Vanderkloof Solar PV and BESS

AQUATIC IMPACT ASSESSMENT REPORT

FOR

Cape EAPrac

BY

EnviroSci (Pty) Ltd

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DATE

6 March 2025

REVISION 1

EXECUTIVE SUMMARY

Vanderkloof Solar (Pty) Ltd appointed EnviroSci (Pty) Ltd to firstly conduct an aquatic Site Sensitivity Verification Report for the proposed Vanderkloof Solar PV facility/ties, located south of Luckhoff, in the Free State Province. This included an assessment of portions of the site during a visit conducted in summer November 2022 and a site specific assessment April 2024. Once the proposed layout had been developed based on the sensitivity constraints received from the specialists, the impacts of the potential project could be assessed. This report therefore focuses on assessing the potential impact of the projects on the aquatic environment. As the receiving environment is rather uniform across the site, the affected environment description is discussed in one chapter below, while separate impact assessments will deal with the respective project site / component as required later in this report.

The regulatory requirements are also discussed with regard the National Water Act and NEMA in Section 4 of this report. While the PROTOCOL FOR SPECIALIST ASSESSMENT AND MINIMUM REPORT CONTENT REQUIREMENTS FOR THE ENVIRONMENTAL IMPACTS ON AQUATIC BIODIVERSITY (Government Gazette 43110, 20 March 2020), superseding the Appendix 6 NEMA requirements, was also adhered to. This report thus meets the criteria to fulfil a Specialist Verification Assessment Report as the proposed site is located within an area rated as ***Very High*** sensitivity by the DFFE Screening Tool due to the presence of Wetlands (Riverine) Rivers Conservation Class AB & C (See Screening Verification Statement – Appendix 2). Noting that no wetlands were observed within 500m of any of the proposed sites.

The findings of this report were supported by baseline data collected during a site specific visit in April. Early autumn, however the extent of the respective waterbodies / wetlands could still be defined due heavy rainfall occurring prior to the site visit and EnviroSci having assessed other projects in the region over an extended period. This assessment adheres to criteria contained in the DWAF 2005 / 2008 delineation manuals and the Wetland / Riverine Classification System.

The greater study area is dominated by three major types of natural aquatic features and a small number of artificial barriers associated with catchments and rivers, characterised as follows:

- Ephemeral watercourses with or without riparian vegetation that included, *Vachellia karroo*, *Searsia lancea*, *Euclea undulata* and *Gymonsporia buxifolia*;
- Depressions (Plate 2), dominated by grass species but well outside the project areas, and
- Dams and weirs / berms with no wetland or aquatic features.

The study area is situated predominantly within the Xhariep Karroid Grassland (Gh 3) and Besemkaree Koppies Shrubland (GH 4) vegetation units, associated with the upper reaches of the Lemoenspruit and Berg rivers catchment (D33C / D31D), a small subquaternary catchments linked to the Orange / Gariep River. This is located within the Orange River Water Management Area (Kimberley), in the Nama Karoo Eco-region, but is not considered part of any wetland cluster, Strategic Water Resource Area, International Bird area.

The presence of these Very High Sensitivity features was confirmed during this assessment, and delineated to a finer scale, but still closely represented the features shown in the Screening Tool results.

The findings of this report were substantiated by the current waterbody inventories (van Deventer *et al*., 2020), 1: 50 000 topocadastral surveys mapping. These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018. These also indicated that the only wetland hydrogeomorphic unit or type observed in the greater region included small pans or depressions (endorheic), seeps and the Channelled Valley Bottom wetlands, which then

correspond to those observed in this site. All of the above information was then integrated into a baseline map and refined using the 2022 survey data, digitised at a scale of 1:5 000.

Coupled to the aquatic delineations, information was collected on potential species that could occur within the watercourses, especially any conservation worthy species (Listed or Protected).

Using the baseline description, aquatic features were identified, then categorised into one of number pre-determined sensitivity categories to provide protection and/or guide the layout planning processes. The sensitivity ratings of High (No-Go) to Low were determined through an assessment of the habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and there are areas where encroachment on these areas would occur (i.e. existing road crossings within systems) and this is considered acceptable since these areas are already disturbed.

The observed sensitive aquatic habitats are shown in the maps provided in this report. In summary, any structures, have been placed outside of the observed aquatic systems, with the exception of the PV 2 panel areas, and the proposed access roads. These roads will however make use of existing tracks and roads thus the potential to improve drainage would actually be seen as a net benefit if the current crossings (mostly informal) are upgraded.

Most of the anticipated impacts would include disturbance during the construction phase, while changes to form and function of the site due to increased runoff roads or hard surfaces would occur in the operational and maintenance (O&M) phase and were identified as follows:

Impact 1:	Loss of Very High Sensitivity systems, through physical disturbance, although these areas except for the access roads have been avoided.
Impact 2:	Impact on all watercourses through the possible increase in surface water runoff on the form and function through hydrological changes if stormwater management is not properly addressed
Impact 3:	Increase in sedimentation and erosion downstream of the sites as an indirect impact related to Impact 2
Impact 4:	Risks on the aquatic environment due to water quality impacts
Impact 5:	Cumulative impacts

However, as requested by DFFE, the specialists are required to assess the impacts of the respective projects separately for the 5 PV sites and the 5 BESS components. This was conducted for the aquatic environment with a summary of the impacts for each contained in Table 6 & 7 in this report, noting that for the majority of the project components are located outside any <u>undisturbed or natural portions</u> of the aquatic environment and thus any direct impacts have been avoided (Figure 10 - 15). The only exception being PV 2 panel areas that are located within two small aquatic buffer areas (Figure 11). This small incursion has not affected the impact ratings due to the scale and locality of the impact, but it is highly recommended that the layout of PV 2 be adjusted to avoid these areas (Table 6).

With this in mind the impacts upon aquatic biodiversity associated with the projects carry a Low significance, after mitigation. The loss of irreplaceable aquatic habitat and/or important biota is highly unlikely. The impacts are considered to be easily mitigated (provided the mitigation measures and monitoring plan within the EMP and this report are implemented and adhered to during all phases of the project).

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ACRONYMS

CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DWS	Department of Water and Sanitation formerly the Department of Water Affairs
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
GA	General Authorisation (WUA type)
GIS	Geographic Information System
NFEPA	National Freshwater Ecosystem Priority Atlas (Nel, *et al*. 2011).
OHL	Overhead Line – transmission line cable that is not buried
ORC	Off road cable – underground or overhead transmission cable not within a road reserve
PES	Present Ecological State
SANBI	South African National Biodiversity Institute
SQ	Subquaternary catchment
WUA	Water Use Authorisation
WUL	Water Use License
WULA	Water Use License Application

SPECIALIST REPORT DETAILS

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments. This also includes the minimum requirements as stipulated in the National Water Act (Act 36 of 1998), as amended in Water Use Licence Application and Appeals Regulations, 2017 Government Notice R267 in Government Gazette 40713 dated 24 March 2017, which includes the minimum requirements for a Wetland Delineation/ Aquatic Report.

Report prepared by: Dr. Brian Colloty Pr.Sci.Nat. (Ecology) / Member SAEIES and Wetland Society of South Africa.

Expertise / Field of Study: BSc (Hons) Zoology, MSc Botany (Rivers), Ph.D Botany Conservation Importance rating, and has worked as an independent consulting specialist from 1996 to present.

I, **Dr. Brian Michael Colloty** declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs and or Department of Water and Sanitation

Signed:… ……………………………………… Date:…6 March 2025…………

1 Introduction

Vanderkloof Solar (Pty) Ltd appointed EnviroSci (Pty) Ltd to firstly conduct an aquatic Site Sensitivity Verification Report for the proposed Vanderkloof Solar PV facility/ties, located south of Luckhoff, in the Free State Province. This included an assessment of portions of the site during a visit conducted in summer November 2022 and a site specific assessment April 2024. Once the proposed layout had been developed based on the sensitivity constraints received from the specialists, the impacts of the potential project could be assessed. This report therefore focuses on assessing the potential impact of the projects on the aquatic environment. As the receiving environment is rather uniform across the site, the affected environment description is discussed in one chapter below, while separate impact assessments will deal with the respective project site / component as required later in this report.

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The study area is situated predominantly within the Xhariep Karroid Grassland (Gh 3) and Besemkaree Koppies Shrubland (GH 4) vegetation units, associated with the upper reaches of the Lemoenspruit and Berg rivers catchment (D33C / D31D), a small subquaternary catchments linked to the Orange / Gariep River

The findings of this report were supported by baseline data collected during a site visit in April. Early autumn, however the extent of the respective waterbodies / wetlands could still be defined due heavy rainfall occurring prior to the site visit and EnviroSci having assessed other projects in the region over an extended period. This assessment adheres to criteria contained in the DWAF 2005 / 2008 delineation manuals and the Wetland / Riverine Classification System.

Several important national and provincial scale conservation plans were also considered, with the results of those studies where relevant being included in this report. Most conservation plans are produced at a high level, so it is important to verify or ground truth the actual status of the study area. Groundtruthing of aquatic resources in the project area was also important as the information was critical for the identification and mapping of important habitat where protected or endangered species are known to occur within the region.

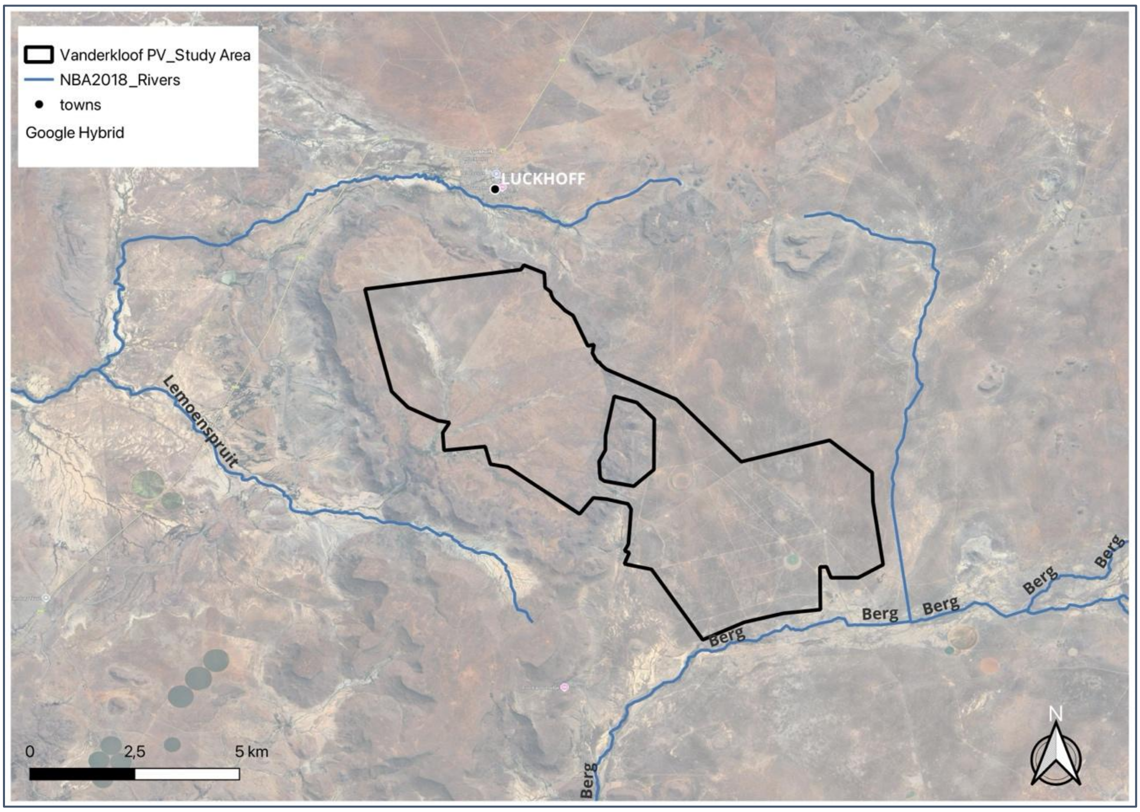

Figure 1: The site boundary in relation to the surrounding mainstem rivers

1.1 Aims and objectives

The aim of this report is to firstly provide a summary of the aquatic baseline and identify any No-Go areas. The report also makes recommendations with regard to further management and mitigation, to further reduce, avoid or mitigate the potential impacts and ultimately ensure the responsible and sustainable use of South Africa's aquatic resources. The proposed layout was then assessed with regard the potential impacts and mitigations later in this report.

Certain aspects of the development could trigger the need for Section 21, Water Use License Applications (WULAs) (or general authorisation [GA] applications) such as river crossings or any activities within 500m of a wetland. Once the final layout receives Environmental Authorisation, these applications must then be submitted to the Department of Water and Sanitation (DWS).

Information regarding the state and function of the observed water bodies, including suitable no-go buffers areas is thus also provided.

1.2 Assumptions and Limitations

To obtain a comprehensive understanding of the dynamics of both the flora and fauna of communities within a study site, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. However, due to time constraints these long-term studies are not feasible and are thus mostly based on instantaneous sampling. This limitation is common to many impact assessment type studies, but the findings are deemed adequate for the purposes of decision-making support regarding project acceptability, unless otherwise stated.

Therefore, due to the scope of the work presented in this report, a long-term investigation of the proposed site was not possible and as such not perceived as part of the Terms of Reference. However, a concerted effort was made to sample and assess as much of the potential site, as well as make use of any supporting literature, species distribution data and aerial photography.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

2 Terms of Reference

The proposed methods used in this assessment have been developed with the renewable industry in mind, coupled to the minimum requirements stipulated by DFFE and the Department of Water and Sanitation. These have been successful in assessing the direct, indirect and cumulative impacts of ca 200 renewable energy projects (2010 – 2025), of which 25 have been constructed:

Phase 1 Screening and Constraints

- Desktop analysis
- Site investigation
- Compilation of one draft and one final site screening / sensitivity report for the project which adheres to the following (this list is not exhaustive):
  - The Initial Site Sensitivity Verification reporting requirements for environmental themes set out in Government Gazette No. 43110 which was promulgated on 20 March 2020 in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA).
  - Identification and mapping of any discrepancies with the environmental sensitivity as identified on the national web based environmental screening tool.
  - Identification of sensitive areas to be avoided (including corresponding spatial data) and the determination of the respective buffers (if applicable) for each site.
  - Initial recommendations for the layout and allowable development footprint from a surface water and aquatic biodiversity perspective (including corresponding spatial data).
  - Recommendations regarding the areas to be utilised for solar technologies within the project site from a surface water and aquatic biodiversity perspective (including corresponding spatial data)
- Supply the client with geo-referenced GIS shape files of the wetland / riverine areas.

Phase 2 EA reports

- Assess the potential impacts, based on a supplied methodology, including cumulative impacts and for pre-construction, construction, operations and decommissioning phases.
- Provide mitigations regarding project related impacts, including engineering services that could negatively affect demarcated wetland or water course areas.
- Provide a separate Risk Assessment Matrix as per the DWS 2016 requirements to determine the Water Use License Application Requirements, i.e. indication of future permitting requirements.

The above would then also fulfil the following DFFE Requirements as follows:

No.	Requirement	Applicable report section/ Comment
2.1	The site sensitivity verification must be undertaken by an environmental assessment practitioner or a specialist.	Assessment undertaken by an ecological specialist with 29 Years experience in the field of aquatic and ecological assessments SACNASP registration 400268/07
2.2	The site sensitivity verification must be undertaken through the use of: (a) a desk top analysis, using satellite imagery;	Completed
	(b) a preliminary on-site inspection; and	Completed
	(c) any other available and relevant information.	Indicated in section 2, 3, 4 and 5 of this report
2.3	2.3. The outcome of the site sensitivity verification must be recorded in the form of a report that: (a) confirms or disputes the current use of the land and the environmental sensitivity as identified by the screening tool, such as new developments or infrastructure, the change in vegetation cover or status etc.;	This report Section 7, 8 and Appendix 2
	b) contains a motivation and evidence (e.g. photographs) of either the verified or different use of the land and environmental sensitivity; and	Section 5 of this report
	(c) is submitted together with the relevant assessment report prepared in accordance with the requirements of the Environmental Impact Assessment Regulations	Will form part of the subsequent Environmental Authorisation application reports and Water Use License applications

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 1998) AND ENVIRONMENTAL IMPACT REGULATIONS, 2014 (AS AMENDED) - REQUIREMENTS FOR SPECIALIST REPORTS (APPENDIX 6)

No	Description	Section in Report
2. Aquatic Biodiversity Specialist Assessment		
2.1	The assessment must be prepared by a specialist registered with the South African Council for Natural Scientific Professionals (SACNASP), with expertise in the field of aquatic sciences.	**Error! Reference source not found.**
2.2	The assessment must be undertaken on the preferred site and within the proposed development footprint.	Sections 6 - 9
2.3	The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects:	Section 6 & 7
2.3.1	A description of the aquatic biodiversity and ecosystems on the site, including;	
(a)	Aquatic ecosystem types; and	
(b)	Presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;	
2.3.2	The threat status of the ecosystem and species as identified by the screening tool;	
2.3.3	An indication of the national and provincial priority status of the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a river freshwater ecosystem priority area or sub-catchment, a strategic water source area, a priority estuary, whether or not they are free-flowing rivers, wetland clusters, a critical biodiversity or ecologically sensitivity area);	

2.3.4	A description of the ecological importance and sensitivity of the aquatic ecosystem including:	
(a)	The description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); and	
(b)	The historic ecological condition (reference) as well as present ecological state of rivers (in-stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel and flow regime (surface and groundwater).	
2.4	The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	Section 9
2.5	Related to impacts, a detailed assessment of the potential impacts of the proposed development on the following aspects must be undertaken to answer the following questions:	
2.5.1	Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	
2.5.2	Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present?	
2.5.3	How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include:	
(a)	Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes);	
(b)	Will the proposed development change the sediment regime of the aquatic ecosystem and its sub-catchment (e.g. sand movement, meandering river mouth or estuary, flooding or sedimentation patterns);	
(c)	What will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary/seasonal/permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and	
(d)	To what extent will the risks associated with water uses and related activities change;	
2.5.4	How will the proposed development impact on the functioning of the aquatic feature? This must include:	
(a)	Base flows (e.g. too little or too much water in terms of characteristics and requirements of the system);	
(b)	Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over-abstraction or in-stream or off-stream impoundment of a wetland or river);	

(c)	Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley-bottom wetland to a channelled valley-bottom wetland);	
(d)	Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication);	
(e)	Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and	
(f)	The loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc.);	
2.5.5	How will the proposed development impact key ecosystems regulating and supporting services especially:	
(a)	Flood attenuation;	
(b)	Streamflow regulation;	
(c)	Sediment trapping;	
(d)	Phosphate assimilation;	
(e)	Nitrate assimilation;	
(f)	Toxicant assimilation;	
(g)	Erosion control; and	
(h)	Carbon storage?	
2.5.6	How will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	
2.6	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to:	N/A
(a)	Size of the estuary;	
(b)	Availability of sediment;	
(c)	Wave action in the mouth;	
(d)	Protection of the mouth;	
(e)	Beach slope;	
(f)	Volume of mean annual runoff; and	
(g)	Extent of saline intrusion (especially relevant to permanently open systems).	
2.7	The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:	Section 1 & 6

2.7.1	Contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	
2.7.2	A signed statement of independence by the specialist;	
2.7.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	
2.7.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;	
2.7.5	A description of the assumptions made, any uncertainties or gaps in knowledge or data;	
2.7.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;	Section 8
2.7.7	Additional environmental impacts expected from the proposed development;	Section 9
2.7.8	Any direct, indirect and cumulative impacts of the proposed development on site;	
2.7.9	The degree to which impacts and risks can be mitigated;	
2.7.10	The degree to which the impacts and risks can be reversed;	
2.7.11	The degree to which the impacts and risks can cause loss of irreplaceable resources;	
2.7.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	
2.7.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	Section 9
2.7.14	A motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate;	N/A
2.7.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	Section 9 and 10
2.7.16	Any conditions to which this statement is subjected.	

3 Relevant legislation, policy and permit requirements

The following is pertinent to this study:

- Section 24 of The Constitution of the Republic of South Africa;
- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998;
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) inclusive of all amendments, as well as the NEM: Biodiversity Act;
- National Water Act, 1998 (Act No. 36 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002);
- National Forest Act (No. 84 of 1998); and
- National Heritage Resources Act (No. 25 of 1999) – could apply if cultural use or heritage is linked to any aquatic resources

NEMA and the CARA identify and categorise invasive plants together with associated obligations on the landowner. Several Category 1 & 2 invasive plants were observed in several areas of the site under investigation.

Based on an assessment of the proposed activities (Table 1) and past engagement with DWS, the following Water Use Authorisations may be required based on the following thresholds as listed in the following Government Notices, however ultimately the Department of Water and Sanitation (DWS) must determine if a General Authorisation (GA) or full WULA will be required during the pre-application process as it relates to the following, bearing in mind that this will only be conducted once a final project scope is known:

- **DWS Notice 538 of 2016, 2 September in GG 40243**– Section 21a water uses relating to the Abstraction of water.
- **Government Notice 509 in GG 40229 of 26 August 2016 –** Section 21c & 21i water uses relating to the Impeding or diverting the flow of water in a watercourse and or altering the bed, banks, course or characteristics of a watercourse.
- **Government Notice 665, 6 September 2013 in GG 36820** - Section 21g relating to disposing of waste in a manner that may detrimentally impact on a water source which includes temporary storage of domestic wastewater i.e. conservancy tanks under Section 37 of the notice.

Table 1: Water Use Activities

	Water Use Activity	Applicable to this development proposal
S21(a)	Taking water from a water resource	In any abstraction is made from a new or existing borehole
S21(b)	Storing water	N/A
S21(c)	Impeding or diverting the flow of water in a watercourse	If any works (permanent or temporary) are located within a watercourse or wetland regulated zone then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation are LOW.
S21(d)	Engaging in a stream flow reduction activity	N/A
S21(e)	Engaging in a controlled activity	N/A
S21(f)	Discharging waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit	N/A
S21(g)	Disposing of waste in a manner which may detrimentally impact on a water resource	N/A as typically grid installation contractors make use of portable toilets.
S21(h)	Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process	Not applicable
S21(i)	Altering the bed, banks, course or characteristics of a watercourse	If any works (permanent or temporary) are located within a watercourse or wetland regulated zone then a GA process can potentially be followed if the DWS Risk Assessment Matrix indicates that all impacts with mitigation are LOW.
S21(j)	Removing, discharging or disposing of water found underground for the continuation of an activity or for the safety of persons	N/A
S21(k)	Using water for recreational purposes	N/A

3.1 Wetland and riverine buffer policy

Currently there are no formalised riverine or wetland buffer distances provided by the provincial authorities and as such the buffer model as described Macfarlane & Bredin (2017) for wetlands, rivers and estuaries was used.

These buffer models are based on the condition of the waterbody, the state of the remainder of the site, coupled to the type of development, as wells as the proposed alteration of hydrological flows. Based then on the information known for the site the buffer model provided the following:

Waterbody Name	Buffer
All watercourses with or without riparian zones	10m
Artificial waterbodies / farm dams	0

4 Project Descriptions

The Applicant, Vanderkloof Solar (Pty) Ltd, is proposing the construction of a number of photovoltaic (PV), and Battery Energy Storage System (BESS) energy facility (collectively known as Vanderkloof PV and BESS) located on the Portion 1 of Farm 113, Remainder of Farm 634, Remainder of Farm 39, Remainder of Farm 253, Remainder of Farm 1132, Portion 1 of Farm 1132 and Remainder of Farm 654 in the Letsemeng Local Municipality in the Xhariep District of the Free State Province.

A study site of approximately 7478ha was assessed as part of this Environmental Process and the infrastructure associated with each of the projects is outlined below:

Vanderkloof PV 1

Vanderkloof PV1 is situated on Portion 1 of St. Elmo 113 and Remaining Extent of Annex Goemmansberg 634 and will consist of a **250MW** PV Development with a footprint of up to 426ha. The PV footprint will include interspersed internal roads, inverters and mini substations within the footprint of the PV field. Associated infrastructure for this 250MW PV facility will include:

- On site Substation of approximately 4ha.
- Temporary laydown areas of approximately 4ha within the PV footprint.
- Permanent Laydown areas of up to 1ha.
- Permanent auxiliary buildings (~0.5ha) including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.
  - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.2ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof PV 2

Vanderkloof PV2 is situated on Remaining Extent of Goedman's Berg 39 & Remaining Extent Troostenberg 253 and will consist of a **250MW** PV Development with a footprint of up to 381ha. The PV footprint will include interspersed internal roads, inverters and mini substations within the footprint of the PV field. Associated infrastructure for this 250MW PV facility will include:

- On site Substation of approximately 4ha.
- Temporary laydown areas of approximately 4ha within the PV footprint.
- Permanent Laydown areas of up to 1ha.
- Permanent auxiliary buildings (~0.5ha) including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.
  - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.2ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof PV 3

Vanderkloof PV3 is situated on Remaining Extent Bergrivier 1132 & Portion 1 of Bergrivier 1132 and will consist of a **250MW** PV Development with a footprint of up to 445ha. The PV footprint will include interspersed internal roads, inverters and mini substations within the footprint of the PV field. Associated infrastructure for this 250MW PV facility will include:

- On site Substation of approximately 4ha.
- Temporary laydown areas of approximately 4ha within the PV footprint.
- Permanent Laydown areas of up to 1ha.
- Permanent auxiliary buildings (~0.5ha) including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.
  - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.2ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof PV 4

Vanderkloof PV4 is situated on Remaining Extent Brakleegte 654 and will consist of a **250MW** PV Development with a footprint of up to 432ha. The PV footprint will include interspersed internal roads, inverters and mini substations within the footprint of the PV field. Associated infrastructure for this 250MW PV facility will include:

- On site Substation of approximately 4ha.
- Temporary laydown areas of approximately 4ha within the PV footprint.
- Permanent Laydown areas of up to 1ha.
- Permanent auxiliary buildings (~0.5ha) including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.
  - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.2ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof PV 5

Vanderkloof PV5 is situated on Portion 1 of St. Elmo 113, Remaining Extent of Goedman's Berg 39, Remaining Extent of Annex Goemmansberg 634, Remaining Extent Bergrivier 1132, Portion 1 of Bergrivier 1132 & Remaining Extent Brakleegte 654 will consist of a **1000MW** PV Development with a footprint of up to 1855 ha. The PV footprint will include interspersed internal roads, inverters and mini substations within the footprint of the PV field. Associated infrastructure for this 1000MW PV facility will include:

- Three on site Substation of approximately 12ha.
- Temporary laydown areas of approximately 16ha within the PV footprint.
- Permanent Laydown areas of up to 4ha.
- Permanent auxiliary buildings (~2ha) including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.

- Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.8ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof BESS 1

Vanderkloof BESS 1 is situated on Remaining Extent of Annex Goemmansberg 634 and will have a capacity of up to 1000MWh. The total footprint of Vanderkloof BESS 1 will be approximately 12ha and will consist of:

- An up to 8ha electrolyte tank footprint or solid-state containerized battery area with interspersed internal roads, cabling routes, and energy management system (EMS) modules.
- On-site substation of approximately 2ha.
- Temporary laydown areas which will not exceed 1ha and will be situated within the assessed footprint.
- Permanent laydown area of approximately 0.3ha.
- Permanent auxiliary buildings of approximately 0.5ha including:
    - Guardhouses, workshops, operations and control centres – each with associated ablutions.
    - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.1ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof BESS 2

Vanderkloof BESS 2 is situated on Remaining Extent of Goedman's Berg 39 and will have a capacity of up to 1000MWh. The total footprint of Vanderkloof BESS2 will be approximately 12ha and will consist of:

- An up to 8ha electrolyte tank footprint or solid-state containerized battery area with interspersed internal roads, cabling routes, and energy management system (EMS) modules.
- On-site substation of approximately 2ha.
- Temporary laydown areas which will not exceed 1ha and will be situated within the assessed footprint.
- Permanent laydown area of approximately 0.3ha.
- Permanent auxiliary buildings of approximately 0.5ha including:
    - Guardhouses, workshops, operations and control centres – each with associated ablutions.
    - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.1ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof BESS 3

Vanderkloof BESS 3 is situated on Remaining Extent Bergrivier 1132 and will have a capacity of up to 1000MWh. The total footprint of Vanderkloof BESS 3 will be approximately 12ha and will consist of:

- An up to 8ha electrolyte tank footprint or solid-state containerized battery area with interspersed internal roads, cabling routes, and energy management system (EMS) modules.
- On-site substation of approximately 2ha.
- Temporary laydown areas which will not exceed 1ha and will be situated within the assessed footprint.
- Permanent laydown area of approximately 0.3ha.
- Permanent auxiliary buildings of approximately 0.5ha including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.
  - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.1ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof BESS 4

Vanderkloof BESS 4 is situated on Remaining Extent Brakleegte 654 and will have a capacity of up to 1000MWh. The total footprint of Vanderkloof BESS 4 will be approximately 12ha and will consist of:

- An up to 8ha electrolyte tank footprint or solid-state containerized battery area with interspersed internal roads, cabling routes, and energy management system (EMS) modules.
- On-site substation of approximately 2ha.
- Temporary laydown areas which will not exceed 1ha and will be situated within the assessed footprint.
- Permanent laydown area of approximately 0.3ha.
- Permanent auxiliary buildings of approximately 0.5ha including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.
  - Offices, accommodation – each with associated canteens and ablutions.
- Temporary accommodation buildings with associated canteens and ablutions of up to 0.1ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

Vanderkloof BESS 5

Vanderkloof BESS 5 is situated on Remaining Extent of Goedman's Berg 39 & Portion 1 of Bergrivier 1132 and will have a capacity of up to 4000MWh. The total footprint of Vanderkloof BESS 4 will be approximately 48ha and will consist of:

- An up to 32ha electrolyte tank footprint or solid-state containerized battery area with interspersed internal roads, cabling routes, and energy management system (EMS) modules.
- Three on-site substation with a total footprint of approximately 6ha.
- Temporary laydown areas which will not exceed 4ha and will be situated within the assessed footprint.
- Permanent laydown area of approximately 1ha.
- Permanent auxiliary buildings of approximately 2ha including:
  - Guardhouses, workshops, operations and control centres – each with associated ablutions.

- Offices, accommodation – each with associated canteens and ablutions.

- Temporary accommodation buildings with associated canteens and ablutions of up to 0.5ha.
- Main Access roads of up to 8m wide and approximately 14km long are required to cumulatively for the Vanderkloof PV and BESS projects. Approximately 6.5km of these roads are existing (to be upgraded) and approximately 7.5km are to consist of new roads).
- Perimeter fencing not exceeding 3m in height.
- Rainwater tanks.
- Diesel tanks (up to 80m^3 cumulatively for the entire Vanderkloof Solar PV and BESS Facilities).

5 Methodology

This study followed the approaches of several national guidelines with regards to wetland assessment. These have been modified by the author, to provide a relevant mechanism of assessing the present state of the study area aquatic systems, applicable to the specific environment and, in a clear and objective manner, identify and assess the potential impacts associated with the proposed development site based on information collected within the relevant farm portions.

Current water resource classification systems make use of the Hydrogeomorphic (HGM) approach, and for this reason, the National Wetland Classification System (NWCS) approach will be used in this study. It is also important to understand the legal definition of a wetland, the means of assessing wetland conservation and importance and the relevant legislation aimed at protecting wetlands. These aspects will be discussed in greater depth in this section of the report, as they form the basis of the study approach to assessing wetland impacts.

For reference the following definitions are as follows:

- **Drainage line**: A drainage line is a lower category or order of watercourse that does not have a clearly defined bed or bank. It carries water only during or immediately after periods of heavy rainfall i.e. non-perennial, and riparian vegetation may not be present.
- **Perennial and non-perennial:** Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.
- **Riparian**: The area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods but which is well drained).
- **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 under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin *et al*., 1979).
- **Water course**: As per the National Water Act 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

5.1 Waterbody classification systems

Since the late 1960's, wetland classification systems have undergone a series of international and national revisions. These revisions allowed for the inclusion of additional wetland types, ecological and conservation rating metrics, together with a need for a system that would allude to the functional requirements of any given wetland (Ewart-Smith *et al*., 2006). Wetland function is a consequence of biotic and abiotic factors, and wetland classification should strive to capture these aspects. **Coupled to this was the inclusion of other**

criteria within the classification systems to differentiate between river, riparian and wetland systems, as well as natural versus artificial waterbodies.

The South African National Biodiversity Institute (SANBI) in collaboration with several specialists and stakeholders developed the newly revised and now accepted National Wetland Classification Systems (NWCS) (Ollis *et al*., 2013). This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, with including structural features at the finer or lower levels of classification (Ollis *et al*., 2013).

Wetlands develop in a response to elevated water tables, linked either to rivers, groundwater flows or seepage from aquifers (Parsons, 2004). These water levels or flows then interact with localised geology and soil forms, which then determines the form and function of the respective wetlands. Water is thus the common driving force, in the formation of wetlands (DWAF, 2005). It is significant that the HGM approach has now been included in the wetland classifications as the HGM approach has been adopted throughout the water resources management realm with regards to the determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) and WET-Health assessments for aquatic environments. All these systems are then easily integrated using the HGM approach in line with the Eco-classification process of river and wetland reserve determinations used by the Department of Water and Sanitation (DWS). The Ecological Reserve of a wetland or river is used by DWS to assess the water resource allocations when assessing WULAs

The NWCS process is provided in more detail in the methods section of the report, but some of the terms and definitions used in this document are present below:

Definition Box

Present Ecological State is a term for the current ecological condition of the resource. This is assessed relative to the deviation from the Reference State. Reference State/Condition is the natural or pre-impacted condition of the system. The reference state is not a static condition, but refers to the natural dynamics (range and rates of change or flux) prior to development. The PES is determined per component - for rivers and wetlands this would be for the drivers: flow, water quality and geomorphology; and the biotic response indicators: fish, macroinvertebrates, riparian vegetation and diatoms. PES categories for every component would be integrated into an overall PES for the river reach or wetland being investigated. This integrated PES is called the EcoStatus of the reach or wetland.

EcoStatus is the overall PES or current state of the resource. It represents the totality of the features and characteristics of a river and its riparian areas or wetland that bear upon its ability to support an appropriate natural flora and fauna and its capacity to provide a variety of goods and services. The EcoStatus value is an integrated ecological state made up of a combination of various PES findings from component EcoStatus assessments (such as for invertebrates, fish, riparian vegetation, geomorphology, hydrology, and water quality).

Reserve: The quantity and quality of water needed to sustain basic *human needs* and *ecosystems* (e.g. estuaries, rivers, lakes, groundwater and wetlands) to ensure ecologically sustainable development and utilisation of a water resource. The *Ecological Reserve* pertains specifically to aquatic ecosystems.

Reserve requirements: The quality, quantity and reliability of water needed to satisfy the requirements of basic human needs and the Ecological Reserve (inclusive of instream requirements).

Ecological Reserve determination study: The study undertaken to determine Ecological Reserve requirements.

Licensing applications: Water users are required (by legislation) to apply for licenses prior to extracting water resources from a water catchment or any other activity that qualifies as a water use.

Ecological Water Requirements: This is the quality and quantity of water flowing through a natural stream course that is needed to sustain instream functions and ecosystem integrity at an acceptable level as determined during an EWR study. These then form part of the conditions for managing achievable water quantity and quality conditions as stipulated in the **Reserve Template**

Water allocation process (compulsory licensing): This is a process where all existing and new water users are requested to reapply for their licenses, particularly in stressed catchments where there is an over-allocation of water or an inequitable distribution of entitlements.

Ecoregions are geographic regions that have been delineated in a top-down manner on the basis of physical/abiotic factors. • NOTE: For purposes of the classification system, the 'Level I Ecoregions' for South Africa, Lesotho and Swaziland (Kleynhans *et al.* 2005), which have been specifically developed by the Department of Water Affairs & Forestry (DWAF) for rivers but are used for the management of inland aquatic ecosystems more generally, are applied at Level 2A of the classification system. These Ecoregions are based on physiography, climate, geology, soils and potential natural vegetation.

5.2 Wetland definition

Although the National Wetland Classification System (NWCS) (Ollis *et al*., 2013) is used to classify wetland types it is still necessary to understand the definition of a wetland. Terminology currently strives to characterise a wetland not only on its structure (visible form), but also to relate this to the function and value of any given wetland.

The Ramsar Convention definition of a wetland is widely accepted as "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres" (Davis 1994). South Africa is a signatory to the Ramsar Convention and therefore its extremely broad definition of wetlands has been adopted for the proposed NWCS, with a few modifications.

Whereas the Ramsar Convention included marine water to a depth of six metres, the definition used for the NWCS extends to a depth of ten metres at low tide, as this is recognised as the seaward boundary of the shallow photic zone (Lombard et al., 2005). An additional minor adaptation of the definition is the removal of the term 'fen' as fens are considered a type of peatland. The adapted definition for the NWCS is, therefore, as follows (Ollis *et al*., 2013):

WETLAND: an area of marsh, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed ten metres.

This definition encompasses all ecosystems characterised by the permanent or periodic presence of water other than marine waters deeper than ten metres. The only legislated definition of wetlands in South Africa, however, is contained within the National Water Act (Act No. 36 of 1998) (NWA), where wetlands are defined as "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 adapted to life in saturated soil." This definition is consistent with more precise working definitions of wetlands and therefore includes only a subset of ecosystems encapsulated in the Ramsar definition. It should be noted that the NWA definition is not concerned with marine systems and clearly distinguishes wetlands from estuaries, classifying the latter as a watercourse (Ollis *et al*., 2013). Table 1 below provides a comparison of the various wetlands included within the main sources of wetland definitions used in South Africa.

Although a subset of Ramsar-defined wetlands was used as a starting point for the compilation of the first version of the National Wetland Inventory (i.e. “wetlands”, as defined by the NWA, together with open waterbodies), it is understood that subsequent versions of the Inventory include the full suite of Ramsar-defined wetlands in order to ensure that South Africa meets its wetland inventory obligations as a signatory to the Convention (Ollis *et al.*, 2013).

Wetlands must therefore have one or more of the following attributes to meet the above definition (DWAF, 2005):

- A high-water table that results in the saturation at or near the surface, leading to anaerobic conditions developing in the top 50 cm of the soil.
- Wetland or hydromorphic soils that display characteristics resulting from prolonged saturation, i.e. mottling or grey soils
- The presence of, at least occasionally, hydrophilic plants, i.e. hydrophytes (water loving plants).

It should be noted that riparian systems that are not permanently or periodically inundated are not considered true wetlands, i.e. those associated with the drainage lines and rivers.

Table 2: Comparison of ecosystems considered to be ‘wetlands’ as defined by the proposed NWCS, the NWA and ecosystems included in DWAF’s (2005) delineation manual.

Ecosystem	NWCS “wetland”	National Water Act wetland	DWAF (2005) delineation manual
Marine	YES	NO	NO
Estuarine	YES	NO	NO
Waterbodies deeper than 2 m (i.e. limnetic habitats often described as lakes or dams)	YES	NO	NO
Rivers, channels and canals	YES	NO[1]	NO
Inland aquatic ecosystems that are not river channels and are less than 2 m deep	YES	YES	YES
Riparian[2] areas that are permanently / periodically inundated or saturated with water within 50 cm of the surface	YES	YES	YES[3]
Riparian[3] areas that are not permanently / periodically inundated or saturated with water within 50 cm of the surface	NO	NO	YES[3]

[1] *Although river channels and canals would generally not be regarded as wetlands in terms of the National Water Act, they are included as a ‘watercourse’ in terms of the Act*

[2] *According to the National Water Act and Ramsar, riparian areas are those areas that are saturated or flooded for prolonged periods and would be considered riparian wetlands, as opposed to non –wetland riparian areas that are only periodically inundated and the riparian vegetation persists due to having deep root systems drawing on water many meters below the surface.*

[3] *The delineation of 'riparian areas' (including both wetland and non-wetland components) is treated separately to the delineation of wetlands in DWAF's (2005) delineation manual.*

5.3 National Wetland Classification System method

Due to the nature of the wetlands and watercourses observed, it was determined that the newly accepted NWCS should be adopted. This classification approach has integrated aspects of the HGM approach used in the WET-Health system as well as the widely accepted eco-classification approach used for rivers.

The NWCS (Ollis *et al*., 2013) as stated previously, uses hydrological and geomorphological traits to distinguish the primary wetland units, i.e. direct factors that influence wetland function. Other wetland assessment techniques, such as the DWAF (2005) delineation method, only infer wetland function based on abiotic and biotic descriptors (size, soils & vegetation) stemming from the Cowardin approach (Ollis *et al.,* 2013).

The classification system used in this study is thus based on Ollis *et al*. (2013) and is summarised below:

The NWCS has a six-tiered hierarchical structure, with four spatially nested primary levels of classification (Figure 2). The hierarchical system firstly distinguishes between Marine, Estuarine and Inland ecosystems (**Level 1**), based on the degree of connectivity the particular system has with the open ocean (greater than 10 m in depth). Level 2 then categorises the regional wetland setting using a combination of biophysical attributes at the landscape level, which operate at a broad bioregional scale.

This is opposed to specific attributes such as soils and vegetation. **Level 2** has adopted the following systems:
- Inshore bioregions (marine)
- Biogeographic zones (estuaries)
- Ecoregions (Inland)

Level 3 of the NWCS assess the topographical position of inland wetlands as this factor broadly defines certain hydrological characteristics of the inland systems. Four landscape units based on topographical position are used in distinguishing between Inland systems at this level. No subsystems are recognised for Marine systems, but estuaries are grouped according to their periodicity of connection with the marine environment, as this would affect the biotic characteristics of the estuary.

Level 4 classifies the hydrogeomorphic (HGM) units discussed earlier. The HGM units are defined as follows:

- Landform – shape and localised setting of wetland
- Hydrological characteristics – nature of water movement into, through and out of the wetland
- Hydrodynamics – the direction and strength of flow through the wetland

These factors characterise the geomorphological processes within the wetland, such as erosion and deposition, as well as the biogeochemical processes.

Level 5 of the assessment pertains to the classification of the tidal regime within the marine and estuarine environments, while the hydrological and inundation depth classes are determined for inland wetlands. Classes are based on frequency and depth of inundation, which are used to determine the functional unit of the wetlands and are considered secondary discriminators within the NWCS.

Level 6 uses six descriptors to characterise the wetland types based on biophysical features. As with Level 5, these are non-hierarchal in relation to each other and are applied in any order, dependent on the availability of information. The descriptors include:

- Geology;
- Natural vs. Artificial;
- Vegetation cover type;
- Substratum;
- Salinity; and
- Acidity or Alkalinity

It should be noted that where sub-categories exist within the above descriptors, hierarchical systems are employed, and these are thus nested in relation to each other.

The HGM unit (Level 4) is the focal point of the NWCS, with the upper levels (Figure 3 Figure – Inland systems only) providing means to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, while the lower levels provide more descriptive detail on the particular wetland type characteristics of a particular HGM unit. Therefore Level 1 – 5 deals with functional aspects, while Level 6 classifies wetlands on structural aspects.

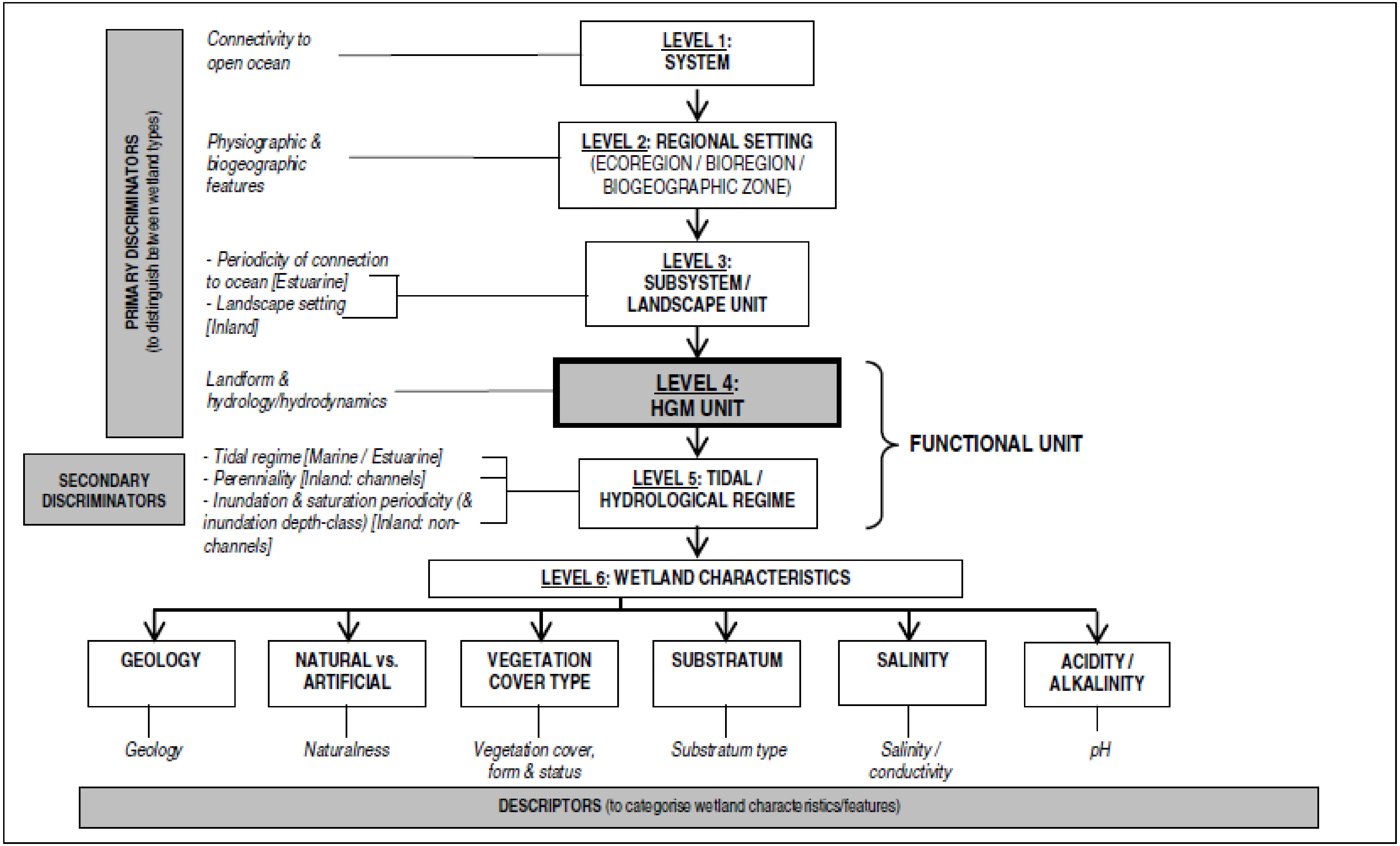

Figure 2: Basic structure of the NWCS, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied

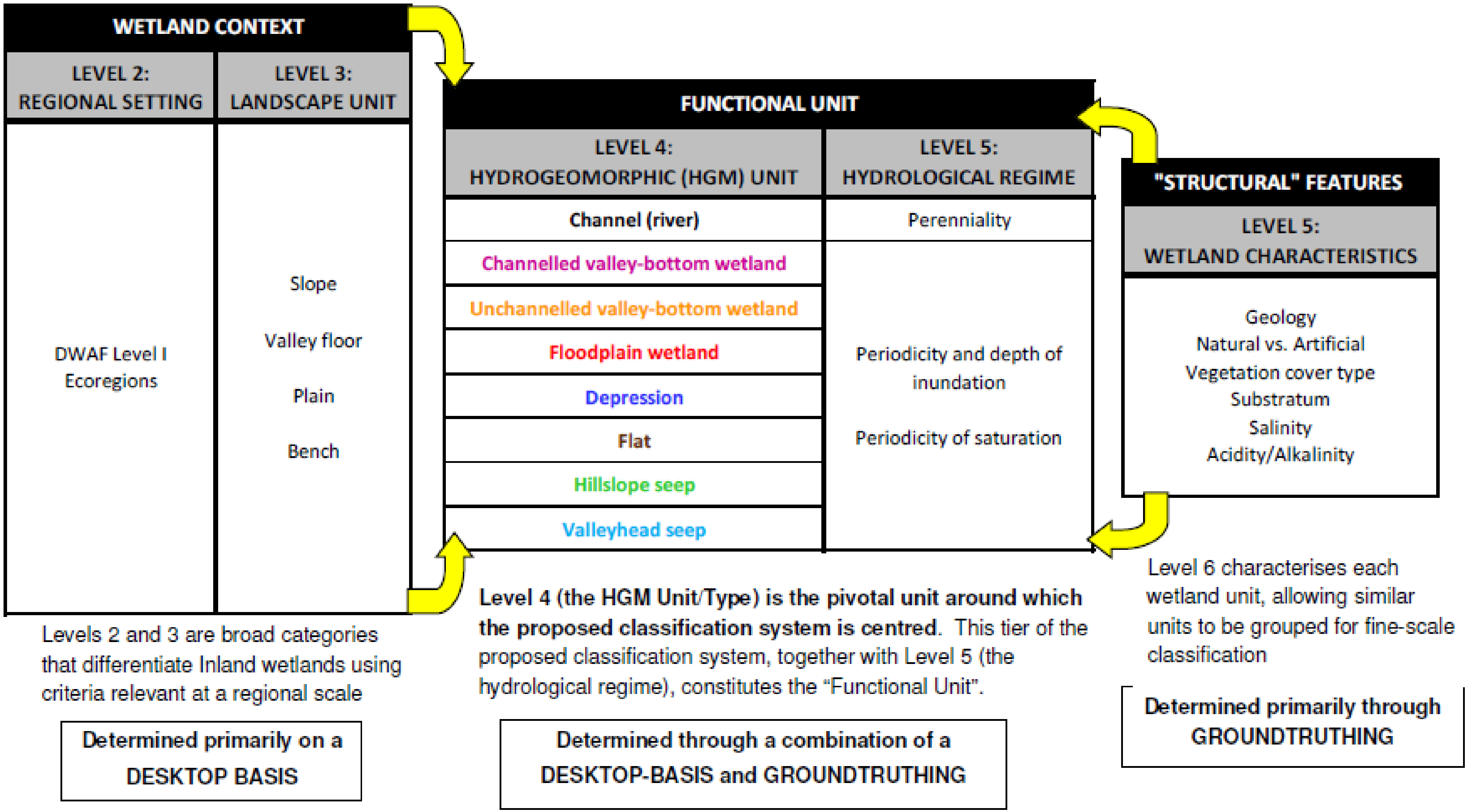

Figure 3: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from Ollis *et al*., 2013)

5.4 Waterbody condition

To assess the PES or condition of the observed wetlands, a modified Wetland Index of Habitat Integrity (DWAF, 2007) was used. The Wetland Index of Habitat Integrity (WETLAND-IHI) is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme (RHP). The output scores from the WETLAND-IHI model are presented in the standard DWAF A-F ecological categories (Table) and provide a score of the PES of the habitat integrity of the wetland system being examined. The author has included additional criteria into the model-based system to include additional wetland types. This system is preferred when compared to systems such as WET-Health – wetland management series (WRC 2009), as WET-Health (Level 1) was developed with wetland rehabilitation in mind and is not always suitable for impact assessments. This coupled with the degraded state of the wetlands in the study area, indicated that a complex study approach was not warranted, i.e. conduct a Wet-Health Level 2 and WET-Ecosystems Services study required for an impact assessment.

Table 3: Description of A – F ecological categories based on Kleynhans *et al*., (2005)

ECOLOGICAL CATEGORY	ECOLOGICAL DESCRIPTION	MANAGEMENT PERSPECTIVE
A	Unmodified, natural.	Protected systems; relatively untouched by human hands; no discharges or impoundments allowed
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	Some human-related disturbance, but mostly of low impact potential
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	**Multiple disturbances associated with need for socio-economic development, e.g. impoundment, habitat modification and water quality degradation**
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	**Often characterized by high human densities or extensive resource exploitation. Management intervention is needed to improve health, e.g. to restore flow patterns, river habitats or water quality**
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	

The WETLAND-IHI model is composed of four modules. The “Hydrology”, “Geomorphology” and “Water Quality” modules all assess the contemporary driving processes behind wetland formation and maintenance. The last module, “Vegetation Alteration”, provides an indication of the intensity of human land use activities on the wetland surface itself and how these may have modified the condition of the wetland. The integration of the scores from these 4 modules provides an overall PES score for the wetland system being examined. The

WETLAND-IHI model is an MS Excel-based model, and the data required for the assessment are generated during a site visit.

Additional data may be obtained from remotely sensed imagery (aerial photos; maps and/or satellite imagery) to assist with the assessment. The interface of the WETLAND-IHI has been developed in a format which is similar to DWA's River EcoStatus models which are currently used for the assessment of PES in riverine environments.

5.5 Aquatic ecosystem importance and function

South Africa is a Contracting Party to the Ramsar Convention on Wetlands, signed in Ramsar, Iran, in 1971, and has thus committed itself to this intergovernmental treaty, which provides the framework for the national protection of wetlands and the resources they could provide. Wetland conservation is now driven by the South African National Biodiversity Institute, a requirement under the National Environmental Management: Biodiversity Act (No 10 of 2004).

Wetlands are among the most valuable and productive ecosystems on earth, providing important opportunities for sustainable development (Davies and Day, 1998). However, wetlands in South Africa are still rapidly being lost or degraded through direct human induced pressures (Nel *et al.,* 2004).

The most common attributes or goods and services provided by wetlands include:

- Improve water quality;
- Impede flow and reduce the occurrence of floods;
- Reeds and sedges used in construction and traditional crafts;
- Bulbs and tubers, a source of food and natural medicine;
- Store water and maintain base flow of rivers;
- Trap sediments; and
- Reduce the number of water-borne diseases.

In terms of this study, the wetlands provide ecological (environmental) value to the area acting as refugia for various wetland associated plants, butterflies and birds.

In the past wetland conservation has focused on biodiversity as a means of substantiating the protection of wetland habitat. However not all wetlands provide such motivation for their protection, thus wetland managers and conservationists began assessing the importance of wetland function within an ecosystem.

Table below summarises the importance of wetland function when related to ecosystem services or ecoservices (Kotze et al., 2008). One such example is emergent reed bed wetlands that function as transformers converting inorganic nutrients into organic compounds (Mitsch and Gosselink, 2000).

Table 4: Summary of direct and indirect ecoservices provided by wetlands from Kotze *et al*., 2008

<table>
<tr><td rowspan="15">Ecosystem services supplied by wetlands</td><td rowspan="9">Indirect benefits</td><td rowspan="8">Hydro-geochemical benefits</td><td colspan="2">Flood attenuation</td></tr>
<tr><td colspan="2">Stream flow regulation</td></tr>
<tr><td rowspan="5">Water quality enhancement benefits</td><td>Sediment trapping</td></tr>
<tr><td>Phosphate assimilation</td></tr>
<tr><td>Nitrate assimilation</td></tr>
<tr><td>Toxicant assimilation</td></tr>
<tr><td>Erosion control</td></tr>
<tr><td colspan="2">Carbon storage</td></tr>
<tr><td colspan="3">Biodiversity maintenance</td></tr>
<tr><td rowspan="6">Direct benefits</td><td colspan="3">Provision of water for human use</td></tr>
<tr><td colspan="3">Provision of harvestable resources[2]</td></tr>
<tr><td colspan="3">Provision of cultivated foods</td></tr>
<tr><td colspan="3">Cultural significance</td></tr>
<tr><td colspan="3">Tourism and recreation</td></tr>
<tr><td colspan="3">Education and research</td></tr>
</table>

Conservation importance of the individual wetlands was based on the following criteria:

- Habitat uniqueness;
- Species of conservation concern;
- Habitat fragmentation or rather, continuity or intactness with regards to ecological corridors; and
- Ecosystem service (social and ecological).

The presence of any or a combination of the above criteria would result in a HIGH conservation rating if the wetland was found in a near natural state (high PES). Should any of the habitats be found modified the conservation importance would rate as MEDIUM, unless a Species of Conservation Concern (SCC) was observed, in which case it would receive a HIGH rating. Any system that was highly modified (low PES) or had none of the above criteria, received a LOW conservation importance rating. Wetlands with HIGH and MEDIUM ratings should thus be excluded from development with incorporation into a suitable open space system, with the maximum possible buffer being applied. Natural wetlands or Wetlands that resemble some form of the past landscape but receive a LOW conservation importance rating could be included into stormwater management features and should not be developed to retain the function of any ecological corridors.

6 Description of the affected environment

The greater study area is dominated by three major types of natural aquatic features and a small number of artificial barriers associated with catchments and rivers, characterised as follows:

- Ephemeral watercourses with or without riparian vegetation that included, *Vachellia karroo*, *Searsia lancea*, *Euclea undulata* and *Gymonsporia buxifolia* (Plate 1);
- Depressions (Plate 2), dominated by grass species and
- Dams and weirs / berms with no wetland or aquatic features.

The study area is situated predominantly within the Xhariep Karroid Grassland (Gh 3) and Besemkaree Koppies Shrubland (GH 4) vegetation units, associated with the upper reaches of the Lemoenspruit and Berg rivers catchment (D33C / D31D), a small subquaternary catchments linked to the Orange / Gariep River (Figure 4). This is located within the Orange River Water Management Area (Kimberley), in the Nama Karoo Eco-region, but is not considered part of any wetland cluster, Strategic Water Resource Area, International Bird area.

The Department of Forestry, Fisheries and Environment (DFFE) identified the aquatic environment for the study area as having a Very High Sensitivity, in the DFFE Screening Tool due to the presence of Wetlands (Riverine) Rivers Conservation Class AB & C (See Screening Verification Statement – Appendix 2).

The presence of these Very High Sensitivity features was confirmed during this assessment, and delineated to a finer scale, but still closely represented the features shown in the Screening Tool results see Appendix 2 for Verification Statement.

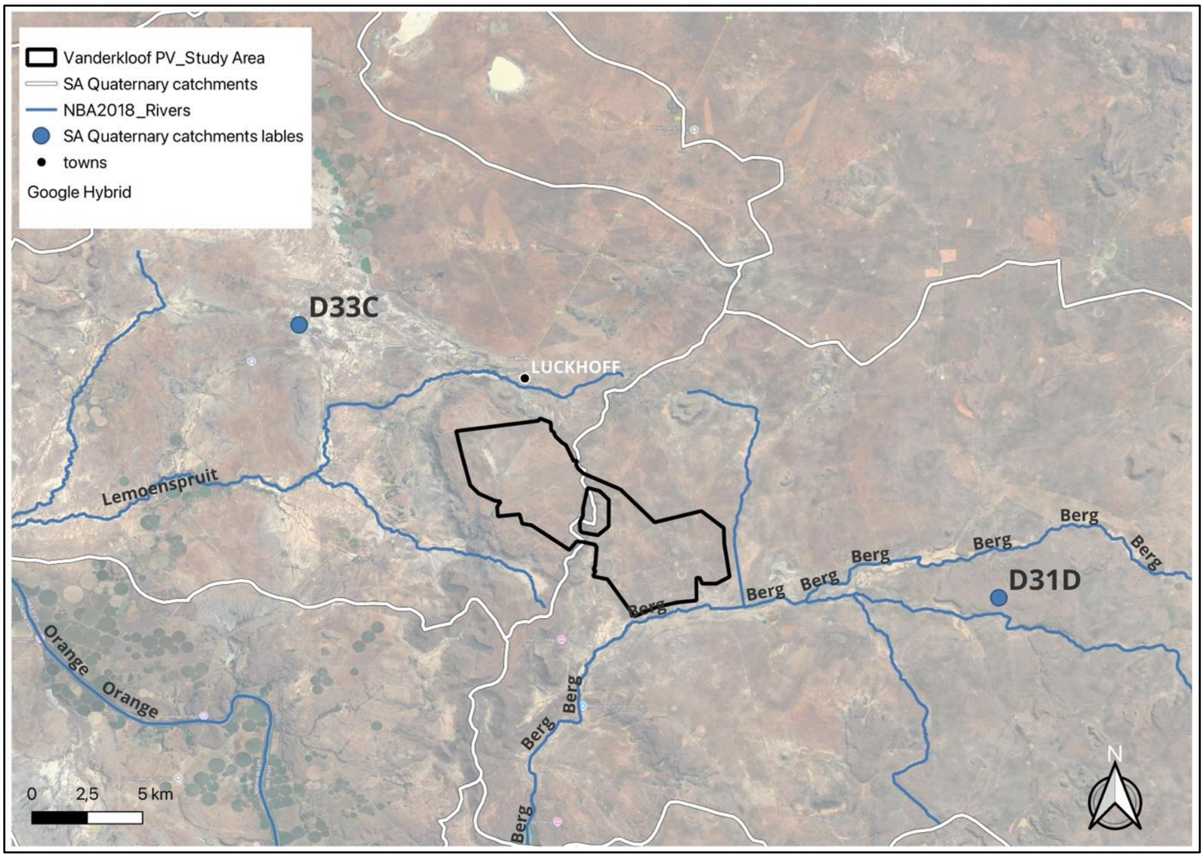

Figure 4: Project locality map indicating the various quaternary catchments and mainstem rivers (Source DWS and NGI) within the project boundary

Plate 1: A watercourse with distinct riparian zone within a broad floodplain, composed of sandy alluvium adjacent the study area

Plate 2: A view of the northern portion of the study area (north of PV 5), where the National databases indicated that these riverine systems contained riverine wetlands, but these areas (red arrow) where confirmed to be riparian, with no facultative or obligate wetland plant species

The groundtruthed delineations were then compared to current waterbody inventories (Figure 5) (van Deventer *et al*., 2020), 1: 50 000 topocadastral surveys mapping and the site. These inventories include wetland spatial data based on landcover 2007 data, previous assessments and wetland information retained by the Provincial authorities, combined into one database that formed part of the updated National Spatial Biodiversity Assessment, 2018.

A baseline map was then developed and refined using the 2022 / 2024 survey data, noting that due to the topography and geology, the features were digitised at a scale of 1:5 000 (Figure 6).

Coupled to the aquatic delineations, information was collected on potential species that could occur within the watercourses, especially any conservation worthy species (Listed or Protected).

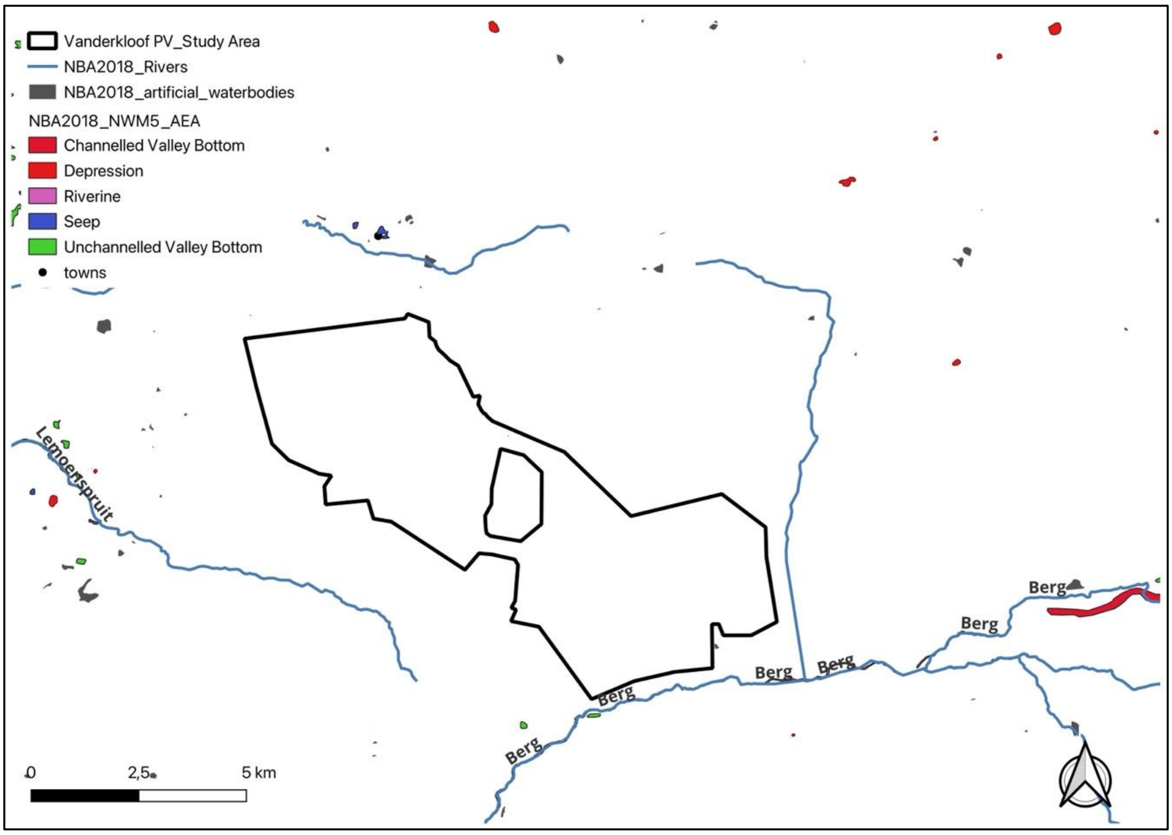

Figure 5: National Wetland Inventory wetlands and waterbodies (van Deventer *et al*., 2020)

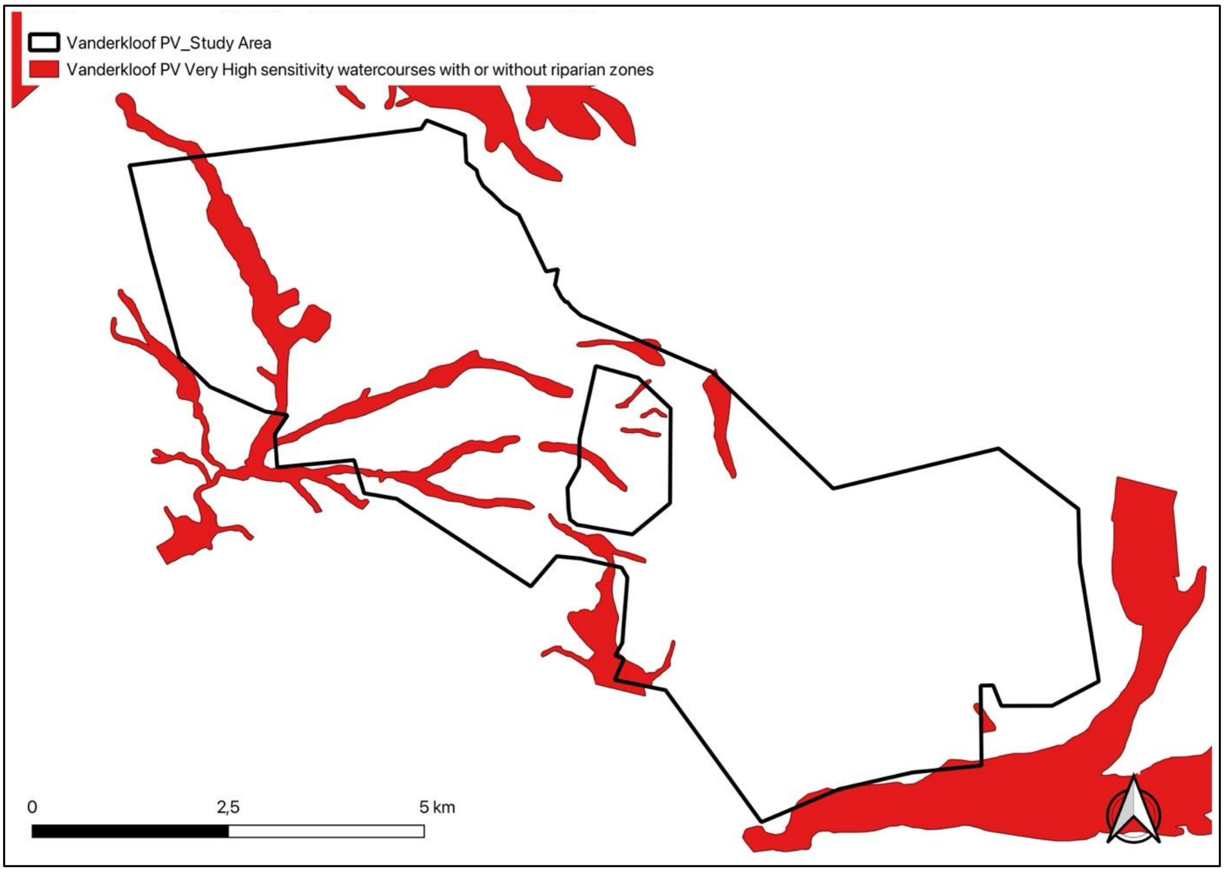

Figure 6: Waterbodies delineated in this assessment based on groundtruthing information collected (no buffers are shown)

7 Present Ecological State and conservation importance

The Present Ecological State (PES) of a river, watercourse or wetland represents the extent to which it has changed from the reference or near pristine condition (Category A) towards a highly impacted system where there has been an extensive loss of natural habit and biota, as well as ecosystem functioning (Category E).

The PES scores have been revised for the country and based on the new models, aspects of functional importance as well as direct and indirect impacts have been included (DWS, 2014). The new PES system incorporates Ecological Importance (EI) and Ecological Sensitivity (ES) separately as opposed to Ecological Importance and Sensitivity (EIS) in the old model, although the new model is still heavily centred on rating rivers using broad fish, invertebrate, riparian vegetation and water quality indicators. The Recommended Ecological Category (REC) is still contained within the new models, with the default REC being B, when little or no information is available to assess the system or when only one of the above-mentioned parameters are assessed or the overall PES is rated between a C or D.

All of the systems assessed by DWS (2014) on a Subquaternary level within the study area were rated as PES = C or Moderately Modified. While these were also rated as High in terms of Ecological Sensitivity and High in terms of Ecological Importance respectively, for both catchments.

Based on the information collected during the field investigations, these ratings are verified and upheld for the riverine systems. The High Ecological Sensitivity rating for the natural water sources, is further substantiated by the fact that the affected catchments contain wetlands downstream of the site, included as).

However, the sites are not shown as being a National Freshwater Ecosystem Priority Area – NFEPA (Figure 7) and only portions are indicated as important upstream catchments to the Orange River. Further, the Free State has not issued formal Aquatic Critical Biodiversity Areas spatial information, so it assumed that any areas could be associated with the mainstem watercourses (Figure 8).

Overall, these catchment areas and subsequent rivers / watercourses are largely in a natural state with localised impacts in some areas, which include the following:

- Erosion and sedimentation associated with road crossings;
- Grazing and farming
- Alien invasive trees / plants
- Impeded water flow due to several in channel farm dams; and

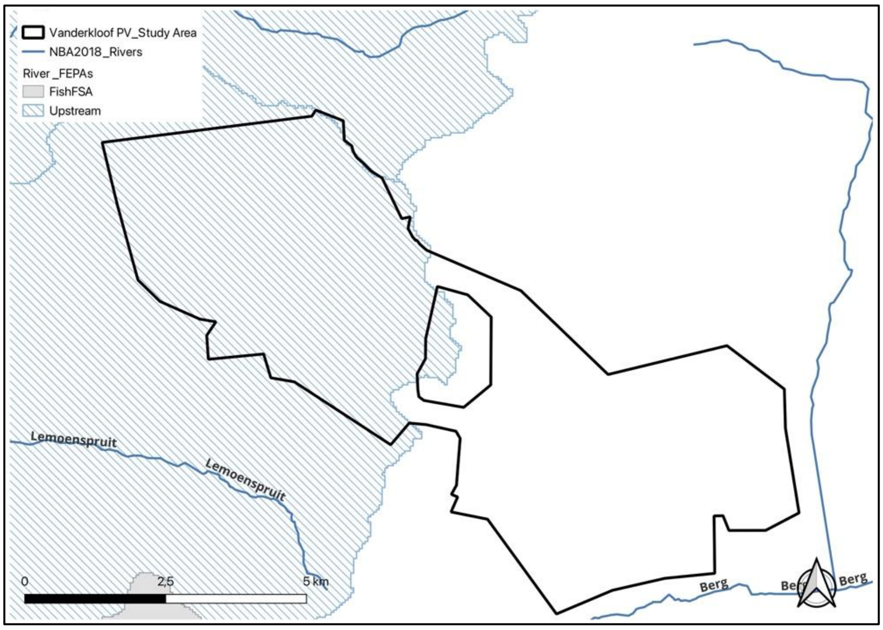

Figure 7: The Freshwater Ecosystem Priority Areas for the study site (Nel *et al,* 2011)

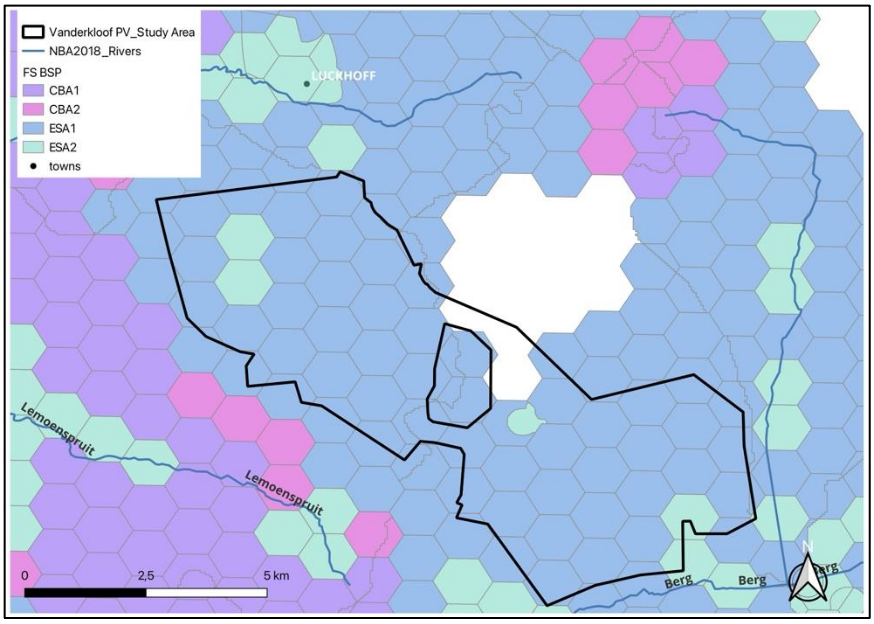

Figure 8: The Critical Biodiversity Areas as per the Free State Province Critical Biodiversity Areas, 2015 (Terrestrial)

8 Site Sensitivity

Using the baseline description and field data while considering the current disturbances and site characteristics, the following features were identified, then categorised into one of number pre-determined sensitivity categories to provide protect and/or guide the layout planning and possibly the design processes of the corridor and a suitable alignment for the grid within:

High = No Go	"No go" areas or setbacks and areas or features that are considered of such significance that impacting them may be regarded as fatal flaw or strongly influence the project impact significance profile Therefore areas or features that are considered to have a high sensitivity or where project infrastructure would be highly constrained and should be avoided as far as possible. Infrastructure located in these areas are likely to drive up impact significance ratings and mitigations
Medium	Buffer areas and or areas that are deemed to be of medium sensitivity but should still be avoid as this would minimise impacts and or the need for additional Water Use Authorisation
Low	Areas of low sensitivity or constraints, such as artificial systems with little to no biological value or would not result in any future licensing requirements e.g. dry earth wall farm dams
Neutral	Unconstrained areas (left blank in mapping)

Table 5 below provides an overview of the sensitivity of various aquatic features (with buffers distances included) as it relates to the main project component types for the project. The features are shown spatially in Figure 9 below. The sensitivity ratings of High No-go and Low were determined through an assessment of the aquatic habitat sensitivity and related constraints. However, these No-Go areas (with buffers) relate in general terms to the project and there are areas where encroachment on these areas would occur, i.e. existing road crossings within systems, but this is considered acceptable since these areas have already been impacted.

These proposed constraints / buffers do not include bird and or bat specialist buffers / constraints as theirs buffers along aquatic features are at times far larger around aquatic features, than those required for the known aquatic species within this region.

Table 5: Results of the sensitivity rating / constraints assessment related to the study area

Waterbody Name	HGM type	Sensitivity	Buffer	Constraint comment
Watercourses with or without riparian systems	Rivers	Very High	10	These are broad river systems with floodplains, some with riparian systems, but for the most part very ephemeral
Artificial waterbodies / farm dams	Man-made	Low	0	These are all man-made systems, thus no buffer has been proposed, as these are mostly non-functional wetlands / watercourses. These could easily be avoided or spanned with no additional impacts to these systems from a hydrological or aquatic habitat point of view

In summary, any structures, should be placed outside of the observed aquatic systems, and the transmission cable could span these areas. It is also assumed that no access tracks will be created within these systems unless existing roads / tracks already exist, and the pylons and towers will thus be placed outside any aquatic features (Figure 9). The respective layouts are however discussed in the impact assessment section in this report, should conflicts if any arise.

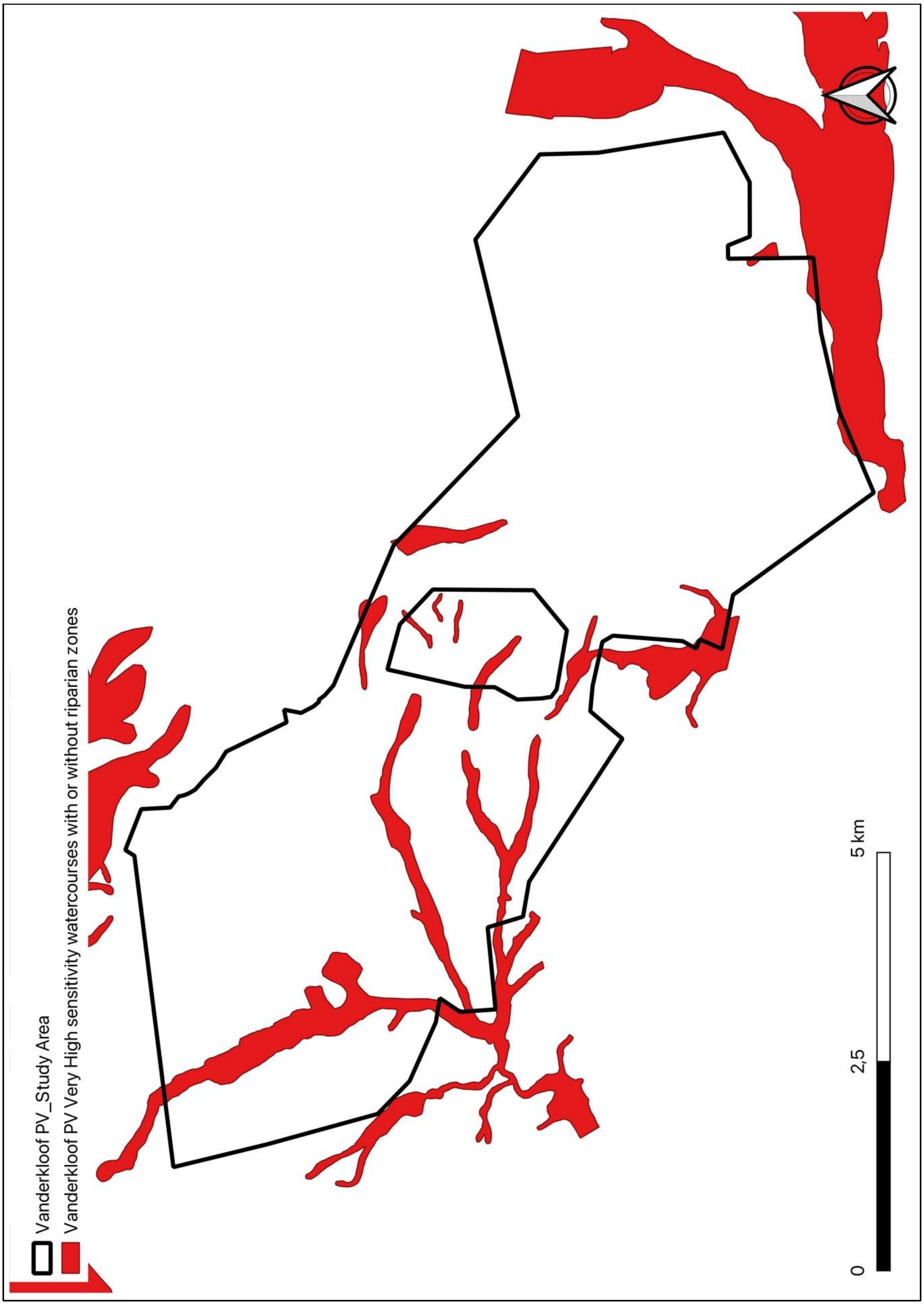

Figure 9: The delineated systems and the related sensitivity ratings for each of the respective HGM units / wetland areas

9 Impact Assessment

9.1 Alternatives Assessment

The 2014 EIA Regulations require that any feasible and reasonable activity, location and technology alternatives considered must be described and comparatively assessed. No feasible or reasonable alternatives have been identified and in terms of the guidelines on alternatives assessment, the only alternative to being comparatively assessed is the no-go option. This due to the fact that all the sites will have been assessed in detail prior to finalising any of the proposed layouts, that took cognisance of the fine scale sensitivity data provided in this report, as well as other specialists working on this assessment.

9.2 No-Go Option

With regard the No-Go option it is assumed that the entire study area would continue to degrade due to the prevalence of grazing and or erosion within the water courses. This would continue into the long-term with a Low intensity that would impact on the regional scale due to loss of important habitat. Little in the way of mitigation could be proposed due to the social needs

9.3 Impact assessment

The proposed project areas were assessed against the aquatic habitat sensitivity and it was determined that the following impacts need to be addressed.

Impact 1: Loss of Very High Sensitivity systems, through physical disturbance, although these areas except for the access roads have been avoided.

Impact 2: Impact on all watercourses through the possible increase in surface water runoff on the form and function through hydrological changes if stormwater management is not properly addressed

Impact 3: Increase in sedimentation and erosion downstream of the sites as an indirect impact related to Impact 2

Impact 4: Risks on the aquatic environment due to water quality impacts

Impact 5: Cumulative impacts

Therefore, the following direct impacts were then assessed, which are aligned with those contained in the Biodiversity Assessment Protocol and assessed against the layout:

Biodiversity Assessment Protocol Impacts found applicable to this project	Impacts assessed in this report below
Fragmentation (physical loss of ecological connectivity)	Impact 1 & 2
Changes in numbers and density of species	Impact 1 & 2
Faunal and vegetation communities inhabiting the site	Impact 1 & 2
Hydrological regime or Hydroperiod changes (Quantity changes such as abstraction or diversion)	Impact 2
Streamflow regulation	Impact 2
Erosion control	Impact 3
Water quality changes (increase in sediment, organic loads, chemicals or eutrophication	Impact 4
Cumulative Impacts	Impact 5

However, as requested by DFFE, the specialists are required to assess the impacts of the respective projects separately for the 5 PV sites and the 5 BESS components. This was conducted for the aquatic environment with a summary of the impacts for each contained in Table 6 & 7 below, noting that for the majority of the project components are located outside undisturbed or natural portions of the aquatic environment and thus any direct impacts have been avoided (Figure 10 - 15). The only exception being PV 2 panel areas that are located within two small aquatic buffer areas (Figure 11). This small incursion has not affected the impact ratings due to the scale and locality of the impact, but it is highly recommended that the layout of PV 2 be adjusted to avoid these areas (Table 6).

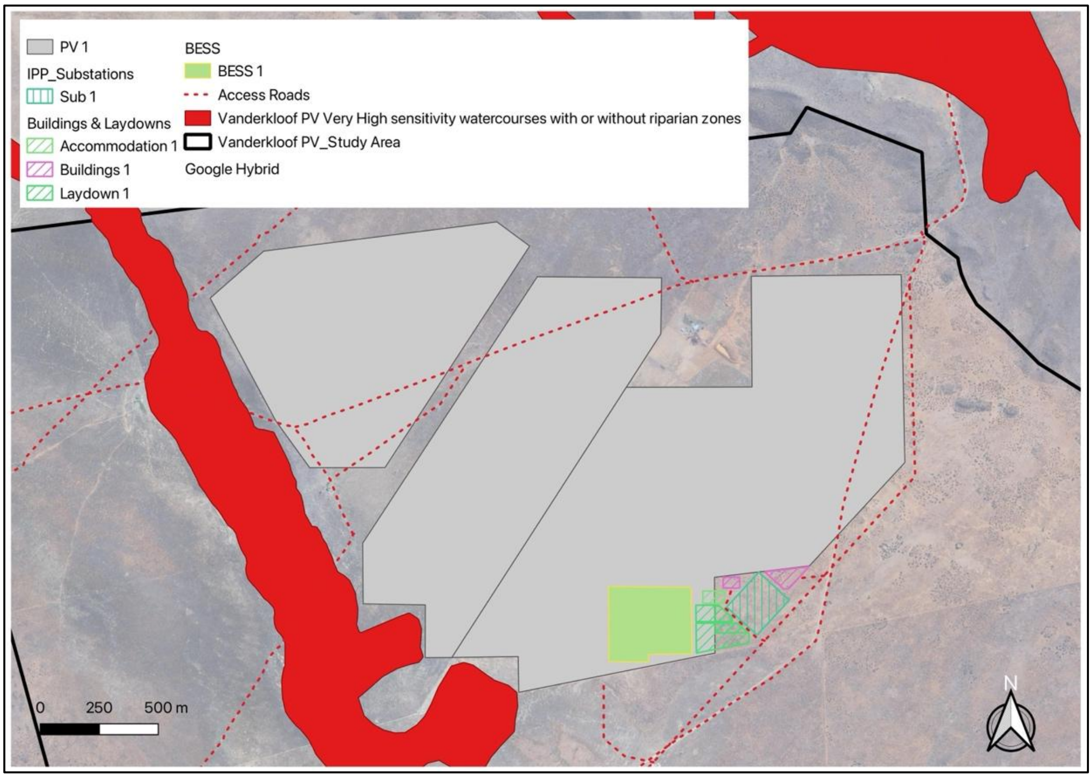

Figure 10: The proposed layout of PV 1 and BESS 1 in relation to the aquatic environment inclusive of the proposed buffers, where the facility components have avoided these ecosystems, while access roads make use of existing tracks or disturbed areas

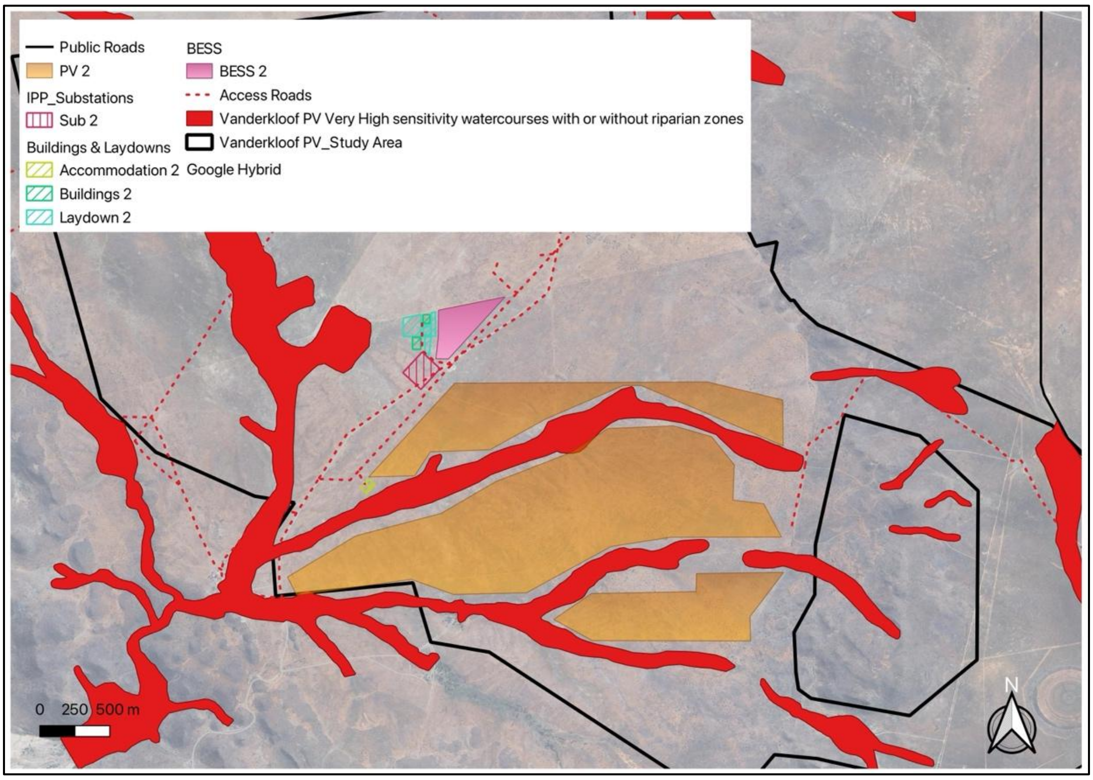

Figure 11: The proposed layout of PV 2 and BESS 2 in relation to the aquatic environment inclusive of the proposed buffers, where the facility components have avoided these ecosystems, while access roads make use of existing tracks or disturbed areas

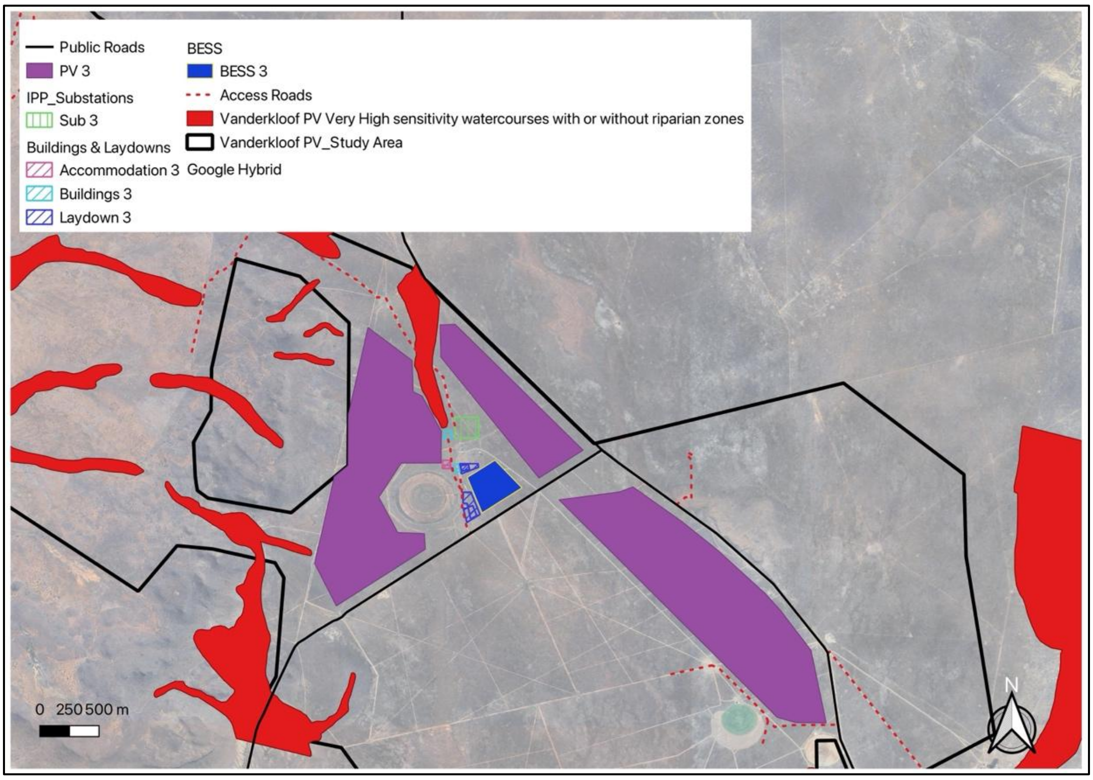

Figure 12: The proposed layout of PV 3 and BESS 3 in relation to the aquatic environment inclusive of the proposed buffers, where the facility components have avoided these ecosystems, while access roads make use of existing tracks or disturbed areas

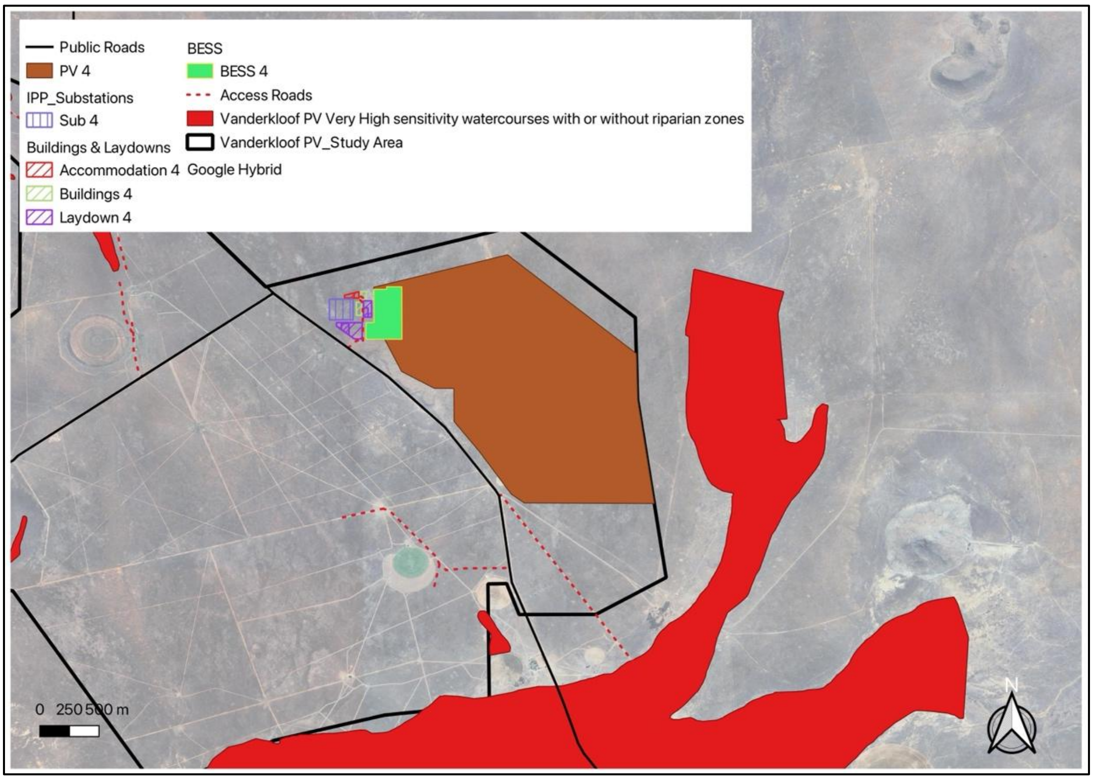

Figure 14: The proposed layout of PV 4 and BESS 4 in relation to the aquatic environment inclusive of the proposed buffers, where the facility components have avoided these ecosystems, while access roads make use of existing tracks or disturbed areas

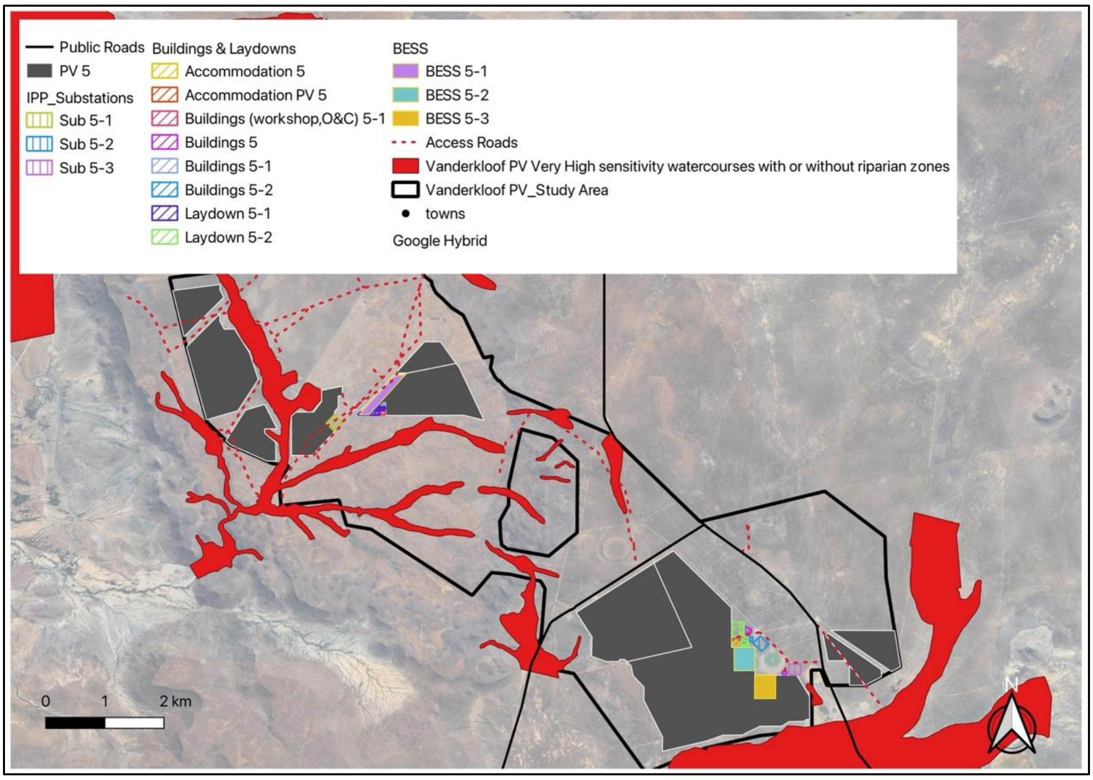

Figure 15: The proposed layout of PV 5 and BESS 5 in relation to the aquatic environment inclusive of the proposed buffers, where the facility components have avoided these ecosystems, while access roads make use of existing tracks or disturbed areas

Table 6: Summary of impact for each of the PV project areas on the aquatic environment

Impact assessed	Impact rating after mitigation				
	PV 1	PV 2	PV 3	PV 4	PV 5
Impact 1: Loss of aquatic environments	Low	Low (assuming the PV panel areas are adjusted and will avoid any aquatic areas)	Low	Low	Low
Impact 2: Impact on all watercourses through the possible increase in surface water runoff on the form and function through hydrological changes if stormwater management is not properly addressed	Low	Low	Low	Low	Low
Impact 3: Increase in sedimentation and erosion downstream of the sites as an indirect impact related to Impact 2	Low	Low	Low	Low	Low
Impact 4: Risks on the aquatic environment due to water quality impacts	Low	Low	Low	Low	Low
Impact 5: Cumulative impacts	Low	Low	Low	Low	Low

Table 7: Summary of impact for each of the BESS project areas on the aquatic environment

Impact assessed	Impact rating after mitigation				
	BESS 1	BESS 2	BESS 3	BESS 4	BESS 5
Impact 1: Loss of aquatic environments	Low	Low	Low	Low	Low
Impact 2: Impact on all watercourses through the possible increase in surface water runoff on the form and function through hydrological changes if stormwater management is not properly addressed	Low	Low	Low	Low	Low
Impact 3: Increase in sedimentation and erosion downstream of the sites as an indirect impact related to Impact 2	Low	Low	Low	Low	Low
Impact 4: Risks on the aquatic environment due to water quality impacts	Low	Low	Low	Low	Low
Impact 5: Cumulative impacts	Low	Low	Low	Low	Low

As the results of the impacts as shown in Table 6 and 7 were similar post mitigation, with similar mitigations , to then avoid repetition one set of Impact Assessment Tables is included below:

The impacts were assessed as follows for the 5 PV sites, with associated infrastructure (see Figure 10 – 15):

Nature: Impact 1:	Loss of Very High Sensitivity systems, through physical disturbance, although these areas except for the access roads have been avoided. See Notes on the PV 2 Panels areas that require adjustment	
	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	

Mitigation:

The most significant form of mitigation would be to select the current development options as these have avoided any Very High Sensitivity Aquatic Zones

- Where large cut and fill areas are required, these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation.
- Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).

To minimise the impact of the access roads:

- The use existing roads or upgrade existing tracks rather than constructing entirely new roads wherever possible has been included in the proposed development layouts for all sites and must be adhered to.
- Use the smallest possible working corridor. Outside the working corridor, all watercourses are to be considered no go areas. Any unnecessary intrusion into these areas is prohibited. Where intrusion is required, the working corridor must be kept to a minimum and demarcated clearly, before any construction commences.
- Removal of vegetation must only be when essential for the continuation of the project. Do not allow any disturbance to the adjoining natural vegetation cover or soils.
- Any fauna (frogs, snakes, etc.) that are found within the construction area must be moved to the closest point of similar habitat type outside of the areas to be impacted.
- All disturbed areas beyond the construction site that are intentionally or accidentally disturbed during the construction phase must be rehabilitated.

It is the contractor's responsibility to continuously monitor the area for newly established alien species during the contract and establishment period, which if present must be removed. Removal of these species shall be

undertaken in a way which prevents any damage to the remaining indigenous species and inhibits the re-infestation of the cleaned areas.
Cumulative impacts: This will be limited as only one other project is currently approved north of Luckhoff and that project will be held to the same design principles indicated in the above mitigations
Residual impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: Impact 2: Impact on all watercourses through the possible increase in surface water runoff on the form and function through hydrological changes if stormwater management is not properly addressed.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation: A stormwater management plan finalised in the in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed areas that previously contained vegetation		
Cumulative impacts: The increase in surface run-off velocities and a reduction in the potential for groundwater infiltration is likely to occur, considering that the development area is near several drainage areas, but with stormwater management the impacts can be mitigated		

Residual impacts: Sizable portion of intact natural environment remain within the greater region.

Nature: Impact 3 - Increase in sedimentation and erosion within the development footprint during the operation phase in downstream areas An increase in hard surface areas and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation: A stormwater management plan finalised in the in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed areas that previously contained vegetation		
Cumulative impacts: Downstream erosion and sedimentation of the downstream systems and farming operations. During flood events, the unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream will be washed into the mainstem systems, that already have high sediment loads.		
Residual impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.		

Nature: Impact 4 - Risks on the aquatic environment due to water quality impacts During both preconstruction, construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes (high)	
Mitigation: • Strict use and management of all hazardous materials used on site. • Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas • Containment of all contaminated water by means of careful run-off management on site. • Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility, located well away from any watercourses (including buffer). These regularly maintained. • Appropriate waste management and disposal.		
Cumulative impacts: This will be limited as only one other project is currently approved north of Luckhoff and that project will be held to the same design principles indicated in the above mitigations.		
Residual impacts: Residual impacts will be negligible after appropriate mitigation.		

Nature: Impact 5 – Cumulative Impacts

In the assessment of this project, any projects have been assessed by the report author within a 35km radius and or other sites were accessed during travelling between the various projects. Projects amongst others, included the AREP projects north of Luckhoff

Of these projects, this report author has been involved in the initial EIA aquatic assessments or has managed / assisted with the associated grid connections these projects.

All of the projects have indicated that their intention with regard to mitigation, i.e. selecting the best possible sites to minimise the local and regional impacts or improving the drainage or hydrological conditions within these rivers, and therefore the cumulative impact could be seen as a net benefit. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects such as stormwater management, and that flows within these systems are sporadic.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (1)	Low (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (18)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes (high)	

Mitigation:

- Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region by local landowners / public works entities where possible
- Install properly sized culverts with erosion protection measures at the present road / track crossings where already installed by local landowners / public works entities

Residual impacts:

Residual impacts will be negligible after appropriate mitigation.

The impacts were assessed as follows for the 5 BESS sites:

Nature: Impact 1:	Loss of Very High Sensitivity systems, through physical disturbance, although these areas have been avoided by all the proposed BESS options. Access to these sites is dealt in the PV site options impact assessment section above.	
	Without mitigation	**With mitigation**
Extent	Regional (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	

Mitigation:

The most significant form of mitigation would be to select the current development options as these have avoided any Very High Sensitivity Aquatic Zones

- Where large cut and fill areas are required, these must be stabilised and rehabilitated during the construction process, to minimise erosion and sedimentation.
- Suitable stormwater management systems must be installed along roads and other areas and monitored during the first few months of use. Any erosion / sedimentation must be resolved through whatever additional interventions maybe necessary (i.e., extension, energy dissipaters, spreaders, etc).

To minimise the impact of the access roads:

- The use existing roads or upgrade existing tracks rather than constructing entirely new roads wherever possible has been included in the proposed development layouts for all sites an must be adhered to.
- Use the smallest possible working corridor. Outside the working corridor, all watercourses are to be considered no go areas. Any unnecessary intrusion into these areas is prohibited. Where intrusion is required, the working corridor must be kept to a minimum and demarcated clearly, before any construction commences.
- Removal of vegetation must only be when essential for the continuation of the project. Do not allow any disturbance to the adjoining natural vegetation cover or soils.
- All pipe culverts must be removed and replaced with suitable sized box culverts, where road levels are raised. Crossings that are installed below the natural ground level are to be constructed with an appropriate drop inlet structure on the upstream side to ensure that headcut erosion does not develop as a result of the gradient change from the natural ground level to the invert level of the culvert.
- The channel profile, regardless of the current state of the river / water course, will be reinstated thus preventing any impoundments from being formed. The related designs must be assessed by an aquatic specialist during a pre-construction walkdown.
- Water diversions must be temporary in nature and no permanent walls, berms or dams may be installed within a watercourse. Sandbags used in any diversion or for any other activity within a watercourse must

be in a good condition, so that they do not burst and empty sediment into the watercourse. Upon completion of the construction at the site, the diversions shall be removed to restore natural flow patterns. Under no circumstance shall a new channel or drainage canals be excavated to divert water away from construction activities. • Any fauna (frogs, snakes, etc.) that are found within the construction area must be moved to the closest point of similar habitat type outside of the areas to be impacted. • All disturbed areas beyond the construction site that are intentionally or accidentally disturbed during the construction phase must be rehabilitated. It is the contractor's responsibility to continuously monitor the area for newly established alien species during the contract and establishment period, which if present must be removed. Removal of these species shall be undertaken in a way which prevents any damage to the remaining indigenous species and inhibits the re-infestation of the cleaned areas.
Cumulative impacts: This will be limited as only one other project is currently approved north of Luckhoff and that project will be held to the same design principles indicated in the above mitigations
Residual impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: Impact 2:	Impact on all watercourses through the possible increase in surface water runoff on the form and function through hydrological changes if stormwater management is not properly addressed from the BESS sites (all).	
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation: A stormwater management plan finalised in the in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions		

and Reno mattresses) of exposed soil and the re-vegetation of any disturbed areas that previously contained vegetation
Cumulative impacts: The increase in surface run-off velocities and a reduction in the potential for groundwater infiltration is likely to occur, considering that the development area is near several drainage areas, but with stormwater management the impacts can be mitigated
Residual impacts: Sizable portion of intact natural environment remain within the greater region.

Nature: Impact 3 - Increase in sedimentation and erosion within the development footprint during the operation phase in downstream areas of the BESS sites (all) An increase in hard surface areas and or roads that require stormwater management increases runoff from a site through the concentration of surface water flows. These higher volume flows, with increased velocity can result in downstream erosion and sedimentation if not managed.		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes	
Mitigation: A stormwater management plan finalised in the in the preconstruction phase, detailing the stormwater structures and management interventions that must be installed to manage the increase of surface water flows directly into any natural systems. The stormwater control systems must be inspected on an annual basis to ensure these are functional. Effective stormwater management must include effective stabilisation (gabions and Reno mattresses) of exposed soil and the re-vegetation of any disturbed areas that previously contained vegetation		
Cumulative impacts:		

Downstream erosion and sedimentation of the downstream systems and farming operations. During flood events, the unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream will be washed into the mainstem systems, that already have high sediment loads.
Residual impacts: Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: Impact 4 - Risks on the aquatic environment due to water quality impacts

During both preconstruction, construction and, to a limited degree, the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities, as well as maintenance activities, could be washed downslope via the watercourses.

With regard the BESS technology options, it has been assumed that the safest / lowest risk option will be selected, e.g. but not limited to Solid State technology, which carries a very low risk with regard leaks and spills.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes (high)	

Mitigation:

- Strict use and management of all hazardous materials used on site, with specific reference to the proposed BESS systems and the diesel storage (e.g. concrete bunded areas etc).
- Strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc.) within demarcated / bunded areas
- Containment of all contaminated water by means of careful run-off management on site.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility, located well away from any watercourses (including buffer). These regularly maintained.
- Appropriate waste management and disposal.

Cumulative impacts: This will be limited as only one other project is currently approved north of Luckhoff and that project will be held to the same design principles indicated in the above mitigations.
Residual impacts: Residual impacts will be negligible after appropriate mitigation.

Nature: Impact 5 – Cumulative Impacts In the assessment of this project, any projects have been assessed by the report author within a 35km radius and or other sites were accessed during the course of travelling between the various projects. Projects included the AREP projects north of Luckhoff Of these projects, this report author has been involved in the initial EIA aquatic assessments or has managed / assisted with the associated grid connections these projects. All of the projects have indicated that their intention with regard to mitigation, i.e. selecting the best possible sites to minimise the local and regional impacts or improving the drainage or hydrological conditions within these rivers, and therefore the cumulative impact could be seen as a net benefit. However, the worse-case scenario has been assessed below, i.e. only the minimum of mitigation be implemented by the other projects such as stormwater management, and that flows within these systems are sporadic.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (1)	Low (1)
Probability	Probable (3)	Probable (3)
Significance	**Low (18)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources	No	No
Can impacts be mitigated	Yes (high)	
Mitigation: • Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region by local landowners / public works entities where possible		

• Install properly sized culverts with erosion protection measures at the present road / track crossings where already installed by local landowners / public works entities
Residual impacts: Residual impacts will be negligible after appropriate mitigation.

9.4 Draft Specialists Recommendations for the inclusion in the EA

The specialist has no objection to the authorisation of the proposed activities assuming that all mitigations and buffer zones are implemented.

The significant impacts are associated with the access road crossings river systems. These systems are generally in a less modified state and still provide some habitat and important ecological functions. Mitigation should focus on these areas and include measures to halt erosion and rehabilitate habitat in the sections affected by the construction. However, with the adoption of mitigation, the proposed project will have a Low impact upon aquatic biodiversity.

10 Conclusion and Recommendations

During this assessment, several sensitive aquatic habitats were observed and are shown in the maps provided in this report. In summary, any structures, have been placed outside of the observed aquatic systems, with the exception of the PV 2 panel areas, and the proposed access roads. These roads will however make use of existing tracks and roads thus the potential improve drainage would actually be seen as a net benefit if the current crossings (mostly informal) are upgraded.

In conclusion, most of the anticipated impacts would include disturbance during the construction phase, while changes to form and function of the site due to increased runoff roads or hard surfaces would occur in the operational and maintenance (O&M) phase.

In summary, the impacts upon aquatic biodiversity associated with the project are of Low significance, after mitigation. The loss of irreplaceable aquatic habitat and/or important biota is highly unlikely. The impacts are considered to be easily mitigated (provided the mitigation measures and monitoring plan within the EMP and this report are implemented and adhered to during all phases of the project).

11 References

- Agenda 21 – Action plan for sustainable development of the Department of Environmental Affairs and Tourism (DEAT) 1998.
- Agricultural Resources Act, 1983 (Act No. 43 of 1983).
- Davies, B. and Day J., (1998). Vanishing Waters. University of Cape Town Press.
- Department of Water Affairs and Forestry - DWAF (2005). A practical field procedure for identification and delineation of wetland and riparian areas Edition 1. Department of Water Affairs and Forestry , Pretoria.
- Department of Water Affairs and Forestry - DWAF (2008). Manual for the assessment of a Wetland Index of Habitat Integrity for South African floodplain and channelled valley bottom wetland types by M. Rountree (ed); C.P. Todd, C. J. Kleynhans, A. L. Batchelor, M. D. Louw, D. Kotze, D. Walters, S. Schroeder, P. Illgner, M. Uys. and G.C. Marneweck. Report no. N/0000/00/WEI/0407. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria, South Africa.
- Driver A., Sink, K.J., Nel, J.N., Holness, S., Van Niekerk, L., Daniels, F., Jonas, Z., Majiedt, P.A., Harris, L. & Maze, K. 2012. National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria.
- Du Preez, L. And Carruthers, V. 2009. A Complete Guide To Frogs Of Southern Africa. Struik Nature, Cape Town
- Ewart-Smith J.L., Ollis D.J., Day J.A. and Malan H.L. (2006). National Wetland Inventory: Development of a Wetland Classification System for South Africa. WRC Report No. KV 174/06. Water Research Commission, Pretoria.
- IUCN (2019). Red List of Threatened Species. IUCN Species Survival Commission, Cambridge Available: http://www.iucnredlist.org/
- Kleynhans C.J., Thirion C. and Moolman J. (2005). A Level 1 Ecoregion Classification System for South Africa, Lesotho and Swaziland. Report No. N/0000/00/REQ0104. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria.
- Kotze D.C., Marneweck G.C., Batchelor A.L., Lindley D.S. and Collins N. (2008). WET-EcoServices A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No: TT 339/08.
- Macfarlane, D.M. & Bredin, I.P. 2017. Buffer Zone Guidelines for Rivers, Wetlands and Estuaries Buffer Zone Guidelines for Rivers, Wetlands and Estuaries. WRC Report No TT 715/1/17 Water Research Commission, Pretoria.
- Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), as amended.
- Mitsch, J.G. and Gosselink, G. (2000). Wetlands 3rd End, Wiley, NewYork, 2000, 920 pg.
- Mucina, L., & Rutherford, M.C., 2006. The Vegetation of South Africa, Lesotho and Swaziland, Strelitzia 19, South Africa.
- National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.
- National Water Act, 1998 (Act No. 36 of 1998), as amended
- Nel, J., Maree, G., Roux, D., Moolman, J., Kleynhans, N., Silberbauer, M. and Driver, A. 2004. South African National Spatial Biodiversity Assessment 2004: Technical Report. Volume 2: River Component. CSIR Report Number ENV-S-I-2004-063. Council for Scientific and Industrial Research, Stellenbosch.
- Nel, J.L., Murray, K.M., Maherry, A.M., Petersen, C.P., Roux, D.J., Driver, A., Hill, L., Van Deventer, H., Funke, N., Swartz, E.R., Smith-Adao, L.B., Mbona, N., Downsborough, L. and Nienaber, S. (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.
- Nel, J., Colvin, C., Le Maitre, D., Smith, J. & Haines, I. (2013). South Africa's Strategic Water Source Areas. CSIR Report No: CSIR/NRE/ECOS/ER/2013/0031/A. Report for WWF South Africa
- Ollis, D.J., Snaddon, C.D., Job, N.M. & Mbona, N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African National Biodiversity Institute, Pretoria.
- Parsons R. (2004). Surface Water – Groundwater Interaction in a Southern African Context. WRC Report TT 218/03, Pretoria.
- Ramsar Convention, (1971) including the Wetland Conservation Programme (DEAT) and the National Wetland Rehabilitation Initiative (DEAT, 2000).

- Rowntree, K., Wadesone, R. and O'Keeffe, J. 2000. The development of a geomorphological classification system for the longitudinal zonation of South African rivers. South African Geographical Journal 82(3): 163-172.
- South African Bird Atlasing Project 2 (SABAP2). 2017. Animal Demographic Unit. Available online: http://sabap2.adu.org.za/
- Stuart, C and Stuart, T. 2007. A field guide to the mammals of Southern Africa. Struik Nature, Cape Town.
  van Deventer H., Smith-Adao, L. Petersen C., Mbona N., Skowno A., Nel, J.L. (2020) Review of available data for a South African Inventory of Inland Aquatic Ecosystems (SAIIAE). Water SA 44 (2) 184-199

12 Appendix 1 – Copy of Specialist CV

CURRICULUM VITAE
Dr Brian Michael Colloty
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083 498 3299

Profession: Ecologist & Environmental Assessment Practitioner (Pr. Sci. Nat. 400268/07)
Member of the South African Wetland Society
Specialisation: Ecology and conservation importance rating of inland habitats, wetlands, rivers & estuaries
Years experience: 25 years

SKILLS BASE AND CORE COMPETENCIES

- 25 years experience in environmental sensitivity and conservation assessment of aquatic and terrestrial systems inclusive of Index of Habitat Integrity (IHI), WET Tools, Riparian Vegetation Response Assessment Index (VEGRAI) for Reserve Determinations, estuarine and wetland delineation throughout Africa. Experience also includes biodiversity and ecological assessments with regard sensitive fauna and flora, within the marine, coastal and inland environments. Countries include Mozambique, Kenya, Namibia, Central African Republic, Zambia, Eritrea, Mauritius, Madagascar, Angola, Ghana, Guinea-Bissau and Sierra Leone. Current projects also span all nine provinces in South Africa.
- 15 years experience in the coordination and management of multi-disciplinary teams, such as specialist teams for small to large scale EIAs and environmental monitoring programmes, throughout Africa and inclusive of marine, coastal and inland systems. This includes project and budget management, specialist team management, client and stakeholder engagement and project reporting.
- GIS mapping and sensitivity analysis

TERTIARY EDUCATION

- 1994: B Sc Degree (Botany & Zoology) - NMU
- 1995: B Sc Hon (Zoology) - NMU
- 1996: M Sc (Botany - Rivers) - NMU
- 2000: Ph D (Botany – Estuaries & Mangroves) – NMU

EMPLOYMENT HISTORY

- 1996 – 2000 Researcher at Nelson Mandela University – SAB institute for Coastal Research & Management. Funded by the WRC to develop estuarine importance rating methods for South African Estuaries
- 2001 – January 2003 Training development officer AVK SA (reason for leaving – sought work back in the environmental field rather than engineering sector)
- February 2003- June 2005 Project manager & Ecologist for Strategic Environmental Focus (Pretoria) – (reason for leaving – sought work related more to experience in the coastal environment)
- July 2005 – June 2009 Principal Environmental Consultant Coastal & Environmental Services (reason for leaving – company restructuring)
- June 2009 – August 2018 Owner / Ecologist of Scherman Colloty & Associates cc
- August 2018 Owner / Ecologist - EnviroSci (Pty) Ltd

SELECTED RELEVANT PROJECT EXPERIENCE

World Bank IFC Standards

- Kenmare Mining Pilivilli, Mozambique - wetland (mangroves, peatlands and estuarine) assessment and biodiversity offset analysis - current
- Botswana South Africa 400kv transmission line (400km) biodiversity assessment on behalf of Aurecon - current
- Farim phosphate mine and port development, Guinea Bissau – biodiversity and estuarine assessment on behalf of Knight Piesold Canada – 2016.
- Tema LNG offshore pipeline EIA – marine and estuarine assessment for Quantum Power (2015).
- Colluli Potash South Boulder, Eritrea, SEIA marine baseline and hydrodynamic surveys co-ordinator and coastal vegetation specialist (coastal lagoon and marine) (on-going).
- Wetland, estuarine and riverine assessment for Addax Biofeuls Sierra Leone, Makeni for Coastal & Environmental Services: 2009
- ESHIA Project manager and long-term marine monitoring phase coordinator with regards the dredge works required in

Luanda bay, Angola. Monitoring included water quality and biological changes in the bay and at the offshore disposal outfall site, 2005-2011

South African

- Plant and animal search and rescue for the Karusa and Soetwater Wind Farms on behalf of Enel Green Power, Current
- Plant and animal search and rescue for the Nxuba, Oyster Bay and Garob Wind Farms on behalf of Enel Green Power, 2018 - 2019
- Plant and Animal Search and Rescue for the Port of Ngqura, Transnet Landside infrastructure Project, with development and management of on site nursery, Current
- Plant and Animal Search and Rescue for the Port of Ngqura, OTGC Tank Farm Project (2019)
- Plant search and rescue, for NMBM (Driftsands sewer, Glen Hurd Drive), Department of Social Development (Military veterans housing, Despatch) and Nxuba Wind Farm, - current
- Wetland specialist appointed to update the Eastern Cape Biodiversity Conservation Plan, for the Province on behalf of EOH CES appointment by SANBI – current. This includes updating the National Wetland Inventory for the province, submitting the new data to CSIR/SANBI.
- CDC IDZ Alien eradication plans for three renewable projects Coega Wind Farm, Sonop Wind Farm and Coega PV, on behalf of JG Afrika (2016 – 2017).
- Nelson Mandela Bay Municipality Baakens River Integrated Wetland Assessment (Inclusive of Rehabilitation and Monitoring Plans) for CEN IEM Unit - Current
- Rangers Biomass Gasification Project (Uitenhage), biodiversity and wetland assessment and wetland rehabilitation / monitoring plans for CEM IEM Unit – 2017
- Gibson Bay Wind Farm implementation of the wetland management plan during the construction and operation of the wind farm (includes surface / groundwater as well wetland rehabilitation & monitoring plan) on behalf of Enel Green Power - 2018
- Gibson Bay Wind Farm 133kV Transmission Line wetland management plan during the construction of the transmission line (includes wetland rehabilitation & monitoring plan) on behalf of Eskom – 2016.
- Tsitsikamma Community Wind Farm implementation of the wetland management plan during the construction of the wind farm (includes surface / biomonitoring, as well wetland rehabilitation & monitoring plan) on behalf of Cennergi – completed May 2016.
- Alicedale bulk sewer pipeline for Cacadu District, wetland and water quality assessment, 2016
- Mogalakwena 33kv transmission line in the Limpopo Province, on behlaf of Aurecon, 2016
- Cape St Francis WWTW expansion wetland and passive treatment system for the Kouga Municipality, 2015
- Macindane bulk water and sewer pipelines wetland and wetland rehabilitation plan 2015
- Eskom Prieska to Copperton 132kV transmission line aquatic assessment, Northern Cape on behalf of Savannah Environmental 2015.
- Joe Slovo sewer pipeline upgrade wetland assessment for Nelson Mandela Bay Municipality 2014
- Cape Recife Waste Water Treatment Works expansion and pipeline aquatic assessment for Nelson Mandela Bay Municipality 2013
- Pola park bulk sewer line upgrade aquatic assessment for Nelson Mandela Bay Municipality 2013
- Transnet Freight Rail – Swazi Rail Link (Current) wetland and ecological assessment on behalf of Aurecon for the proposed rail upgrade from Ermelo to Richards Bay
- Eskom Transmission wetland and ecological assessment for the proposed transmission line between Pietermaritzburg and Richards Bay on behalf of Aurecon (2012).
- Port Durnford Exarro Sands biodiversity assessment for the proposed mineral sands mine on behalf of Exxaro (2009)
- Fairbreeze Mine Exxaro (Mtunzini) wetland assessment on behalf of Strategic Environmental Services (2007).
- Wetland assessment for Richards Bay Minerals (2013) – Zulti North haul road on behalf of RBM.
- Biodiversity and aquatic assessments for 118 renewable projects in the past 9 years in the Western, Eastern, Northern Cape, KwaZulu-Natal and Free State provinces. Clients included RES-SA, Red Cap, ACED Renewables, Mainstream Renewable, GDF Suez, Globeleq, ENEL, Abengoa amongst others. Particular aquatic sensitivity assessment and Water Use License Applications on behalf of Mainstream Renewable Energy (8 wind farms and 3 PV facilities.), Cennergi / Exxaro (2 Wind farms), WKN Wind current (2 wind farms & 2 PV facilities), ACED (6 wind farms) and Windlab (3 Wind farms) were also conducted. Several of these projects also required the assessment of the proposed transmission lines and switching stations, which were conducted on behalf of Eskom.
- Vegetation assessments on the Great Brak rivers for Department of Water and Sanitation, 2006 and the Gouritz Water Management Area (2014)
- Proposed FibreCo fibre optic cable vegetation assessment along the PE to George, George to Graaf Reinet, PE to Colesburg, and East London to Bloemfontein on behalf of SRK (2013-2015).

SACNASP

South African Council for Natural Scientific Professions

herewith certifies that

Brian Michael Colloty

Registration Number: 400268/07

is a registered scientist

in terms of section 20(3) of the Natural Scientific Professions Act, 2003
(Act 27 of 2003)
in the following field(s) of practice (Schedule 1 of the Act)

Ecological Science (Professional Natural Scientist)

Effective **7 November 2007** Expires **31 March 2025**

Chairperson

Chief Executive Officer

To verify this certificate scan this code

13 Appendix 2: Site verification report, as per the DFFE Screening Tool guideline

Site verification report – Aquatic Ecology

Government Notice No. 645, dated 10 May 2019, includes the requirement that an Initial Site Sensitivity Verification Report must be produced for a development footprint. As per Part 1, Section 2.3, the outcome of the Initial Site Verification must be recorded in the form of a report that-

(a) Confirms or disputes the current use of the land and environmental sensitivity as identified by the national web based environmental screening tool;

(b) Contains a motivation and evidence of either the verified or different use of the land and environmental sensitivity;

(c) Is submitted together with the relevant reports prepared in accordance with the requirements of the Environmental Impact Assessment Regulations.

This report has been produced specifically to consider the aquatic ecology theme and addresses the content requirements of (a) and (b) above. The report will be appended to the respective specialist study included in the Scoping and EIA Reports produced for the projects.

Site sensitivity based on the aquatic biodiversity theme included in the Screening Tool and specialist assessment

Based on the DFFE Screening Tool, the site contains areas of very high sensitivity due to the presence of Wetlands (Riverine & Rivers Conservation Class AB & C (Figure 1).

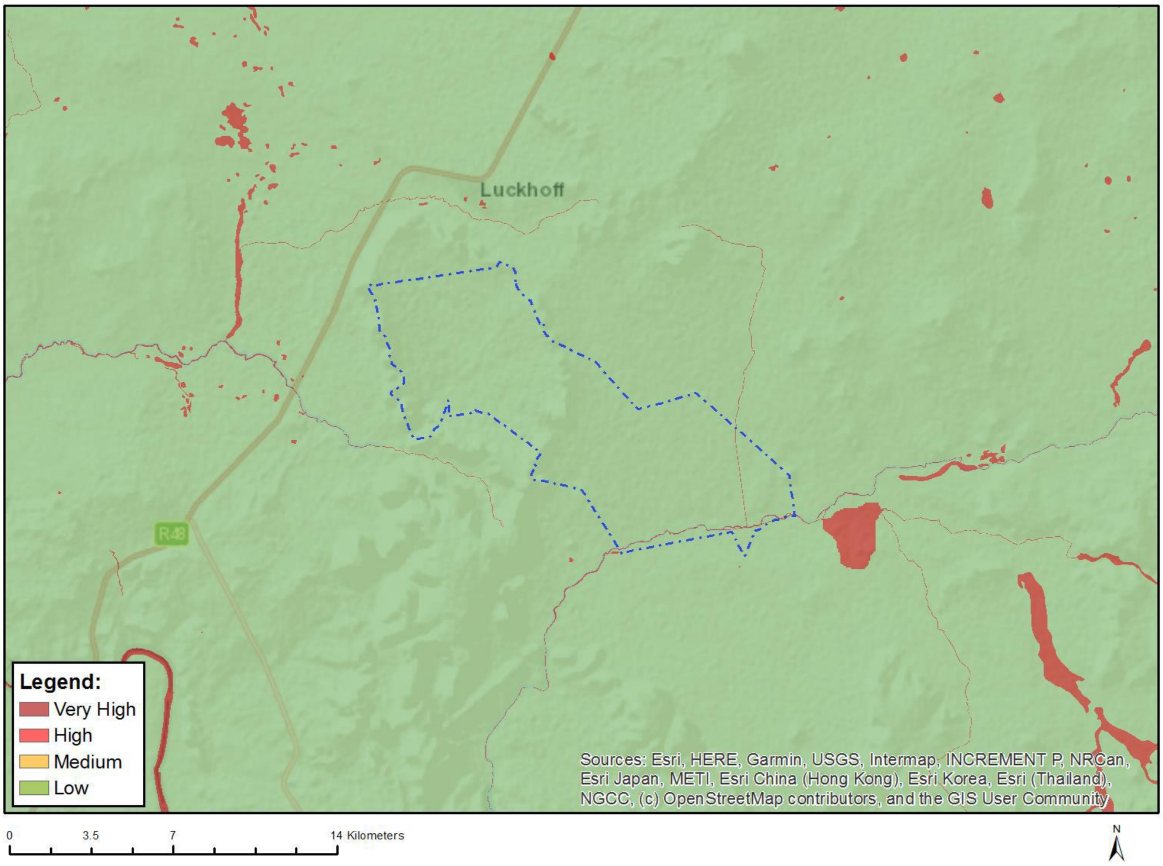

Figure 1: DFFE Screening Tool outcome for the aquatic biodiversity theme for the study area

Based on the above outcomes, the specialist **agrees with** the environmental sensitivities identified on site. The findings have been informed by a site visits undertaken by Dr Brian Colloty in January 2023 and May 2024. The systems observed are sensitive and thus shown in this assessment as No-Go i.e. Very High sensitivity.

Figure 2 below shows the sensitivity map produced following the desktop assessment as well as a groundtruthing exercises, with mapping of the observed features at a finer scale.

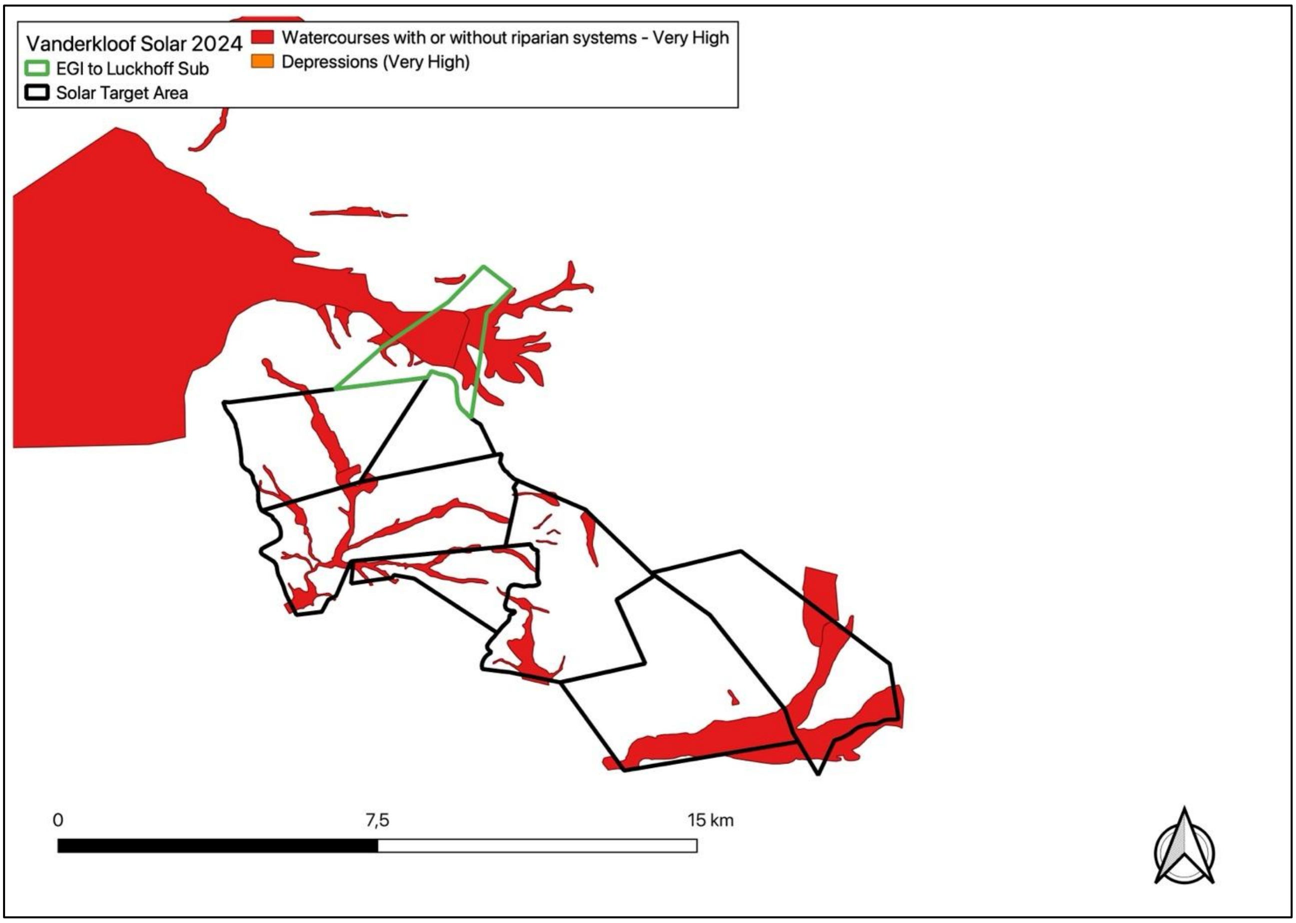

Figure 2. Environmental sensitivity map produced by the aquatic specialist (Very High)

Motivation of the outcomes of the sensitivity map and key conclusions

In conclusion, the DFFE Screening Tool identified two sensitivity ratings within the development footprint, namely, Low and Very High. There is overlap with the findings on site and the Screening Tool's outcome, thus the development footprint must be developed with cognisance of these sensitivities.

Therefore, environmental sensitivity input received from the aquatic ecology specialist must be taken forward and considered within the EIA process and the impact to these areas assessed. Appropriate layout and development restrictions will be implemented within the development footprint to ensure that the impact to aquatic ecology is deemed acceptable by the aquatic ecologist.