

# **PROPOSED DEVELOPMENT OF A DAM ON FARM KLEINVLEI 209, PORTION 1, CERES, WESTERN CAPE**



## **DRAFT ENVIRONMENTAL IMPACT REPORT**

**D:EA&DP REF: 16/3/3/2/B5/2/1029/21**

September 2021

# **PROPOSED DEVELOPMENT OF A DAM ON FARM KLEINVLEI 209, PORTION 1, CERES, WESTERN CAPE**

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## **PREPARED FOR:**

**TSR Boerdery (Pty) Ltd**

**P.O. Box 86  
Ceres,  
6836**

## **PREPARED BY: EnviroAfrica**

**P.O. Box 5367  
Helderberg  
7135  
Tel: 021 – 851 1616  
Fax: 086 – 512 0154**

## INDEPENDENCE & CONDITIONS

EnviroAfrica is an independent consulting firm that has no interest in the proposed activity other than fair remuneration for services rendered. Remuneration for services is not linked to approval by decision making authorities and EnviroAfrica has no interest in secondary or downstream development as a result of this project. There are no circumstances that compromise the objectivity of this Environmental Impact Report. The findings, results, observations and recommendations given here are based on the author's best scientific and professional knowledge and available information. EnviroAfrica reserves the right to modify aspects of this report, including the recommendations if new information becomes available which may have a significant impact on the findings of this report.

## RELEVANT QUALIFICATIONS & EXPERIENCE OF THE EAP

This Draft Environmental Impact Report was compiled by Clinton Geyser who has a MSc. Degree in Environmental Management. He has been working as an Environmental Assessment Practitioner since 2009 and is currently employed at EnviroAfrica cc.

### Qualifications:

- BSc. Earth Sciences, Majors in Geology and Geography and Environmental Management (1998 – 2000) and;
- BSc. (hons): Geography and Environmental Management (2001) and;
- MSc. Geography and Environmental Management (2002), all from the University of Johannesburg.

### Expertise:

Clinton Geyser has over twelve years' experience in the environmental management field as an Environmental Assessment Practitioner and as an Environmental Control Officer, having worked on a variety of projects in the Western, Eastern and Northern Cape.

The entire process and report was supervised by Bernard De Witt who has more than 20 years' experience in environmental management and environmental impact assessments.

Please refer to **Appendix 14** for the CV's of the EAPs.

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## ACRONYMS

BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
D:EA&DP	Department of Environmental Affairs and Development Planning
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
ECA	Environment Conservation Act (Act No. 73 of 1989)
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Programme
ESA	Ecological Support Area
EWR	Environmental Water Requirements
HIA	Heritage Impact Assessment
HWC	Heritage Western Cape
I&APs	Interested and Affected Parties
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NHRA	National Heritage Resources Act (Act No. 25 of 1999)
NID	Notice of Intent to Develop
NWA	National Water Act
OESA	Other Ecological Support Area
SAHRA	South African Heritage Resources Agency

SANBI  
WULA

South African National Biodiversity Institute  
Water Use Licence Application

# 1. INTRODUCTION

## 1.1 BACKGROUND

Consideration is being given to the development of a new dam on Farm Kleinvlei 209, Portion 1, Ceres. The Applicant, TSR Boerdery (Pty) Ltd, a 51% BEE owned entity, currently has summer water rights to abstract water directly from the Houdenberg River but would like to ensure the existing water use for permanent cultivars by creating winter storage.

The applicant, TSR Boerdery (Pty) Ltd, will undertake the activity should it be approved. EnviroAfrica CC has been appointed as the independent Environmental Assessment Practitioner (EAP) responsible for undertaking the relevant EIA and the Public Participation Process required in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA).

The Final Scoping Report and Plan of Study for EIA were submitted to the Department of Environmental Affairs and Development Planning (DEA&DP) on 15 July 2021. The Scoping Report and Plan of Study for EIA were approved by DEA&DP on 25 August 2021 and EnviroAfrica were advised to proceed with the EIA process (**Appendix 7A**).

This Draft Environmental Impact Report (EIR) for comment, which will be submitted to the Department of Environmental Affairs and Development Planning (D:EA&DP) for consideration, forms part of the EIA process. The purpose of this Draft EIR for comment is to describe the proposed project, the process followed to date, to present alternatives and to identify the potential impacts of the proposed development on the receiving environment, as well as provide recommendations and mitigation measures as suggested by the specialist.

## 1.2 DESCRIPTION OF THE PROPOSED ACTIVITY

TSR Boerdery (Pty) Ltd is proposing the development of a dam on Farm Kleinvlei 209, Portion 1, Ceres.

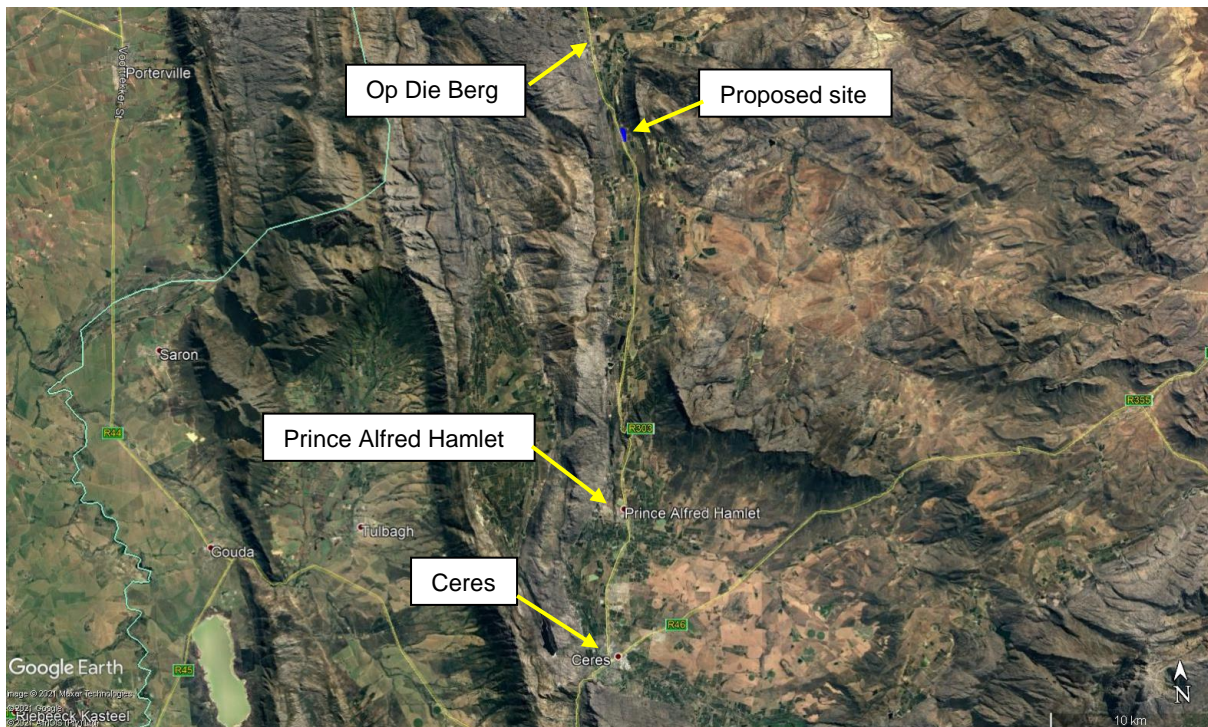
The proposed dam will have a total storage capacity of 235 000m<sup>3</sup> and will be exclusively filled from an existing water use, namely, winter water from the Houdenbeks River, and from its own catchment. The proposed Kleinvlei dam will create the opportunity to store winter water for summer irrigation during times when the Houdenbeks River nearly runs dry.

The proposed Kleinvlei dam will be a zoned earthfill embankment across the valley including an open channel spillway provisionally against the northern bank plus a pipe outlet under the central embankment. The proposed dam is considered an in-stream dam with a straight alignment across the valley. The dam wall will have a maximum wall height of approximately 8.4m and a crest length of 154.3m and crest width of 4.0m. The maximum flooded area will be approximately 12ha, with a total footprint of 13ha. The dam will also include an outlet pipe with a ø250mm and ±55m long (through the damwall).

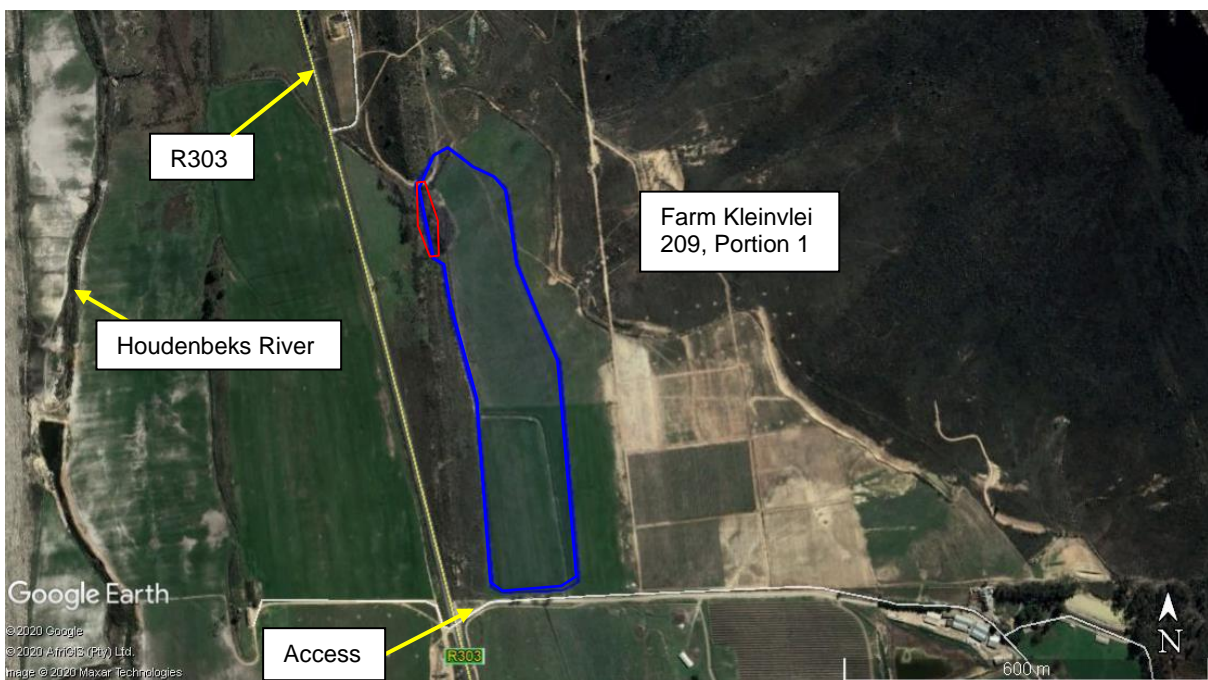
The site is located approximately 23km north of Prince Alfred Hamlet, 5km south of Op Die Berg, off the R303.

Site co-ordinates: Proposed dam wall: 33° 04' 02.50" S, 19° 19' 57.50" E.





**Figure 1:** Google Earth image showing the locality of the proposed Kleinvlei Dam.



**Figure 2:** Google Earth image of the site. The blue polygon represents the approximate high-water mark of the dam. The red polygon the approximate dam wall/embankment footprint.

## 2. NEED AND DESIRABILITY

In terms of the National Environmental Management Act, and EIA 2014 regulations, as amended, the Scoping/EIA report must provide a description of the need and desirability of the proposed activity. The consideration of “need and desirability” in EIA decision-making requires the consideration of the strategic context of the development proposal along with the broader societal needs and the public interest.

While the concept of need and desirability relates to the *type* of development being proposed, essentially, the concept of need and desirability can be explained in terms of the general meaning of its two components in which *need* refers to *time* and *desirability* to *place* – i.e. is this the right time and is it the right place for locating the type of land-use/activity being proposed? Need and desirability can be equated to *wise use of land* – i.e. the question of what is the most sustainable use of land.

### 2.1 NEED

The Applicant, TSR Boerdery (Pty) Ltd, a 51% BEE owned entity, currently has summer water rights to abstract water directly from the Houdenberg River but would like to ensure the existing water use for permanent cultivars by creating winter storage.

According to the preliminary Design Report (**Appendix 5**), summer abstraction will be switched or exchanged for winter abstraction with the key motivation to store winter water for summer irrigation, also benefiting and ensuring the protection of the Houdenberg River during the dry summer months when the water levels fall drastically.

The dam will mainly be filled from the Houdenberg River via an existing pump and pipeline system while plantations will be irrigated directly from the dam during summer periods.

The proposed development is considered in line with the Witzenberg Municipality Amended Integrated Development Plan (IDP)(2017 – 2022) and the Spatial Development Framework (2020): Focus on Agriculture in the Witzenberg Area, in protecting food security while supporting sustainable diversification of the agricultural sector and encouraging more efficient methods and models.

It also supports the following key implications:

- Support private sector led institutional arrangements to enable joint planning and development of agriculture related activities.
- Enable the diversification of farmer income through enabling complimentary uses on farms in a manner which does not detract from the functionality and integrity of farming areas and landscapes.

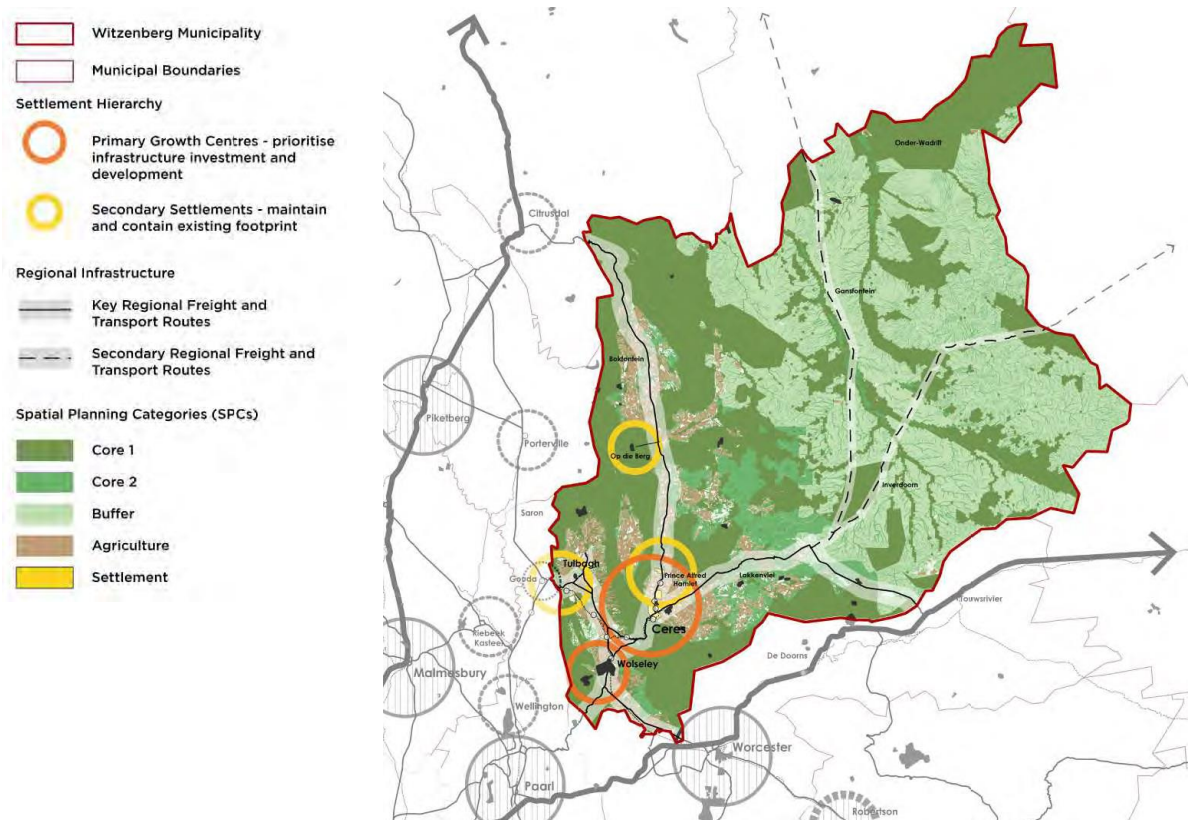
According to the Witzenberg Municipality Amended Integrated Development Plan (IDP)(2017 – 2022) the agricultural sector comprised R1,2 billion (or 19,7 per cent) of the municipality’s GDP in 2015. It displayed steady growth of 2,5 per cent for the period 2005 – 2015, but growth has nevertheless become stagnant in the post-recessionary period (the sector experienced a growth rate of 0,3 per cent over the period 2010 – 2015). Agriculture employed 34,9 per cent of the municipality’s workforce.

According to the Witzenberg Municipality Spatial Development Framework (2020), the agricultural objective is to promote consolidation of farming landscapes and prevent their fragmentation, provide for land and agrarian reform, improve the economic viability of farming by facilitating diversification of agricultural production, promote enterprise opportunities within the food system and promote



sustainable farming practices. The proposed development is considered to be in line with these objectives.

The proposed site also appears to be in an area specified as Buffer/Agricultural in terms of the consolidated Municipal Framework Map for the Witzenberg Municipality (see Figure 3 below)



**Figure 3:** Consolidated Municipal Framework Map for the Witzenberg Municipality (Witzenberg Municipality Spatial Development Framework (2020).

No Environmental Management Framework relevant to the application was found.

## 2.2 DESIRABILITY

The following factors determine the desirability of the area for the proposed dam development.

### 2.2.1 Location and Accessibility

According to the preliminary Design Report (**Appendix 5**), the dam site is located within the Houdenberg River catchment being part of the larger Olifants-Doorn system. The use of the water as well as the construction of the proposed Kleinvlei dam should have no negative effect on the downstream users since it is based exclusively on an existing taking which was executed on the property.

The site is easily accessible from the R303, and is adjacent to TSR Boerdery's existing orchids.

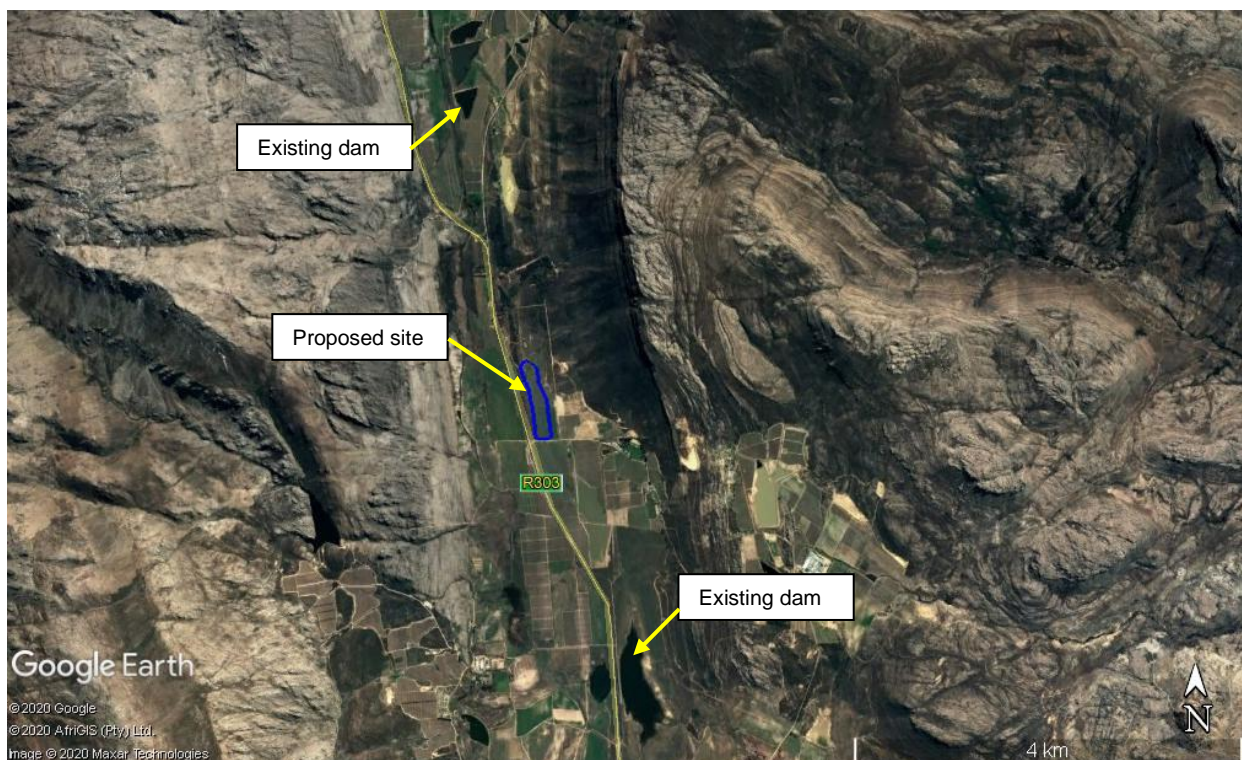
The site is located on old, cultivated fields, part of which has recently been used for orchids, limiting any loss of natural vegetation in the area.

The topography is also ideal, as the dam wall will be constructed between two existing ridges, limiting the amount of material required for the dam wall.

The proposed activity is also within the existing land use rights of the property. The property is zoned Agricultural. The proposed activity is the development of a new dam for agricultural purposes. The surrounding land-uses are also predominantly agricultural in nature.

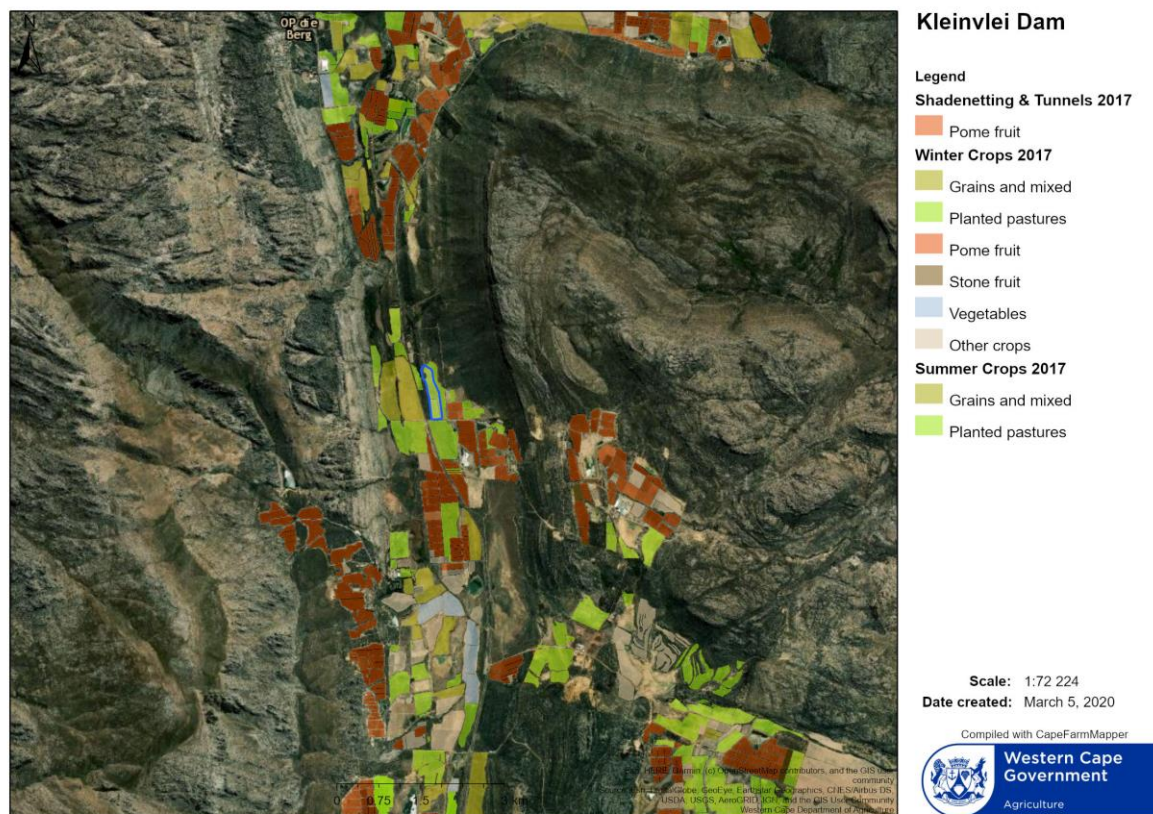
### 2.2.2 Compatibility with the Surrounding Area

The proposed site is directly adjacent to the existing orchards of TSR Boerdery. The surrounding area is also generally agricultural in nature, with other farms dams in the area (the closest being approximately 2.2km south and 2.5km north of the proposed site). The proposed dam will therefore not be considered inappropriate for the area and is compatible with the existing land-uses in the area.



**Figure 4:** Google Earth image of the surrounding landscape. The proposed development will be in an agricultural area, with other similar farm dams to the south and to the north.





**Figure 5:** CapeFarmMapper image (Crop Census 2017) shows the surrounding area is mostly agricultural.

The proposed development is not expected to impact on people's health and well-being (e.g., in terms of noise, odours, visual character and 'sense of place', etc.). The proposed development will not produce noise, odours, and is expected to have a very low to negligible impact on the visual character and "sense of place", since, as described above, is an agricultural development within an agricultural area. There are also a number of other dams in the area.

### 3. LEGAL REQUIREMENTS

The current assessment is being undertaken in terms of the National Environmental Management Act (Act 107 of 1998, NEMA), to be read with section 24 (5): NEMA EIA Regulations 2010. However, the provisions of various other Acts must also be considered within this EIA.

The legislation that is relevant to this study is briefly outlined below.

#### 3.1 THE CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA

The Constitution of the Republic of South Africa (Act 108 of 1996) states that everyone has a right to a non-threatening environment and that reasonable measures are applied to protect the environment. This includes preventing pollution and promoting conservation and environmentally sustainable development, while promoting justifiable social and economic development.

## 3.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998)

The National Environmental Management Act (Act 107 of 1998) (NEMA), as amended, makes provision for the identification and assessment of activities that are potentially detrimental to the environment, and which require authorisation from the relevant authorities based on the findings of an environmental assessment. NEMA is a national act, which is enforced by the Department of Environmental Affairs (DEA). These powers are delegated in the Western Cape to the Department of Environmental Affairs and Development Planning (DEA&DP).

On the 4 December 2014 the Minister of Environmental Affairs promulgated regulations in terms of environmental impact assessments, under sections 24(5) and 44 of NEMA, namely the EIA Regulations 2014 (GN No. R 326) these regulations were amended in April 2017, and include:

- GN No. R. 327 (Listing Notice 1);
- GN No. R. 325 (Listing Notice 2); and
- GN No. R. 324 (Listing Notice 3).

Listing Notice 1 and 3 are for a Basic Assessment and Listing Notice 2 for a full Environmental Impact Assessment.

According to the 2014 EIA regulations, as amended in 2017, the following potentially listed activities may be triggered (refer to Table 1 below)

**Table 1: Summary of 2014 EIA regulations triggered**

GN R327	Short description of relevant Activity(ies) in terms of Listing Notice 1	Description of specific portion of the development that might trigger the listed activity.
12	The <b>development</b> of; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs; (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	Proposed development of a dam with a footprint of more than 100m <sup>2</sup> . The proposed dam is considered an in-stream dam.
19	The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10cubic meters from a watercourse:	The development of the in-stream dam will involve the infilling, depositing, excavation, moving and removal of material from within the watercourse.
27	The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation, except where such clearance of indigenous vegetation is required for – (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a MMP.	Although the majority of the dam development footprint is within an area that has been previously cleared and cultivated, the construction of the dam and dam wall will involve the removal or inundation of some indigenous vegetation, and a large stand of poplar trees, which may exceed 1ha in extent.

GN R325	Short description of relevant Activity(ies) in terms of Listing Notice 2	Description of specific portion of the development that might trigger the listed activity.
16	Development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 meters or higher or where the high-water mark of the dam covers an area of 10ha or more.	The proposed dam wall will have a maximum wall height of approximately 8.4m and a crest length of 154.3m. The maximum flooded area will be approximately 12ha, with a total footprint of 13ha.
GN R324	Short description of relevant Activity(ies) in terms of Listing Notice 3	Description of specific portion of the development that might trigger the listed activity.
N/A		

The principles of environmental management as set out in section 2 of NEMA have been taken into account. The principles pertinent to this activity include:

- People and their needs will be placed at the forefront while serving their physical, psychological, developmental, cultural and social interests. The activity seeks to provide additional employment and economic development opportunities, which are a local and national need – *the proposed activity is expected to have a beneficial impact on people, especially developmental and social benefits, as well providing additional employment and economic development opportunities.*
- Development will be socially, environmentally and economically sustainable. Where disturbance of ecosystems, loss of biodiversity, pollution and degradation, and landscapes and sites that constitute the nation's cultural heritage cannot be avoided, are minimised and remedied. The impact that the activity will potentially have on these will be considered, and mitigation measures will be put in place - *potential impacts have been identified and considered, and any further potential impacts will be identified during the public participation process. Mitigation measures will be included in the EMP.*
- Where waste cannot be avoided, it will be minimised and remedied through the implementation and adherence of the Environmental Management Programme (EMP) – *this will be included in the EIR.*
- The use of non-renewable natural resources will be responsible and equitable.
- The negative impacts on the environment and on people's environmental rights will be anticipated, investigated and prevented, and where they cannot be prevented, will be minimised and remedied.
- The interests, needs and values of all interested and affected parties will be taken into account in any decisions through the Public Participation Process.
- The social, economic and environmental impacts of the activity will be considered, assessed and evaluated, including the disadvantages and benefits.
- The effects of decisions on all aspects of the environment and all people in the environment will be taken into account, by pursuing what is considered the best practicable environmental option.

### 3.3 NATIONAL HERITAGE RESOURCES ACT

The protection and management of South Africa's heritage resources are controlled by the National Heritage Resources Act (Act No. 25 of 1999). South African National Heritage Resources Agency (SAHRA) is the enforcing authority and in the Western Cape, SAHRA have, in most cases, delegated this authority to Heritage Western Cape (HWC).

In terms of Section 38 of the National Heritage Resources Act, SAHRA and/or HWC will require a Heritage Impact Assessment (HIA) where certain categories of development are proposed. Section 38(8) also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is found to be adequate, a separate HIA is not required.

The National Heritage Resources Act requires relevant authorities to be notified regarding this proposed development, as the following activities are relevant:

- *any development or other activity which will change the character of a site exceeding 5 000 m<sup>2</sup> in extent;*

Furthermore, in terms of Section 34(1), no person may alter or demolish any structure or part of a structure, which is older than 60 years without a permit issued by the SAHRA, or the responsible resources authority. Nor may anyone destroy, damage, alter, exhume or remove from its original position, or otherwise disturb, any grave or burial ground older than 60 years, which is situated outside a formal cemetery administered by a local authority, without a permit issued by the SAHRA, or a provincial heritage authority, in terms of Section 36 (3). In terms of Section 35 (4), no person may destroy, damage, excavate, alter or remove from its original position, or collect, any archaeological material or object, without a permit issued by the SAHRA, or the responsible resources authority.

In terms of Section 38(8) of the National Heritage Resources Act, a Notification of Intent to Develop (NID) was submitted to HWC on 17 January 2020 (Case Number: 19121213AS0117E). Final response was received from HWC (dated 30 January 2020)(see **Appendix 7B**), stating that since there is no reason to believe that heritage resources would be impacted by the proposed dam, no further action under Section 38 of the NHRA is required.

### **3.4 EIA GUIDELINE AND INFORMATION DOCUMENT SERIES**

The following are the latest guidelines that form part of the DEA&DP's *Environmental Impact Assessment Guideline and Information Document Series (Dated: October 2011)*:

- ✓ *Guideline on Transitional Arrangements*
- ✓ *Guideline on Alternatives*
- ✓ *Guideline on Public Participation*
- ✓ *Guideline on Exemption Applications*
- ✓ *Guideline on Appeals*
- ✓ *Guideline on Need and Desirability*
- ✓ *Information Document on the Interpretation of the Listed Activities*
- ✓ *Information Document on Generic Terms of Reference for EAPs and Project Schedules*

### **3.5 NATIONAL WATER ACT**

The National Water Act (Act no 36 of 1998) provides the legal framework for the effective and sustainable management of our water resources. The Act was published in 1998 with the aim of fundamentally reforming the past laws relating to water resources which were discriminatory and not appropriate to South African conditions. Central to the National Water Act is a recognition that water is scarce and precious resource that belongs to all of the people of South Africa. It also recognises the ultimate goal of water resource management is to achieve the sustainable use of water for the benefit of all South Africans. The Act aims to protect, use, develop, conserve, manage and control water resources as a whole, promoting the integrated management of water resources with the participation of all stakeholders.



Besides the provisions of NEMA for this EIA process, the proposed development will also require authorizations under the National Water Act (Act NO. 36 of 1998). The Department of Water and Sanitation (DWS), who administer that Act, will be a leading role-player in the EIA.

The Water Use Licence Application (WULA), in terms of Section 21 (b)(c) and (i), has been submitted to DWS. This application will run concurrently with the NEMA Application. See **Appendix 12** for proof of WULA submission.

A Dam Safety Permit in terms of the Dam Safety Regulations in terms of Section 123(1) of the National Water Act is also required. An application has been submitted to the Dam Safety Office on 20 November 2019.

### **3.6 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT**

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) is part of a suite of legislation falling under NEMA, which includes the Protected Areas Act, the Air Quality Act, the Integrated Coastal Management Act and the Waste Act. Chapter 4 of NEMBA deals with threatened and protected ecosystems and species and related threatened processes and restricted activities. The need to protect listed ecosystems is addressed (*Section 54*).

## 4. ALTERNATIVES

Alternatives have been considered during the Scoping phase and these are described below.

### 4.1 SITE ALTERNATIVES FOR THE PROPOSED DAM

The proposed site is the only viable site available at this stage and the only one that will be investigated in this application. The property is relatively small, and due to the topography, existing infrastructure and orchards on the property, the proposed site is the only feasible site. The rest of the property is either too mountainous and/or where natural vegetation would need to be removed.

### 4.2 ACTIVITY ALTERNATIVES

There are no feasible activity alternatives that would be provide summer irrigation for the farm. The proposed dam is the only alternative to storing winter water for irrigation during the dry summer months.

### 4.3 LAYOUT ALTERNATIVES

Three dam wall layouts were initially proposed and investigated by the engineers. Please refer to **Appendix 3**.

**Option 1:** This option has the same wall position as the preferred alternative (Option 2), but also has an additional saddle wall on the upstream side making it extremely difficult firstly to get flood water into the dam and then around it when its full. It will have a capacity of approximately 168 000m<sup>3</sup>. It has a storage ratio of +/- 5, which is considered economically viable.

**Option 2 (preferred dam wall layout):** This option is the preferred layout. It has the same dam wall position as Option 1, but does not have the second wall (saddle wall). Its capacity is larger than option 1 (~235 000m<sup>3</sup> compared to 168 000m<sup>3</sup>) and has a better storage ratio (far exceeding 5) and is therefore more economical and financially viable than option 1.

**Option 3:** Although this option has a storage capacity of approximately 212 000m<sup>3</sup>, it has a lower storage ratio than both Option 1 and 2, and was therefore uneconomical and not financially viable. The dam would also cover more of the natural vegetation to the north, and is therefore also not desirable.

### 4.4 NO-GO ALTERNATIVE

This is the option of not developing the proposed dam.

Although the no-go development might result in no potential negative environmental impacts, the direct and indirect socio-economic benefits of not constructing the dam development will not be realised. The need for summer storage for irrigation purpose will not be realised.

## 5. SITE DESCRIPTION

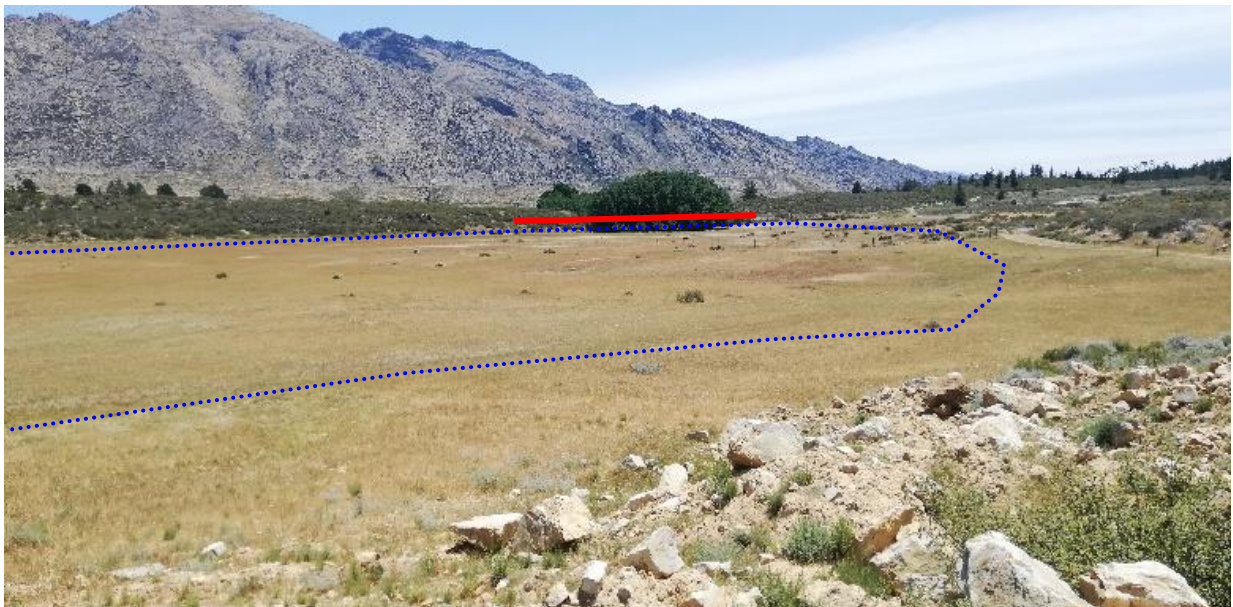
### 5.1 LOCATION

The proposed site is located on Portion 1 of Farm Kleinvlei 209, Ceres. The site is located approximately 23km north of Prince Alfred Hamlet, off the R303 (see Figure 1 and **Appendix 1**).

Site co-ordinates: Proposed dam wall: 33° 04' 02.50" S, 19° 19' 57.50" E.



**Figure 6:** General view of part of the proposed site looking south-west. The approximate dam surface is indicated by the blue dashed line.



**Figure 7:** General view of part of the site, looking north-west. The approximate dam surface is indicated by the blue dashed line and the location of the dam wall is indicated by the red line.





**Figure 8:** General view of the dam area, looking east from the location of the dam wall. The approximate dam surface is indicated by the blue dashed line.

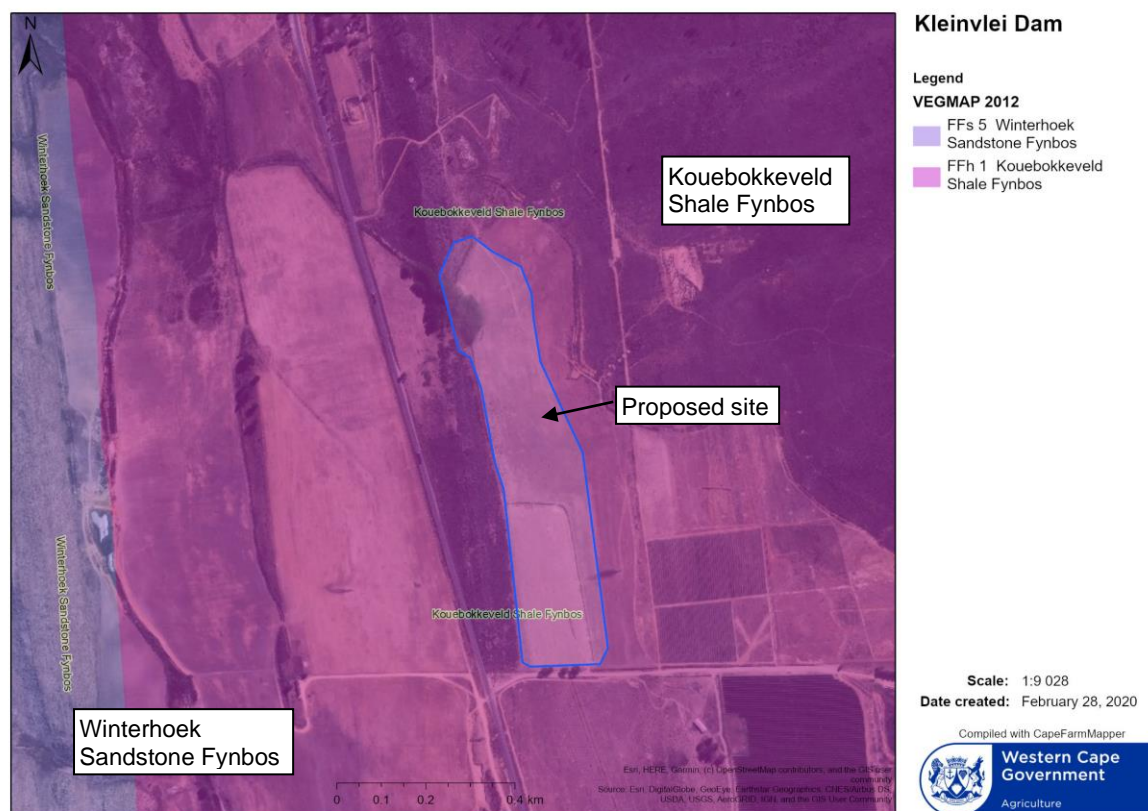


**Figure 9:** General view of the dam area, looking south-east from the location of the dam wall. The approximate dam surface is indicated by the blue dashed line

## 5.2 VEGETATION

The site is located on old, cultivated fields, part of which has recently been used for orchids, as can be seen in Figures 6 – 9 above. There is a small patch of natural vegetation to the north of the proposed dam wall which may be inundated at the high-water mark of the dam, which will therefore be lost. A large, mature stand of Poplar Trees (*Populus x canescens*) is located on the location of the proposed dam wall, between the two ridges. Although the majority of the dam development footprint is within an area that has been previously cleared and cultivated, the construction of the dam and dam wall will involve the removal or inundation of some indigenous vegetation, and a large stand of poplar trees, which may exceed 1ha in extent.

According to the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated in the 2012 beta version) only one broad vegetation type is expected on the majority of the proposed site, namely Kouebokkeveld Shale Fynbos, which is classified as Vulnerable.



**Figure 10:** SANBI Vegetation map of the area (CapeFarmMapper).

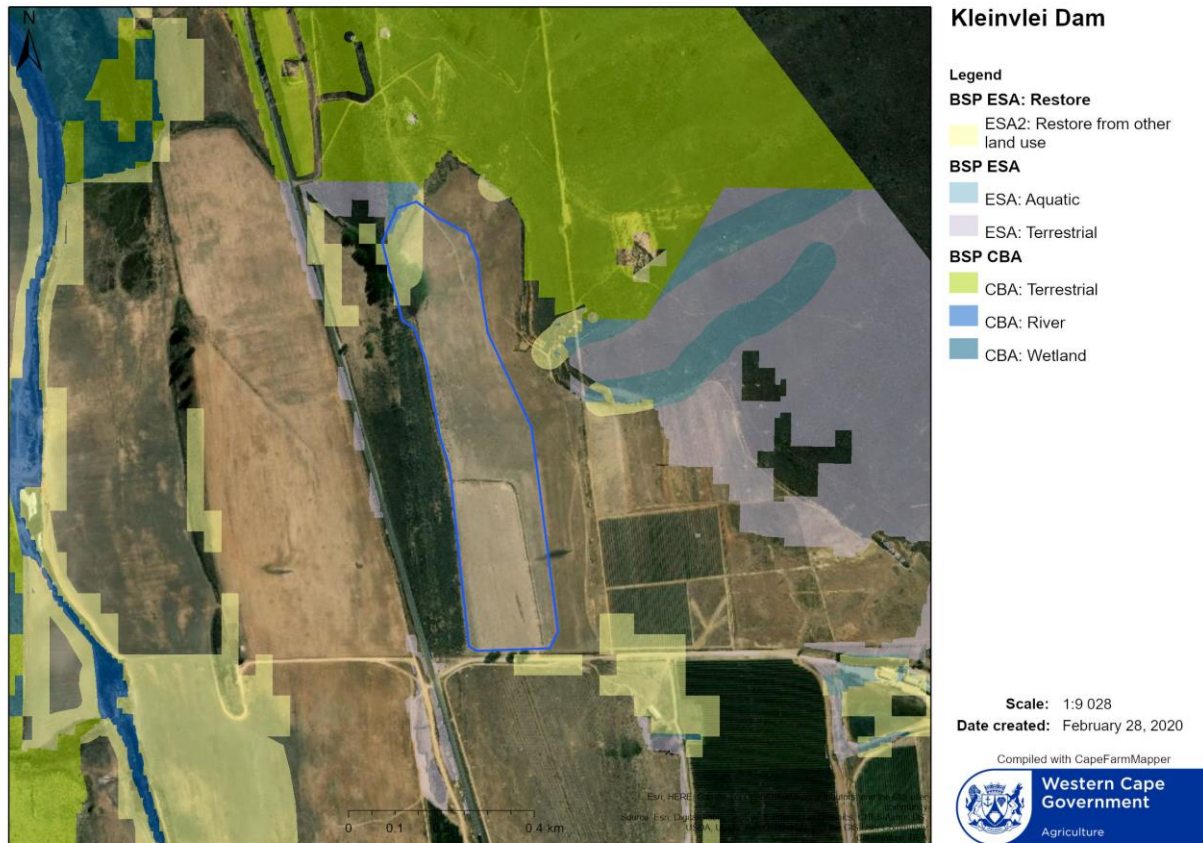
According to biodiversity overlay maps from Cape Farm Mapper (**Figure 11**) the site partially falls within a Critical Biodiversity Area (CBA), as well as Ecological Support Areas (ESA & ESA2s).

CBAs are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. The objective is to maintain these areas in a natural or near natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated.

The proposed dam will fall in an Ecological Support Area (ESA), Category 1: Terrestrial & Aquatic. These areas are not essential for meeting biodiversity targets, but play an important role in supporting the functioning of protected areas and CBAs, and are often vital for delivering ecosystem services. The objective is to maintain a functioning, near natural state. Some habitat loss is acceptable, provided that underlying biodiversity objectives and ecological functioning are not compromised.

The proposed dam will fall in an ESA2. These areas are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas and CBA, the objective is to restore and manage to minimise impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and allow for natural movement.



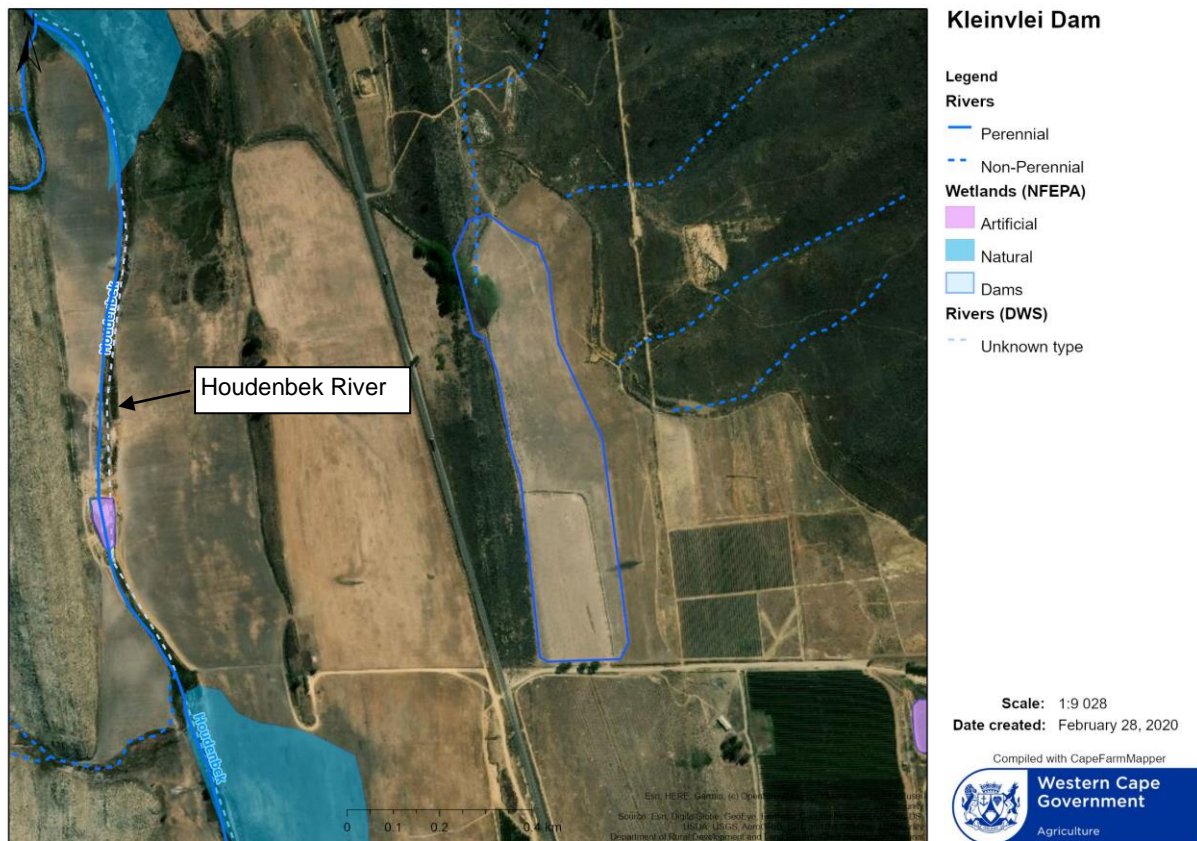


**Figure 11:** CBA Map of the site (CapeFarmMapper).

A Botanical assessment was conducted (**Appendix 8A**) and findings is discussed in Section 10 of the EIR.

### 5.3 FRESHWATER

From the SANBI National Freshwater Ecosystem Priority Areas map (see Figure 12 below), there are a number of non-perennial rivers to the north and east of the site. These ephemeral drainage lines convey surface water into a number of excavated channels within, and adjacent to, the proposed site, and into the Houdenberg River, located approximately 590m to the west of the dam site.



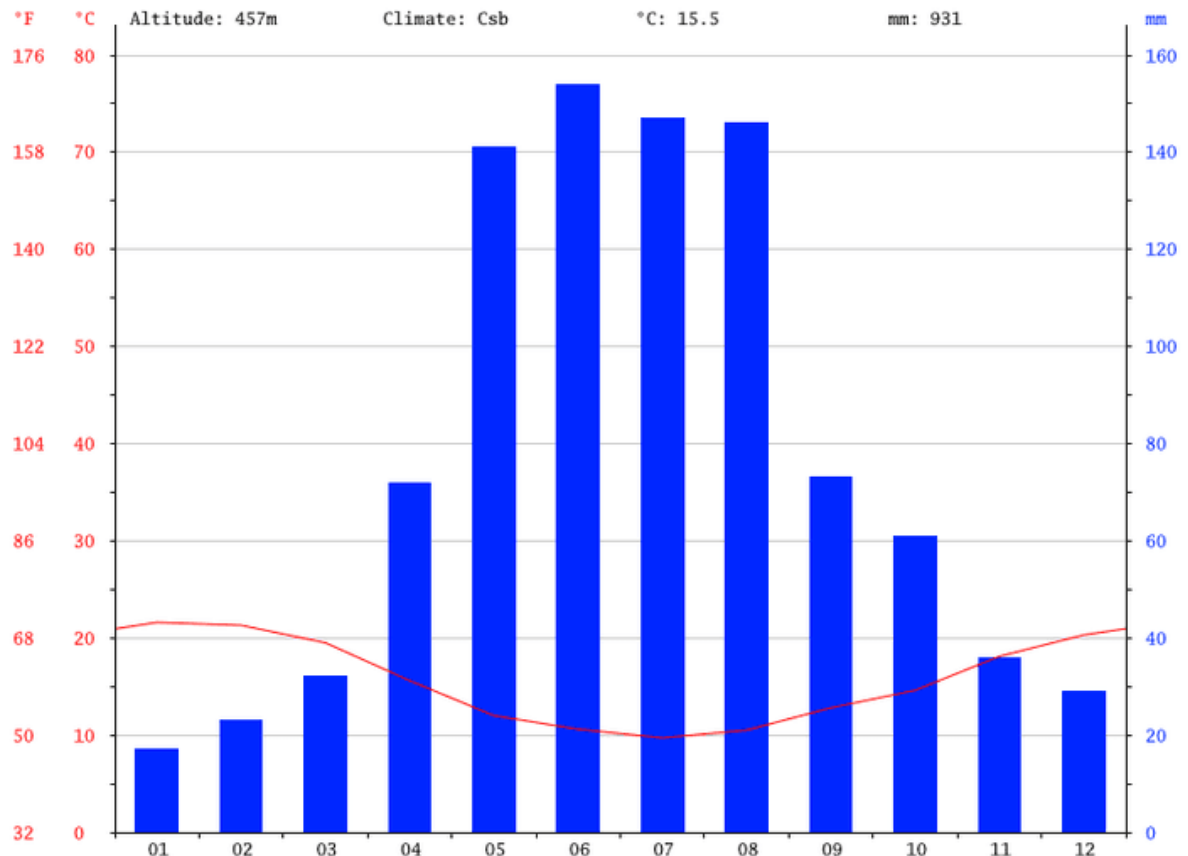
**Figure 12:** CapeFarmMapper map of the water resources in the area.

A Freshwater Ecological Assessment (**Appendix 8B**) and a Hydrological and Environmental Water Requirements Assessment (**Appendix 8C**) were conducted, and the findings are discussed in Section 10 of the EIR.

## 5.4 CLIMATE

The Ceres area climate is regarded as warm and temperate. According to the Koppen climate classification, the climate is classified as Csb (warm-summer Mediterranean). This area normally receives most of its rain during the winter months (May – August). It receives the least amount of rain in summer (December – February).

The average temperature in Ceres is 15.5 °, and the average yearly rainfall is 931 mm. Please refer to Figure 13 below.



**Figure 13:** Climate data for Ceres (Source: <https://en.climate-data.org/africa/south-africa/western-cape/ceres-23232/>)

## 5.5 SOCIO-ECONOMIC CONTEXT

According to the Western Cape Socio-economic Profile for Witzenberg Local Municipality (2017), the Witzenberg municipal area is one of the smallest economies in the District (Cape Winelands District), contributing 13.9 per cent to the economy in terms of GDP and 16.8 per cent to employment. Over the last five years since 2010, Witzenberg's tertiary sectors have achieved above average growth rates in terms of GDP and has contributed significantly to employment. The local economy of the Witzenberg municipal area is driven by the agriculture, forestry and fishing sector (17.3 per cent), the wholesale and retail trade, catering and accommodation sector (16.9 per cent), the finance and business services sector (15.4 per cent) and the manufacturing sector (14.2 per cent). Combined, these sectors contribute more than R5.0 billion to the economy. In 2014, the agriculture, forestry and fishing sector's GDP growth rate was 8.5 per cent; this growth rate can be attributed to a significant increase in exports in pome fruits (apples and pears) in the period due to good weather, increased production and the depreciating Rand. The sector subsequently contracted by 2.8 per cent in 2015 with a more severe contraction predicted for 2016.

The sectors that contributed the most to the 63 361 jobs in the Witzenberg municipal area in 2015 were the agriculture, forestry and fishing sector (34.7 per cent) and the wholesale and retail trade, catering and accommodation sector (18.4 per cent). Even though the manufacturing sector contributes R1.1 billion (14.2 per cent) to the GDP, this sector only employed 3 605 people (5.7 per cent of employment) in 2015 indicating that the manufacturing sector within the Witzenberg municipal



area is less labour intensive and more dependent on mechanisation. The agriculture, forestry and fishing sector in the Witzenberg municipal area has shed 5 684 jobs between 2005 and 2015, however, it has experienced a significant increase in agricultural jobs in 2012, 2013 and 2015, which is in line with the change in employment in this sector for the District over the same period. Employment in this sector is volatile, with job losses in 2011, 2014 and 2016. Labour needs within the agricultural, forestry and fishing sector are seasonal i.e. not permanent, which depends on the harvest each year. Changes in the number of hectares under production will also have an impact on the demand for labour. Favourable economic conditions resulting in new investment from farmers to expand their orchards and vineyards will increase the demand for labour and vice versa.

According to the Draft Integrated Development Plan (2018-19), the number of poor people in the Witzenberg municipal area increased between 2011 and 2016. The poverty headcount increased from 1,8 per cent of Witzenberg's population in 2011 to 2,5 per cent in 2016.

## 5.6 HERITAGE FEATURES

Due to the nature and size of the proposed development, potential heritage resources may be affected by the development. Heritage resources include any of the following, as defined by the National Heritage Resources Act (Act 25 of 1999):

- living heritage as defined in the National Heritage Council Act No 11 of 1999 (cultural tradition; oral history; performance; ritual; popular memory; skills and techniques; indigenous knowledge systems; and the holistic approach to nature, society and social relationships);
- Ecofacts (non-artefactual organic or environmental remains that may reveal aspects of past human activity; definition used in KwaZulu-Natal Heritage Act 2008);
- places, buildings, structures and equipment;
- places to which oral traditions are attached or which are associated with living heritage;
- historical settlements and townscapes;
- landscapes and natural features;
- geological sites of scientific or cultural importance;
- archaeological and palaeontological sites;
- graves and burial grounds;
- public monuments and memorials;
- sites of significance relating to the history of slavery in South Africa;
- movable objects, but excluding any object made by a living person; and
- battlefields.

In terms of Section 38(8) of the National Heritage Resources Act, a Notification of Intent to Develop (NID) was submitted to HWC on 17 January 2020 (Case Number: 19121213AS0117E). Final response was received from HWC (dated 30 January 2020)(see **Appendix 7B**), stating that since there is no reason to believe that heritage resources would be impacted by the proposed dam, no further action under Section 38 of the NHRA is required.

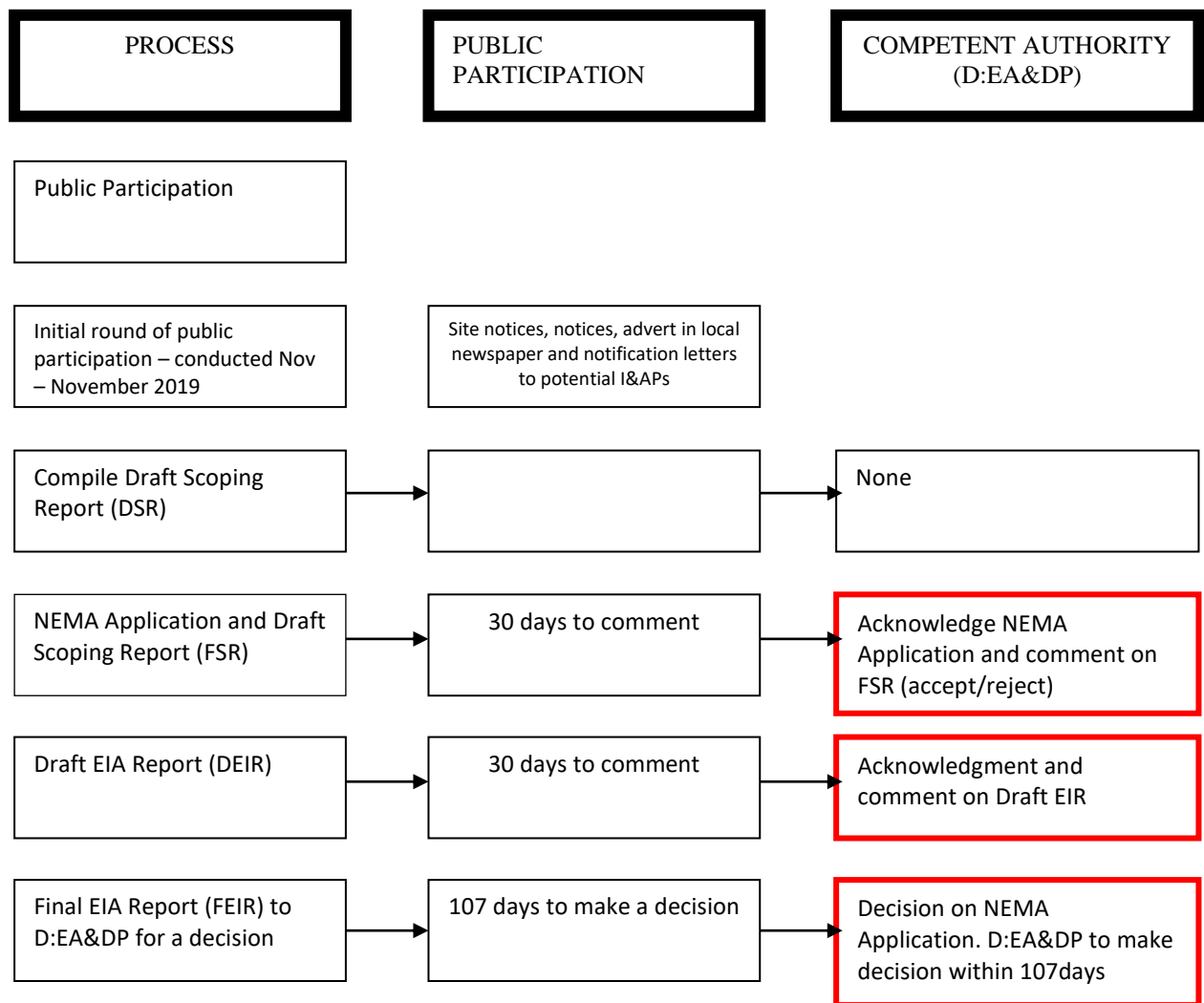
## 6. PROCESS TO DATE

The section below outlines the various tasks undertaken to date, the members of the team involved in the project, as well as the Public Participation Process.

### 6.1 TASKS UNDERTAKEN TO DATE

Table 2: Tasks undertaken in the EIA to date.

DATE	TASK
<b><u>SCOPING PHASE</u></b>	
November 2019 – January 2020	Initial public participation, including newspaper advertisements, posters, letter drops, BID and notification letters to identified interested and affected parties.
December 2019	Submit Notice of Intent to DEADP
July 2020 – September 2020	Distribution of notifications for the availability of the Pre-Application Draft Scoping Report to Registered Interested and Affected Parties, and 60-day comment period
June 2021	Submission of NEMA Application
09 June 2021	Acknowledgement of Receipt of the NEMA Application from DEADP
June 2021 – July 2021.	Distribution of notifications for the availability of the Post-Application Draft Scoping Report to Registered Interested and Affected Parties, and 30-day comment period
11 July 2021	30-day comment period ends.
15 July 2021	Submit Final Scoping Report to DEADP.
25 August 2021	Acceptance of Scoping report and Plan of Study for EIA ( <b>Appendix 7A</b> )
<b><u>ENVIRONMENTAL IMPACT ASSESSMENT REPORT PHASE (THIS PHASE)</u></b>	
August – September 2021	Compilation of Draft Environmental Impact Report
September – October 2021	Draft Environmental Impact Report compiled and made available for viewing and comment to Registered Interested and Affected Parties (this report)



**Figure 14.** Summary of the EIA process and public participation process. The red indicates the stages where the competent authority will be consulted during the process.

## 6.2 TASKS TO BE UNDERTAKEN DURING THE EIA PHASE

The following tasks must still be undertaken during the EIA phase of the process:

- Compile Draft Environmental Impact Report (EIR) (THIS DOCUMENT) for public comment based on specialist information.
- Advertise Draft EIR for public comment
- Distribute and/or make the Draft EIR available for viewing and comment
- Receive comments on Draft EIR. All comments received and responses to the comments will be incorporated into the Final Environmental Impact Report (EIR)
- Preparation of a FINAL EIR for submission to D:EA&DP for consideration and decision-making.

Please refer to Figure 14 to see where the public participation process is present in the environmental impact assessment. The Interested and Affected Parties will have a chance to view and comment on all the reports that are submitted. The figures also indicated what timeframes are applicable to what stage in the process. If required, meetings with key stakeholders will be held.

At the end of the comment period, the EIR will be revised in response to feedback received from I&APs. All comments received and responses to the comments will be incorporated into the Final Environmental Impact Report (EIR). The Final EIR will then be submitted to D:EA&DP for consideration and decision-making.

Correspondence with I&APs will be via post, telephone, email and newspaper advertisements.

Should it be required, this process may be adapted depending on input received during the on-going process and as a result of public input. D:EA&DP will be informed of any changes in the process.

### 6.3 PROFESSIONAL TEAM

The following professionals are part of the project team.

Table 3: Members of the professional team

DISCIPLINE	SPECIALIST	ORGANISATION
Environmental Consultants	Clinton Geyser / Bernard de Witt	<b>EnviroAfrica cc</b>
Dam Engineers	Lizbe Bester	<b>Sarel Bester Ingenieurs BK</b>
Water Use Licence Application	Lizbe Bester	<b>Sarel Bester Ingenieurs BK</b>
Botanist	Dr David McDonald	<b>Bergwind Botanical Surveys and Tours</b>
Heritage	Jonathan Kaplan	<b>Agency for Cultural Resource Management</b>
Freshwater	Christel du Plessis	<b>FEN Consulting</b>
Hydrological and EWR Assessment	Gerald Howard and Bruce Paxton	<b>Freshwater Research Centre</b>

### 6.4 PUBLIC PARTICIPATION

A Public Participation Process was undertaken in accordance with the requirements of the NEMA Environmental Impact Assessment Regulations: Guideline and Information Document Series. *Guidelines on Public Participation 2013* and the NEMA EIA Regulations 2014 (amended). Issues and concerns raised during the Scoping phase are dealt within this report.

Interested and Affected Parties (I&APs) were identified throughout the process. Landowners adjacent to the proposed site, relevant organs of state, organizations, ward councillors and the Local and

District Municipality were added to this database. A complete list of organisations and individual groups identified to date is shown in **Appendix 6D**.

Public Participation was conducted for this proposed dam in accordance with the requirements outlined in Regulation 41, 42, 43 and 44 of the NEMA EIA Regulations 2014 as amended, as well as the Department of Environmental Affairs and Development Planning's guideline on Public Participation 2011. The issues and concerns raised during the scoping phase will be dealt with in the EIA phase of this application.

As such each subsection of Regulation 54 contained in Chapter 6 of the NEMA EIA Regulations will be addressed separately to thereby demonstrate that all potential Interested and Affected Parties (I&AP's) were notified of the proposed development.

Table 4: Summary of the public participation process

<b>R41</b>	<b>Posters, Advertisement &amp; Notification letters</b>
(2) (a) (i)	<p>A site notice (A2) was placed at the entrance to the farm from the R303, and A3 posters were placed at other locations including:</p> <ul style="list-style-type: none"> <li>- Prince Alfred Public Library</li> <li>- Community notice board at the Spar in Prince Alfred Hamlet</li> <li>- Community notice board at the KaapAgri in Op die Berg</li> <li>- Community notice board at the Spar in Op die Berg.</li> </ul> <p>Refer to <b>Appendix 6B</b> for proof of posters.</p>
(ii)	N/A No alternative site
(2) (b) (iii)	<p>Notification letters were sent to the municipal ward councilor at the Witzenberg Municipality.</p> <p>Refer <b>Appendix 6C</b> for proof. Please see the post office stamp on the I&amp;AP register for proof of notification letters sent.</p>
(iv)	<p>Notification letters were sent to Cape Winelands District Municipality and Witzenberg Local Municipality.</p> <p>Refer <b>Appendix 6C</b> for proof. Please see the post office stamp on the I&amp;AP register for proof of notification letters sent</p>
(v)	<p>Notification letters were sent to the following organs of state:</p> <ul style="list-style-type: none"> <li>• Department of Water and Sanitation</li> <li>• CapeNature</li> <li>• Heritage Western Cape</li> <li>• Department of Agriculture</li> </ul> <p>Refer <b>Appendix 6C</b> for proof. Please see the post office stamp on the I&amp;AP register for proof of notification letters sent</p>
(vi)	<p>Notification letters were sent to neighbouring landowners</p> <p>Please refer to <b>Appendix 6C</b> neighbours were notified via email.</p>
(2) (c) (i)	<p>An advert was placed in the Witzenberg Herold 15 November 2019</p> <p>Please refer to <b>Appendix 6A</b></p>

<b>R42 &amp; 34</b>	<b>Register of I&amp;AP</b>
(a), (b), (c), (d)	A register of interested and affected parties was opened and maintained and is available to any person requesting access to the register in writing  Please refer to <b>Appendix 6D</b> for the of Interested and Affected Parties register
<b>R43</b>	<b>Registered I&amp;AP entitled to comments</b>
3	I&AP were given 30 days for comments during the initial public participation phase
<b>R44</b>	<b>I&amp;AP to be recorded</b>
	A summary of issues raised by I&AP are addressed in the Comments and Response Report (C&RR)  Refer to <b>Appendix 6E</b> for the C&RR and for comments received.

#### **6.4.1 PUBLIC PARTICIPATION UNDERAKEN DURING THE EIA PHASE:**

A number of groups and individuals were identified as Interested and Affected Parties during the initial Public Participation Process. A complete list of organisations and individual groups identified to date, as well as those I&APs that have registered are shown in **Appendix 6D**.

Full copies of the Environmental Impact Assessment Report (EIR) will be sent to all Registered I&APs, and will be notified of the Environmental Impact Report (EIR) by means of notification letters (via preferred method of communication), informing them of the availability of the Draft EIR and will be invited to comment. The EIR will be made available for a 30-day comment period.

At the end of the comment period, the EIR will be revised in response to feedback received from I&APs. All comments received and responses to the comments will be incorporated into the Final Environmental Impact Report (Final EIR) in the form of a Comments and Response Table. The Final EIR will be made available for a further 30-day comment period. The Final EIR will then be submitted to D:EA&DP for decision.

Should it be required, this process may be adapted depending on input received during the ongoing process and as a result of public input. Both D:EA&DP and registered I&APs will be informed of any changes in the process.

#### **6.4.2 INTERESTED AND AFFECTED PARTIES**

Interested and Affected Parties (I&APs) have been notified by means of advertisements in regional and local newspapers, site notices and letters and/or emails to registered I&APs on the project database.

A list of I&APs is included as **Appendix 6D**.

## **7. ENVIRONMENTAL ISSUES AND POTENTIAL IMPACTS**

### **7.1 BIODIVERSITY**

Although the majority of the site is located on old, cultivated fields, part of which has recently been used for orchards, there is a small patch of natural vegetation to the north of the proposed dam wall which may be inundated at the high-water mark of the dam. A large, mature stand of Poplar Trees (*Populus x canescens*) is located on the location of the proposed dam wall, between the two ridges. Although the majority of the dam development footprint is within an area that has been previously cleared and cultivated, the construction of the dam and dam wall will involve the removal or inundation of some indigenous vegetation, and a large stand of poplar trees, which may exceed 1ha in extent.

According to the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006, as updated in the 2012 beta version) only one broad vegetation type is expected on the majority of the proposed site, namely Kouebokkeveld Shale Fynbos, which is classified as Vulnerable.

According to biodiversity overlay maps the site partially falls within a Critical Biodiversity Area (CBA), as well as Ecological Support Areas (ESA & ESA2s).

CBAs are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. The objective is to maintain these areas in a natural or near natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated.

The proposed dam will fall in an Ecological Support Area (ESA), Category 1: Terrestrial & Aquatic. These areas are not essential for meeting biodiversity targets, but play an important role in supporting the functioning of protected areas and CBAs, and are often vital for delivering ecosystem services. The objective is to maintain a functioning, near natural state. Some habitat loss is acceptable, provided that underlying biodiversity objectives and ecological functioning are not compromised.

The proposed dam will also fall in an ESA2. These areas are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of protected areas and CBA, the objective is to restore and manage to minimise impact on ecological processes and ecological infrastructure functioning, especially soil and water-related services, and allow for natural movement.

### **7.2 FRESHWATER**

From the SANBI National Freshwater Ecosystem Priority Areas map (see Figure 12 below), there are a number of non-perennial rivers to the north and east of the site. These ephemeral drainage lines convey surface water into a number of excavated channels within, and adjacent to, the proposed site, and into the Houdenbek River, located approximately 590m to the west of the dam site.

The potential impact of the proposed dam on the Houdenbek River, in particular run-off into the Houdenbek River and the potential impact this may have on downstream users, has also been identified. The potential impact of the proposed dam on the catchment, as well as on other water users, lower downstream of the dam, was raised by CapeNature and the Department of Water and Sanitation. The Houdenbeks River is under stress, and run-off from the Houdenbeks River has decreased.

### **7.3 HERITAGE**

The possible impact on heritage resources has been identified as a possible environmental impact because of the construction of the dam.

Due to the location, nature and size of the proposed development, potential heritage resources may be affected by the development.

In terms of Section 38(8) of the National Heritage Resources Act, a Notification of Intent to Develop (NID) was submitted to HWC on 17 January 2020 (Case Number: 19121213AS0117E). Final response was received from HWC (dated 30 January 2020)(see **Appendix 7B**), stating that since there is no reason to believe that heritage resources would be impacted by the proposed dam, no further action under Section 38 of the NHRA is required.

### **7.4 VISUAL IMPACT**

The potential impact on the sense of place of the proposed dam has also been considered. The surrounding area is characterised by agricultural activities, as well as a number of farm dams in the local area, and the proposed dam will therefore not be uncharacteristic for the area.

The sense of place is not expected to be significantly altered by the proposed dam, and no further studies are suggested.

### **7.5 SAFETY**

According to the Preliminary Design Report from Sarel Bester Engineers (**Appendix 5**), a dam safety and classification application was submitted on 20 November 2019 to the Dam Safety Office.

### **7.6 SOCIO-ECONOMIC IMPACT**

Although the construction of the proposed dam will create jobs during the construction phase of the activity, the dam will indirectly secure additional jobs during the operational phase. As indicated in *Section 2.1*, the proposed dam is of critical importance to ensure the existing water use for permanent cultivars by creating winter storage.

### **7.7 OTHER ISSUES IDENTIFIED**

No other issues were identified in the Scoping Phase.



## 8. SPECIALIST STUDIES

As a result of the environmental issues and potential impacts identified in the Scoping Report and in Section 6, the need for the following specialist studies has been identified. As a result, the following specialist have been appointed:

- Botanical Assessment
- Freshwater Assessment
- Hydrological and Environmental Water Requirements

The specialists are provided with set criteria for undertaking their assessments, to allow for comparative assessment of all issues. These criteria are detailed in the Terms of Reference to each specialist and summarised below.

### 8.1 CRITERIA FOR SPECIALIST ASSESSMENT OF IMPACTS

The impacts of the proposed activity on the various components of the receiving environment will be evaluated in terms of duration (time scale), extent (spatial scale), magnitude and significance. These impacts could either be positive or negative.

The magnitude of an impact is a judgment value that rests with the individual assessor while the determination of significance rests on a combination of the criteria for duration, extent and magnitude. Significance thus is also a judgment value made by the individual assessor. Each specialist has their own methodology to determine significance.

### 8.2 BREIFS FOR SPECIALIST STUDIES

#### 8.2.1 Botanical Assessment

Dr David McDonald (Bergwind Botanical Surveys and Tours) conducted the botanical impact assessment. Please find the report attached **Appendix 8A**.

The terms of reference for the botanical assessment are as follows:

- Provide a broad, baseline description of the vegetation of the study area, placing it in a regional context. Reference should also be made to any bioregional maps of the area.
- Describe the vegetation communities and associated conservation value/sensitivity of the study area and identify any areas of specific concern (e.g. high sensitivity and/or conservation status).
- Provide specific information relating to the vegetation in the study area, with reference to any species of special concern and their conservation status, which can be used as baseline information for the assessment of potential impacts of the proposed project.
- Identify, describe and assess the impacts of the proposed activities on the vegetation.
- Recommend appropriate mitigation measures that would reduce all major (significant) impacts or enhance potential benefits, if any.

#### 8.2.2 Freshwater Assessment

Christel du Preez (FEN Consulting Pty (Ltd)) were appointed to conduct the Freshwater Ecological Assessment (**Appendix 8B**).

The terms of reference for the Freshwater Ecological Assessment include the following:

- identify all watercourses that may potentially be impacted by the proposed dam development
- to define the ecology of the watercourse associated with the study area in terms of the watercourse characteristics, including mapping of the watercourse, defining areas of increased Ecological Importance and Sensitivity (EIS), and defining the Present Ecological State (PES) of the watercourses associated with the study area.
- determine the significance of the impacts associated with the proposed dam development and
- identify mitigatory measures which aim to minimise the potential impacts.
- provide detailed information to guide the proposed dam development in the vicinity of the watercourse, to ensure the ongoing functioning of the ecosystems, such that local and regional conservation requirements and the provision of ecological services in the local area are supported while considering the need for sustainable economic development.

### **8.2.3 Hydrological and Environmental Water Requirements Assessment**

Gerald Howard and Bruce Paxton (Freshwater Research Agency) was appointed to conduct a hydrological and Environmental Water Requirements (EWR) study (**Appendix 8C**).

The following is a summary of tasks required to generate hydrological flows for the EWR determination and for quantifying the required supplementary diversion.

- Re-establish the ACRU Model configuration of the Koue-Bokkeveld.
- Generate flows at both sites and the appropriate sub-catchments and generate daily flows at the proposed dam site as well as the diversion site where abstractions might be required.
- Establish the environmental flows (using the monthly inflow record) at both the proposed dam site and abstraction site.
- Quantify the proposed dam inflow and assess the additional transfers required.
- Report Writing

### **8.2.4 Heritage Assessment**

Jonathan Kaplan (Agency for Cultural Resource Management) was appointed to compile and submit a Notification of Intent to Develop (NID) in terms of Section 38(8) of the National Heritage Resources Act.

The NID was submitted to HWC on 17 January 2020 (Case Number: 19121213AS0117E). Final response was received from HWC (dated 30 January 2020)(see **Appendix 7B**), stating that since there is no reason to believe that no heritage resources would be impacted by the proposed dam, no further action under Section 38 of the NHRA is required.

## 9. ENVIRONMENTAL IMPACT ASSESSMENT, SIGNIFICANCE AND MITIGATION METHODOLOGY

The following impact rating approach used by EnviroAfrica CC is a basic exponential rating system to assess actual and potential negative environmental impacts of viable alternatives by the EAP.

Positive environmental impacts are not listed. All positive impacts need to be enhanced or increased where possible but positive impacts are not rated or given a score since the rating is based on risks.

Environmental activities or aspects are identified, based on:

- the phases of the project,
- the nature (or description) of the actual and potential impacts of the activities.

For every project activity or aspect, various environmental impacts are listed. Every negative impact is allocated a value – as per each of the following criteria:

- Probability (Likelihood)
- Extent
- Duration (Frequency)
- Consequence (Receiving Environment)
- Magnitude (Intensity/severity)

Every negative impact is allocated a ( - )value as per each of the following criteria:

- Probability (Likelihood)
- Extent
- Duration (Frequency)
- Magnitude (Intensity/severity)

Once a value is allocated for each of the criterion, the scores are averaged to determine the final impact rating (see Table 5 below).

EnviroAfrica then further assesses environmental significance, based on the nature of the impact, as per the score and colour key which forms part of the table below. This results in impacts having either a low (indicated in green), medium (indicated in yellow) or high (indicated in orange and red) negative significance.

**Note:** i. As a baseline, impact rating values/scores are allocated taking the **worst case** scenario into account i.e. with no mitigation. The baseline rating is compared with those after mitigation has been taken into account i.e. the post-mitigation rating. Post mitigation rating is used for the actual impact assessment.

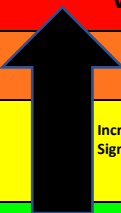
Table 5: Impact Assessment Methodology

SIGNIFICANCE CRITERIA	Very High	High	Medium	Low	Negligible (very-low)	Score
Value	16	8	4	2	1	
<b>Probability (likelihood) (P)</b>	Definite. Impact will definitely occur.	Highly probable. Very likely for impact to occur.	Probable. Impact may likely occur.	Improbable. Impact may occur. Distinct Possibility	Improbable. Low likelihood/unlikely for impact to occur.	
<b>Extent (E)</b>	Impact potentially reaches beyond national boundaries	Impact has definite provincial/potential national consequences	Impact confined to regional area/ town	Impact confined to local region and impact on neighbouring properties	Impact confined to project property / site	
<b>Duration (D)</b>	Permanent The impact is expected to have a permanent impact, with very little to no rehabilitation possible	Long-Term The impact is expected to last for a long time after construction with rehabilitation expected to be 15-50 years. Impact is reversible but only with long-term mitigation	Medium-term The impact is expected to last for some time after construction with rehabilitation expected to be 5 - 15 years. Impact is reversible but only with on-going mitigation	Short-term The impact is expected to last for a relatively short time with rehabilitation expected to be 2-5 years. The impact is reversible through natural process and/or some mitigation.	Very short/ temporary The impact is expected to be temporary and last for a very short time with rehabilitation expected to be less than 2 years. The impact is easily reversible through natural process and/or some mitigation.	
<b>Magnitude (Intensity/ Severity) (M)</b>	It is expected that the activity will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible	It is expected that the activity will have a severe impact on the surrounding environment. Functioning may be severely impaired and may be temporarily cease. Rehabilitation will be needed to restore system integrity	It is expected that the activity will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved	It is expected that the activity will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved	It is expected that the impact will have little or no effect on the integrity of the surrounding environment	
<b>Receiving environment (Consequence): (RE)</b>	Very sensitive, pristine area – protected site or species permanently or seasonally present	Unused area containing only indigenous fauna / flora species	Unused area containing indigenous and alien fauna / flora species	Semi-disturbed area already rehabilitated / recovered from prior impact, or with moderate alien vegetation	Disturbed area/ transformed/ heavy alien vegetation	
<b>FINAL RATING (average score)</b>						

## ENVIRONMENTAL RATING SIGNIFICANCE KEY:

### Negative Impacts

SIGNIFICANCE	RATING	Final rating score / value range
Very Significant	Very High	-11 to -16
Significant	High	-7 to <-11
Increasing Significance	Medium	-4 to <-7
Insignificant	Low	-2 to <-4
	Very Low	-1 to <-2



## ENVIRONMENTAL SIGNIFICANCE RISK RATING

Please refer to **Appendix 9** for the Environmental Impact Risk rating matrix. The matrix aims to identify potential impacts of the proposed development on the receiving environment, based on a desktop study.

In addition to determining the individual impacts against the various criteria, the element of mitigation, where relevant, will also be brought into the assessment. In such instances the impact will be assessed with a statement on the mitigation measure that could/should be applied. Specialist recommendations and mitigation measures will be included. A more detailed assessment is included in Section 10, taking specialist findings into consideration.

## 10. ASSESSMENT OF ENVIRONMENTAL IMPACTS

The specialist studies detailed in **Section 8** were undertaken to determine significance of the impact that may arise from the proposed development. The findings of the specialist studies are summarised here. Full copies of the studies are included in **Appendix 8**.

The following studies were undertaken:

### 10.1 Botanical Impact Assessment

The Botanical Assessment was conducted by Dr David McDonald (Bergwind Botanical Surveys and Tours). Please refer to **Appendix 8A** for the full report.

#### 10.1.1 Key findings

According to the Botanical Assessment (**Appendix 8A**), the proposed Kleinvlei Dam (all alternatives) is located in an area that was originally Kouebokkeveld Shale Fynbos.

Kouebokkeveld Shale Fynbos is a moderately tall and dense proteoid shrubland on shale slopes, with asteraceous shrubs prominent. Waboomveld i.e., where *Protea nitida* is common occurs on colluvial soils. Restiolands occur in bottomlands and this is what would have been present in the 'dam basin' before it was cleared.

A few isolated patches of shrubby Winterhoek Sandstone Fynbos dominated by *Cliffortia ruscifolia*, occur in the area, specifically at the location of the dam wall for Alternatives 1 & 3 and at the western side of the saddle wall for Dam 1. These patches of fynbos vegetation on sandstone are very old and not sensitive; they have not been burnt for a very long time and are somewhat moribund.

At Waypoint 1, located at the dense stand of poplar trees, no indigenous vegetation was found at this location, neither under the trees, nor outside in the area used for grazing.

At Waypoint 2, located on the northern edge of the dam area, is an excavated channel. The channel is somewhat overgrown with grasses and shrubs. *Stoebe plumosa* (slangbos) and *Elytropappus gnaphaloides* had vigorously colonized disturbed ground in this vicinity. The location was characterized by a low species richness and the species including those above are indicative of disturbance. The other species recorded include, *Anthospermum aethiopicum*, *Athanasia trifurcata*, *Berkheya rigida*, *Cliffortia ruscifolia*, *Cymbopogon marginatus*, *Psoralea* sp. and *Tenaxia stricta*.

At Waypoint 3, located on a sandstone ridge where the dam wall (Alternative 1 and Alternative 2: preferred option) would be constructed. An existing track has been cleared between the poplar stand and the rocky sandstone ridge. This has resulted in a fair amount of disturbance that has encouraged the growth of *Stoebe plumosa* and *Athanasia trifurcata*, amongst other early colonizing species. The area around this waypoint is grassy with *Tenaxia stricta* dominant and with an open to mid-dense shrub stratum dominated by *Cliffortia ruscifolia*. Other plant species recorded on the sandstone outcrop include, *Achyranthemum* sp., *Athanasia trifurcata*, *Chrysocoma ciliata*, *Corymbium glabrum*, *Diospyros glabra*, *Ehrharta* sp., *Elytropappus gnaphaloides*, *Elytropappus rhinocerotis*, *Manulea* sp. – orange flowers, *Pentaschistis* sp., *Protea repens*, *Searsia angustifolia*, *Syncarpha* sp. The vegetation on the rocky sandstone ridge is an isolated patch of Winterhoek Sandstone Fynbos but it is too small to map as a separate unit in the VEGMAP.

Waypoint 4 was located in the area of the Dam 3 option (outside of the Preferred Dam inundated area). The terrain is an old land that is now dominated by exotic grasses (all dry at the time of the survey) and scattered patches of *Stoebe plumosa*. This area has very low sensitivity and additional plant species recorded were *Bromus* sp., *Avena fatua* and *Elytropappus rhinocerotis*.

At Waypoint 5, the vegetation is the same along the ridge of sandstone. An excavated channel runs along the toe of the sandstone ridge. Again, the vegetation is an isolated patch of Winterhoek Sandstone Fynbos that is dominated by dense *Cliffortia ruscifolia*. This fynbos has also not been burnt for a long time. Apart from *C. ruscifolia*, additional plant species recorded on the ridge include, *Athanasia trifurcata*, *Berkheya rigida*, *Chrysocoma ciliata*, *Conyza bonariensis*, *Diospyros glabra*, *Ehrharta* sp., *Pelargonium englerianum*, *Protea laurifolia* (one plant), *Syncarpha* sp. and *Tenaxia stricta*. Apart from *Tenaxia stricta*, other grass species were present but dry and not identified. Along the channel that functions as an agricultural drain, *Gomphocarpus fruticosus* and *Pennisetum macrourum* (riverbed grass) were dominant.

Waypoint 6 was recorded at the south end of the extent of the proposed Dam 2 (preferred layout) at full supply level. The 'upstream' channel that would feed into the dam goes through a culvert under the farm access road near this point. The entire area is transformed, having been previously cultivated. The only plants of note were *Juncus scirpoides* and *Pennisetum macrourum*, both indicating wetness along the agricultural furrow. Exotic Kikuyu grass (*Pennisetum clandestinum*) also occurs in the furrow.

#### **Western Cape Biodiversity Spatial Plan:**

According to the Botanical Assessment (**Appendix 8A**), the Western Cape Biodiversity Spatial Plan [WCBSP] (CapeNature, 2017; Pence, 2017; Pool-Stanvliet, 2017) shows that the proposed Kleinvlei Dam would be constructed in an area with low sensitivity.

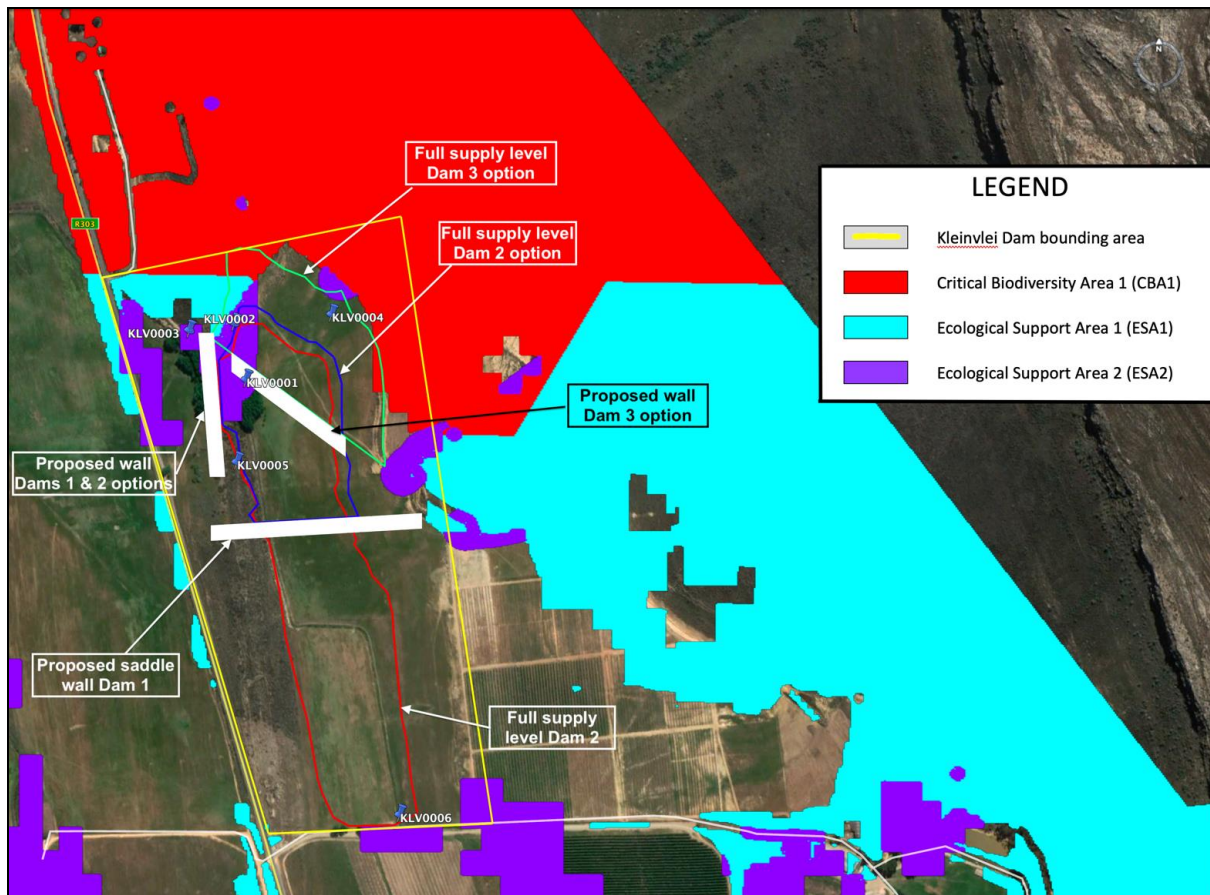
As can be seen in Figure 15 below, the proposed wall for the Dam 1 and Dam 2 (preferred alternative) alternatives is located in an ESA2 area. However, this is not so because the mapping has assigned ESA2 to the stand of poplar trees and it most certainly is not an ESA2 area.

#### **DEA Screening Tool:**

According to the Botanical Assessment (**Appendix 8A**), when the National Web-based Environmental Screening Tool was applied to the proposed Kleinvlei Dam area and for the Relative Plant Species Theme Sensitivity, it shows that the site is mostly **Low Sensitivity** with some mapped as **Medium Sensitivity**. The ground-truthing undertaken clearly indicates that the site has **Low to Very Low Sensitivity** with respect to flora and vegetation (see Figure 27 of the Botanical Impact Assessment (Appendix 8A) and the DEA Screening Tool (**Appendix 13**). As noted, the small table in Figure 27 indicates **High Sensitivity**. This is obviously erroneous.

The map for Relative Terrestrial Biodiversity Theme Sensitivity indicates that the entire area of the dam and its surrounds has **Very High Sensitivity**. With respect to the footprint of any of the dam alternatives, not one would be located in an area of **Very High Sensitivity** for Terrestrial Biodiversity (see Figure 28 of the Botanical Impact Assessment (Appendix 7A) and the DEA Screening Tool (**Appendix 13**). The rationale for this classification in the National Web-based Environmental Screening Tool is not known but it is not supported at all by observations on the site. At best the site has **Low Sensitivity** for terrestrial biodiversity.





**Figure 15:** Google Earth™ aerial image with Western Cape Biodiversity Spatial Plan map superimposed for the proposed Kleinvelei Dam, showing that it mostly falls outside any critical biodiversity areas or ecological support areas except two of the dam wall options that apparently affect an ESA2 area. However, this is misleading since the ESA2 area is located on the stand of exotic poplar trees. (Source: Figure 26 of the Botanical Assessment).

### 10.1.2 Impact Assessment

According to the Botanical Impact Assessment (**Appendix 8A**), direct impacts are those impacts that would be caused specifically by the construction of a dam and inundation due to the filling of the dam. As far as this study is concerned, the direct impact would be the effect on areas that have historically been cleared, ploughed and grazed by sheep. There would be a limited amount of negative impact on Winterhoek Sandstone Fynbos from the construction of the wall that would be required for Dam 1 and Dam 2. Dam 1 would have the extra 'saddle wall' and that would result in a small loss of Winterhoek Sandstone Fynbos in the vicinity of waypoint KV0005. Its direct impact is thus rated as Low Negative prior to mitigation and Very Low Negative after mitigation. There would also be a Low Negative impact of the Dam 3 wall on Winterhoek Sandstone Fynbos.

The construction and operation of the dam, whichever alternative is pursued, will have no effect on vulnerable Kouebokkeveld Shale Fynbos since this vegetation type is no longer present on the dam footprint of all alternatives. It will also have minimal effect (negative or positive) on any riparian vegetation even though there are some patches of wetness that have resulted from the excavation of agricultural drains. The wall of the dam as well as the inundation caused by filling total would have a Low Negative impact on indigenous vegetation.



In the case of the 'No Go' scenario, the proposed dam would not be constructed. The medium- to long-term outcome would be that there would be little change to the local environment since the area would continue to be used for grazing sheep. The result would be Very Low Negative.

### **10.1.3 Mitigation Measures**

The following recommendations are provided by the Botanical Impact Assessment:

- The dam wall should be vegetated with local fynbos plants and not exotic species or plant species not locally found. The best method would be to brush-cut local fynbos and lay the cut material on the soil surface of the wall of the dam. This would allow seeds in the cut material the opportunity to grow and they would be protected by the cut branches.
- A second mitigation would be to ensure that the exotic poplar trees are properly and completely removed so that they do not resprout from roots left in the soil.

### **10.1.4 Conclusion**

The Botanical Assessment concluded that the construction of the Kleinvlei Dam would not result in the loss of much natural terrestrial vegetation. The basin of the dam of all alternatives would be on areas that have been historically disturbed and where there is no longer any Kouebokkeveld Shale Fynbos. The dam walls of all three alternatives would have a limited (small) effect on isolated patches of old Winterhoek Sandstone Fynbos that has low sensitivity. The impact would consequently be **Very Low Negative** after mitigation.

From a terrestrial botanical viewpoint, the construction of any of the dam alternatives would be within acceptable 'Low Negative' limits and all alternatives are supported. However, since it would be optimal from a water storage point of view that the Dam 2 (preferred alternative) would be built, there is no reason to indicate it would not be desirable. It is therefore supported without reservation.

## **10.2 Freshwater Ecological Assessment**

### **10.2.1 Key findings**

According to the Freshwater Ecological Assessment (**Appendix 8B**), several episodic drainage lines were identified in the eastern portion of the investigation area, conveying surface water into the excavated channels in the study area, which ultimately flow into the Houdenberg River, located to the west of the study area. Historically (prior to any land use transformation) these excavated channels were potentially functioning waterways (as part of the upstream drainage lines) which have become severely degraded as all indigenous vegetation has been removed, and the channels straightened to optimise the area for cultivation, to the point that they only function as artificial waterways, through episodic conveyance of water from the limited upgradient catchment area to the downstream Houdenberg River. Thus, these excavated channels do not receive and retain sufficient water to support a wetland response or sustain riparian characteristics, such as:

- Facultative or obligate wetland vegetation species:

The excavated channel does not retain sufficient water to support wetland or riparian characteristics (such as facultative or obligate wetland vegetation; soils with prolonged and frequent saturation; no

indication of a saturated soil zone within 50 cm of the soil surface and no significant change in structure and composition of bankside vegetation due to hydromorphological drivers). Clearance of excavated channels were noted, while other channels hosted well established terrestrial vegetation cover.

- Have a change in structure and composition of bankside vegetation due to hydromorphological drivers:

Although there is a change from the vegetation species located within the excavated channels to that of the surrounding area, it is only due to the surrounding area being cultivated (all natural vegetation has been removed) and only graminoid and shrub species, which are not considered indicators of wetland conditions/riparian habitat, persist within the excavated channels. Thus, there are no distinct changes in structure from the vegetation within the drainage line to that of the surrounding area.

- Have soils with prolonged and frequent saturation:

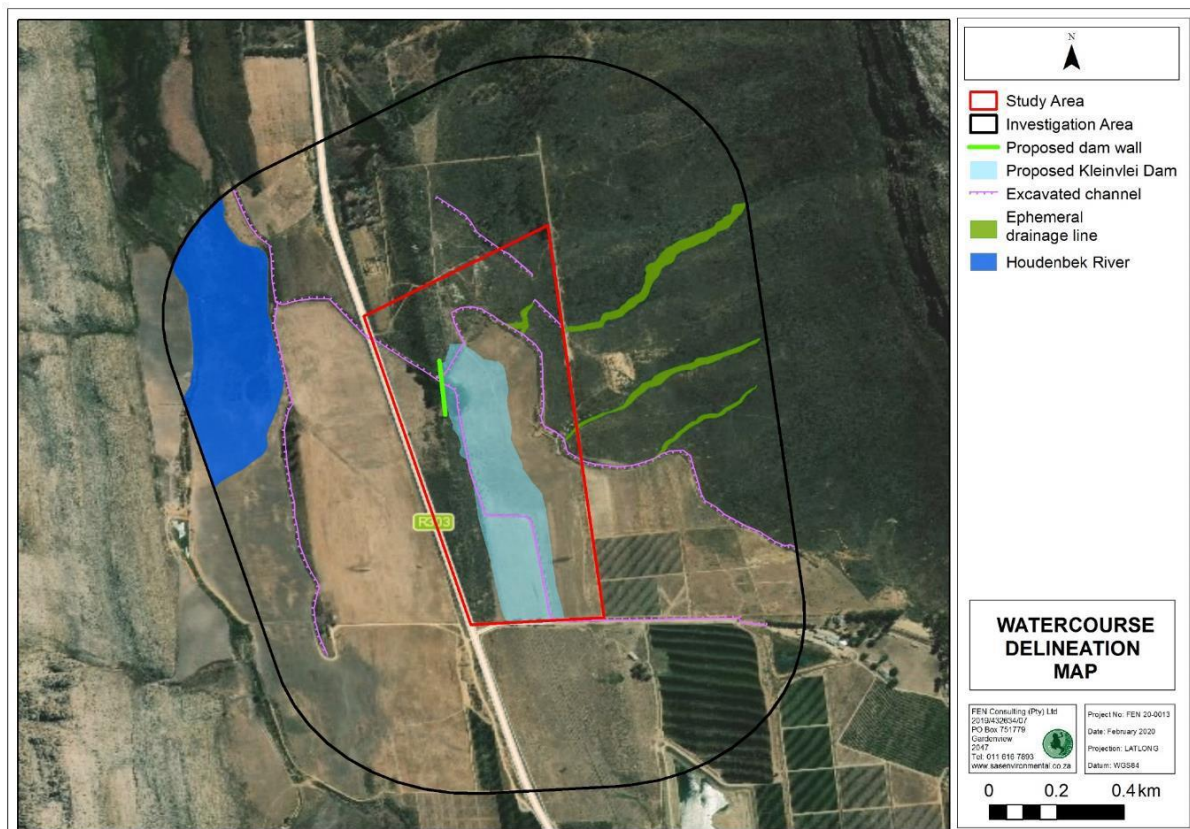
The soil profile associated with the excavated channels was investigated using a hand auger. Due to the clayey nature of soils in the area, it was only possible to auger to a depth of 20cm. This auger sample was uniform in colour (orange/brown) and did not show any redoximorphic features such as mottling or gleying (which is caused by prolonged saturated conditions in the soil and the subsequent development of anaerobic conditions).

The episodic drainage lines located outside of the study area were identified primarily due to prominent vegetation growth, due to thicket vegetation propagating in these drainage lines on the steep slope. This is mainly due to ideal microclimatic conditions, protection from fires etc. that these ravine areas provide, especially in gullies that provide protection from adverse weather conditions and reduce evaporation potential as a result of increased canopy cover.

The soil profile of the episodic drainage lines was investigated, which indicated that no redoximorphic characteristics are present and that the water moves longitudinally through the drainage lines during periods of rainfall. The soil profile consisted of a deep clay layer with finer material with cobbles above it. Alluvial soils consisting of fine silts with small rounded cobbles were also identified in drainage line

According to the Freshwater Ecological Assessment (**Appendix 8B**), it can be derived from the description of the drainage network associated with the study area as presented above, that the excavated channels lack the characteristics that define a wetland or river with associated riparian zone and as such the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the excavated channels in the study area was not deemed applicable. The upstream reaches of the episodic drainage lines associated with the surrounding mountainous area (upgradient from the proposed dam) are considered true watercourses. The excavated channels cannot be classified as watercourses from an ecological perspective due to the lack of saturated soils and wetland/riparian vegetation. However, based on the definition of a watercourse water flows regularly or intermittently within these excavated channels, conveying water from the limited upgradient catchment area - from the episodic drainage lines - into the downgradient Houdenbek River. As such, they can be considered as watercourses due to their importance for hydrological functioning as they do function as waterways and therefore enjoy protection in terms of the National Water Act, 1998 (Act No. 36 of 1998).

Figure 16 below presents the locality of the excavated channels relative to the proposed Kleinvelei Dam footprint and the study area.



**Figure 16:** A map presenting the delineation of the watercourses identified relative to the proposed Kleinvlei Dam.

### 10.2.2 Impact Assessment

The Freshwater Ecological Assessment identified the following potential impacts to the hydrological functioning of the watercourse network associated with the study area during the following phases of the project:

#### - Site Preparation

Vehicular movement (transportation of construction materials) and access to the site.

- Transportation of construction materials can result in disturbances to soils, and increased risk of sedimentation/erosion; and
- Soil and stormwater contamination from oils and hydrocarbons originating from construction vehicles.

Removal of vegetation and associated disturbances to soils.

- Removal of vegetation, including the large stand of poplar trees between the two ridges, leading to the exposure of soils;
- These soils can be transported into the excavated channel (the portion of channel between the proposed dam wall and the R303 crossing) underneath the R303 road, causing sedimentation of the downstream Houdenbek River;
- Any sheet runoff from the dam footprint area cleared of vegetation can cause erosion, resulting in a high sediment load entering the downstream excavated channel;
- Proliferation of alien vegetation as a result of disturbances.

- Construction

Excavation of dam basin to source fill material, Stockpiling of material, and Infilling and compaction of the proposed dam wall footprint.

- Runoff from stockpiled material or sediment laden runoff from the construction footprint area could enter the excavated channel between the proposed dam wall and the R303 road and result in blockages;
- Disturbance to vegetation and soils due to edge effects.

Use of concrete within close proximity to the excavated channel, and connecting the downstream excavated channel to the spillway outlet

- Potential negative impact on the water quality (if present);
- Potential erosion of excavated channel

- Operation

First filling of dam to full supply level, potential foundation seepage of stored water into the downstream excavated channel and eventually into the Houdenbek River (positive impact), and overflow of water over the spillway when the dam is at full capacity.

- Increase in the volume of water that may seep through the dam wall into the excavated channel (positive impact);
- Erosion of the excavated channel where water enters the excavated channel from the spillway;
- Potential increased sedimentation of the excavated channel due to erosion associated with the spillway.

- Maintenance

Maintenance of the dam wall, including inspections, and desilting activities resulting in the:

- Removal of vegetation; and
- Earthworks and silt stockpiling, the runoff from which has the potential to increase silt loads within the downstream excavated channel.

In the event where a leak has been detected within the dam wall itself, impacts include:

- An increase in water quantity downstream (potential seepage below dam wall) could cause extended periods of water saturation of the downstream excavated channel eliciting a wetland response;
- Repair of a leak would entail the impacts as per Activity 2 and 3 above.

The results of the risk assessment are summarised in **Appendix 8B**, including key mitigation measures for each activity.

Based on the outcome of the risk assessment, the proposed Kleinvlei Dam development is expected to have a low risk significance to the excavated channel and ultimately to the Houdenbek River, however, the loss of EWR (albeit limited volumes) must be verified by a suitably qualified hydrologist to ensure no significant loss of recharge to the Houdenbek River will occur which could pose a risk to the long term ecological functioning of the system (see Section 10.3 below). It is considered imperative that all works be undertaken during the drier summer months to limit surface water contamination and the need for any surface water diversion during the construction works. Should construction be scheduled for the winter rainy season, the construction of silt traps in the excavated

channels prior to any construction activities will limit the impact of edge effects from occurring on the downstream Houdenbek River.

### **10.2.3 Mitigation Measures**

The following mitigation/control measures were recommended for the following phases of the dam construction and operation:

- Site preparation prior to construction
  - It is imperative that all construction works be undertaken during the dry, summer months as it is expected that surface runoff collected in the excavated channels will be minimal and no diversion of flow would be necessary and would prevent any indirect effects impacting on the downstream Houdenbek River;
  - Due to the accessibility of the site, no unnecessary crossing of the excavated channels may be permitted (with specific mention of the excavated channel section between the proposed dam wall and the R303 road). This will limit edge effects, erosion and sedimentation of the downstream excavated channel (the portion of channel between the proposed dam wall and the R303 crossing) which connects to the Houdenbek River;
  - Contractor laydown areas, vehicle re-fuelling areas and material storage facilities to remain outside of the excavated channels and may be located either south of the proposed dam wall or north east thereof but must be at least 10m away from the excavated channels. These localities and the access to them are considered to have the minimal edge effects on the downstream excavated channel;
  - The removal of the poplar trees may potentially result in an increase of dust and sediments in the downstream excavated channel. Thus, sediment control devices (such as silt traps) should be constructed in the downstream excavated channel (just before the R303 road crossing culvert) prior to any vegetation clearing, if construction occurs during the wet winter season. This will prevent any blockages of the portion of excavated channel before the R303 road crossing;
  - All cleared vegetation must be stockpiled in a designated area, at least 10m from the excavated channels. Vegetation may not be disposed of in the excavated channels as this may cause blockages. During the removal of the poplar trees, a temporary stockpile may be created directly east thereof (in the proposed dam footprint). Once all clearing activities has commenced all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site;
  - Any topsoil removed must be stockpiled separately from all other materials, for use covering the new dam wall. Soil stockpiles may not be contaminated, and it must be ensured that the minimum surface area is taken up, however the stockpiles may not exceed 2m in height;
  - All exposed soils must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) in order to prevent dust generation resulting in vegetation smothering and sedimentation of the downstream excavated channel. This is especially important since the surrounding landscape is utilised for harvestable fruits/crops that may be sensitive to excessive dust.
- Construction
  - On completion of the civil works for the construction of the dam wall, the wall must be covered with topsoil (removed during site preparation activities), specifically the crest and outer side;
  - Should additional topsoil be imported, it must be ensured that the topsoil used are weed-free to limit the establishment of alien and invasive vegetation species;



- The slope of the dam wall may not exceed the maximum slope ratio of 3:1, and must be stabilised (on the western embankment of the dam wall) during the construction phase with the use of a geotextile product such as hessian or Geojute, which is to be staked to the surface of the dam wall slope while revegetation of the dam wall occurs;
  - The dam wall must be revegetated after the construction activities, to stabilize the soils and prevent erosion of the dam wall. A graminoid seed mixture (such as the MayFord Fynbos Biomosome seed mixture) can be used for this purpose, as it will allow for quick establishment.
  - The proposed spillway placement must connect with the downstream excavated channel that has a culvert below the R303;
  - No mixed concrete may be deposited outside of the designated construction footprint. The following recommendations must be adhered to:
    - Fresh concrete and cement mortar should not be mixed near the excavated channel. Preferably in the laydown area/construction camp, may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. Consideration must be taken to use ready mix concrete;
    - No mixed concrete shall be deposited directly onto the ground within the excavated channel. A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing;
    - A washout area must be designated outside of the excavated channel and dam footprint area, and wash water must be treated on-site or discharged to a suitable sanitation system. Wash water may not be discharged into the excavated channel without treatment;
    - Empty cement bags must be disposed of through the hazardous substance waste stream;
    - Concrete spillage outside of the demarcated area must be promptly removed and taken to a suitably licensed waste disposal site.
  - As a precautionary principle, it should be ensured that the spillway (when in use) does not cause erosion of the downstream excavated channel when water is flowing. As such, scour protection (either loose rocks or reno mattresses) must be placed at the base of the outlet to decrease the velocity of water and prevent erosion from occurring;
  - The inlet and outlet of the proposed spillway must be of equal width to allow water to enter the spillway and diffusely flow through the spillway and into the downstream excavated channel, without the flow being concentrated.
- Operation
- The dam and spillway should regularly be inspected for erosion, especially after heavy rainfall events when overflow from the dam is expected and the flow velocity is increased. If erosion is noted, this should be rectified, preferably reinstating vegetation in the eroded areas in the excavated channel. If erosion is pronounced, erosion control devices such as reno mattresses should be considered, in consultation with a freshwater ecological specialist;
  - If erosion is apparent on the dam wall, immediate measures such as strategic placement of hessian sheets or gum poles or stabilisation with sandbags must be taken in order to prevent additional erosion from occurring;
  - The spillway and excavated channel must be maintained free of any debris and silt/sediment that could block the system.
- Maintenance
- Control measures applicable to this activity would be as per Construction and Operation above. Additionally, the following is applicable:
  - During desilting, silt associated with the dam should immediately be removed in order to prevent sedimentation of the downstream excavated channel. Additionally, during desilting a

temporary silt trap would be installed at the spillway and in the excavated channel. This would be emptied on a regular basis and not allowed to reduce the capacity of the dam.

#### **10.2.4 Conclusion**

The Freshwater Ecological Assessment concluded that based on the findings of the watercourse assessment and the results of the impact assessment, it is the opinion of the ecologist that the proposed Kleinvlei Dam poses a low risk to the integrity of the watercourses downgradient of the proposed dam development provided that adherence to cogent, well-conceived and ecologically sensitive construction plans are implemented and the mitigation measures provided in this report as well as general good construction practice are adhered to.

### **10.3 Hydrological and Environmental Water Requirements Study**

A Hydrological and Environmental Water Requirements (EWR) Study was conducted due to the potential impact of the proposed dam on the catchment, as well as on other water users, lower downstream of the dam, as raised by CapeNature and the Department of Water and Sanitation.

The Freshwater Ecological Assessment recommended that a hydrological investigation be conducted to determine the volume of water entering the Kleinvlei Dam from the upgradient catchment and the relevant releases (should this be required by the relevant authorities) determined from the dam.

Please refer to **Appendix 8C**, for the Hydrological and EWR Study.

#### **10.3.1 Key findings**

According to the Hydrological and Environmental Water Requirements (EWR) Study, hydrological conditions in the catchment are strongly seasonal with practically no summer flows. In addition, there is a large variability in annual flows. This analysis is based on an EWR requirement that is fully met in the Proposed Dam catchment. However, due to highly developed nature of the Diversion Site catchment the Low Flow EWR can only be met 49 % of the time. The analysis therefore only includes pumping at the Diversion Site during months when flow exceeds the required EWR.

The variable nature of flow results in a 100% assurance yield that is very low. Generally, an 80% assurance yield is considered appropriate for irrigation. The proposed Kleinvlei Dam with a capacity of 0.235 Mm<sup>3</sup> can supply an 80% assurance yield of 0.175 Mm<sup>3</sup>/annum from its own catchment. This can be increased to 0.205 Mm<sup>3</sup>/annum using a supplementary diversion from the Houdenbeks River with a pumping capacity of 10 l/s.

#### **10.3.2 EWR Implementation**

According to the Hydrological and Environmental Water Requirements (EWR) Study, the mean monthly EWR in m<sup>3</sup>/s required at the Diversion Site on the Houdenbeks River is presented in Table 6. This can be supplied by any combination of dams upstream, operating rules for other diversions, or from the proposed Kleinvlei Dam. It is however recommended that a bottom release be incorporated into the dam during the construction phase should EWR releases be required.

**Table 6: Required mean monthly EWR (m3/s) at the diversion site.**

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
0.016	0.008	0.003	0.000	0.000	0.000	0.000	0.013	0.029	0.021	0.051	0.021	<b>0.161</b>

However, according to the Hydrological and Environmental Water Requirements (EWR) Study, the release of a variable EWR as defined in Table 6 is not currently feasible as these releases would simply be stored in downstream on-channel dams. The EWR can only therefore be effective in the context of broader catchment-wide water management plan that includes Quaternary catchments E21A, E21B and E21E (refer to Figure 2.1 of the Hydrological and Environmental Water Requirements (EWR) Study (Appendix 8C) for a map indicating the various catchments).

Please refer to Section 5 of the Hydrological and Environmental Water Requirements (EWR) Study for more details and requirements on the water management plan.

### **10.3.3 Conclusion**

The hydrological conditions in the catchment are strongly seasonal with practically no summer flows. In addition, there is a large variability in annual flows. This analysis is based on an EWR requirement that is fully met in the Proposed Dam catchment. However, due to highly developed nature of the Diversion Site catchment the Low Flow EWR can only be met 49 % of the time. The analysis therefore only includes pumping at the Diversion Site during months when flow exceeds the required EWR.

The variable nature of flow results in a 100% assurance yield that is very low. Generally, an 80% assurance yield is considered appropriate for irrigation. The proposed Kleinvlei Dam with a capacity of 0.235 Mm3 can supply an 80% assurance yield of 0.175 Mm3/annum from its own catchment. This can be increased to 0.205 Mm3/annum using a supplementary diversion from the Houdenbeks River with a pumping capacity of 10 l/s.



# 11. SUMMARY OF IMPACTS AND CUMMULATIVE EFFECT

## 11.1 Summary of Impacts

Please refer to **Appendix 9** for the impact and significance rating tables for the different phases of the proposed project as well as mitigation measures. The following table is a summary of all the impacts assessed, taking in consideration the risk assessment of the EAP (**Appendix 9**) as well as the risk assessments conducted by the various specialists.

Table 7: Impact Summary (Preferred Alternative)

Aspect	Impact	Significance No Mitigation	Significance With Mitigation
<b>Phase: Construction</b>			
Heritage	Loss and/or damage to potential archaeological and historical sites within the construction footprint	No Impact	No Impact
Palaeontology	Loss and/or damage to potential fossils within the construction footprint	No Impact	No Impact
Botanical	Loss of fynbos vegetation and / or riparian vegetation	Low (Negative)	Very Low (Negative)
Freshwater	Site preparation prior to construction activities (applicable to all proposed project activities) <ul style="list-style-type: none"> <li>- Removal of vegetation, including the large stand of poplar trees between the two ridges, leading to the exposure of soils;</li> <li>- Exposed soils can be transported into the excavated channel underneath the R303 road, causing sedimentation of the downstream Houdenberg River;</li> <li>- Any sheet runoff from the dam footprint area cleared of vegetation can cause erosion, resulting in a high sediment load entering the downstream excavated channel;</li> <li>- Proliferation of alien vegetation as a result of disturbances.</li> </ul>	Low (Negative)	Low (Negative)
	Construction activities related to construction of the dam wall utilising excavated material from the basin of the proposed dam. <ul style="list-style-type: none"> <li>- Runoff from stockpiled material or sediment laden runoff from the</li> </ul>	Low (Negative)	Low (Negative)

	<p>construction footprint area could enter the excavated channel between the proposed dam wall and the R303 road and increase its sediment load;</p> <ul style="list-style-type: none"> <li>- Disturbance to vegetation and soils due to edge effects.</li> </ul>		
	<p>Construction of an open side channel spillway against the northern bank of the dam wall</p> <ul style="list-style-type: none"> <li>- Potential negative impact on the water quality (if present);</li> <li>- Potential erosion of excavated channel.</li> </ul>	Low (Negative)	Low (Negative)
Socio-economic	Job created during the construction phase	Low (Positive)	
Dust	Dust may be generated during the construction of the proposed development.	Medium-Low (Negative)	Low (Negative)
Visual	Visual impact of construction activities and plant on site	Medium (Negative)	Low (Negative)
Traffic	Increase in trucks and construction plant	Medium (Negative)	Low (Negative)
Noise	Noise will be generated during the construction phase.	Low (Negative)	Very Low (Negative)

Aspect	Impact	Significance No Mitigation	Significance With Mitigation
<b>Phase: Operational and Maintenance</b>			
Freshwater	<ul style="list-style-type: none"> <li>- Increase in the volume of water that may seep through the dam wall into the excavated channel (positive impact);</li> <li>- Erosion of the excavated channel where water enters the excavated channel from the spillway;</li> <li>- Potential increased sedimentation of the excavated channel due to erosion associated with the spillway.</li> </ul>	Low (Negative)	Low (Negative)
	<p>Desilting activities resulting in the:</p> <ul style="list-style-type: none"> <li>- Removal of vegetation; and</li> <li>- Earthworks and silt stockpiling, the runoff from which has the potential to increase silt loads within the downstream excavated channel.</li> </ul>	Medium (Negative)	Low (Negative)

	<p>In the event where a leak has been detected within the dam wall itself, impacts include:</p> <ul style="list-style-type: none"> <li>- An increase in water quantity downstream (potential seepage below dam wall) could cause extended periods of water saturation of the downstream excavated channel eliciting a wetland response;</li> <li>- Repair of a leak would entail the impacts as per Construction activities above.</li> </ul>	Medium (Negative)	Low (Negative)
Visual	Visual impact of the dam	Low (Negative)	Low (Negative)
Socio-economic	Creation of long-term employment opportunities.	Low (Positive)	

## 11.2 Cumulative effect

Cumulative effect in relation to the activity means the past, current and reasonably future impact of an activity, considered together with the impact of activities associated with that activity, that itself may not be significant but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

According to the Botanical Impact Assessment (Appendix 8A), as far as cumulative impacts on terrestrial ecosystems are concerned there would be negligible negative effect.

## 12. CONCLUSION AND RECOMMENDATIONS

The following specialist studies were undertaken as part of the Environmental Impact Assessment:

- Botanical Assessment
- Freshwater Ecological Assessment
- Hydrological and Environmental Water Requirements Study

The specialist studies and information provided in the EIA Report, indicate that the proposed development does not pose any significant impact to the environment and can be implemented with strict adherence to the recommended mitigation measures.

Mitigation measures as recommended by the specialists must be enforced if the proposed development were to be approved. These mitigation measures and recommendations are discussed in Section 10 of this report and have been included in the Environmental Impact Report (EMPr) attached as **Appendix 10**. Mitigation measures with regards to any activities in the watercourses are discussed in the river Maintenance and Management Plan (MMP)(**Appendix 11**). This MMP should be read in conjunction with the EMPr.

In terms of the need and desirability of the proposed development, the need exists for a storage dam for the Applicant, which currently has summer water rights to abstract water directly from the Houdenberg River but would like to ensure the existing water use for permanent cultivars by creating winter storage. According to the preliminary Design Report (**Appendix 5**), summer abstraction will be switched or exchanged for winter abstraction with the key motivation to store winter water for summer irrigation, also benefiting and ensuring the protection of the Houdenberg River during the dry summer months when the water levels fall drastically.

The surrounding area is also generally agricultural in nature, with other farms dams in the area (the closest being approximately 2.2km south and 2.5km north of the proposed site). The proposed dam will therefore not be considered inappropriate for the area, and is compatible with the existing land-uses in the area.

The site is considered the best option since the majority of the dam will be located on old, cultivated fields limiting any loss of natural vegetation in the area. The topography is also ideal, as the dam wall will be constructed between two existing ridges, limiting the amount of material required for the dam wall.

The purpose of the proposed dam is to provide storage capacity for the storage of existing water use right. No other activity alternatives were considered.

Three various dam wall alternatives were considered. Option 2 is the preferred layout as it has the same dam wall position as Option 1, but does not have the second wall (saddle wall). Its capacity is larger than option 1 (~235 000m<sup>3</sup> compared to 168 000m<sup>3</sup>) and has a better storage ratio (far exceeding 5) and is therefore more economical and financially viable than option 1. Option 3 has a lower storage ratio than both Option 1 and 2, and was therefore uneconomical and not financially viable.

The “no-go” option, is the option of not going ahead with the proposed development. Although the no-go development might result in no potential negative environmental impacts, the direct and indirect socio-economic benefits of not constructing the dam development will not be realised. The need for summer storage for irrigation purpose will not be realised.

No heritage resources are expected to be impacted by the proposed dam.

According to the Botanical Assessment, the construction of the Kleinvlei Dam would not result in the loss of much natural terrestrial vegetation. The basin of the dam of all alternatives would be on areas that have been historically disturbed and where there is no longer any Kouebokkeveld Shale Fynbos. The dam walls of all three alternatives would have a limited (small) effect on isolated patches of old Winterhoek Sandstone Fynbos that has low sensitivity. The impact would consequently be **Very Low Negative** after mitigation. From a terrestrial botanical viewpoint, the construction of any of the dam alternatives would be within acceptable 'Low Negative' limits and all alternatives are supported.

According to the Freshwater Ecological Assessment, the proposed Kleinvlei Dam poses a low risk to the integrity of the watercourses downgradient of the proposed dam development provided that adherence to cogent, well-conceived and ecologically sensitive construction plans are implemented and the mitigation measures provided as well as general good construction practice are adhered to.

Considering all the information, it is not envisaged that the development of the Kleinvlei dam will have a significant negative impact on the environment, if mitigation and monitoring measures, as advised by the specialists are strictly adhered to.

It is therefore recommended that the proposed Kleinvlei Dam be supported and be authorised with the necessary conditions of approval, subject to the implementation of the recommended enhancement and mitigation measures contained in Section 10 of this report, the EMPr (**Appendix 10**) and the MMP (**Appendix 11**).



### 13. DETAILS AND EXPERTISE OF THE EAP

This Draft Environmental Impact Report was prepared by Clinton Geyser who has a MSc. Degree in Environmental Management. He has been working as an Environmental Assessment Practitioner since 2009 and is currently employed at EnviroAfrica CC.

Report compiled by Clinton Geyser -

Qualifications:

- BSc. Earth Sciences, Majors in Geology and Geography and Environmental Management (1998 – 2000) and;
- BSc. (hons): Geography and Environmental Management (2001) and;
- MSc. Geography and Environmental Management (2002), all from the University of Johannesburg.

Expertise:

Clinton Geyser has over eleven years' experience in the environmental management field as an Environmental Assessment Practitioner and as an Environmental Control Officer, having worked on a variety of projects in the Western, Eastern and Northern Cape. Previous completed applications include, but not limited to:

- Civil engineering infrastructure including pipelines, Waste Water Treatment Works, and roads in the Western and Northern Cape.
- Agricultural developments, including reservoirs and dams, in the Western and Northern Cape.
- Telecommunications masts in the Western and Eastern Cape
- Housing Developments in the Western and Northern Cape.
- Resort developments in the Western and Northern Cape.
- Cemeteries in the Western Cape
- Waste Management Licences in the Western Cape

Employment:

Previous employment as an EAP: Doug Jeffery Environmental Consultants (2009 – 2012)

Current employment: EnviroAfrica cc (2012 – present).

The whole process and report was supervised by Bernard de Witt who has more than 20 years' experience in environmental management and environmental impact assessments.

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