species and Species of Conservation Concern was carried out. Plant species not identified in the field, were collected and/or photographed and identified at the office and Compton (Kirstenbosch) Herbarium. The 2012 South African Vegetation Map and the latest floristic taxonomic literature and reference books were used for the purpose of this specialist study. Any plants classified as rare or endangered in the Red List of South African Plants online database are highlighted. The assessment follows Brownlie's (2005), CapeNature and other relevant guidelines for biodiversity assessments.

The following information was recorded during the site visit:

1. The condition of the vegetation. Is the vegetation either disturbed or degraded? A

disturbed or degraded area could range from agricultural fields (fallow land), or areas previously disturbed by construction activities, to an area that has been severely eroded or degraded as a result of bad land management or alien infestation.

2. The species diversity. This refers to the numbers of different indigenous plant species occurring on site. Indigenous fauna observed was also noted.
3. Species of Conservation Concern, as well as protected tree species occurring on site. This would include rare, vulnerable, endangered or critically endangered species. Species listed as vulnerable were mapped using Easy GPS v2.5 software on an iPhone. Accuracy is given as ± 4 m.
4. Identification of the vegetation type(s) and communities (if discernible) on the site. This would include trying to establish the known range of a vegetation type and whether or not this vegetation type is vulnerable (VU), endangered (EN) or critically endangered (CR).

5 LIMITATIONS TO THE STUDY

Since fieldwork was carried out at the beginning of autumn, flowering plants that only flower at other times of the year (e.g. winter to spring), such as certain bulbs, may have been missed. The overall confidence in the completeness and accuracy of the botanical findings is however considered to be moderate to good and no follow-up survey is considered necessary to aid decision making.

6 LOCALITY & SITE DESCRIPTION

The study site is located in the Great Karoo basin (± 830 masl) at the foot of the Nuweveld Mountains (part of the Great Escarpment). The prominent Nuweveld Mountains to the northwest of Beaufort West rises a further 1000 m above the plains, which separates the lower Gamka Karoo from the Upper Karoo veld types. The terrain around the site is relatively flat, probably due to the eroding effects of numerous small seasonal rivers found in the area. This has left extensive saline flats in the low-lying areas, typically covered with salt bushes.

The watercourses in the area are lined with *Vachellia karroo* and *Lycium* thorn trees (see Photo 1). The Kuilsrivier, a tributary of the Gamka River, skirts the eastern boundary of the site, while the wastewater treatment works is found on the western side (see Map 2). An area around the wastewater treatment works has been mapped as a natural wetland on the NFEPA layer (see Map 3). However, no evidence of any wetlands was found on or directly adjacent to the site during the site survey. Significant waste dumping (especially excavated rock and building rubble) was noted in the southern part of the site.



Photo 1 Kuilsrivier after recent rains.

Beaufort West is located within the arid region of the Great Karoo and receives a relatively low annual rainfall of 200-300 mm. The mean annual rainfall for the property is 233 mm (as per Cape Farm Mapper climatic data for 1950 to 2000). The peak rainfall period is the months of February to March (i.e. late summer to autumn), while the driest period is from June to September (winter to spring). Mean daily maximum and minimum temperatures are 32.3°C and 4.1°C for January and July, respectively (as per Cape Farm Mapper climatic data). Frost occurs frequently in winter (Mucina & Rutherford 2006).

The site is underlain by Beaufort Group sediments, which comprises mainly grey-green to reddish mudstones and thick, river-channel sandstones (Norman & Whitfield 2006). The Beaufort Group belongs to the Karoo Supergroup. It generally supports very shallow and stony soils. These were deposited on extensive alluvial floodplains, crossed by meandering north-flowing rivers, and inhabited by diverse primitive land-dwelling reptiles (Norman & Whitfield 2006). The Beaufort deposits are well known for its well-preserved fossils, especially its mammal-like reptiles.



Legend

Wetlands (NFEPA)

- Artificial
- Natural

Rivers

- Non-Perennial

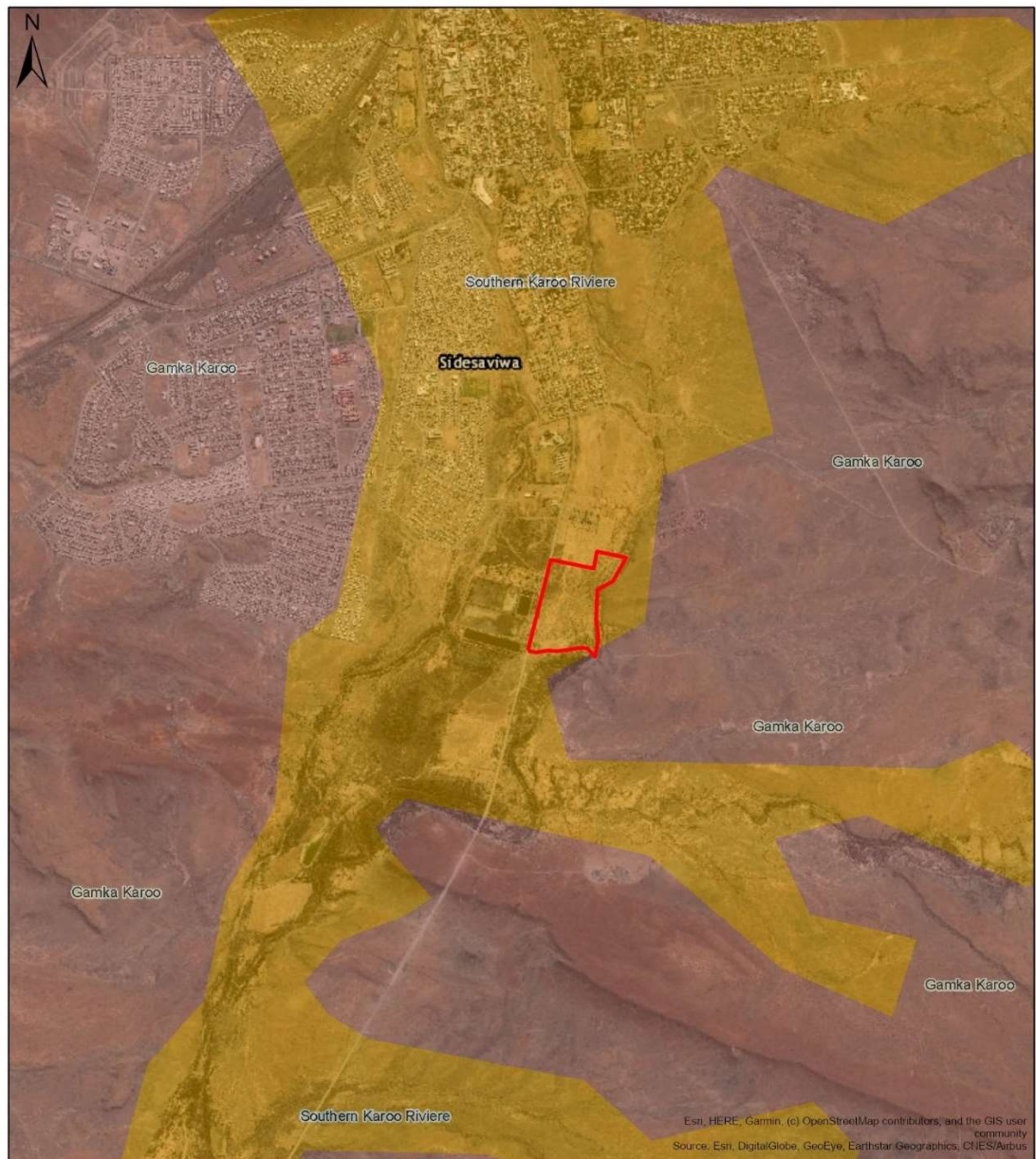
0 0.1 0.2 0.4 km

Map 3 Satellite photo illustrating the surface hydrology of the study area. Source: Cape Farm Mapper

7 BIOGEOGRAPHICAL CONTEXT

The study site is located inside the Nama-Karoo Biome, a vast arid shrubland area extending from the Cape Fold Mountains in the Western and Southern Cape deep into the Northern Cape. The Vegetation Map of South Africa (Mucina & Rutherford 2006) classifies the main vegetation types found in the general area as Southern Karoo Riviere and Gamka Karoo (see Map 4).

Southern Karoo Riviere occurs in the Western and Eastern Cape Provinces on the alluvial plains of among other the Gamka and Dwyka Rivers (Mucina & Rutherford 2006). It is embedded within several Karoo vegetation types, including Gamka Karoo. It comprises narrow riverine flats supporting a complex of *Vachellia karroo* or *Tamarix usneoides* thickets, bordered by *Salsola*-dominated shrubland.



Map 4 Extract of the 2012 SA Vegetation Map (Source: Cape Farm Mapper), showing the position of the site (outlined in red) inside Southern Karoo Riviere, with Gamka Karoo on the eastern side.

Gamka Karoo also occurs mainly in the Western Cape and Eastern Cape Provinces, between

the Great Escarpment (Nuweveld Mountains) in the north and the Cape Fold Belt mountains (mainly the Swartberg Mountains) in the south (Mucina & Rutherford 2006). The landscape can be described as slightly undulating plains, covered with dwarf spinescent shrubland and scattered low trees. Sometimes drought-resistant grasses dominate on sandy basins after good rains. Being located in the rain shadow of the Cape Fold Belt, it is considered as one of the most arid units of the Nama-Karoo Biome.

8 VEGETATION & FLORA

The study site falls within Southern Karoo Riviere, while the slightly elevated (rockier) area west of the Kuilsrivier is covered by Gamka Karoo (see Photo 2). The Kuilsrivier riverbed neatly separates the two vegetation types. The general condition of the Riviere vegetation is fair to good. Structurally, it can be described as a short (± 0.6 m) closed ($\pm 40\%$ cover) shrubland following Edward's (1983) classification of structural formations. *Vachellia karroo* (Karoo thorn) and *Prosopis glandulosa* (muskietboom) are prominent (2-4 m) emergent species in the area. Small clumps of the latter species were observed along the Kuilsrivier and in the south-western corner of the site (see Photo 3). *Prosopis glandulosa* is a declared invasive thorn tree from north-east Mexico and the south-western parts of the USA (Henderson *et al.* 1987). From a distance it closely resembles *V. karroo*, and also invades the riverine areas.

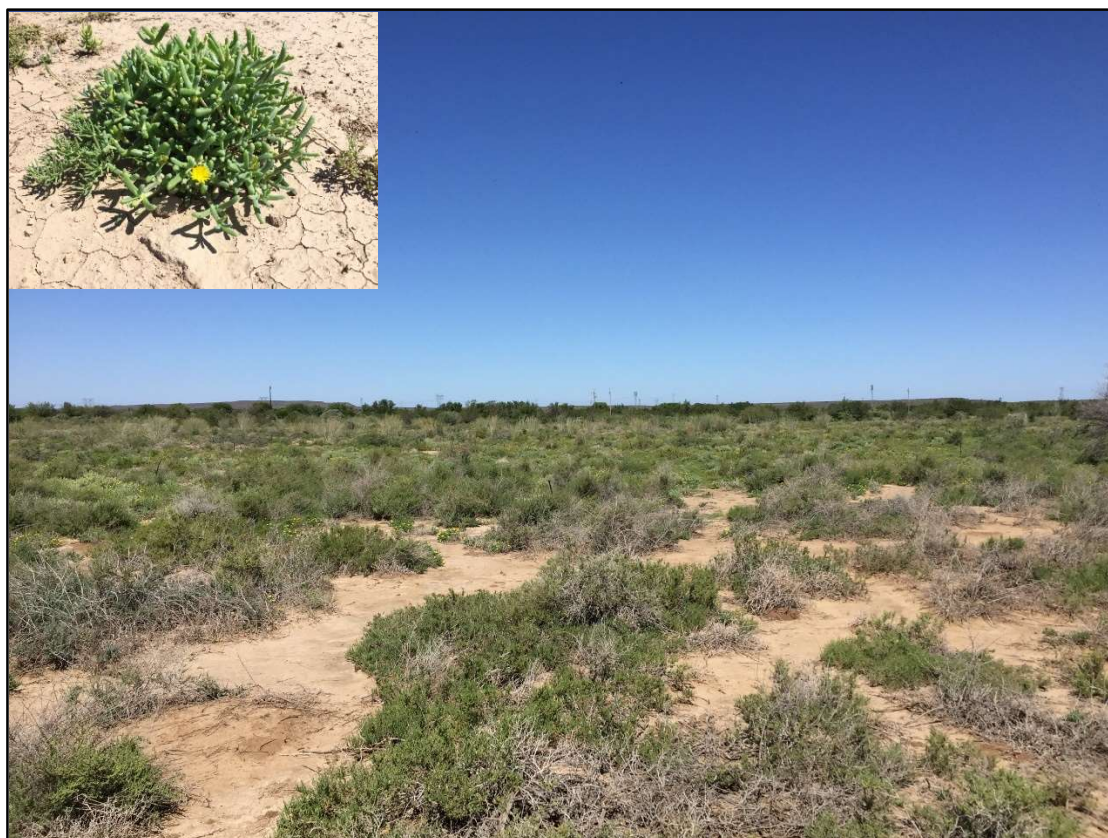


Photo 2 Southern Karoo Riviere, as viewed from the bypassing Blyth Street. Insert: *Malephora latipetala*

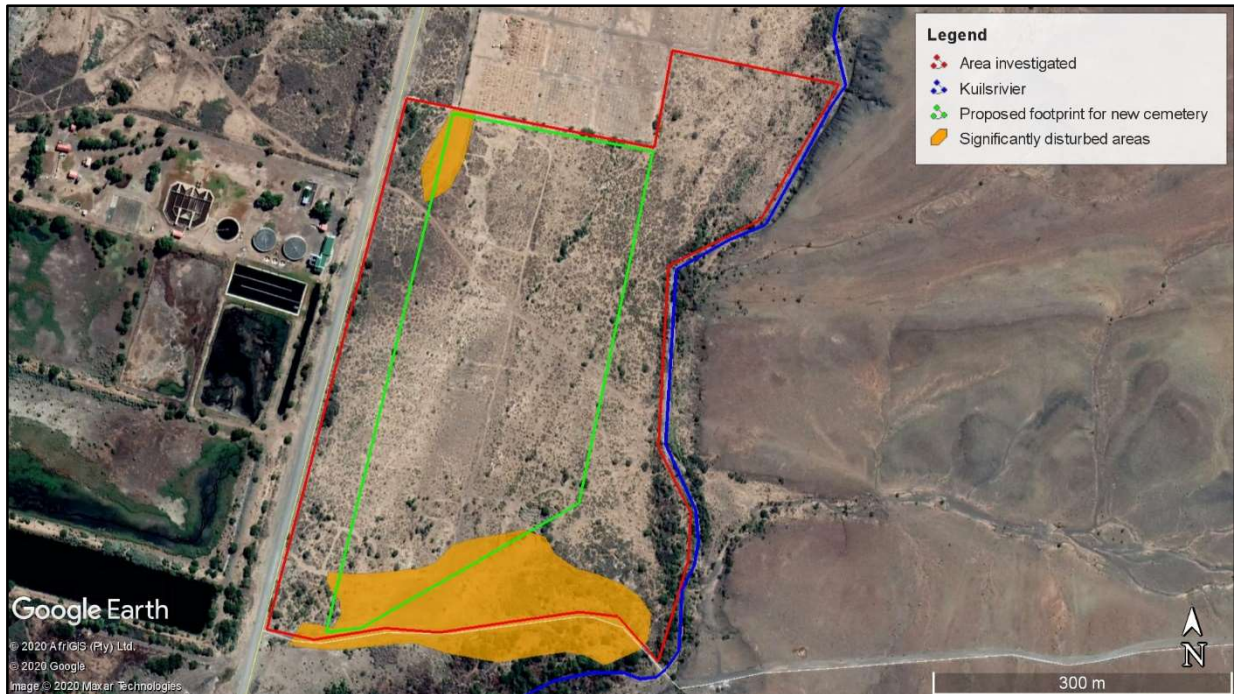


Photo 3 *Vachellia karroo* thicket in the south-western corner of site. Insert: *Caroxylon aphyllum*

Indigenous shrub species recorded include *Caroxylon aphyllum*, *Tetraena retrofracta*, *Sesamum capense* (common in riverbeds and disturbed areas), *Vachellia karroo*, *Pentzia incana*, *Gazania krebsiana*, *Gomphocarpus filiformis*, *G. fruticosus*, *Malephora latipetala* (dominant in places), *Drosanthemum hispidum*, *Lampranthus uniflorus*, *Mesembryanthemum coriarium*, *M. cf. granulicaule*, *Trichodiadema pomeridianum* (recorded in Gamka Karoo vegetation on western side of Kuilsrivier), *Asparagus* sp., *Aptosimum indivisum*, *Lycium oxycarpum*, *L. horridum* and *L. cf. cinereum*. Grasses recorded include *Chloris virgata* and *Dactyloctenium cf. aegyptium*.

Considerable disturbance was noted in the southern part (waste dumping), as well as in the north-western corner (vegetation stripped next to the existing cemetery) (see Map 5; Photos 4-6). The site enjoys easy and unrestricted access from the town. A few dirt tracks and an Eskom powerline also cross the site. A significant presence of invasive cacti and *Prosopis glandulosa* was noted, especially in and around the waste dumping area and along the Kuilsrivier. Invasive cacti (escaped from garden refuse!) recorded include *Opuntia elata*, *Cylindropuntia fulgida* var. *mamillata* (boxing glove cactus), *Tephrocactus articulatus* and *Trichocereus spachianus*. Exotic weeds recorded include *Atriplex nummularia* (old man salt bush), *A. lindleyi* subsp. *inflata*, *A. semibaccata*, *Salsola kali*, *Tribulus terrestris*, *Argemone ochroleuca*, *Xanthium spinosum*, *Solanum elaeagnifolium* and *Portulaca oleracea*. Nearly all these species are listed invasive

aliens in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) Alien and Invasive Species List (2016). The harbouring of *Atriplex nummularia* (Category 2 invader) on a property is prohibited without a permit.



Map 5 Aerial photograph showing the biodiversity attributes of the site.



Photo 4 Disturbed southern part of site. Insert: *Opuntia elata*

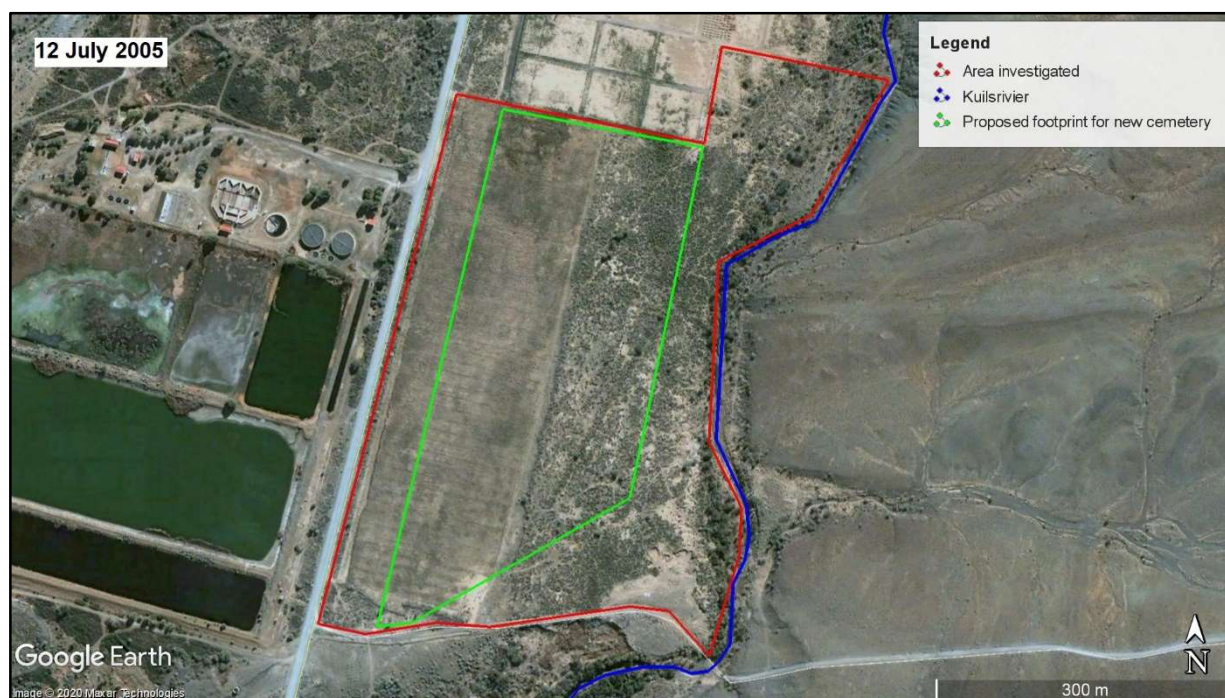


Photo 5 Disturbed north-western corner of site, with the Goue Akker cemetery in background.



Photo 6 *Atriplex nummularia* in a disturbed part of the site. Insert: *Cylindropuntia fulgida* var. *mamillata*

The local authority should make an effort to prevent illegal dumping in this area by providing suitable waste disposal facilities where waste, including garden refuse, can be recycled and disposed off in a controlled manner. Evidence of past agricultural activities (cultivation!) was noted on a historical Google Earth photograph (see Map 6). The vegetation has recovered remarkably well as little evidence of this past disturbance was found during the site survey.



Map 6 Historical 2005 Google Earth photo illustrating past agricultural activities on the site.

No Species of Conservation Concern, regional endemics or protected species were recorded. All the species recorded are widespread and common.

9 CONSERVATION STATUS & BIODIVERSITY NETWORK

Only about 1.5% of Southern Karoo Riviere is formally conserved in the Karoo National Park, and a few other nature reserves, including the Gamkapoort and Karoo Nature Reserves (Mucina & Rutherford 2006). About 88% of Southern Karoo Riviere still remains (Mucina & Rutherford 2006). The Karoo National Park is located just outside Beaufort West, 5 km northwest of the site. Gamka Karoo is equally poorly conserved, with only 2% formally conserved in the Karoo National Park and very little (<1%) is transformed (Mucina & Rutherford 2006). It is therefore well represented in the larger area. Both veld types are currently not listed as threatened (DEA 2011).

The site forms part of the Beaufort West biodiversity network (see Map 7). It marginally affects mapped ESA's (ecological support areas, indicated as wetland, watercourse or water recharge

areas), which provide support for the large the CBA (critical biodiversity area) corridors associated with the Gamka River and its tributaries. In their biodiversity assessment of the Central Karoo District Municipality, Skowno *et. al.* (2009) identified areas of critical importance in order to facilitate the functioning of ecological processes (both currently and in the face of climate change) which are required to ensure that the biodiversity features persist in the long term. These areas include high priority unfragmented landscapes and riparian corridors, such as the Gamka River.



Map 7 Biodiversity network map (Source: Cape Farm Mapper), with the site outlined in red.

CBA's are defined as areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure (Pool-Stanvliet *et al.* 2017). These sites are selected for meeting national targets for species, habitats and ecological processes (Pool-Stanvliet *et al.* 2017). Many of these areas support known occurrences of threatened plant species, and/or may be essential elements of designated ecological corridors. Loss of designated CBA's is therefore not recommended. ESA's, on the other hand, are supporting zones required to prevent the degradation of CBA's and Protected Areas. With the site marginally affecting an ESA, one can expect a low impact on the network.

Although the site borders onto a mapped NFEPA (National Freshwater Ecosystem Priority Areas) wetland, which partly surrounds the adjacent wastewater treatment works, the cemetery footprint will not affect the wetland directly. No evidence of any wetlands was found on site.

10 IMPACT ASSESSMENT

About 10 ha of Southern Karoo Riviere will be directly affected by the project. The quality of the affected vegetation is considered to be fair to good, with about half of the footprint area previously cultivated. Associated construction activities include the construction of a gravel access road, boundary fence, a caretaker and ablution facility, and stormwater drainage. During the construction phase care must be exercised to avoid the unnecessary disturbance of the adjacent veld, which must be left intact. Already disturbed areas (as shown on Map 5) should be used for the accommodation of construction plant, construction material, offices and parking during the construction phase. Due to Southern Karoo Riviere being well represented in the larger area, the impact on vegetation type *per se* is of a low to moderate concern.

No known Species of Conservation Concern, regional endemics or protected species will be affected. All the recorded species are widespread and common. Search and rescue of suitable species (e.g. bulbs and cuttings of succulents) is not needed unless it can be used in the rehabilitation of disturbed areas outside the cemetery footprint. Table 1 below summarises the impact on vegetation type, habitat and species.

It is uncertain how much (if any) of the disturbed areas will be rehabilitated. Some of the species which originally occurred on site will return, including the aliens. Saltbushes will probably act as pioneer shrubs in this regard. Erosion should not be a big concern due to the relatively flat terrain and low rainfall. As an indirect impact, soil disturbance caused by earthworks will provide ideal conditions for the establishment of invasive alien species. The presence of aliens, such as *Prosopis glandulosa*, *Atriplex nummularia* and a variety of invasive cacti, may exacerbate this

impact. As an operational phase impact, alien control will be required on and around the site as an ongoing management concern.

Table 1 Impact on vegetation type, habitat and species.

Mitigation	Extent	Duration	Intensity	Probability of occurrence	Significance – Current site option	Confidence
Without mitigation	Limited to site	Permanent	High	High	Med (-)	Med-high
With mitigation	Limited to site	Permanent	High	High	Low-medium (-)	Med-high
Mitigation measures: Demarcate/fence off the construction area; contain disturbance to the demarcated construction area; consider search and rescue of bulbs and cuttings of succulents for use in the rehabilitation of disturbed areas outside the cemetery footprint; control aliens on and around the site as a long-term management requirement; prohibit further waste dumping in the area.						

The impact on the biodiversity network, including the CBA's and ESA's, is of a lesser concern since the project only marginally affects mapped ESA's. The extensive ESA's to the west and east will remain intact and unaffected. The very positive mitigation measures would be to rehabilitate the disturbed area and section of the Kuilsrivier on the southern side of the site where waste dumping occurred. The affected section of the Kuilsrivier should be reinstated or included as part of the biodiversity network. Table 2 below summarises the impact on CBA's.

Table 2 Impact on the biodiversity network, CBA's, etc.

Mitigation	Extent	Duration	Intensity	Probability of occurrence	Significance – Current site option	Confidence
Without mitigation	Limited to site & surroundings	Permanent	Med	High	Low-med (-)	Med-high
With mitigation	Limited to site & surroundings	Permanent	Med	High	Low (-)	Med-high
Mitigation measures: Rehabilitate the disturbed area and section of the Kuilsrivier on the southern side of the site where waste dumping occurred; control aliens as a long-term management requirement; prohibit further waste dumping in the area.						

11 CONCLUSION & RECOMMENDATIONS

The vegetation recorded on site is described as fair to good quality Southern Karoo Riviere. Due to Southern Karoo Riviere being well represented in the larger area and not threatened, the impact on vegetation type *per se* is of a low to moderate concern. If construction activities are restricted to the indicated footprint area and the adjacent disturbed areas, the direct impact

involves the removal of ±10 ha of vegetation. No known Species of Conservation Concern, regional endemics or protected species will be affected. All the recorded species are widespread and common. The impact on the biodiversity network, including the CBA's and ESA's, is of a lesser concern since the project only marginally affects mapped ESA's. The extensive ESA's to the west and east will remain intact and unaffected.

Strict mitigation measures will be required before and during the construction phase to minimise the impact. During construction, mitigation should focus on the protection of veld adjacent to the works areas, and maybe the rehabilitation of the disturbed areas outside the site. The following mitigation measures should be considered:

- In order to minimise disturbance of the adjacent vegetation and Kuilsrivier, the construction area should be demarcated/fenced off prior to the start of construction activities. No disturbance or spoiling may occur outside this area.
- Consider search and rescue of bulbs and cuttings of succulents for use in the rehabilitation of disturbed areas outside the cemetery footprint.
- Implement alien control on and around the site as a long-term management requirement.
- Prohibit further waste dumping in the area.
- Rehabilitate the disturbed area and section of the Kuilsrivier on the southern side where waste dumping occurred. The affected section of the Kuilsrivier should be reinstated or included as part of the biodiversity network.

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Skowno, A.L., Holness, S.D. & Desmet, P. 2009. Biodiversity Assessment of the Central Karoo District Municipality. DEAP Report EADP05/2008.

BRIEF CV OF SPECIALIST

M.G. (Mark) BERRY

ENVIRONMENTAL CONSULTANT & BIODIVERSITY SPECIALIST

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Tel: 083 286-9470 **Fax:** 086 759-1908 **E-mail:** markberry@webafrica.org.za

PROFESSIONAL STATEMENT

Environmental assessment professional and biodiversity specialist with over 20 years of experience mainly in the Western Cape Province, but also in the Northern Cape and Eastern Cape. Experience in Environmental Impact Assessments (EIA's), biodiversity assessments, Environmental Management Programmes (EMPr's), Environmental Control Officer (ECO) duties and environmental due diligence investigations.

WORK EXPERIENCE

- 1989-1990** Nature Conservation Officer in the South African Air Force, based at Langebaan Road Air Force Base
- 1997-2005** Employed as principal environmental specialist at Planning Partners, a multi-disciplinary consultancy specialising in town and regional planning, environmental planning and landscape architecture. Duties included the conducting of EIA's, compiling EMPr's, ECO duties, biodiversity surveys and status quo environmental assessments for spatial development frameworks.
- 2000-2006** Examiner for the Board of Control for Landscape Architects (BOCLA), responsible for the setting up and marking of the Environmental Planning Section of exam paper.
- 2005-current** Started Mark Berry Environmental Consultants in June 2005. Responsibilities include office management, seeking tenders, conducting EIA's, compiling EMPr's, construction site environmental audits, biodiversity surveys, etc. A relationship is maintained with previous employer, and, among other, undertook land-use surveys and reporting for the Eskom's site safety reports for three proposed nuclear power plants in the Western and Eastern Cape Provinces.

QUALIFICATIONS

- BSc (1988) University of Stellenbosch
- BSc-Hons in Botany (1991) University of Stellenbosch
- MSc in Botany (1993) Nelson Mandela Metropolitan University
- PhD in Botany (2000) Nelson Mandela Metropolitan University.

PROFESSIONAL MEMBERSHIP

Professional member (reg. no. 400073/98) of the South African Council for Natural Scientific Professions (SACNASP).

REFERENCES

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John Sharples (Sharples Environmental Services, George)

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Andrew Cleghorn (civil engineer and branch manager at Knight Piesold (Pty) Ltd)

Phone: (021) 555-0400, e-mail: acleghorn@knightpiesold.com

Prof Eileen Campbell (Department of Botany, Nelson Mandela Metropolitan University)

Phone: (041) 504-2329, e-mail: Eileen.Campbell@nmmu.ac.za

DECLARATION OF INDEPENDENCE

I Mark Gerald Berry, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I :

- in terms of the general requirement to be independent:
 - **other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity;** or
 - am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the Specialist:



Name of Company:

Mark Berry Environmental Consultants

Date:

3 April 2020