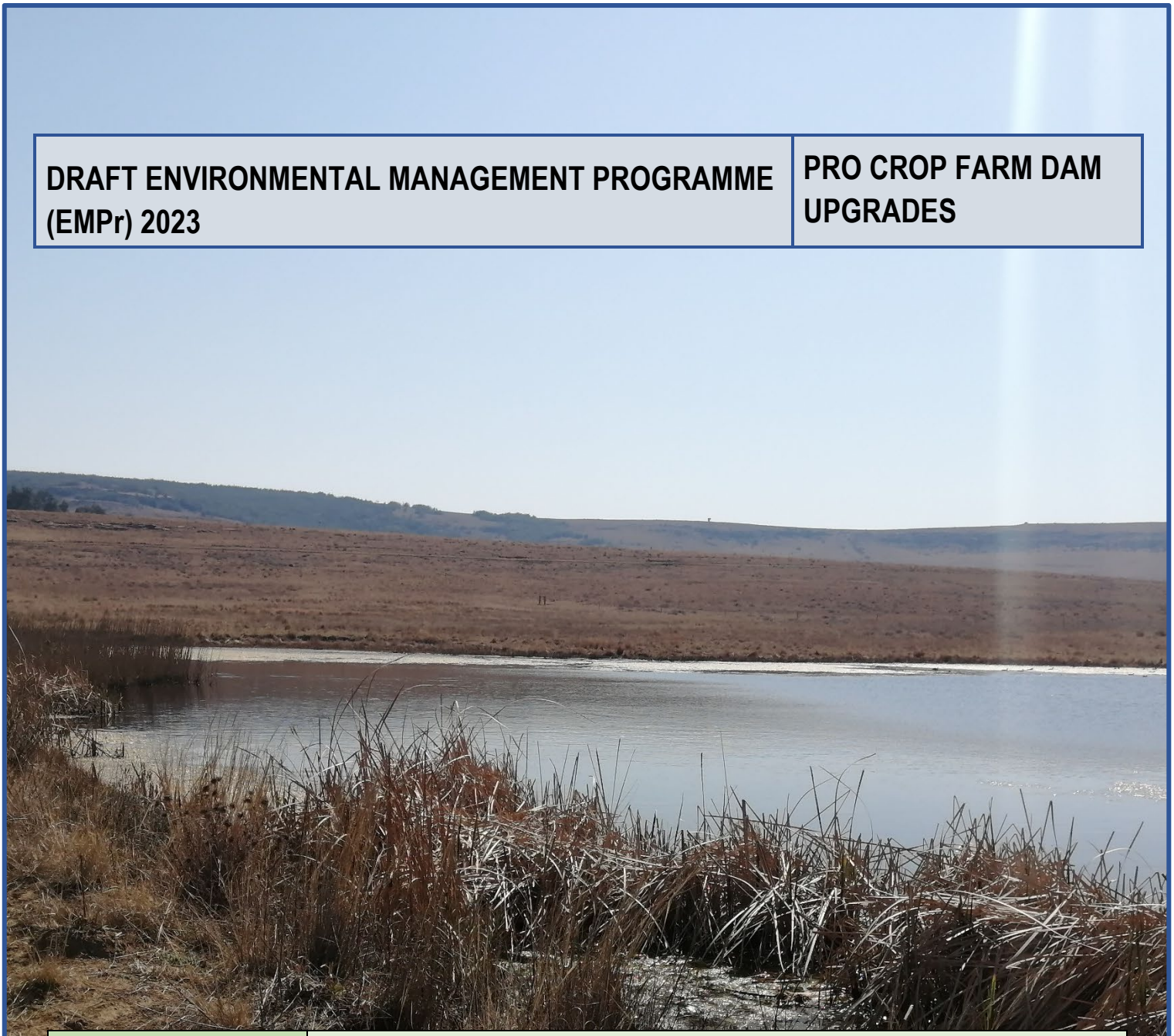
DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) 2023	PRO CROP FARM DAM UPGRADES



PROJECT NAME	**PRO CROP FARM DAM UPGRADES**
APPLICANT	**Pro Crop CC** PO Box 55 Bergville 3350 WoodG@agricare.co.za
PROPERTIES	**THE REMAINDER OF THE FARM ELON 674, THE REMAINDER OF PORTION 1 OF THE FARM HILL COTTAGE 390 AND THE REMAINDER OF THE FARM CYPRUS 567**
CONSULTANT	**AQUASTRAT SOLUTIONS** Marli Burger (EAP No. 220/2019; Pr. Sci. Nat 115534; MSc Aquatic Health) P O Box 72194, Lynnwood Ridge, 0040 Cell: +27 72 284 9332 Email: oryxsolutionsafrica@gmail.com Website: www.aquastratsolutions.co.za

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DECLARATION OF INDEPENDENCE

I, Marli Burger (820903 0245 087) declare that I:

- am subcontracted as specialist consultant for the project described in this report
- am committed to a balanced socio-economic and environmental approach to environmental management and recognize the principles of sustainable resource utilization
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- abide by the Code of Ethics of the Environmental Assessment Practitioners Association of South Africa
- have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to the project manager and client as well as the competent authority any material information regarding impacts, mitigation measures, non-compliance with the relevant authorizations and any other duty or function required in terms of the National Environmental Management Act (Act 107 of 1998), the Environmental Impact Assessment Regulations, 2014 (as amended 2017), the National Water Act (Act 36 of 1998) and relevant regulations and guidelines.

Marli Burger
SACNASP Reg. No: 115534
EAPASA Reg. No: 220/2019

DISCLAIMER

AquaStrat Solutions (Pty) Ltd has prepared this report as per agreed scope of works, and acts as an advisor to the Client within the code of ethics, and in a manner consistent with the level of care and expertise generally expected of the environmental profession and the nationally recognized and required Professional bodies. Reports are commissioned by and prepared for the exclusive use of the Client and AquaStrat cannot be held liable for any loss or damage suffered by any other party arising from the content or conclusion of this report. This report is written in good faith based on site conditions and/or information provided by the responsible parties and subsequent discussions with regulatory authorities.

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EXPERTISE OF THE EAP

ENVIRONMENTAL CONSULTANT – AquaStrat Solutions
Marli Burger: MSc Aquatic Health; EAPASA No. 2019/220; Pr. Sci. Nat. No.115534

Marli Burger, a SACNASP (Nature Conservation) and EAPASA Registered Environmental Consultant with 14 years of environmental legal compliance experience. She has a Master's degree in Science from the University of Johannesburg and specializes in Aquatic Health and Project Management. She has been involved in a variety of different types of Environmental Impact Assessments and WUL Applications including applications for water supply projects, dams, transmission lines, roads, mining, agricultural activities, residential developments and constructed wetlands in South Africa. Marli also is experienced in the use of Geographic Information Systems for environmental impact assessment and management purposes, environmental status quo reports, water quality assessments, legal compliance audits and open space planning. CV of the project EAP is attached to the BAR as Annexure E.

Marli Burger
SACNASP Reg. No: 115534
EAP Reg. No: 220/2019

1. DEFINITIONS & ABBREVIATIONS

Definitions

The definitions below are derived from various bibliography, except for the quoted definitions obtained from the National Water Act (NWA), Act 36 of 1998, the NEMA EIA regulations, GN 326 of April and Listing Notice 1, GN 327 of April 2017.

Alien or invasive vegetation	this includes species listed in the Conservation of Agricultural Resources Act (CARA regulations, 1983) and especially species listed in Regulation 507 and 508 (19 July 2013) of the National Environmental Management Biodiversity Act, 2004.
Approved Project Footprint Area	Includes the construction works area of 10m around the proposed dam upgrade activities
Construction activity	includes the building, installation and related activities during the construction/installation process or phase.
Environmental file	Record (at least one hard copy must be available on site at all times) of documentation relevant to environmental matters including, but not limited to: - Environmental Authorisation or Exemption - Water Use Licence or General Authorisation Registration or Exemption documentation - Master layout and relevant designs (storm water and/or rehabilitation structures) - Method statements - Monitoring and audit reports - Environmental Management Programme - Complaints and incidents register - Waste disposal receipts
Environmental Management Programme	"The environmental management programme must contain- (a) information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24 (1A), including environmental impacts or objectives in respect of- (i) planning and design;

	(ii) pre-construction and construction activities; (iii) the operation or undertaking of the activity in question; (iv) the rehabilitation of the environment; and (v) closure, if applicable; (b) details of- (i) the person who prepared the environmental management programme; and (ii) the expertise of that person to prepare an environmental management programme; (c) a detailed description of the aspects of the activity that are covered by the environmental management programme; (d) information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a) (e) information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on the compliance; (f) as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and (g) a description of the manner in which it intends to- (i) modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) remedy the cause of pollution or degradation and migration of pollutants; and (iii) comply with any prescribed environmental management standards or practices. The environmental management programme must, where appropriate- (a) set out time periods within which the measures contemplated in the environmental management programme must be implemented; (b) contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and (c) develop an environmental awareness plan describing the manner in which- i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment".
Environmental site training	Environmental training of all personnel on site to ensure day to day activities adhere to the EMPr (Refer to Appendix C as a guideline).
EMPr	"means an environmental management programme contemplated in regulations 19 and 23" of the NEMA, 1998
EMPr training	Environmental training provided by the ECO to the managing personnel in terms of compliance with the EMPr.
Ecological drivers	(of aquatic ecosystems) Flow regime, water quality, geomorphology.
Ecological responses	(of aquatic ecosystems) Habitat and biota
Ecosystem	An ecosystem is a community of living (biotic) organisms (plants, animals and microbes) interacting with non-living (abiotic) components of their environment (air, water, soil, minerals, etc.). The ecosystem is viewed as a complexity of interacting organisms through nutrient cycles and energy flows. Each ecosystem invariably is confined to a specific area or habitat.
Maintenance	"means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint"
Maintenance management Plan	**"**means a management plan for maintenance purposes defined or adopted by the competent authority"
Pollution	"means the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it -

	(a) less fit for any beneficial purpose for which it may reasonably be expected to be used; or *(b)* harmful or potentially harmful - *(aa)* to the welfare, health or safety of human beings; *(bb)* to any aquatic or non-aquatic organisms; *(cc)* to the resource quality; or *(dd)* to property".
Rehabilitation	The recovery of ecosystem functions and processes in a degraded habitat. Rehabilitation addresses disturbed habitats and involves establishing geological and hydrological stable environments. Rehabilitation does not necessarily return an environment to the pre-disturbed condition.
Resource quality	"means the quality of all the aspects of a water resource including - *(a)* the quantity, pattern, timing, water level and assurance of instream flow; *(b)* the water quality, including the physical, chemical and biological characteristics of the water; *(c)* the character and condition of the instream and riparian habitat; and *(d)* the characteristics, condition and distribution of the aquatic biota".
Runoff	Rainwater that flows over the land and into surface water bodies.
Site	the area (indicated by site boundary on the layout map in Appendix B) pertaining to the construction, installation, maintenance, monitoring and awareness activities
Topsoil	The top layer of soil containing organic material and in which microbial and the majority of herbaceous root growth activity occurs.
Watercourse	"means - *(a)* a river or spring; *(b)* a natural channel in which water flows regularly or intermittently; *(c)* a wetland, lake or dam into which, or from which, water flows; and *(d)* any collection of water which the Minister may, by notice in the *Gazette,* declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks"
Water resource	"includes a watercourse, surface water, estuary, or aquifer"
Wetland	"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil"

Abbreviations

EAP	Environmental Assessment Practitioner
ECO	Environmental Compliance Officer
EMPr	Environmental Management Programme
GDARD	Gauteng Department of Agriculture and Rural Development
DWS	Department of Water and Sanitation
NEMA	National Environmental Management Act, (Act No. 107 of 1998), as amended
NEMBA	National Environmental Management: Biodiversity Act (Act No. 10 of 2004)
NWA	National Water Act (Act No. 36 of 1998)
WULA	Water Use License Application

2. INTRODUCTION

Pro Crop CC is applying for Environmental Authorization and a Water Use License (WUL) for the construction and operation of the Farm Dam Upgrades, consisting of three instream dam wall expansions on **The Remainder of The Farm Elon 674, Remainder of Portion 1 Of The Farm Hill Cottage 390 And Remainder Of The Farm Cyprus 567**.

The application sites will consist of two 4.2ha dams (Elon and Cyprus dams) and one 1.36 ha dam, and will include borrow pits as the majority of the material for the embankments/dam walls. The project area (3941 ha) is situated 14.2 km south-east of Warden along the gravel road towards Verkykerskop in the Free State Province.

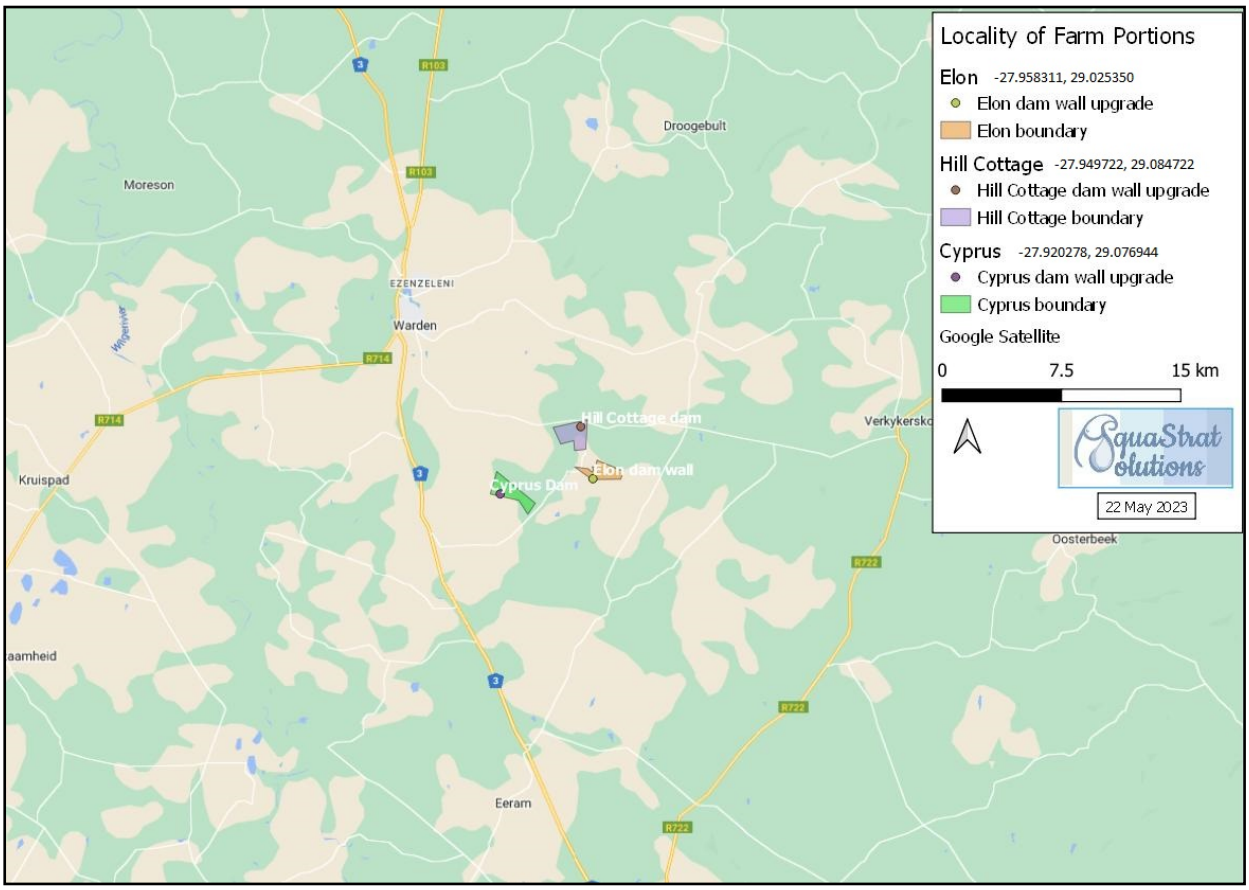

Figure 1. Locality of the site

This EMPr will serve as guideline for mitigation measures of potential impacts on the environment during the process of construction, but more importantly, will form the guideline document for ongoing management activities related to natural resources and the environment on the property. Specialist studies that inform this document are included in the reference list, and include Aquatic Assessment, Terrestrial Fauna and Vegetation Assessments, Heritage (Archaeological and Palaeontological), and Hydrology Assessments.

The **EMPr** is a working document and must be **updated** when:

- ❖ management or mitigation measures change (may require approval)
- ❖ activities that trigger an Environmental and/or Water Use Application (requiring approvals).

The **planning documents** incorporated in the BA and EMPr include:

- ❖ Free State Biodiversity Conservation Plan V.1
- ❖ Phumelela Spatial Development Framework 2012/16
- ❖ Phumelela Metropolitan Municipality (draft) Integrated Development Plan 2020/2027

The following provincial, municipal and **site sensitivities** incorporated into the BA and EMPr include:

- Conservation Plan: ESA 1 & 2
- Endangered Ecosystem: Eastern Free State Sandy Grassland vegetation type
- Nearest Protected Area: None
- Vegetation: The study areas are located within natural watercourse systems; some Provincially protected plants that require a permit for relocation.
- SCC fauna: buffer zones for Martial Eagle, Blue Crane and Otter
- Other species: Aardvark burrows
- Aquatic: Channelled valley bottom wetlands
- Heritage: old farm structure (not affected by proposed activities)

The **expected outcomes** of the 2023 EMP implementation include:

- Mitigation of impacts during construction and operation on:
  - biodiversity, habitat and ecology during construction and operation
  - natural resources and socio-economic aspects during construction and operation
  - SCC remain protected during the construction and operational phases, and are not disturbed or if required, disturbed minimally, during construction.
  - Stormwater management during construction
- Maintaining terrestrial biodiversity by means of habitat management and improvement
- Provide monitoring measures to gauge the progress and inform adaptive management measures.

This EMPr will serve as the **Maintenance Management Plan** for the defined activities to be undertaken site.

3. LEGAL REQUIREMENTS OF EMPr

According to Appendix 4 of the amended EIA Regulations (GN 326 of 7 April 2017), the content of and Environmental Management Programme (EMPr) should include:

NEMA EIA amended Regulations	Section
(1)□□ An EMPr must comply with section 24N of the Act and include─ □ (a) details of– (i) the EAP who prepared the EMPr; and (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	Appendix A
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 4
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Appendix B
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including─ (i) planning and design; (ii) pre-construction activities; (iii) construction activities; (iv) rehabilitation of the environment after construction and where applicable post closure; and (v) where relevant, operation activities;	Section 5 read with Section 6
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to — (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; (ii) comply with any prescribed environmental management standards or practices; (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and (iv) comply with any provisions of the Act regarding financial provision for rehabilitation, where applicable;	Section 5 read with Section 6
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 9
(h) the frequency of monitoring the implementation of the impact management actions	Section 9

contemplated in paragraph (f);	
(i) an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 6
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 9
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 5
(m) an environmental awareness plan describing the manner in which— (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 7
n) any specific information that may be required by the competent authority.	Section 11

4. ACTIVITY AND METHOD STATEMENT

Construction Phase:

The proposed project includes expansion of the following dams and activities:

- new dam wall to increase capacity of Cyprus dam from 14 800m3 to 101 000m3.
- new dam wall to increase capacity of De Villiers dam from 14 500m3 to 250 000m3.
- new dam wall to increase capacity of Hill Cottage dam from <2000m3 to 22 400m3.
- borrow pits for the dam wall material

The applicant intents to clear vegetation and excavate and infill within the relevant watercourses in order to expand the three existing dams.

Operational Phase:

The purpose of the expansion of the dams is to provide sufficient drinking water for 240 cattle, which is within carrying capacity for the farm size (verbal confirmation from applicant, 2022). Other existing activities on the farm include rainfed crops. Two pivot point fields will also be planted on the existing fields and a Water Use License Application is being applied for.

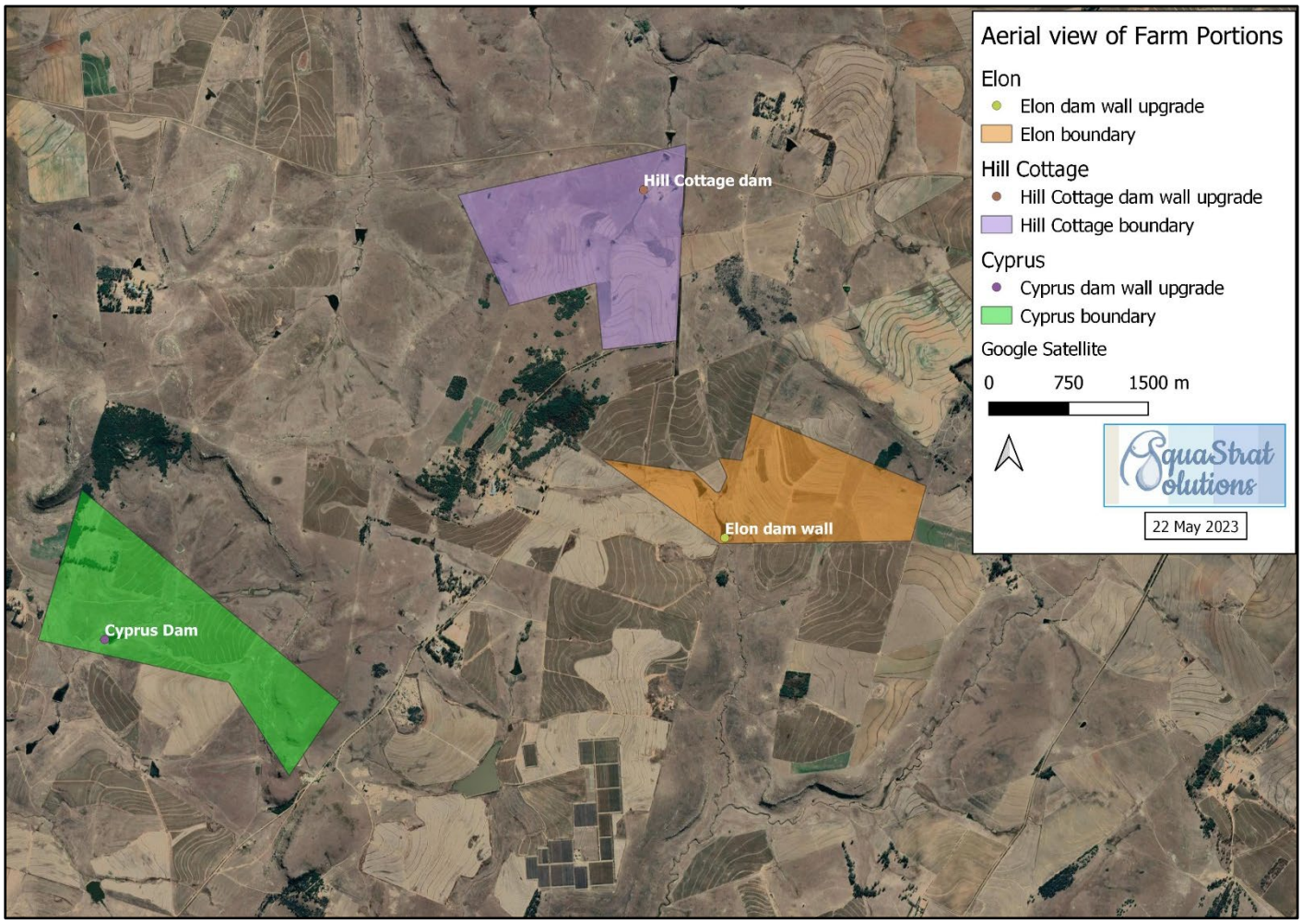

Figure 2. Localities of the farm portions where farm dams are to be upgraded.

Refer to the Design Reports and Designs included in the BAR as Appendix C.

5. ENVIRONMENTAL SENSITIVITIES

The following aspects include the sensitivities on the property that need to be incorporated into management/mitigation measures:

- **SCC vegetation**: no SCC vegetation; some Provincially protected plants including *Eucomis, Boophone, Gladiolus, Stapelia, Ceropegia, Trichocaulons (*Asclepiadaceae*), Helichrysum,* Asphodelaceae family.
- **SCC fauna**: Martial Eagle, Blue Crane and Otter; Aardvark burrows
- **Aquatic**: Channelled valley bottom wetlands

6. SUMMARY OF IMPACTS, MITIGATION & OUTCOMES

The table below summarizes the impacts, mitigation and monitoring measures during construction and operation. The Mitigation measures are discussed in more detail in Section 9 of the EMP.

Table 1. Summary of the expected impacts, mitigation and monitoring measures of the proposed activities:

Resource	Impact	Legislation	Performance indicator	Construction Phase Mitigation Measures	Monitoring method & frequency	Operational Phase Mitigation measures	Monitoring method & frequency
Soil	Compaction	Conservation of Agricultural Resources Act, Act 43 of 1983.	Not specified	9.1.6 **Soil protection**	Visual / photographic; monthly ECO report	9.2.1 **Erosion control**	Annually after completion of topsoil replacement
	Pollution			9.1.2 **Vehicles & hazardous material** 9.1.3 **Erosion & sedimentation** 9.1.4 **Stormwater & surface water resources**	Visual / photographic; monthly ECO report		
	Erosion			9.1.3 **Erosion & sedimentation**	Visual / photographic; monthly ECO report		After heavy rainfall events during the first season after rehabilitation and annually thereafter

Vegetation	Clearing and Provincially protected plant removal	National Environmental Management Act, Act 108 of 1998; National Environmental Management: Biodiversity Act, Act 10 of 2004 TOPS list; Red Data list	Not specified	9.1.1 **Prior to construction**	Visual / photographic; monthly ECO report	N/A	Bi-annually for first year after rehabilitation and annually thereafter.
	Alien Invasive Vegetation	National Environmental Management: Biodiversity Act, Act 10 of 2004 Alien & Invasive Species list of 2020		9.1.5 **Alien invasive vegetation**	Visual / photographic; monthly ECO report	9.2.3 **Alien Invasive Vegetation Control**	Bi-annually for first year after rehabilitation and annually thereafter
	Fire	National Veld and Forest Fire Act,		9.1.7 **Vegetation & Fauna**	Visual / photographic; monthly ECO report	9.2.4 **Fire regime**	Annual (if required for maintenance)

Biodiversity	Habitat destruction	National Environmental Management: Biodiversity Act, Act 10 of 2004	Not specified	9.1.1 **Prior to construction** 9.1.7 **Vegetation & Fauna**	Visual / photographic; monthly ECO report	9.2.6 **Vegetation & Habitat protection**	Annual habitat assessment
Surface water	Sedimentation	National Water Act, Act 36 of 1998	Resource Quality Objectives of specific catchment for comparison	9.1.4 **Stormwater & surface water resources**	Monthly upstream and downstream sampling of Water quality of receiving watercourse: TSS, Turbidity	9.2.2 **Stormwater Management** Communicate maintenance, illegal disposal of waste, and sewer leaks or pollution to council.	After heavy rainfall events during the first season after rehabilitation and annually thereafter
	Pollution general	National Environmental Management: Waste Act, Act 59 of 2008.		9.1.9 **Waste management**	Monthly upstream and downstream sampling of Water quality of receiving watercourse: pH, temperature, instream flow, TDS		
	Pollution organic			9.1.4 **Stormwater & surface water resources**	Monthly upstream and downstream sampling of		

					Water quality of receiving watercourse: TSS, Turbidity		
	Pollution hazardous			9.1.2 **Vehicles & hazardous material**	Monthly upstream and downstream sampling of Water quality of receiving watercourse: TSS, Turbidity		
Groundwater	Pollution		Not specified	9.1.1 **Prior to construction**	Test when required	Not expected to require mitigation in operational phase.	When pollution is suspected.
Air Quality	Dust	NEM: AQA (No. 39 of 2004) Dust Control Regulations (GN 872 November 2013)	Gravimetric Dust Fallout must be below the stipulated limit 1200 mg/m²/day	9.1.11 **Dust**	Visual / photographic; monthly ECO report	Not expected to require mitigation in operational phase.	N/A

	Noise	NEM: AQA (No. 39 of 2004) Dust Control Regulations (GN 872 November 2013) Noise Control Regulations Government Notice 5479 of 1999, promulgated under the Environment Conservation Act 1989 (Act 73 of 1989)	Not specified	9.1.10 **Noise & Safety**	Complaints register to be checked by ECO; communicate with ward councillor / neighbours if required to verify working hours	Not expected to require mitigation in operational phase, besides operating within business hours.	N/A
	Health	Occupational Health and Safety Act (Act No. 85 of 1993)	Not specified	Occupational Health and Safety Act (Act No. 85 of 1993)	Visual / photographic; monthly ECO report	Not expected to require mitigation in operational phase.	N/A
Heritage	Destruction of structures or artifacts	The South African Heritage Resources Act (SAHRA),	Not specified	9.1.8 **Heritage**	Visual / photographic; monthly ECO report	9.2.7 **Heritage Resources Protection**	N/A

		1999 (Act No. 25 of 1999)					
Services	Capacity	Water Services Act, Act 108 of 1997	Not specified	Communicate maintenance or pollution to council.	Visual / photographic; monthly ECO report	Communicate maintenance, illegal disposal of waste, and sewer leaks or pollution to council.	Annually with audit
Social	Safety	Occupational Health and Safety Act (Act No. 85 of 1993)	Not specified	Environmental education to include snake find protocols and provision of contact numbers of nearest snake handler.	Visual / photographic; monthly ECO report	9.2.8 **Social Aspects**	N/A
	Visual	National Environmental Management Act, Act 107 of 1998.	Not specified	Closing off construction camp with shade net.	Visual / photographic; monthly ECO report	Not expected to require mitigation in operational phase.	N/A

The daily and current activities that may have an impact on the receiving environment have been considered and mitigation measures are included in Section 9. Monitoring of mitigation measures will assist in indicating effectiveness of implementation and/or methods.

7. ROLES, RESPONSIBILITIES & PROJECT PHASES

At least one copy of this EMPr must be kept at the facility office (or be available at all times on site) and must be distributed to all managing personnel who must familiarise themselves with the contents. All staff must receive environmental training on site (Appendix C contains minimum/basic rules).

Definition of Roles:

Environmental (General) Manager: overall responsibility for managing the project team consisting of employees and consultants and ensuring that the EMPr requirements are met. The general manager has the authority to stop activities that are in contravention of the relevant authorisation and/or the EMPr.

Environmental site agent (employee): Responsible for monitoring compliance with the EMP with the guidance of the General Manager and if necessary, the environmental control officer.

Environmental Control Officer/Environmental Auditor: An independent appointment to objectively monitor implementation of relevant environmental legislation, conditions of Environmental Authorisation, and the EMP, as well as the WUL conditions. The ECO should consult specialist expertise as and when required. The ECO must conduct audits on compliance to relevant environmental legislation, conditions of Environmental Authorisation, and the EMPr, as well as the WUL. The ECO must liaise between the relevant authorities and the project team. The ECO must communicate any changes or specific requirements of the relevant authorities to the developer and consulting engineers as required. The ECO must be proactive and be suitably experienced with the relevant environmental management qualifications and competent in relevant methods and practices. The ECO must treat information received from whistle blowers in a confidential manner and must address and report these and other incidences to the relevant Authority as soon as possible.

Contractor: Responsible for overall compliance by all contractors by means of method statements.

EAP: Individuals or firms who act in an independent and unbiased manner to provide information for decision-making and manages all environmental and related applications.

PHASES

Planning Phase

Pre-construction activities include demarcating sensitive areas and defining the access road/pathway to the site. Environmental site training must be provided to all site personnel.

Construction Phase

This phase commences as soon as the first site preparation (generally clearing of vegetation and stockpiling of topsoil) is done and is complete when all construction/installation activities and clean-up have taken place.

Rehabilitation Phase

This phase generally commences after completion of construction phase and can continue into the operational phase.

Operational Phase

Maintenance mitigation measures must be accompanied by monitoring to compare results of rehabilitation for the period specified in the EA, WUL and other relevant authorisations, exemptions and/or specifications.

Table 2. Responsibilities of Environmental Compliance on site

Activity **Implement** action **Verify** implementation **Monitor** EMP compliance	**Environmental Manager**	**Environmental Control Officer**	**Contractor**	**Phase**
Method statements	Verify	Monitor	Implement	Planning / Pre-construction
Pre-construction site meeting	Verify	Monitor	Implement	Planning / Pre-construction
EMPr training	Verify	Monitor	Implement	Planning / Pre-construction
Environmental Site Training	Verify	Monitor	Implement	Planning / Pre-construction
Keep incident & complaints register	Implement	Monitor	Implement	Construction: Contractor Operational: Manager
Rehabilitation of construction impacts	Verify	Monitor	Implement	Post-construction
Continuous implementation of EMPr and monitoring	Implement	Monitor	N/A	Operational

Audit compliance with EMPr, EA and legislation	Verify	Implement	N/A	Construction & Operational
Liaise with authorities and project team on special requirements	Verify	Implement	N/A	Planning / Pre-construction Construction & Operational

8. ENVIRONMENTAL AWARENESS

The contractor shall ensure that adequate environmental training takes place. **All employees involved** in **construction, rehabilitation and/or ongoing management mitigation measures**, shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees. The following aspects need to be discussed during the Environmental Awareness Training:

- The importance of conformance with all environmental policies and the consequences of departure from standard operating procedures;
- Environmental impacts, actual or potential, caused by work activities, prevention measures to avoid them and mitigation measures when they occur;
- Work force roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirement of the Developer's environmental management systems, including emergency preparedness and response requirements; and
- The environmental benefits of improved personal performance.

Induction: The contractor shall provide evidence that such induction courses have been presented.

Ongoing environmental management awareness:

- All personnel must be made aware of the importance of floral and faunal SCC and the conservation of such species within the project area. All staff to receive basic training on management measures.
- No harvesting of firewood or collection of floral species from natural areas surrounding the project footprint should be allowed by staff.

9. MANAGEMENT MITIGATION MEASURES

The construction requires specific mitigation measures in order to minimise the potential impacts on the environment as identified and rated in the Basic Assessment Report (2023).

The operational phase of the facility also requires specific management measures to ensure rehabilitation of areas disturbed during construction is rehabilitated, as well as to mitigate potential impacts of the day-to-day operation of the park on the environment and natural resources.

These management actions are rarely included in the planning and budgeting phase, however are essential to the ongoing sustainable protection of the affected natural resources. Listed and described below are the management actions required to protect the terrestrial and aquatic ecosystems of the study site. These are to be supplemented by any specific requirements of other authorisations.

9.1 Specific mitigation measures to address **CONSTRUCTION IMPACTS**

The expected impacts that may result during the construction phase have to be minimised by means of the following measures:

9.1.1 Prior to construction

- Clearly demarcate the approved project footprint and prohibiting unnecessary disturbance to natural vegetation by construction workers. A temporary fence or demarcation must be erected around the construction area (include the actual footprint, as well as areas where material is stored) to prevent access to adjacent sensitive vegetation
- Demarcate the edge of the 350m no-go buffer for the Martial Eagle nest, on the ground.
- Keep overall sensitivity map on site to ensure protective fauna buffer zones are implemented.
- Faunal specialist to execute an intensive trapping and active searching exercise within the inundation zone of each dam aimed at to capturing and safely relocation as many wetland dependant rodents, shrews, reptiles and amphibians as possible. At least three trap days per dam should be sufficient. The relocation exercise should be conducted in summer preferably just after the first big rains.
- Search and Rescue for Provincially protected plants by vegetation specialist; obtain permits for relocation.
- Alien invasive management plan must be drafted and site sensitivities must be incorporated
- Contracts with contractors must specify actions that will be taken against contractors who do not conduct activities in line with the EMP
- Topsoil:
    a. Prior to construction, the topsoil must be removed and stored separately from subsoil. The topsoil is imperative for the successful re-establishment of indigenous vegetation and it carries seed from the existing vegetation

b. Topsoil (the upper 25 cm of soil) is an important natural resource; where it must and can be stripped, never mix it with subsoil or any other material, store and protect it separately until it can be re-applied, minimise handling of topsoil.
c. Topsoil is typically stored in berms with a width of 150 – 200 cm, and a maximum height of 100 cm, preferably lower, ideally in a disturbed but weed-free area. Place berms along contours or perpendicular to the prevailing wind direction.
d. Rapid decomposition of organic material in warm, moist topsoils decreases microbial activity necessary for nutrient cycling, and reduces the number of beneficial micro-organisms in the soil. Therefore, topsoil should therefore not be stored for extensive periods and it is recommended that the reapplication of topsoil takes place as soon as possible. Adhere to the following general rule: the larger the pile of topsoil storage needs to be, the shorter should be the time it is stored
e. Topsoil handling should be limited to stripping, piling (once), and re-application.
f. Any movement of heavy machinery or vehicles over stored topsoils must be strictly prohibited.

- Stormwater management for construction period must ensure that there is no runoff from the construction, storage and borrow pit areas into the watercourses.

9.1.2 Vehicles & hazardous material

- Vehicle access beyond limits of the project footprint must be prohibited
- All construction vehicles and equipment, as well as construction material should be free of plant material. Therefore, all equipment and vehicles should be thoroughly cleaned prior to access on to the construction areas. This should be verified by the ECO.
- Drip trays must be provided for vehicles parked on site.
- Avoid unnecessary vehicle movement on site and limit speed.
- No services or washing of vehicles on site is allowed.
- Minimise the impact of construction vehicles and on-foot traffic by limiting movement to one access road and one foot path.
- Spills and waste should be immediately cleaned up/removed. Spill kit to be kept and implemented on site.
- Prevent spillage from chemicals, fuels or hazardous material containers by means of bunds or drip trays.

9.1.3 Erosion & sedimentation

- Ensure prevention/control measures are implemented along watercourses to prevent erosion during construction
- Implement soft technique erosion control measures in eroded watercourses and take cognisance of the listed activities related to this activity, for which the environmental thresholds are infilling/excavating 10m^3 of material into or from a watercourse, and infrastructure of 100m^2 within a watercourse.
- Rehabilitate and re-vegetate cleared areas immediately downstream of dam.
- Protect stockpiles from erosion by placing in flat areas and surrounding with a berm.
- Stabilise access and regular work areas where necessary to avoid erosion.

- Project footprint: the development footprint must remain within authorised limits of disturbance and the amount of vegetation cleared must be limited to what is absolutely necessary.

9.1.4 Surface water resources & Stormwater management

- It is recommended that no dam raising activities take place at Hill Cottage Dams 1 and 2. This is important to avoid impacts to the downstream peat wetland unit.
- It is recommended that the livestock watering within the organic wetland habitat of HGM1 is avoided
- It is recommended that impoundments only be raised should it be found absolutely required
- A water balance assessment is therefore recommended to ascertain whether the raising of the impoundments is necessary.
- Should the raising of the impoundments be considered, it is recommended that a floodline assessment which incorporates the expected inundation zone of the raised impoundments is derived.
- The ecological water requirements for the downstream watercourses must be maintained where at minimum 25% of the Mean Annual Runoff for each watercourse is maintained during the low flow period.
- Attenuation of storm water runoff must be implemented during the construction phase to settle out sediments and prevent the release of contaminated (sedimentation or pollutants) stormwater.
- Use sediment controls, such as erosion berms and silt traps, where necessary.
- Storing of equipment, building materials, vehicles, chemicals/hazardous substances must be done at the site camp with relevant pollution control measures such as drip trays and bunds.
- Operation and storage of machinery and construction-related equipment must be done outside of wetlands/watercourses as well as outside natural surface water runoff areas, as much as practically possible.
- Routinely check machinery for oil or fuel leaks each day before construction activities begin
- Stockpiling must not be stored in watercourses, drainage lines or any sensitive habitat on site and the method of storing must not cause erosion, sedimentation or compaction. Topsoil must be stored separately and replaced as soon as construction/installation is complete.
- Excavation and construction must preferably take place in winter months/dry period; however, control measures must be applied if construction cannot be limited to the dry months.
- Sanitation – portable toilets to be provided where construction is occurring. Workers need to be encouraged to use these facilities and not the natural environment. Toilets should be located outside of the wetlands/watercourses and any natural surface water runoff areas. Waste from chemical toilets should be disposed of regularly and in a responsible manner by a registered waste contractor.
- Waste from chemical toilets should be disposed of regularly and in a responsible manner by a registered waste contractor.

9.1.5 Alien invasive vegetation

- Declared weed and invader species must be removed before (Category 1b) and during construction and must be ongoing after construction/installation.

9.1.6 Soil protection

- All areas of disturbed and compacted soils need to be ripped, landscaped and be prepared for vegetation re-establishment. This should not exceed the approved project footprint area.
- Contaminated soil must be removed and taken to an appropriate (hazardous) waste facility, the spill recorded in the spill register, the ECO informed and the relevant punitive measures taken.
- Topsoil must be stored separately to protect seedbank for vegetation re-establishment.
- Method of storing must not cause erosion, sedimentation or compaction.
- Any disturbed, denuded or eroded areas noted must be rehabilitated to avoid progressive habitat degradation
- Excavated material may not be placed in drainage areas or wetlands

9.1.7 Vegetation & Fauna

- Elon dam construction must be limited to the non-breeding season (from January to end April), nesting period 2.5-4 months.
- Avoid disturbing, clearing or excavating the series of Aardvark burrows 186 m south-west of the dam wall (-27.951395°; 29.084632°). These burrows are actively used not only by provincially Protected Aardvark but also African Clawless Otter and a host of other mammals and also Ant-eating Chats.
- To minimise impacts on otters and other wetland associated SCC limit construction activities to normal working daylight hours (from 09:00-17:00) when otters and other wetland SCC are least active and by timing construction outside of peak breeding season (mid-summer, November-February).
- Keep dust low by wetting roads during construction;
- Minimise the effects of light pollution on nocturnal fauna; This may be achieved by:
  - Keeping all external perimeter lighting to a minimum
  - Fitting all outdoor lights with hoods and angle them downwards; and
  - Avoid lights with high UV content (blue-white short wavelength lights) as they are very attractive to insects. Instead opt for warm (long wavelength) yellow-red light.
- Keep the disturbance footprint as small as possible and prohibit the moment of vehicles in the ecologically sensitive areas.
- Utilise the same access routes and avoid the unnecessary creation of additional tracks.
- For all dams other than De Villiers Dam (which needs special timing to avoid disrupting Martial Eagle breeding) do initial vegetation clearing in Winter.
- Avoid construction, stockpiling or equipment storage in areas of High or Very High sensitivity namely the grasslands, rocky outcrops and Martial Eagle bushclump
- No fires are allowed on site and especially no burning of waste is allowed.
- No hunting or removing of animal species or fishing of indigenous species is allowed on site.

- ❖ No disturbing of nests, burrows and other habitat of indigenous fauna is allowed on site.
- ❖ After construction, the land must be cleared of rubbish, surplus materials, and equipment, and all parts of the land must be left in a condition as close as possible to that prior to construction
- ❖ A vegetation rehabilitation plan must be drawn up and implemented if vegetation growth in areas where topsoil is replaced, is unsuccessful.

9.1.8 Heritage

- ❖ If archaeological sites or graves are exposed during construction work, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made. The "chance find protocol" as described in the HIA report (Forssman & Lotter, 2021) must be implemented.
- ❖ 30m buffer zone around old farm structure, not expected to be impacted.

Chance Find Protocol

The following guidelines should be implemented by the applicant and all associated contractors (e.g., developers, builders, landscapers, etc.) should heritage resources be encountered during the development activities. This applies to all archaeological and palaeontological heritage, in addition to graves and burial grounds. Given that heritage resources have been identified on the property, and based on the SAHRIS low palaeolontological sensitivity for the property that requires a finds protocol, the following steps should be implemented. Where necessary, the applicant should enlist the services of a suitably-qualified heritage professional to assist with any mitigation work or to implement the recommendations provided by additional heritage and/or professional bodies.

Steps:

1. All development activities should be halted and the heritage resource should be avoided.
2. The individual (e.g., staff member, contractor, etc.) who identified the heritage resource should immediately notify the appropriate person (i.e., assigned individual who is managing or supervising on site activities, such as the Site Foreman, Site Manager, or Environmental Control Officer).
3. All information pertaining to the chance find should then be recorded by both the individual and the appropriate person, namely:
    a. The exact site location (preferably using a GPS)
    b. Photos of the find in the landscape prior to removal (i.e., if artefacts have to be removed, photos of their location should be taken before they are moved).
    c. Photos using an appropriate scale should also be taken (i.e., placing a pen or ruler next to the finds)
    d. Time and date of the discovery
    e. A brief description of the discovery and, if possible, the level of preservation (i.e., pristine or disturbed).
    f. In the case of any loose artefacts/fossils at the surface that are at risk of being destroyed and/or removed, and if this destruction/modification cannot be avoided, they should be put aside and protected (placed in appropriate storage bags/boxes with suitable labels and information on their original location). In the case of grave/burial goods, these should be left as is

4. The appropriate person should then contact a suitable specialist/s (e.g., archaeologist, palaeontologist, etc.) to assess the significance of the identified heritage resources. Photos of the discovery/resources can be sent to the specialist/s for preliminary assessment. In the case of burials/graves, the appropriate person should notify the South African Police Services (SAPS), in addition to the Burial Grounds and Graves (BGG) Unit of the South African Heritage Resources Agency (SAHRA).
5. If, after preliminary assessment, the specialist deems the discovery to be significant/sensitive, then the appropriate person should coordinate a site visit/inspection with the relevant specialist/s. For burials/graves, an inspection by SAPS and the SAHRA BGG Unit will be required to assess the age of the burial and whether it is archaeological, historic, or forensic. Generally speaking, the BGG Unit will allow a suitably-qualified specialist to inspect and report on the burial/grave on their behalf, and the applicant should appoint a qualified professional to perform the inspection in conjunction with SAPS.
6. During the site visit, the appropriate person should show the specialist/s the location of the discovery, and they should also make available all the collected artefacts/fossils for further assessment by the specialist/s. The specialist/s should also be shown any other areas of interest, where applicable, that have been affected by the development activities.
7. Palaeontological heritage, if deemed significant and of scientific value by the specialist/s, should be removed and curated wherever appropriate (local repository) for future study. A permit for removal is required by the specialist/s, for which an application needs to be made to SAHRA. In addition, local Heritage Resource Authorities (HRAs) may need to be contacted. For archaeological heritage of the same nature, the same will apply and a Phase II mitigation programme may be established to record, document, and preserve the encountered sites and/or heritage. As per SAHRA regulations, all reporting guidelines must be followed by the relevant specialist/s when receiving permits for mitigation work. For burials/graves, SAPS and the BGG Unit will make the applicant aware of any additional measures they should put in place to mitigate future impacts to the discovery.
8. Once the development activities continue post-mitigation/assessment, future site inspections by specialists will only be needed if additional heritage resources are identified.

9.1.9 Waste management

- All waste must be separated according to type and stored in separate drums, adequately marked according to waste sort. Waste collected during the construction phase will be recycled, re-used or recovered as far as economically feasible.
- Waste Hierarchy: Avoid, minimize, and 30% reuse and/or recycle.
- Waste must be removed to a registered landfill site and receipts must be kept in the Environmental File as proof.
- Washing of containers, wheelbarrows, spades, picks or other equipment contaminated with cement or chemicals must be prohibited on site.
- Portable toilets, if used, must be placed outside a 100m buffer from the edge of the watercourses.
- Liquid and hazardous waste must be contained and weekly monitoring for leak prevention, structural integrity and deterioration must be done by ECO.

- Due to proximity of petrol stations, hydrocarbon storage on site should be limited to daily needs only.

9.1.10 Noise & Safety

- Adhere to working hours as stipulated in the Environmental Authorisation, usually between 8am to 5pm.
- Contractors should commit to following road safety rules.
- Ensure all excavations are clearly marked with construction tape or similar material.

9.1.11 Dust

- If dust control is required (low probability), measures including wetting of roads and/or construction area can be implemented.

9.2 Specific mitigation measures for the **OPERATIONAL PHASE** include:

9.2.1 Erosion control

- Reinstating and repairing damaged spillways and embankments and rehabilitation measures including sandbags, hessian sheets, silt fences, retention or replacement of vegetation and geotextiles such as soil cells which must be used in the protection of slopes.
- Any erosion or areas prone to erosion noted should be rectified immediately making use of soft engineering techniques where feasible.
- Erosion should be avoided as far as possible by ensuring good vegetation cover, especially in the watercourses. Natural vegetation should be retained.
- Erosion must not be allowed to develop on a large scale before effecting repairs.

9.2.2 Stormwater Management

- Maintenance of spillways and embankments must be implemented as required.
- Stormwater release areas must be protected from erosion by reducing the velocity by means of energy dissipaters.

9.2.3 Alien Invasive Vegetation Control

- Removal of alien invasive plants (refer to Section 11 in this report) should form part of ongoing management budgeting and planning.
- Removal should start upgradient and move downwards in the topography to avoid dispersal from upper reaches, especially along the drainage area, thereby minimising effort required to control these species.
- Ensure that areas outside of the operational footprint that were disturbed, are adequately rehabilitated and that dense stands of encroacher species are prevented

9.2.4 Fire regime

- Firebreaks for the protection of property should be done in alternating strips (different strips parallel to the previous year's firebreak) to avoid burning the same strip every year, which will alter the vegetation composition negatively.
- Firefighting readiness: equipment and systems, action plan as required by the National Veld and Forest Fire Act, Act 101 of 1998.
- Controlled management fire objectives include enhancing vegetation diversity and/or to remove build-up of moribund grass.
- Controlled management fire: burning should be implemented according to a fire management plan in order to maintain grasslands, taking the following into consideration:
  - Best practice principles, methods and procedures;
  - The season of burning;
  - The type of fire;
  - Frequency of burning;
  - Percentage of land area to be burned at a time;
  - The presence and maintenance of fire breaks;
  - Training of staff;
  - Procurement of firefighting equipment;
  - Site preparation, i.e., removal of alien species that could contribute a high fuel load;
  - Potential impacts on small animals;
  - After fire management; and
  - Approval and coordination from the surrounding land owners and the relevant authorities.

9.2.5 Waste Management

- Allocate a designated organic **waste management area**, where alien invasive species material that may contain viable seed, can be safely (temporarily) stored after removal to avoid further spread. No dumping or storing of waste may take place outside the designated waste management area.

9.2.6 Vegetation & Habitat protection

- Staff should be educated on their requirements in terms of the site sensitivities.
- Implement monitoring as recommended in Section 13 of this report.

9.2.7 Heritage Resources Protection

- Implement 30m buffer zone
- Refer to (oo) to (rr) of Section 9.1 in this report for Archaeological chance finds on the property.

10. IMPORTANT INDIGENOUS VEGETATION

The Provincially protected species including *Eucomis, Boophone, Gladiolus, Stapelia, Ceropegia, Trichocaulons* (Asclepiadaceae), *Helichrysum*, Asphodelaceae family, require a Provincial permit for relocation. No vegetation buffer has been recommended, but activities must avoid sensitive areas as much as possible.

11. ALIEN & INVASIVE VEGETATION MANAGEMENT

- Ongoing alien invasive species management must take place, with emphasis on eradicating NEMBA Category 1b listed alien invasive species.
- Alien species encroachment into the surrounding natural areas must be prevented.
- Eradication should include follow-up control and the eradication of seedlings and sapling that may emerge to limit re-invasion.
- Placement of removed alien species plant material within the proximity of drainage lines should be avoided as this may inadvertently contribute to the downstream spread and proliferation of such species.
- Hand-pulling and mechanical means of removal should be used wherever possible, as opposed to using chemical control.
- When using chemical control methods, the manufacturer's specifications are to be followed, especially in terms of quantities, time of application etc. Care should be taken when using chemical control methods in wetland and drainage channels.
- It must be ensured that only properly trained people handle and make use of chemicals.
- All areas where alien and invasive species have been removed must be rehabilitated if removal leads to the exposure of soils.
- A long-term alien and invasive species management programme must be developed for implementation. If such a programme is already in place; this must be updated and reviewed regularly.

12. ENVIRONMENTAL MANAGEMENT PROGRAMME

The Environmental Management Programme is a tool specifically aimed at transposing specific ongoing and long-term management actions to a year-planner for ease of planning and implementation. The main activities are indicated in the first column in the table below and specific actions are allocated for each month with general seasonality requirements considered. Specific actions under main activity (described in Section 9 in this report) should be followed for correct implementation.

The allocation of activities can be rearranged as required, as long as the seasonality requirements of the activity is considered. For example, firebreaks are generally burnt at the start of winter when grasses are dry enough to burn. Controlled management fires (to remove moribund and/or promote biodiversity) are generally implemented in the late dry season or early spring to minimise the period between burning and re-growth. Alien invasive vegetation eradication will be dependent on seasonality requirements depending on the method used; chemical treatment generally works better when applied in the growing season.

The Environmental Programme (table below) will be provided to the Environmental Site Manager and must be modified as required, and should be used for planning, management and monitoring.

Table 3. Environmental Management Programme: Pro Crop Farm Dam Upgrades

Project schedule															
	Demarcation	Trapping; Search & Rescue	Diversion	Vegetation Clearing	Topsoil removal	Excavate	Chimney drain	Spillways	Embankment	Riprap	Replace topsoil	Net sausages	Vegetation	Follow up alien veg removal
Elon	Jan 2024				Feb 2024			Mar 2024			April 2024			
Cyprus	May 2024				June 2024			July 2024			Aug 2024			
Hill Cottage	May 2025				June 2025			July 2025			Aug 2025			

Demarcation:

Permit application for Provincially protected plants to be submitted in this stage.

Diversion:

The watercourse water will be collected and diverted around the construction site by means of temporary works including cut-off and bypass channels, small coffer dam, temporary pumps, to collect and contain the water in order to ensure safe and acceptable working conditions that have minimal impact to the environment.

13. MONITORING MECHANISMS, TIMEFRAME & FREQUENCY AND ROLEPLAYERS

Monitoring entails periodic or continuous data collection of physical parameters as well as regular site inspections to determine compliance with environmental specifications and approval conditions. It provides an objective, quantitative means to assess the effectiveness of the mitigation measures and to detect potential environmental impacts. Monitoring measures during and after the construction period, as well as the monitoring of ongoing management measures, are provided in separate columns in the tables that follow.

Each specialist assessment included the following monitoring measures:

Vegetation

- Monitor provincially protected plants monthly after relocation for a year.
- Monitor vegetation re-growth in areas where topsoil is replaced.
- Monitor alien vegetation re-growth after eradication.

Fauna

- Annual avifaunal monitoring staring before construction and lasting for at least two years post construction is recommended in light of the Martial Eagle Nest and potential abandonment risks associated with the dam construction. This should involve:
- Re-visiting all identified SCC nests, particularly the Martial Eagle nest. The following should be documented:
    - Activity status (active / inactive)
    - Breeding status (nest building, courtship, construction of inner wreath, eggs, young)
    - Number of fledglings
    - Fledgling age
    - Nest diameter
    - Nest depth
    - Nest height above ground
    - Tree species
    - Prey supplied (if possible)
- Re-surveying all point count sampling localities:
    - Conduct standardized, timed point counts at the various locations that were established during the winter survey. Data recorded at each point must include but not be limited to:
    - Location / Site code
    - Date, time

- Habitat
- Weather conditions
- Observer name
- Counts of all species detected within 100 m radius within 10 min period.
- Presence or absence of SCC nests.
- Activity (e.g. perched, flushed, commuting

Table 4. Monitoring measures required for the Construction and Operational Phases

Monitoring Programme			
Monitoring Activity	**Frequency during construction/installation phase**	**Frequency during operation**	**Parameters/Criteria**
Topsoil	Daily monitoring by contractor, weekly monitoring by ECO.	Monthly after rehabilitation for 3 months	Section 9.1 mitigation measures to be monitored
Waste on site	Daily monitoring by contractor, waste receipts must be filed in the Environmental site file. Weekly monitoring by ECO.	Annual auditing by ECO / Ecological Management Plan specialist.	Monitor measures of 9.1 for construction activities and 9.2 for ongoing management measures.
Alien invasive removal (installation footprint)	Weekly monitoring by ECO	Monthly after rehabilitation for 3 months. Every second month for re-emerging plants and monthly after removal for 3 months	Follow up treatment
Erosion	Daily monitoring by contractor, weekly monitoring by ECO	Visual inspections of areas prone to erosion and areas where erosion has been rectified, especially after heavy rainfall events.	Fixed-point photography
Social and Cultural aspects	Daily monitoring by contractor, weekly monitoring by ECO	Annual audit should provide evaluation of management measures and	Measures in 9.1
Fires	Daily monitoring by contractor, weekly monitoring by ECO	Firebreak impact monitoring can be done annually by the Ecological Management Plan specialist.	Measures in 9.1

Safety	Daily monitoring by contractor, weekly monitoring by ECO	N/A	Measures in 9.1
Spill kit	Daily monitoring by contractor, weekly monitoring by ECO.	N/A	Monitor measures of 9.1.
Vehicles on site	Daily monitoring by contractor, weekly monitoring by ECO	N/A	Monitor measures of 9.1.
Stormwater measures	Daily monitoring by contractor, weekly monitoring by ECO	Monitor stormwater structures after every heavy rainfall for litter, sedimentation, erosion or damage.	Monitor measures of 9.1 for Construction and 9.2 for ongoing measures.
Flora (general)	Daily visual monitoring by contractor, weekly fixed point photography monitoring by ECO – vegetation removal during construction and re-establishment after construction.	Monthly fixed-point photography The perimeter of the development footprint: walkthroughs every second month	Following Construction: Fixed-point photography of areas that were re-vegetated and areas where alien vegetation has been removed. Ongoing: The perimeter of the development footprint must be monitored by means of walkthroughs every second month for early detection of the spread of alien and ornamental species into surrounding natural habitats.
Fauna	N/A	Record species sighted and note SCC and protected species.	Inventory of faunal species and records of faunal SCC and protected species.
Rehabilitated Areas (operational)	N/A	Monthly for a year, and then twice a year	Fixed point photography: determine success and follow up

14. REPORTING, COMMUNICATION & RECORD KEEPING

The IAPs must be informed of commencement of construction as per WUL and EA.

Complaints register to be updated daily and kept on site in the Environmental File.

The Contractor must record all incidents in the relevant register and must report all incidents to the ECO.

The Alien/Invasive Plant Control Report must be kept in the Environmental File for continuation of control efforts.

The Environmental File must contain all relevant documentation and registers and must be updated monthly.

The ECO must provide the relevant authority with monthly audit reports and must report all spill incidents to the Department within 48 hours.

Communication channels between role players must be identified and contact details must be provided to all relevant personnel.

Reporting of any archaeological or cultural artefact or site discovery is to be reported to the relevant authority (SAHRA), as well as the ECO.

Photographic (fixed point) monitoring of construction and rehabilitation activities must be kept on file in soft and hard copy formats.

A soft copy of all relevant documentation, including the Environmental File, must be kept off-site, so information is not lost or destroyed.

15. ADAPTIVE MANAGEMENT

Terrestrial ecology and rehabilitation are dynamic processes due to the nature of ecosystems that constantly change resulting from interactions between biotic, abiotic, and anthropogenic processes. Therefore, an adaptive management approach to a watercourse rehabilitation process is required. This is based on the principle that feedback will give effect to necessary alterations of design or methodology so as to achieve the rehabilitation goals identified during the assessment process. Measurable goals should be set to achieve consistency in auditing and feedback, for example, water quality parameters can be measured to determine how alterations to the system have affected the ecological drivers and/or responses.

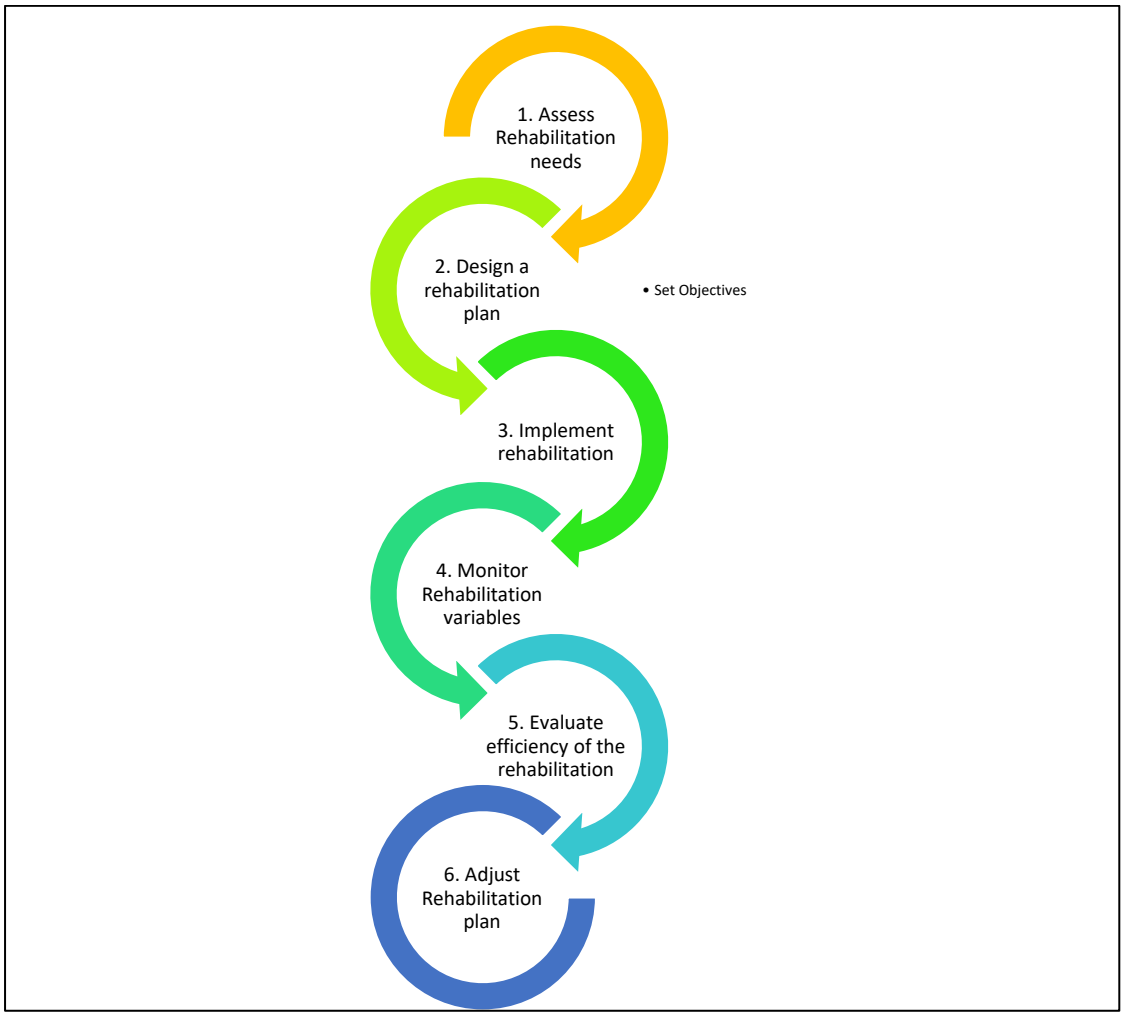

Figure 3: The adaptive management approach cycle to Rehabilitation

Table 5: Adaptive management description

Steps	Description
1. Assessment of rehabilitation needs	Determined by the specialist compiling the rehabilitation plan. Based on knowledge of the aquatic systems on site and information as provided by engineers, developers and environmental control officers.
2. Rehabilitation Objectives	For the project the main objective would be the rehabilitation of the affected ecosystems after construction and: - To reduce the impact of construction on natural resources and sensitivities - To reinstate a pre-construction vegetation layer consisting of indigenous species.
3. Design of rehabilitation plan	Rehabilitation is designed to: - Curb erosion and resultant siltation of the receiving watercourses - Enhance healthy, biodiverse vegetation community that supports current species and SCC. Maintenance of rehabilitation structures include: - Reinstating and repair to damaged stormwater structures and rehabilitated areas - Removal of alien invasive plants
4. Implementation of rehabilitation plan	Implemented by contractors with experience in rocky/sloped and sensitive terrain. The management and approval of implementation must be guided by an ECO with experience in terrestrial ecosystem management.
5. Monitor rehabilitation variables	Conducted by ECO and monthly report must indicate level of compliance to the EMP and Ecological Management Plan.
6. Evaluate efficiency and adjustment of the rehabilitation	Conducted by ECO in cooperation with Departmental approval for amendments to Rehabilitation Plan and/or EMP.

16. EXISTING SERVICES AND INFRASTRUCTURE

Electricity: supplied by Eskom

Water: supplied by groundwater from boreholes and surface water to cattle.

Sewer: septic tank at the homestead and production store.

17. MAINTENANCE OF EMBANKMENTS, WATER LINE EDGES AND SPILLWAYS

Ongoing maintenance is required where instream structures and watercourse reaches are damaged due to high velocity flows or by vegetation growth or animal activity.

The following maintenance activities will be implemented as and when required:

17.1 Rehabilitation of eroded watercourse reaches within 500m of the dam footprint:

17.1.1 Sloping the banks (1:3) of the watercourse to minimize erosion

17.1.2 Pegging net-logs along the contours on the watercourse banks where sloping was done.

Figure 4. Eco-logs (biodegradable net filled with biodegradable material, i.e., treated bark/log shavings).

17.1.3 Re-establishing vegetation where banks were sloped from topsoil, seeding and planting of indigenous vegetation listed under the Eastern Free State Sandy Grassland species.

17.2 Replacing damaged rip-rap and associated earth berm/s along embankment and/or spillway and chimney drain

17.3 Planting indigenous vegetation to stabilize up-and downstream reaches and above waterline

17.4 Removing alien invasive vegetation

17.5 Sedimentation removal from deep water areas near embankment.

Monitoring actions to determine if maintenance actions are required:

(a) Vegetation on embankments and in dam footprint: trees and shrubs must be removed before root system creates a seepage pathway

(b) Grazing impact and trampling: healthy vegetation cover must not be allowed to decline once established, to avoid erosion

(c) Erosion downstream of embankment: implement short berms that create meandering effect

(d) Burrows or other damage from animal activity: specialist to repeat “search and remove” after rehabilitation of the impacted areas have taken place, to ensure animal activity is minimized while the embankment settles and hardens. Riprap should provide sufficient protection.

(e) Obstruction in chimney drain: may require engineer assistance

(f) Muddy or cloudy discharge from chimney drain: may require engineer assistance

(g) Excessive seepage on the lower back slope and toe of the dam, or vegetation change indicating seepage, to avoid erosion: control velocity and quantity immediately, as dam failure can result if not rectified.

18. AMENDMENTS TO THIS EMP

Adjustments to the allocation of monthly actions in the Environmental Management Programme, as indicated in Table 6 on p.42, does will not require approval from the GDARD, if the seasonality requirements of the specific actions are incorporated in the adjustments.

19. REFERENCES

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20. APPENDICES

Appendix A: EAP CV

Appendix B: Layout map

Appendix C: Environmental site training