
ENVIRONMENTAL IMPACT ASSESSMENT (EIA): DRAFT EIA REPORT

PROPOSED CONSTRUCTION OF A DAM FOR THE PROPOSED TOWN DEVELOPMENT AT VERKYKERSKOP, FREE STATE

Applicant: Verkykerskop Nedersetting Ontwikkeling (Edms) Bpk

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TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION	3
1.1 BACKGROUND TO THE STUDY	3
1.2 COMPILATION OF EIA REPORT	5
1.3 TERMS OF REFERENCE	5
1.4 INFORMATION ON THE METHODOLOGY OF EIA	5
CHAPTER 2: ENVIRONMENTAL ASSESSMENT PRACTITIONERS	6
2.1 DETAILS OF THE EAP'S	6
2.2 EXPERTISE OF THE EAP'S	6
CHAPTER 3: PROJECT INFORMATION	9
3.1 PARTICULARS OF APPLICANT	9
3.2 DESCRIPTION OF THE PROPOSED ACTIVITY	9
3.3 NEED AND DESIRABILITY OF PROPOSED ACTIVITY	10
3.4 FEASIBLE AND REASONABLE ALTERNATIVES	11
CHAPTER 4: PUBLIC PARTICIPATION	12
4.1 INTRODUCTION AND OBJECTIONS	12
4.2 METHODOLOGY	13
4.3 SUMMARY OF KEY ISSUES RAISED BY THE I & AP'S	14
CHAPTER 5: ENVIRONMENTAL ASPECTS	15
5.1 LITERATURE REVIEW	15
5.2 DESCRIPTION OF ENVIRONMENT	15
5.3 SUMMARY OF FINDINGS AND RECOMMENDATIONS OF REPORTS OF SPECIALIST STUDIES AND SPECIALIZED PROCESSES	21
CHAPTER 6: IMPACT ASSESSMENT	28
6.1 SOIL MANAGEMENT	30
6.2 POLLUTION OF GROUNDWATER RESOURCE	31
6.3 EROSION	32
6.4 WASTE CREATION	33
6.5 FAUNA	34
6.8 DESTRUCTION OF FLORA	35
6.9 AQUATIC SPECIES	36
6.10 SAFETY AND SECURITY	37
6.11 DUST CONTROL	38
6.12 VISUAL IMPACT	38
6.13 NOISE IMPACT	39
6.14 IMPACT ON WETLANDS	40
6.15 DOWNSTREAM LAND USERS	41

CHAPTER 7: ENVIRONMENTAL IMPACT STATEMENT	43
7.1 SUMMARY OF THE KEY FINDINGS OF THE EIA	43
7.2 COMPARATIVE ASSESSMENT OF THE POSITIVE AND NEGATIVE IMPLICATIONS OF PROPOSED ACTIVITY AND ALTERNATIVES	43
7.3 ASSUMPTIONS AND LIMITATIONS	44
7.4 SHOULD THE PROPOSED ACTIVITY BE AUTHORISED	44
7.5 CONDITIONS THAT SHOULD BE MADE IN RESPECT OF THE AUTHORISATION	44
CHAPTER 8: LITERATURE	46

1. INTRODUCTION

1.1. BACKGROUND TO THE STUDY

A storage dam is planned to provide water for the proposed Verkykerskop Town Development (separate EIA).

The rural Village of Verkykerskop is situated between Harrismith and Memel along the S722 road in the Eastern Free State. The existing village of approximately 46 ha includes residences, tourist accommodation facilities, a general dealer with a restaurant, a police station complex, a boutique hotel, deli / coffee shop, butchery, liquor store and agri-retail store with fuel pumps. The village and public plain also serves as point of colocation for the local community during festivals, weddings, cultural events, elections, market days and pension payout.

The applicant proposes to develop business, tourist accommodation, small tourist and agri-industries, residential units, light industries (e.g. manufacturing of crafts) and recreational facilities at Verkykerskop.

Subsequent to liaisons with the Phumelela Municipality, Free State Provincial Government and Verkykerskop Boerevereeniging, a Micro Spatial Development Framework for Verkykerskop was formulated and approved by the Phumelela Local Council in 2009.

Geohydrological surveys were commissioned (refer to **Annexure J** for Geohydrological Assessment), from which groundwater bore holes were drilled, confirming substantial yields. The groundwater source as only source was found to be inadequate to though for an acceptable level of security of supply for the fully developed township. It was found by a Water Resource Specialist Study (refer to **Annexure I** for the complete Hydrological Analysis) that in combination; the groundwater and storm water storage dam would provide an acceptable level of supply security the fully developed township.

The water supply for the planned town development will thus be groundwater from boreholes in the area and surface water from the planned storage dam.

The design daily peak water demand for the town development is calculated to be 422 kℓ/day.

The proposed storage dam is planned on the Farm Annas Dal no. 668 in the Warden district (refer to **Annexure L** for title deeds). The proposed dam site is approximately one kilometer to the southeast of Verkykerskop (refer to locality plan in **Annexure A**).

The proposed storage dam will be located within the confines of the rural development node, but just outside the proposed town development (refer to locality plan in **Annexure A**). The dam is proposed as an earth dam with a wall height of 13.3 meters and a length of 271 meters between the spillway openings and 346 meters including the spillways. The full supply water surface area of the dam is calculated at 6.95 ha as shown on the layout plan (**Annexure B**). The dam capacity assumed at basic planning stage in the Water Resource Study was calculated at 330 000 m³. The capacity as determined in the detail design report (refer to **Annexure E** for Dam Design Report) is 327 200 m³. It was further calculated that the proposed dam will receive water from a catchment of 6.65 km² which falls within the borders of the following properties:

- Farm Aansluit Landgoed 1986;
- Portions 1, 7 and 8 of the Farm Rustdal 875;
- Portion 1 of the Farm Heelgoed 324;
- Farm Annas Dal 668;
- Farm Lands View 1987;
- Remainder of the Farm Aansluit 261;
- Portions 3, 7 and 15 of the Farm Verkykerskop A 1519;
- S.A.P. Post B 1550;
- S.A.P. Post A 1551
- Remainder of the Farm Verkykerskop B 1520

The majority of the catchment falls within the Rural Development Node and the property belonging to the developers.

Refer to **Annexure A** for the locality plan indicating the catchment area.

1.2 COMPILATION OF EIA REPORT

The following report was compiled by MDA on acceptance of the submitted Scoping Report and advice from the competent authority in terms of Regulation 31(1)(a) to proceed with the tasks contemplated in the plan of study for Environmental Impact Assessment, including the Public Participation Process. The report was compiled according to Regulation 32 (2)(a) – (q) of the Regulations No. 385 (GKR 385 of 21 April 2006) promulgated in terms of Chapter 5 of the National Environmental Management Act (Act No. 107 of 1998) stipulating the information that is necessary for the competent authority to consider the application and to reach a decision contemplated in Regulation 36.

1.3 TERMS OF REFERENCE

The objective of this study is to conduct an environment assessment exercise. The broad terms of reference for an assessment exercise are to:

- Conduct an in-depth investigation into biophysical and socio-economic aspects, focusing on key issues;
- Address the issues that were identified during the scoping process and investigation, which are associated with this planned project;
- Advise the proponent about the potential impacts (positive and negative impacts) of their planned development, as well as the implications for the design, construction and operational phases of the project;
- Facilitate public input on environmental and social matters;
- Identify possible measures to mitigate the potential impacts of the planned project;
- Address the cumulative impact of all aspects of the planned development as well as possible mitigating measures.

1.4 INFORMATION ON THE METHODOLOGY OF EIA

This report addresses the biophysical as well as the socio-economic environments. The information was captured in the following manner:

- Site visits to determine the setting, visual character and land-uses in the area;
- Site surveys were conducted to identify any plant and animal populations that could be impacted by the development (scoping);

- The project plans were superimposed onto the gathered baseline environmental information to identify possible impacts;
- Discussions were held with the client to identify specific aspects of the development which could affect the environment;
- I & APs were informed and consulted by phone, letters, notice boards and advertisements to capture issues that could affect the environment;
- Identifying positive, as well as negative issues;
- Specialist studies done by independent specialists in areas where impacts were identified;
- Making recommendations and presenting guidelines for the mitigation of impacts identified during this exercise.

2. ENVIRONMENTAL ASSESSMENT PRACTITIONERS

2.1 DETAILS OF ENVIRONMENTAL ASSESSMENT PRACTITIONERS (EAPS) WHO PREPARED THE REPORT

A multi-disciplinary team of specialists contributed to the information presented in this document:

Co-ordination, supervision & management

Mr. Neil Devenish - MDA Consultant

Public Participation & report writing

Ms. Marike du Plessis - MDA Consultant

Ms. Marguerite Cronje - MDA Consultant

2.2 EXPERTISE OF THE EAPS TO CARRY OUT THE EIA PROCEDURES

a) Mr. Neil Devenish

Key qualifications:

- Key competencies and experience include development control applications (applications and appeals pertaining to rezoning, consolidations, subdivisions etc.) township establishment applications, environmental management and control applications.
- Registered at the SACTRP [TRP(SA)].

Education:

- B. A. (Sociology, Geography) University of the Free State, SA, 1994
- Master of Town and Regional Planning, University of the Free State, SA, 1996
- Managing the Environmental Impact Assessment Process, Environmental Management Unit, PU for CHE, 2000
- Environmental Management Consulting, South African Institute of Ecologists & Environmental Scientists, 2001

Courses:

- Managing the Environmental Impact Assessment Process, Environmental Management Unit, PU for CHE, 2000
- Environmental Management Consulting, South African Institute of Ecologists & Environmental Scientists, 2001
- Water Law of South Africa, The South African Institute of Civil Engineers (SAICE), 2006

b) Ms. Marike du Plessis**Key qualifications:**

- Key competencies and experience include environmental management and research in geology.
- Registered at IAIAAsa.

Education:

- B.Sc. (Geology), University of the Free State, 2005
- B.Sc. Honours (Geology), University of the Free State, 2006

c) Ms. Marguerite Cronje**Key qualifications:**

- Key competencies and experience include environmental management and research in zoology.
- Registered at IAIAAsa.

Education:

- B.Sc. (Zoology), University of the Free State, South Africa, 2002
- B.Sc. Honnours (Zoology), University of the Free State, South Africa, 2003
- M.Sc. Diploma (Equine Science), University of Edinburgh, UK, 2005

- Masters in Environmental Management, University of the Free State, South Africa, 2008

Conferences:

- 10 years of Environmental Impact Assessments in South Africa – Somerset West (2008)
- Free State Provincial Waste Summit – Bloemfontein (2010)

3. PROJECT INFORMATION

3.1 PARTICULARS OF APPLICANT

Verkykerskop Nedersetting Ontwikkeling (Edms) Bpk

P.O. Box 93
HARRISMITH
9880

Contact person: Dr Louis Grobler

Cell: 083 6289699

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E-mail: louis@verkykerskop.com

3.2 DESCRIPTION OF THE PROPOSED ACTIVITY

The proposed development includes the construction of an earth dam in order to provide water to the planned Verkykerskop township establishment. The proposed storage dam will be located within the confines of the Verkykerskop Rural Development Node with its catchment contained within these boundaries, and on the property of the applicant.

The dam is proposed as an earth dam with a wall height of 13.3 meters and a length of 270 meters between the spillway openings and 346 meters including the spillways. The full supply water surface of the dam is calculated at 6,95 ha as shown on the layout plan (**Annexure B**). The dam capacity is determined in the detail design to be 327 200 m³. The spillway of the dam is planned for a capacity to let a 50 year flood through with an additional dry free board of 400 mm, to give a total free board of 1.5 meters. The total capacity of the spillway, with no free board, will allow for the passage of a flood with return period of 100 years. Refer to **Annexure C** for photos of the proposed development site and area.

The main feature of the proposed dam is the earth embankment that is responsible for holding back the water in the dam. The earth wall will consist of three separate parts: a) a central clay core, responsible for sealing the earth wall; b) the upstream face, responsible for holding back the water, and

c) the downstream portion of the dam giving structural stability to the earth wall. Detailed characteristics and construction of the three parts are discussed in the Dam Design Report (**Annexure E**).

3.3 NEED AND DESIRABILITY OF PROPOSED ACTIVITY

The applicant, namely the Verkykerskop Nedersetting Ontwikkeling (Edms) Bpk, owning most of the properties within the confines of the Rural Development Node propose to develop business, tourist accommodation, small tourist and agri-industries, light industries (e.g. manufacturing of crafts), residential units and recreational facilities at Verkykerskop. The applicant plans to develop the rural node in joint venture with other land owners owning property within the rural node. These land owners, including the SAPS in Verkykerskop, do not have any substantial water sources on their land and will depend on the water source being applied for.

The proposed town development's average daily demand has been estimated as 264 kℓ/day with a design daily peak demand of 422 kℓ/day. Although boreholes will be used, it is envisaged to construct a storage dam to constitute a significant volume. On their own, neither the groundwater nor storage dam will be adequate to meet the water demand of the entire proposed Verkykerskop Town Development in a sustainable manner, but together the two sources will provide an acceptable level of supply assurance.

Negotiations with the Phumelela Municipality and the Free State Provincial Government (Spatial Planning Directorate) have been underway for some time now and a Micro Spatial Development Framework (MSDF) for the Verkykerskop area has already been approved (August 2009).

During 2012 the Phumelela Local Council, on advice of an independent review consultant, approved the Engineering Services Report for the township development, which encompasses the development of the water sources and the distribution infrastructure.

In February 2013, the Phumelela Local Council endorsed the Township Establishment Application as well as the application for the amendment of the Vrede Township Scheme to the Provincial Government.

Institutionally speaking, Verkykerskop is therefore recognised as a rural development node in the Phumelela SDF (Spatial Development Framework) and as a tourism node with social facilities in the Provincial SDF.

It is recommended that the earth dam is constructed as planned, and that the groundwater source as well as the surface water source be used in tandem to supply in the demand for the Verkykerskop development. This will ensure that the groundwater source be used on a sustainable basis (refer to Geohydrological Assessment in **Annexure J**). The construction of this dam also adds value of protection from floods and droughts.

The EIA for the town development is currently underway.

3.4 FEASIBLE AND REASONABLE ALTERNATIVES

3.4.1 Site alternatives: Site alternatives were assessed during the planning process of the proposed dam. The site is ideal relative to the existing boreholes, which would be recharged by water from the dam. The boreholes and dam should provide water to the planned township establishment at Verkykerskop. The proposed dam site, which is situated in a valley at a dolerite dyke, is also economical for a dam, as it maximises the hold capacity and limits the dam wall size. The dam site was optimized with the view to reduce the impoundment surface area in the landscape for the required hold capacity. The dam basin is fairly steep, which will reduce evaporation and minimize the effect of water level fluctuations from a recreation and aesthetics point of view. The dam will also stabilize the active erosion that has taken place on the tail end of the dam. Therefore, alternative sites for the proposed dam have all been eliminated.

3.4.2 Activity alternatives: Alternative sources of water investigated for the proposed Verkykerskop Town Development include:

- **Abstraction from the Meul River**

This was not deemed a viable option as the Meul River is approximately 3km downstream of the end point of usage and the river runs dry during dry cycles.

- Additional underground sources (boreholes)

Although this may be a short-term option for water supply to the proposed Verkykerskop Town development, there would be a shortfall if the town development is extended to the full planned extent.

3.4.3 Design alternatives: Various design alternatives were considered and the current design plan is the result. Specialist studies were conducted prior to the EIA phase (triggered from the Environmental Framework phase) rendered the selected design as most preferable from an environmental point of view. Refer to **Annexure E** for the Dam Design Report that was done to ensure the best storage dam design option was selected for the proposed development.

3.4.4 No-go option: This alternative addresses the scenario of the *status quo* remaining unchanged. Although the use of boreholes for water supply is also planned, the shortfall in supply without the proposed dam will prevent the proposed town development from developing to the full planned extent.

4. PUBLIC PARTICIPATION

4.1 INTRODUCTION AND OBJECTIONS

As an important component of the EIA process, the public participation process, involves public inputs from interested and affected parties (I & AP's) according to Section 24(A) and 56 of the NEMA Regulations. I & AP's may comment during the planning phase of the proposed project.

The key objectives of the public participation process are to:

- Identify a broad range of I & AP's, and inform them about the proposed project.
- Understand and clearly document all issues, underlying concerns and suggestions raised by the I & AP's, and
- Identify areas that require further specialist investigation

4.2 METHODOLOGY

The public participation process was undertaken in accordance with the plan of study accepted in terms of Regulation 31(1)(a). The following actions have already been undertaken as part of this process:

- Advertisements in the local/provincial newspaper
- On-site notices
- Notices to the Local Municipality
- Notices to organs of state having jurisdiction in the area (Local Municipality and the Free State Provincial Government)

4.2.1 Identification of key I & AP's

Key I & AP's, are the following types of organizations:

- Surrounding landowners
- Environmental organizations
- Authorities
- GOs
- NGOs
- Business and civic organizations

A register of I & AP's was compiled in terms of Regulation 57. See **Annexure D4** for a list of registered I & AP's.

4.2.2 Notification of potential I & AP's of EIA

i) Newspaper notifications (Annexure D1):

Table 1. Notifications placed in newspapers.

Newspaper	Date
<i>Vrystaat</i>	25 November 2010
<i>Maluti</i>	16 February 2011
<i>Vrystaat</i>	17 February 2011

- ii) **On site notices:** On site notices were also placed at the site on 26 November 2010 allowing 30 days for public response (**Annexure D2**).

- iii) **Public Meeting:** A public meeting was held at the Verkykerskop Entertainment Centre on 19 February 2011 to discuss the proposed development and document issues and concerns. The minutes of the meeting are attached in **Annexure D3**.

4.2.3 Public comments

Comments received on the Scoping Report by I&AP's and our responses thereto is included in **Annexure D5**. The draft EIA Report is currently being circulated for a 40-day comment period. Comments received and our responses thereto will be included in the final EIA in **Annexure D5**.

4.3 SUMMARY OF KEY ISSUES RAISED BY THE I & AP's

All comments raised and our responses during the Scoping Report are included in this report (**Annexure D5**).

Find below a summary of the key environmental issues raised (and responded to) by I & AP's:

- Dam safety risk.
- Motorized motor craft.
- Obtaining permits if any fish were to be introduced to the dam.
- Socio-economic benefit.

The draft EIA Report is currently being circulated for a 40-day comment period. Any additional comments received and our responses thereto will also be included in **Annexure D5** of the final EIA.

5. ENVIRONMENTAL ASPECTS

5.1 LITERATURE REVIEW

Literature pertinent to this area and its immediate environs has been reviewed. The literature included published and unpublished reports: Branch, 1998, Bredenkamp, *et al.* 1996, Brooke 1984, Bulpin 1980, Golding, 2002, Harrison *et al.* 1997, Henderson 2001, Hilton-Taylor 1996, Low & Rebelo 1996, and Smithers 1986.

5.2 DESCRIPTION OF THE ENVIRONMENT

5.2.1 Biophysical Environment

The area is generally undulating, except for a steep sloped valley (creed) to the south east of the proposed dam site. A low rise that dips sharply towards the west occurs on the north western side of the site. A number of plant communities are present on the site with a variety of plant species. Marshy seepage areas are present along the slopes of the valley and in the headwaters. The altitude in the area varies from 1 754 to 1 936 m.a.s.l.

5.2.2 Climate

The area lies within a summer rainfall region with an average annual rainfall of 700 mm. Big temperature differences occur between summer and winter averages. Frost is a regular occurrence in winter.

5.2.3 Geology of area

The geology of the area is underlain by the Transvaal Supergroup. It can be subdivided into the lower Normandien Formation and upper Tarkastad Subgroup. From oldest to youngest, the geology around Verkykerskop is made up of Late Permian sandstones, early Triassic sandstones of the Tarkastad Subgroup, Jurassic dolerite intrusions, Quaternary alluvium and residual soils.

The overlying Tarkastad Subgroup is represented by coarse to fine-grained sandstones of the Verkykerskop Formation and mudstones and subordinate sandstone of the Driekoppen Formation.

The general geology of the area consists of dolerite intrusions that intersect sedimentary rock of the Beaufort Group. The Beaufort Group represents deposits and consists of the lower olive green mudstone- and sandstone associations of the Adelaide Subgroup and top brown-red and grey mudstone and sandstone associations of the Tarkastad Subgroup. Tarkastad can be divided in the lower sandstone unit, the Verkykerskop Formation and the upper mudstone unit, the Driekoppen Formation. The valley is as a result of eroded sandstone and mudstone layers.

For more information, refer to the Palaeontological Desktop Study (**Annexure H**) as well as the Geohydrological Assessment (**Annexure J**).

5.2.4 Terrain forms & habitats

The following terrain forms and habitats were observed in the area to be developed.

Table 2: Terrain form and habitats area

Terrain form		Habitat types	
Hill top		Grassland	X
Hill side		Karoo	
Flat		Karroid (scattered)	
Valley	X	Natural forest	
River bank		Plantations	
Wetland		Ploughed or fallow fields	
Foot slope		Riparian	
		Savanna	
		Shrub	
		Other	

5.2.5 Soils of area

The soil found in the valley varies from soil with high clay content in the middle to sandy, silty, clay towards the outside of the valley. From visual inspection, it should be possible to build the dam wall using soil from within the dam basin.

5.2.6 Vegetation of area

The natural vegetation in the area of the site is characterised by grass-covered slopes with scattered bush clumps in the valley and rocky outcrops as well as hill slope seeps and valley-bottom wetlands. Crop fields and stands of exotic trees reflect the impact of humans on the natural vegetation. No extensive areas of particular floral sensitivity were identified. The shrub communities in the valleys as well as the wetlands can be regarded as sensitive.

Most Red Data Species found in habitats similar to that of the study area are habitat specialists and are restricted to specific sensitive habitat types (ridges, seasonal pans, etc.). This study site does not cater for unique and specialized habitats and thus only a few Red Data Species would actually visit this site.

A search and rescue exercise is required to remove and translocate any protected plants found (if any). A permit will be obtained from the DETEA permit office for removal and translocation.

A pristine wetland occurs in the valley. It is still intact just upstream of the existing donga. The donga formed over time by erosion and has damaged the wetland on the stream banks. The impoundment of the proposed dam will be clear of the pristine part of the wetland and may serve to prevent the donga from growing deeper by building up silt at the inlet. It is recommended that the area upstream from the donga be rehabilitated in order to prevent the donga from extending deeper into the pristine part of the wetland.

The proposed development is considered suitable for the proposed development because the footprint is placed in such a way that these sensitive communities are not impacted upon.

Refer to **Annexure F** for the Ecological Report undertaken for the proposed development area.

5.2.7 Animals (moths, butterflies, reptiles, fish, birds & mammals) of the area

No areas of faunal significance or sensitivity within the natural habitat were observed within the study area. This is probably due to the close proximity of the residential area as well as the farming activities on the various farms in the district. A survey was also undertaken to assess the occurrence of threatened species in the area. The impact on rare and endangered animal species can be regarded as low because no rare and endangered habitats / species were found on site.

The grassland biome has relatively high bird diversity, with the most prominent being the Secretary Bird, Black Harrier, Black Stork, Blue Crane, Mahem and Denham's Bustard, as well as the migratory Steppe Buzzard and Booted Eagle.

Refer to **Annexure F** for the Ecological Report undertaken for the proposed area.

5.2.8 Aquatic systems

The catchment of the proposed dam drains into a short seasonal tributary of the Meul River, which in turn joins up with the Wilge River, a major tributary of the Vaal River. There is no permanent aquatic ecosystem situated in the catchment tributary due to the seasonality of the stream.

The planned development will cause an impact on the aquatic, but these impacts will only be of temporary nature and will stabilize over time. Aquatic species and water birds will increase in the environment due to the creation of a new aquatic habitat.

A new aquatic ecosystem (plants and animals) will develop in the proposed dam leading to an increase in biodiversity in the area. Refer to **Annexure F** for the Ecological Report undertaken for the proposed area.

5.2.9 1 : 100 year flood line

The proposed dam has to be built within the flood area, as the purpose of the dam is to collect water. The construction of this dam adds the value of protection from floods and droughts.

5.2.10 Socio-economic Environment

The Village of Verkykerskop is located along the S722 road between Harrismith and Memel. Currently the village serves as a small service centre and social focal point to the surrounding community.

Agriculture is the main sector in the region. Verkykerskop is also seen as a tourism node with an Autumn Festival being held annually.

Employment opportunities will be created during the construction phase of the proposed development. Future development of the area is subject to the provision of water and thus employment opportunities will also arise during operational phase. The proposed dam will contribute to the infrastructure and service provision of the area.

5.2.11 Surrounding land uses

The site proposed for the proposed dam is surrounded by agricultural land.

The site is situated to the southeast of Verkykerskop and is mainly on agricultural ground. No buildings are present near the proposed dam site. Verkykerskop currently does not have the status of a town due to the low population numbers. However, township establishment is planned.

Just downstream of the dam site (Portion 1 of the Farm Brakwal no. 667) the Nhlanhla community conducts commercial farming. The community comprises families who benefited from government's Land Redistribution Programme. The construction of the proposed dam may be beneficial to this community with regards to the supply of irrigation water under certain conditions.

Refer to the locality plan in **Annexure A**.

5.2.12 Historical, archaeological, cultural or palaeontological sites

An Archaeological Impact Assessment (AIA) has been undertaken to assess the site and determine whether any artefacts, rock paintings, other significant material or graves are present at or near the site. Due to the lapsing of the AIA presented in the Scoping Report, a new AIA was done (**Annexure G**). The findings however stayed the same.

The terrain surrounding the proposed development is characterized by rolling hill topography and open, grass covered plains punctuated by several small man-made dams. Four grave sites were also recorded in the area. The field assessment did not reveal any evidence of intact or capped Stone Age artifacts or Iron Age structures within the confines of the footprint.

The grave sites, old Annas Dal homestead and kraal are located outside the proposed development areas. Refer to **Annexure G** for the complete Archaeological Impact Assessment.

A palaeontological desktop study was also included after being requested by SAHRA. This evaluation indicates that Verkykerskop lies within the outcrop belt of the Normandien Formation and overlying Tarkastad Subgroup rocks. The potentially fossil-bearing Normandien Formation is overlain by the Verkykerskop and Driekoppen Formations that have no palaeontological sensitivity. It is expected that the infrastructure development at Verkykerskop will primarily impact on Quaternary-age residual soils of little palaeontological significance.

Refer to Palaeontological Desktop Study (**Annexure H**) for more information.

5.2.13 Dam Safety Regulations

According to the Dam Safety Regulations, Government Notice R. 139 (24 February 2012), every dam with a safety risk must be classified in accordance with the regulation on the basis of its size and hazard potential to determine the level of control over the safety of the structure that is applicable in terms of these Regulations.

The size classification of a dam with a safety risk is based on the maximum wall height. The hazard potential classification of a dam with a safety risk is based on the potential impact on resource quality due to failure, the storage of polluted / hazardous water / substances, the potential of losing life, economic loss or resource quality downstream. The applicant is in liaison with DWA and is aware of the relevant approvals in terms of the Regulations.

5.2.14 Motorized motorsport

Human activities act to disrupt the natural habitat and affect the local fauna and flora. Management measures of motorized motorsport and other recreational activities (e.g. water-skiing etc.) should be implemented at the proposed dam.

5.3 SUMMARY OF FINDINGS AND RECOMMENDATIONS OF REPORTS OF SPECIALIST STUDIES AND SPECIALIZED PROCESSES

The necessary specialised studies and specialised processes have been performed in areas where possible negative impacts were identified. This was done according to Section 24 of the NEMA Regulations No. R. 385 published in the Government Notice No. 28753 of 21 April 2006 of NEMA. Specialised studies relevant to the project include:

5.3.1 Archaeological Impact Assessment (Annexure G)

An archaeological study to assess the significant historical and cultural findings. The study was undertaken by:

Mr. Lloyd Rossouw

P.O. Box 266

Bloemfontein

9320

Tel: 084 250 5992

E-mail: lloyd.rossouw@gmail.com

Findings:

The field assessment revealed no evidence of intact or capped Stone Age artefacts or Iron Age structures within the confines of the footprint.

Previously recorded grave sites as well as the old Annas Dal homestead and kraal are located outside the proposed development areas.

Recommendations:

The affected area around Verkykerskop village is graded General Protection C (Field Rating IV C) and can be accessed for further development. See **Annexure G** for the complete Archaeological Impact Assessment.

5.3.2 Paleontological Desktop Study (Annexure H)

A desktop study that investigated the possibility of the occurrence of paleontological significant sites in the proposed area. This study was undertaken by:

Paleo Field Services

Mr. Lloyd Rossouw

P.O. Box 38806

Langenhovenpark

9330

Tel: 084 250 5992

E-mail: lloyd.rossouw@gmail.com

Findings:

This study indicates that the development lies within the outcrop belt of the Normandien Formation (Late Permian Schoondraai and Harrismith Members) and overlying Tarkastad Subgroup rocks (Early Triassic Verkykerskop and Driekoppen Formations).

Recommendations:

The potentially fossil-bearing Normandien Formation is generally considered to be of high palaeontological sensitivity whereas the overlying Verkykerskop and Driekoppen Formations are not.

It is expected that infrastructure development at Verkykerskop will primarily impact on Quaternary-age residual soils of little palaeontological significance.

5.3.3 Ecological Report (Annexure F)

An ecological study to assess the area for protected and endangered plant and animal species.

Dr. P.J. du Preez

MDA Consultants

P.O. Box 3943

Bloemfontein

9300

Tel: (051) 447 1583

Fax: (051) 448 9839

Cell: 082 376 4404

Findings:

The natural vegetation in the area of the site is characterised by grass-covered slopes with scattered bush clumps in the valleys and rocky outcrops as well as hill slope seeps and valley-bottom wetlands. Crop fields and stands of exotic trees reflect the impact of humans on the natural vegetation. Most of the natural animal communities have already moved away due to farming practices.

The site is considered suitable for the proposed development as it is placed in such a way that these sensitive communities are not impacted upon. The building of the dam may protect the upstream wetland as the current donga formation is damaging this system. Large areas of natural vegetation will remain untouched by the proposed development.

Most Red Data Species found in habitats similar to that of the study area are habitat specialists and are restricted to specific sensitive habitat types (ridges, seasonal pans, etc.). This study site does not cater for unique and specialized habitats and thus only a few Red Data Species would actually visit this site.

Recommendations:

Search and rescue exercise is recommended on those areas where construction will take place in order to remove and translocate protected plants, if any are found. Permits must be obtained from DETEA for the abovementioned actions.

The soils in the area are dispersive and prone to serious erosion and thus care must be taken to rehabilitate the disturbed areas after construction.

5.3.4 Dam Design Report (Annexure E)

A design report for the proposed storage dam was undertaken to ensure the most appropriate design is used for the development.

SW Jacobsz

P.O. Box 468

Senekal

9600

Cell: 083 305 0757

Findings:

The catchment of the dam is very wet, fountains occur up stream of the dam. In the rainy season the spillways could remain wet for months at a time. The grass in the spillways will tend to get waterlogged, killing the grass and losing the protection against floods. Flood calculations were calculated to 85.4 m³/sec for the 50 year flood and 120m³/sec for the 100 year flood.

The soil profiles below the dam are very promising. Test holes show dense clay from 400 mm below the surface to 3.5 meters plus. Only in the centre of the valley on a depth of 2.5 meters gravel was found which could cause a leak.

Recommendations:

The flood water spillways are proposed one at each end of the embankment. Each is to be 30 meters wide. The eastern spillway is to be built at least 200 mm lower than the western spillway so that the minor spill only on the one side, leaving the other side relatively dry. This will allow for dry access onto the dam wall for pedestrians under most conditions.

5.3.5 Hydrological Analysis (Annexure I)

A hydrological analysis of the proposed storage dam, gathering information with regards to fluid drainage, watercourses, flooding etc. was undertaken.

Schoeman & Vennote

P.O. Box 2471

Brits

0250

Tel: 012 252 0458

Fax: 012 252 1120

Findings:

- The volume of water released and spilled is close to 6 times the reserve needed for the environment and any future reserve requirement will easily be met.
- The option of supplementing the surface water from the underground source to increase the assurance of supply does not impact substantially on the water balance of the surface water system and the levels of the dam. This is because the sustainable and required groundwater abstraction is small in relation to surface water source.
- It should be noted that on average, only about 17% of available surface water and about 6% of available borehole water will consumptively be used by the proposed project. Evaporation accounts for about 6% of the available surface water and about 77% of the surface water will therefore flow

downstream of the dam after requirements have been satisfied.

Recommendations:

- It is recommended that borehole water should be included in the overall water supply so that relative unknowns such as the actual long term water requirements of the development, the pattern of abstraction during different seasons and unforeseen drought conditions are catered for.
- A licence application for the storing of water, the taking of surface water from the dam and the taking of water from the borehole supply should be undertaken.

5.3.6 Geohydrological Assessment (Annexure J)

A geohydrological feasibility study was undertaken to assess the existing boreholes, to do a geophysical study for the establishment of new boreholes, to calculate the abstractable groundwater source and to propose a groundwater management system.

GEO-LOGIC Trading Trust

25th Avenue 327

Villoria

Pretoria

0186

Tel: 012 329 1352

Fax: 012 329 1352

Cell: 082 872 5705

Findings:

- Based on the calculation for the property size only, the abstraction is classified as Category A - Small Scale Abstraction (<60% of recharge on property).
- If the planned storage earth dam is built and it functions as the main supply with borehole BH01 and BH02 as backup supply, the additional groundwater recharge from the earth dam will increase the summer maximum abstraction volumes to

$233\text{m}^3/\text{d} + 86.3\text{m}^3/\text{d} = 319.3\text{m}^3/\text{d}$ and increase the winter abstraction volumes to $233\text{m}^3/\text{d} + 32.2\text{m}^3/\text{d} = 265.2\text{m}^3/\text{d}$.

- Abstraction of groundwater in the area by other users is minimal.

Recommendations:

- It is recommended that the earth dam is constructed as planned and that the groundwater source as well as the surface water source be used in tandem to supply in the demand for the Verkykerskop development. This will ensure that the groundwater source can be used on a sustainable basis.
- The water level depths, rainfall figures and abstraction figures of the proposed development must be measured on a monthly basis prior to the start of abstraction to establish historic water level trends.
- Hydrogeological monitoring data (as described above) should be evaluated bi-annually by a qualified hydrogeologist.
- A Groundwater Management Plan, with relevant Groundwater Monitoring and Reporting Protocol, should be established and calibrated annually.
- Groundwater level monitoring in all boreholes on the farm, on a monthly basis, is strongly advised, even before water abstraction for the development starts. The normal seasonal water level variation can be captured during this period. Once water abstraction for the development starts, this data will be lost.

6. IMPACT ASSESSMENT

Please refer to **Annexure K** for the draft Environmental Management Programme for the proposed development. Impact assessment must take into account the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the project stages from planning, through construction and operation to the decommissioning phase. Where necessary, the proposal for mitigation or optimisation of an impact is noted. A brief discussion of the impact and the rationale behind the assessment of its significance is also included.

A rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 3: Criteria for the classification of an impact

Nature	A brief description of the environmental aspect being impacted upon by a particular action or activity is presented.
Extent (Scale)	<p>Considering the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment phase of a project in terms of further defining the determined significance or intensity of an impact.</p> <p>Site Within the construction site</p> <p>Local Within a radius of 2 km of the construction site</p> <p>Regional Provincial and parts of neighbouring provinces</p> <p>National The whole of South Africa</p>
Duration	<p>Indicates what the lifetime of the impact will be.</p> <p>Short-term The impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase.</p> <p>Medium-term The impact will last for the period of the construction phase, where after it will be entirely negated.</p> <p>Long-term The impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by</p>

	<p>natural processes thereafter.</p> <p>Permanent The only class of impact which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.</p>
Intensity	<p>Describes whether an impact is destructive or benign.</p> <p>Low Impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.</p> <p>Medium Effected environment is altered, but natural, cultural and social functions and processes continue albeit in a modified way.</p> <p>High Natural, cultural and social functions and processes are altered to extent that they temporarily cease.</p> <p>Very high Natural, cultural and social functions and processes are altered to extent that they permanently cease.</p>
Probability	<p>Describes the likelihood of an impact actually occurring.</p> <p>Improbable Likelihood of the impact materialising is very low.</p> <p>Possible The impact may occur.</p> <p>Highly probable Most likely that the impact will occur.</p> <p>Definite Impact will certainly occur.</p>
Significance	<p>Significance is determined through a synthesis of impact characteristics. It is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.</p> <p>Low impact No permanent impact of significance. Mitigatory measures are feasible and are readily instituted as part of a standing design, construction or operating procedure</p> <p>Medium impact Mitigation is possible with additional design and construction inputs.</p> <p>High impact The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.</p> <p>Very high impact The design of the site may be affected. Intensive remediation as needed during construction and / or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.</p>
Status	<p>Denotes the perceived effect of the impact on the affected area.</p> <p>Positive (+) Beneficial impact</p> <p>Negative (-) Deleterious or adverse impact</p> <p>Neutral Impact is neither beneficial nor adverse</p> <p>It is important to note that the status of an impact is assigned based on the <i>status</i></p>

	<i>quo</i> – i.e. should the project not proceed. Therefore not all negative impacts are equally significant.
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The suitability and feasibility of all proposed mitigation measures will be included in the assessment of significant impacts. This will be achieved through the comparison of the significance of each impact before and after the proposed mitigation measure is implemented.

Issues identified are discussed and assessed below:

6.1 Soil management

The soil found in the area varies from soil with high clay content in the middle of the valley to sandy silty clay towards the outside of the valley. Refer to **Annexure E** for complete Dam Design Report.

6.1.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Site	Permanent	High	Highly probable	High	Negative
With Mitigation	Site	Long term	Medium	Improbable	Low	Positive

6.1.2 General recommendations

6.1.2.1 Planning: None

6.1.2.2 Construction:

- Construction procedure should start by the removal of the top 200 mm of topsoil from the base of the dam and stockpiled for later use. This will be used to cover the dam wall to prepare soil surface for establishing a dense grass cover over the dam wall.
- Soil disturbance should be kept to a minimum.
- The use of smooth rollers is not permitted.
- Topsoil will be removed where physical disturbance of surface will occur.

- Topsoil will be stockpiled separate and protected from weed infestation and erosion.

6.1.2.3 Rehabilitation:

- Topsoil will be returned and hydroseeded.
- Ensure topsoil is protected from erosion.

6.2 Pollution of groundwater resource

Groundwater resource needs mitigation, ensuring to contamination occurs. The groundwater source as only source was found inadequate to supply for the fully developed township. The proposed dam provides an acceptable level of supply security. Refer to **Annexure J** for the Geohydrological Assessment.

6.2.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Regional	Long term	High	Possible	High	Negative
With Mitigation	Site	Short term	Medium	Improbable	Low	Neutral

6.2.2 General recommendations

6.2.2.1 Planning:

- Groundwater level monitoring in all boreholes on the farm on a monthly basis is advised even before water abstraction for the development starts. The normal seasonal water level variation can be captured during this period. Once water abstraction for the development starts, this data will be lost.
- Water level depths, rainfall figures and abstraction figures of the planned development must be measured on a monthly basis prior to the start of abstraction to establish historic water level trends.
- Hydrogeological monitoring data (mentioned above) should be evaluated bi-annually by a qualified hydrogeologist.

6.2.2.2 Construction:

- Continues monitoring of boreholes, abstraction, water levels etc. as mentioned above.
- Any spillages should be treated and removed as soon as possible to ensure no contamination of groundwater source.

6.2.2.3 Rehabilitation:

- A Groundwater Management Plan with relevant Groundwater Monitoring and Reporting Protocol should be established and calibrated annually.
- The information gathered during abovementioned monitoring programmes can be used to manage future abstraction figures.

6.3 Erosion

High run-off from the proposed development could have a negative impact in terms of erosion. Refer to **Annexure F** for the Ecological Report. Erosion of soils (especially topsoil) should be curbed. The proposed development will probably halt a natural existing erosion donga expanding into the valley (therefore the proposed construction would create a positive impact).

6.3.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Site	Permanent	High	Highly probable	High	Negative
With Mitigation	Site	Short term	Medium	Improbable	Low	Positive

6.3.2 General recommendations

6.3.2.1 Planning:

- During clearance of the area for construction, special precautionary measures need to be in place as these areas are relatively susceptible to erosion.

6.2.3.2 Construction:

- Soil erosion should be attended to immediately.
- Access roads should be designed and maintained to curb erosion.

- For protection of the dam wall against erosion a dense grass cover needs to be established on the surface of the wall. The downstream slope of 2:1 is to be covered with a layer of top soil and planted with grass.
- Measures of erosion control such as gabions or Enviroblocks must be installed to stabilize the soil where necessary.

6.2.3.3 Rehabilitation:

- Any barren soil patches will be ripped and seeded with seed mixture of the natural occurring vegetation of the specific area.

6.3 Waste creation

Building material, construction waste and general waste must be properly managed and disposed of to reduce the risk of pollution from materials. Practices such as trash disposal, recycling, proper material handling, spill prevention and cleanup measures can reduce the potential for storm water runoff to mobilize construction site waste and contaminate soil, fauna, flora, surface and / or groundwater.

6.3.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Long term	Medium	Highly probable	High	Negative
With Mitigation	Site	Short term	Low	Improbable	Low	Neutral

6.3.2 General recommendations

6.3.2.1 Planning:

- Suitable containers should be placed on site to collect waste (to be disposed of at the nearest authorised landfill site).
- French drains will be planned (and managed) in such a way to not pollute any water source.
- No long-drops / VIP toilets are envisaged.

6.3.2.2 Construction:

- No waste (construction or domestic) must be dumped in the veld.
- No littering is permitted.

- No dumping, burning or burying of waste may take place on site.
- Spills of any waste (such as diesel, cement, paint etc.) will be reported, treated and cleaned up immediately.
- Recyclable waste will be sold or re-used.
- Proper sanitation for construction workers will be in place.

6.3.2.3 Rehabilitation:

- Ensure the site and veld is cleared of any and all waste.

6.4 Fauna

No extensive areas of particular faunal sensitivity were identified. Most of the animal communities have already moved away due to farming practices. Refer to **Annexure F** for the complete Ecological Report.

6.4.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Site	Long term	Low	Improbable	Low	Neutral
With Mitigation	Site	Short term	Low	Improbable	Low	Neutral

6.4.2 General recommendations

6.4.2.1 Planning:

- Access to the valley and wetlands will be limited to protect wildlife.

6.4.2.2 Construction:

- Care must be taken not to damage the natural vegetation that will remain during this phase and afterwards.
- Construction vehicles must stick to the constructed roads.
- No hunting, capturing or collecting of fauna on site or in the surrounding area is permitted.
- If any dangerous animals are found on site, an experienced and qualified person must be contacted to remove and translocate the animal to a safe environment.

- No fires are allowed on site. The risk of veld fires is considered high especially during the dry months.

6.4.2.3 Rehabilitation:

- The applicant will apply for a permit from all relevant authorities if any fish want to be added to the dam. No exotic fish species are allowed.

6.5 Destruction of flora

The proposed site area does not cater for unique and specialized habitats. If protected species are identified, they should be translocated. Refer to **Annexure F** for complete Ecological Report.

6.5.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Site	Long term	High	Definite	High	Negative
With Mitigation	Site	Short term	Medium	Definite	Medium	Neutral

6.5.2 General recommendations

6.5.2.1 Planning:

- It is recommended that a search and rescue exercise must be conducted on these areas where construction will take place to remove and translocate protected plants (if any are found) to a similar habitat nearby.
- Permits must be obtained from DETEA for the removal of above mentioned plants (if any are found).
- Access to the valley and wetlands will be limited to protect wildlife.

6.5.2.2 Construction:

- Care must be taken to rehabilitate degraded vegetation in the areas surrounding the proposed dam as quickly as possible.
- Alien plant control and monitoring programme must be developed.

- Care should be taken to limit destruction of the natural vegetation unnecessarily.
- Construction vehicles (and all human movement and activities) must stick to the constructed roads and designated construction areas.
- No fires are allowed on site. The risk of veld fires is considered high especially during the dry months.
- Collection of firewood on the site on surrounding areas will not be allowed.
- Alien species (Category 1 plants) must be removed by hand or approved chemicals during the development.

6.5.2.3 Rehabilitation:

- Species, especially grass, trees and shrubs occurring in the region must be used to rehabilitate disturbed areas.
- Indigenous shrubs and trees, which attract birds, should preferably be used during rehabilitation.

6.6 Aquatic species

The planned development will cause an impact on the aquatic, but these impacts will only be of temporary nature and will stabilize over time. Aquatic species and water birds will increase in the environment due to the creation of a new aquatic habitat.

6.6.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Long term	Low	Improbable	Low	Neutral
With Mitigation	Local	Long term	Medium	Definite	Medium	Positive

6.6.2 General recommendations

6.6.2.1 Planning: None

6.6.2.2 Construction:

- No groundwork material should be allowed to enter the existing dam or the river.

- Any spillages should be treated and removed as soon as possible to ensure no contamination of water source.
- Care should be taken to limit destruction of the natural environment unnecessarily.

6.6.2.3 Rehabilitation: None

6.7 Safety and security

The developer will ensure that the construction contracts include safety and security measures.

6.7.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Long term	High	Possible	High	Negative
With Mitigation	Site	Short term	Medium	Improbable	Medium	Neutral

6.7.2 General recommendations

6.7.2.1 Planning:

- The developer should liaise with the local police to ensure joint monitoring in the vicinity of the site.
- Fire-fighting equipment should be on-site at all times and construction workers should be trained in the usage thereof.
- Site should be demarcated by fencing.
- The construction contracts should include safety and security measures.

6.7.2.2 Construction:

- Precautions to ensure that construction staff and sites are visible and do not pose danger to road users, should be implemented.

6.7.2.3 Rehabilitation:

- Site should stay demarcated by fencing until rehabilitation has finished.

- The safety risk of the dam will be classified according to the Dam Safety Risk Regulations R. 139 (24 February 2012).

6.8 Dust control

Dust control is important to any construction site where there is the potential for air and water pollution from dust.

6.8.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Short term	Medium	Possible	Medium	Negative
With Mitigation	Site	Short term	Low	Improbable	Low	Neutral

6.8.2 General recommendations

6.8.2.1 Planning:

- The speed of vehicles making use of the access roads and / or construction site will be limited to 35 km/h to avoid dangerous conditions, the formation of dust and excessive deterioration of the roads.

6.8.2.2 Construction:

- The formation of dust will be controlled by the use of water spraying and / or other dust-allying agents.

6.8.2.3 Rehabilitation:

- The formation of dust will be controlled by the use of water spraying and / or other dust-allying agents.

6.9 Visual impact

The visual impact of the proposed development in the landscape is the function of several factors of which the viewing distance; visual absorption capacity and landform are measurable. The visual impact during construction phase includes the sight of the construction site and the housekeeping thereof. The visual impact during operational phase would be permanent and definite, but the impact can be lowered by planting trees which would act as visual screens.

6.9.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Permanent	High	Definite	High	Negative
With Mitigation	Local	Permanent	Low	Definite	Medium	Neutral

6.9.2 General recommendations

6.9.2.1 Planning:

- Suitable containers should be placed on site to collect waste (to be disposed of as the nearest authorised landfill site).

6.9.2.2 Construction:

- Neatness of the construction site would influence the temporary visual impact.
- Control measures over the storage of material and discarding of waste will ensure a neat impression.

6.9.2.3 Rehabilitation:

- Visual impact could be softened by planting more trees and shrubs in the area surrounding the site.

6.10 Noise impact

A relatively low noise level is expected during operational phase. A temporary noise impact is anticipated during the construction phase, but will be confined to working hours.

6.10.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Short term	Medium	Possible	Medium	Negative
With Mitigation	Local	Short term	Low	Possible	Low	Neutral

6.10.2 General recommendations

6.10.2.1 Planning: None

- 6.10.2.2 Construction:
- Construction work must be limited to normal working hours.

- 6.10.2.3 Rehabilitation:
- Rehabilitation work must be limited to normal working hours.

6.11 Impact on wetlands

Isolated pockets of wetland plants were detected on the farm Annas Dal. These include hill slope seeps, valley bottom wetlands, drainage lines and seasonal streams. The soils in these areas also indicate signs of wetness.

A riparian area, in terms of the National Water Act (Act 36 of 1998) is the “physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas. Riparian vegetation occurs along the seasonal streams that drain the valley”.

A pristine wetland occurs in the valley. It is still intact just upstream of the existing donga. The donga formed over time by erosion and has damaged the wetland on the stream banks. The impoundment of the proposed dam will be clear of the pristine part of the wetland and may serve to prevent the donga from growing deeper by building up silt at the inlet.

A number of small dams retain most of the water that flows from the catchment. Currently the hydrology of the streams can be regarded as moderately modified. Refer to **Annexure F** for the complete Ecological Report.

6.11.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Long term	Medium	Possible	Medium	Negative
With Mitigation	Local	Short term	Low	Possible	Low	Neutral

6.11.2 General recommendations

6.11.2.1 Planning:

- The development should remain outside of the drainage lines, unless a Water Use License is obtained that authorizes encroachment.
- In areas where infrastructure such as electricity cables and pipes has to cross drainage lines, DETEA's guidelines to trench through drainage lines will have to be followed by the developer.
- Wetlands must be avoided at all times (no-go areas).

6.11.2.2 Construction:

- Storm water and erosion control measures should be in place.

6.11.2.3 Rehabilitation:

- Erosion control measures should be in place, especially for barren areas.

6.12 Downstream land users

It should be noted that on average, only about 17% of available surface water and about 6% of available borehole water will be consumptively used by the proposed project. Evaporation accounts for about 6% of the available surface water and about 77% of the surface water will therefore flow downstream of the dam after requirements have been satisfied.

6.12.1 Assessment

	Extent	Duration	Intensity	Probability	Significance	Status
Without Mitigation	Local	Permanent	High	Highly probable	High	Negative
With Mitigation	Local	Short term	Low	Improbable	Low	Neutral

6.12.2 General recommendations

6.12.2.1 Planning:

- Surface water would be allowed to flow downstream after the requirements have been satisfied.

6.12.2.2 Construction: None

6.12.2.3 Rehabilitation:

- Surface water would be allowed to flow downstream after the requirements have been satisfied.

7. ENVIRONMENTAL IMPACT STATEMENT

7.1 SUMMARY OF THE KEY FINDINGS OF THE EIA

The results of this EIA report indicate that:

- the proposed development has no envisaged impact on the archaeological and historical resources;
- the geological characteristics is adequate to accommodate the planned development;
- the site has no threatened or endangered species (Red Data species);
- the planned development would have a medium-low visual impact;
- the proposed dam may protect the pristine wetland from being damaged by erosion (donga formation);
- erosion potential of the soils is relatively high especially during construction;
- this proposed development would serve the local community of Verkykerskop and surrounding through job creation during the construction phase and by water supply during the operation phase.
- these developments would create a number of employment opportunities, for especially the lower income groups, during the construction of the development.

7.2 COMPARATIVE ASSESSMENT OF THE POSITIVE AND NEGATIVE IMPLICATIONS OF PROPOSED ACTIVITY AND ALTERNATIVES

Find in the table below a comparison between positive and negative implications of the proposed activity.

Table 3: Positive and negative implications of the proposed activity and alternatives.

POSITIVE IMPLICATIONS	NEGATIVE IMPLICATIONS
Structured development planned by professional engineers.	Natural vegetation in the development footprint area will be destroyed.
Much needed water supply to the Verkykerskop area.	Illegal access to the site could take place, which could lead to possible drowning.

Employment opportunities.	Contamination if not mitigated.
Housing opportunities because supporting the township establishment.	

7.3 ASSUMPTIONS AND LIMITATIONS

7.2.1 Assumptions

- The information obtained from all different sources such as site inspections, desk studies and specialist studies is accurate.

7.2.2 Limitations

In terms of specialist studies, limiting factors included:

- Current disturbances to the proposed site, vegetation cover, etc. limited complete inspection of the ground for surface remnants of archaeological and historical material.

7.4 SHOULD THE PROPOSED ACTIVITY BE AUTHORISED

One of the stated primary objectives of the applicant is to instate best-practice land use policies comprising the protection and rehabilitation of sensitive natural area and the sustainable use of natural resources.

In the view of the environmental assessment practitioner the information contained in this report and the documentation attached hereto is sufficient to make a decision in respect of the activity applied for. There is no obvious environmental reason why the proposed development should be denied.

7.5 CONDITIONS THAT SHOULD BE MADE IN RESPECT OF THE AUTHORISATION

The following is a list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application:

- It is recommended that the mitigation measures, suggested in this report for the planning, construction and operational phases be incorporated in the Record of Decision (RoD), should this development receive authorization to go ahead. Specific recommended mitigation measures are listed in Table 13.

Table 4: A summary of the specific recommended mitigation measures for the planned development.

RECOMMENDATION	MITIGATION MEASURES
Erosion Control	The outer slope of the embankment should be protected against surface erosion by the planting of suitable grasses and the embankment, which parallels the river, should be protected with gabions or rough stone pitching up to the top of the river flood level.
Dust control	Dust could be suppressed by irrigation during the construction phase and by re-establishing of natural vegetation during the operational phase.
Archaeological or palaeontological sites could be unearthed. In this case the contractor is obliged to cease the operation temporarily.	The project archaeologist, as well as the relevant authorities must be contacted to conduct further investigations. Construction may not resume without consent.
Noise and light control	Work during construction should be limited to normal operational hours.
Site fencing	Areas should be properly fenced to keep children and animals from the proposed development property

An Environmental Management Programme (EMPr) is required for the construction phase to minimize any negative impacts during this phase. The EMPr should contain guidelines for mitigating impacts caused during the construction phase as well as address the rehabilitation of disturbed areas. A Draft EMPr is included in **Annexure K** of this report.

8. LITERATURE

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