



Figure 3: Conservation status map illustrating the conservation status/category associated with the assessment area

6. Details of the Specialist

Adriaan Johannes Hendrikus Lamprecht (*Pr.Sci.Nat*)

M.Env.Sci. Ecological remediation and sustainable utilisation (NWU: Potchefstroom)

South African Council for Natural Scientific Professions (SACNASP): Professional Ecological Scientist
(No 115601)

EcoFocus Consulting (Pty) Ltd

Physical Address: 7a AG Visser Street
Langenhovenpark
Bloemfontein, 9330

Mobile Phone: 072 230 9598

Email Address: ajhlamprecht@gmail.com

Abbreviated Curriculum Vitae

Qualifications

- M.Env.Sci Ecological Remediation and Sustainable Utilisation/Vegetation Ecology
 - 2010 - North West University Potchefstroom
- B.Sc Botany and Zoology (Cum Laude)
 - 2008 - North West University Potchefstroom

Accredited courses completed

- Implementing Environmental Management Systems ISO 14001
 - 2011 - North West University Potchefstroom
- Environmental Law for Environmental Managers
 - 2011 - North West University Potchefstroom
- SASS 5 Aquatic Biomonitoring Training Course
 - 2017 – GroundTruth Consulting

Professional registrations

- South African Council for Natural Scientific Professions (**SACNASP**)
 - Professional Ecological Scientist Registration number 115601
- International Association for Impact Assessment (**IAIA**)
 - Registration number 5232
- South African Green Industries Council (**SAGIC**) Invasive Species training
 - Registration number 2405/2459

Employment and Experience Background

Upon completion of his studies, Rikus started his career in 2011 as an **Environmental Professional in Training (PIT) at Anglo American Thermal Coal: Environmental Services**. He received environmental training and practical implementation experience in all environmental facets of the mining industry with the focus on: Environmental rehabilitation, land management (biodiversity and invasive species eradication), waste & water-, air quality-, game reserve-, environmental management and legislation, as well as corporate reporting. He was also appointed as the Biodiversity management custodian at Anglo American Thermal Coal collieries.

He was subsequently employed by **Fraser Alexander Tailings from October 2011 to the end of November 2015 as an Environmental Contracts Manager**, where he was responsible for the technical and operational management of all Fraser Alexander Tailings' mining environmental rehabilitation work. He was responsible for all facets of project management, as well as implementation of rehabilitation and environmental strategies, by planning activities, organising physical, financial and human resources, delegating task responsibilities, leading people, controlling risks and providing technical support.

He conducted a significant amount of quantitative and qualitative ecological vegetation monitoring during his employment period with the company. Such monitoring mainly included environmentally rehabilitated mining areas in the open-cast coal-, gold-, platinum- and chrome mining industries situated in the Free State, Gauteng, Mpumalanga, North West and Limpopo Provinces. He was involved with analysis, processing and interpretation of environmental monitoring data and compilation of high quality technical/scientific environmental monitoring reports for clients. He was subsequently further involved with providing adequate ecological management and maintenance recommendations for rehabilitated areas. He also provided technical/scientific environmental rehabilitation support to mining clients, with regards to sufficient soil preparation and amelioration, grassing processes, as well as grass species mixtures and ratios.

He was then employed by **Enviroworks Consulting from January 2016 to the end of May 2017 as a Senior Ecological Specialist** where he was responsible for virtually all Ecological, Aquatic and Wetland specialist assessments and reporting related to Environmental Impact Assessment (EIA) and Basic Assessment (BA) projects. He also completed numerous EIA and BA projects as the main project Environmental Assessment Practitioner (EAP).

Rikus then subsequently established the company EcoFocus Consulting (Pty) Ltd at the end of May 2017, which provides high quality professional environmental and ecological specialist services and solutions to the industrial development-, construction-, mining-, agricultural and other sectors.

He possesses significant qualifications, vast knowledge, skills and practical experience in the specialist field of ecological and environmental management. This, coupled with his disciplined, determined and goal-driven approach, as well as his high level of personal standards, ensure high quality, timely and outcomes-based outputs and service delivery relating to any project.

Ecological & Wetland Specialist Assessment & Report Completion for the last two years

2022

- Aquatic Ecological Assessment for the proposed 178 ha A1 Groblershoop 50 MW PV Solar Plant Development, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 178 ha A1 Groblershoop 50 MW PV Solar Plant Development, Northern Cape Province.
- Proposed 14.3 ha North West Department of Education Ga-Maloka Primary School Expansion project in Ga-Maloka, North West Province.
- Aquatic Ecological Site Verification Report for the proposed 661 ha Khauta Solar PV Cluster Development, Riebeeckstad, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Fourina No. 362 outside Fouriesburg, Free State Province.
- Desktop ecological assessment for the proposed 2.7 ha Muller Composting Abattoir and Composting Facility Development near Frankfort, Free State Province.
- Proposed 5.22 ha Equity Properties Midway Guesthouse Development in Bloemfontein, Free State Province.
- Proposed 1.5 ha Reeco Holdings (Pty) Ltd 15 Eco-villa Units Development near Ritchie, Northern Cape Province.

- Proposed 63.4 ha Kareeberg Local Municipality Carnarvon Residential Development, Northern Cape Province.

2021

- Proposed 126.77 ha Orania Residential development project in Orania, Northern Cape Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Tweefontein no 3344, outside Newcastle, KwaZulu-Natal Province.
- Proposed 245.5 ha Kgatelopele Local Municipality Residential development project in Danielskuil, Northern Cape Province.
- Relocation of provincially protected plant species individuals for the proposed 30 ha Portion 30 of the Farm Lilyvale no 2313 Residential development project in Bloemfontein, Free State Province.
- Proposed 0.5 ha Mduwelanga Projects Agricultural development project outside Paul Roux, Free State Province.
- Proposed Moledi Gorge Watercourse Weir NEMA Section 24G development outside Derby, North West Province.
- Revision of a proposed 135 ha Farm Zulani no 167 agricultural development project outside Douglas, Northern Cape Province.
- Grazing and Invasive Species Assessment for the Farm Kuilenburg no 241, outside Reitz, Free State Province.
- Revision of the Biodiversity Offset Feasibility Report for a proposed 385 ha Idstone Farming agricultural development projects outside Douglas, Northern Cape Province.
- Erosion and Invasive Species Assessment for the Farms Nebo A no 957, Tevrede no 1088, Sarona no 1089 & Uitkyk no 1119, outside Reitz, Free State Province.
- Proposed 267.2 ha Tswaing Local Municipality residential development project in Ottosdal, North West Province.
- Proposed 10.2 ha PepsiCo Inc residential development project in Marchand, Northern Cape Province.
- Proposed 182 ha Farm Selosesha no 900 mixed land use development project in Thaba Nchu, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 182 ha Farm Selosesha no 900 mixed land use development project in Thaba Nchu, Free State Province.

- Proposed 3.5 ha Itau Milling NEMA Section 24G Solar Power Development project in Bloemfontein, Free State Province.
- Grazing and Invasive Species Assessment for the Farm Brakfontein no 244, outside Verkykerskop, Free State Province.
- Wetland/watercourse Assessment for the proposed 250 ha Subsolar Energy Serurubele Solar Development project near Bloemfontein, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 250 ha Subsolar Energy Serurubele Solar Development project near Bloemfontein, Free State Province.
- Wetland/watercourse Assessment for the proposed 171 ha Subsolar Energy Sonneblom Solar Development project near Bloemfontein, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 171 ha Subsolar Energy Sonneblom Solar Development project near Bloemfontein, Free State Province.
- Proposed 13.6 ha Haldon Estate development project in Bloemfontein, Free State Province.
- Wetland/watercourse Assessment for the proposed 200 ha Subsolar Energy Delta Solar Development project near Bloemhof, North West Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 200 ha Subsolar Energy Delta Solar Development project near Bloemhof, North West Province.
- Water Use License Application (WULA) Specialist Opinion and Recommendation Letter for the proposed three Subsolar Energy Solar Development projects.
- Grazing and Invasive Species Follow-up Assessment for the Farm Waterval West no 653, outside Steynsrus, Free State Province.
- Proposed 25 ha Letsemeng Local Municipality landfill site development project in Luckhof, Free State Province.
- *Vachellia erioloba* Counting Report for the proposed 286 ha Subsolar Energy Gamma Solar Development project near Vryburg, North West Province.
- *Vachellia erioloba* Counting Report for the proposed 243 ha Subsolar Energy Khubu Solar Development project near Vryburg, North West Province.
- *Vachellia erioloba* Counting Report for the proposed 224 ha Subsolar Energy Protea Solar Development project near Vryburg, North West Province.
- *Vachellia erioloba* Counting Report for the proposed 262 ha Subsolar Energy Impala Solar Development project near Vryburg, North West Province.
- *Vachellia erioloba* Counting Report for the proposed 265 ha Subsolar Energy Sonbesie Solar Development project near Vryburg, North West Province.

- Ecological site suitability assessments for three potential 583 ha, 300 ha and 227 ha Alt-e Developments Herbert Phase 2 Solar Power Facility development projects near Douglas, Northern Cape Province.
- Proposed 113 ha Danrika Boerdery Edms BPK Vineyard Development project near Prieska, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Ecological Rehabilitation and Alien Invasive Species Management Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Protected Plant Species Management Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Ecological Stormwater and Erosion Management Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- GIS Master Layout Plan for a proposed 120 ha Northern Cape Department Agriculture Agricultural Development outside Hopetown, Northern Cape Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Klipfontein No 71 outside Lindley, Free State Province.
- Proposed 384.3 ha Prieska Power Reserve Solar Power Facility Development outside Prieska, Northern Cape Province.
- Aquatic Ecological Assessment for the proposed Farm Bullhoek Chicken Layer Houses and Evaporation Ponds Expansion near Swartruggens, North West Province.
- Water Use License Application (WULA) Risk Assessment for the proposed Farm Bullhoek Chicken Layer Houses and Evaporation Ponds Expansion near Swartruggens, North West Province.
- Grazing and Invasive Species Assessment for the Farm Kleine Fontein No 1160 outside Bergville, KwaZulu-Natal Province.
- Proposed 1.37 km Mantsopa Local Municipality Water Pipeline Development in Ladybrand, Free State Province.
- Water Use License Application (WULA) Risk Assessment for the proposed 1.37 km Mantsopa Local Municipality Water Pipeline Development in Ladybrand, Free State Province.

- Grazing and Invasive Species Assessment for the Farm Elizabeth No 220 outside Bethlehem, Free State Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Retiefs Nek No 123 outside Bethlehem, Free State Province.
- Grazing and Invasive Species Follow-up Assessment for the Farm Brakfontein No 244, outside Verkykerskop, Free State Province.
- Proposed 107.8 ha Danrika Boerdery Edms BPK NEMA Section 24G Development project near Prieska, Northern Cape Province.

2020

- Proposed 120 ha Northern Cape Department Agriculture Hopetown Agricultural Development outside Hopetown, Northern Cape Province.
- Proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Rehabilitation and Alien Invasive Species Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Protected Species Relocation Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Stormwater Management Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- GIS Master Layout Plan for a proposed 3.27 ha Lynette Brand Ritchie NEMA Section 24G river lodge development project in Ritchie, Northern Cape Province.
- Preliminary Ecological Specialist Findings and Opinion Letter for the proposed 294 ha Northern Cape Department Agriculture Bucklands Agricultural Development, Douglas Northern Cape Province.
- Proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.

- Rehabilitation and Alien Invasive Species Management Plan for a proposed 1.58 km Dihlabeng Local Municipality Sewer Bridge and Pipeline Development, Paul Roux, Free State Province.
- Proposed 2064 ha Free State Strategic Solar Project Development outside Bethulie, Free State Province.
- Proposed 7.83 ha Carpe Diem Raisins NEMA Section 24G Evaporation Pond Development project outside Upington, Northern Cape Province.
- Water Use License Application (WULA) Risk Assessment for a proposed 7.83 ha Carpe Diem Raisins NEMA Section 24G Evaporation Pond Development project outside Upington, Northern Cape Province.
- Desktop Protected Species and Alien Invasive Species Management Plan for a proposed Northern Cape N 8 & N 10 highway maintenance project between Britstown, Prieska, Groblershoop and Upington, Northern Cape Province.
- Proposed 10.7 ha Dikgatlong Local Municipality NEMA Section 24G residential development in Barkly West, Northern Cape Province.
- Erosion and Rehabilitation Monitoring Report for the Farms Die Kranse no 1174 and De Rotsen no 52 outside Vrede, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Tweefontein no 3344, outside Newcastle, KwaZulu-Natal Province.
- Grazing and Invasive Species Management Plan for the Farm Malpha Noord no 1063, outside Senekal, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Mizpah no 706, outside Memel, Free State Province.
- Grazing and Invasive Species Management Plan for the Farm Welgelegen no 102, outside Clarens, Free State Province.
- Proposed 123 ha Slovo Park Residential development project in Brandfort, Free State Province.
- Proposed 2.43 ha Zeekoefontein Resort development project in Vaal Oewer, Gauteng Province.
- Grazing and Invasive Species Assessment for the Farm De Hoek no 1238, outside Bethlehem, Free State Province.
- Proposed 236 ha Northern Cape Department Agriculture Bucklands Agricultural Development outside Douglas, Northern Cape Province.
- Proposed 9.1 ha Motheo College Expansion NEMA Section 24G development in Bloemfontein, Free State Province.

- Proposed 84.7 ha Sol Plaatje Local Municipality Residential development project in Kimberley, Northern Cape Province.
- Proposed 201 ha Siyathemba Local Municipality Residential development project in Prieska, Northern Cape Province.
- Proposed 60.2 ha Siyancuma Local Municipality Residential development project in Douglas, Northern Cape Province.
- Proposed 58.9 ha Maremane Communal Property Association Residential development project in Maremane, Northern Cape Province.
- Proposed 15 ha Maketshemo Trading Filling Station and Truckstop development project in Winburg, Free State Province.
- Rehabilitation and Alien Invasive Species Management Plan for the Moledi Gorge Watercourse Weir decommissioning outside Derby, North West Province.
- GIS Master Layout Plan for a proposed 35 ha Gladium Boerdery Familietrust NEMA Section 24G agricultural development project outside Niekerkshoop, Northern Cape Province.
- Proposed 46.5 ha Siyathemba Local Municipality Residential development project in Niekerkshoop, Northern Cape Province.
- Proposed 475 m Setsoto Local Municipality Pipeline development and water treatment works upgrade project in Clocolan, Free State Province.

7. Objectives of the Assessment

- Identify, delineate and discuss any significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats, if potentially found to be present within the assessment area.
 - The delineations do not include formal 1:100-year floodline calculations, as this is deemed to be an engineering function.
- Assess and discuss the Present Ecological State (PES) of the identified watercourses/wetlands and/or aquatic features/habitats, in order to provide an indication of their current ecological condition as well as the extent and severity of degradation and/or transformation, if applicable.
- Assess and discuss the Ecological Importance and Sensitivity (EIS) of the identified watercourses/wetlands and/or aquatic features/habitats, in order to provide an indication of their ecological sensitivity/conservational significance.
- Identify, evaluate, rate and discuss any potential aquatic ecological impacts associated with the proposed development.
 - Provide recommendations on impact mitigation and management measures in accordance with the requirements of the NEMA (Act No. 107 of 1998): Mitigation Hierarchy, in order to attempt to reduce/alleviate the adverse effects of identified potential aquatic ecological impacts.
- Provide recommendations on the aquatic ecological suitability/acceptability of the assessment area and proposed three transmission line route alternatives for the proposed development.
- A digital report (this document) as well as digital .KML files will be provided to the EAP, of any identified significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats, if potentially found to be present within the assessment area or along the proposed three transmission line route alternatives.

8. Methodology

- The proposed development area was assessed on foot and with the use of a vehicle.
- Visual observations/identifications were made of any significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats and their conditions, as well as relevant species present.
- Identified species were listed and categorised as per the Red Data Species List; Protected Species List of the National Forests Act (Act No. 84 of 1998), Invasive Species List of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Alien and Invasive Species Regulations, 2014 as well as the Provincially Protected species of the Northern Cape Nature Conservation Act (Act No. 9 of 2009).
- Significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats which were found to be present within the assessment area, were identified, delineated and discussed as per the methodology described below:
 - For the purposes of this investigation a wetland was defined according to the definition in the National Water Act (Act 36 of 1998) 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 in normal circumstances, supports or would support vegetation typically adapted to life in saturated soil.”
 - In 2005 DWAF published a wetland delineation procedure in a guideline document titled “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”. Guidelines for the undertaking of biodiversity assessments exist. These guidelines contain a number of stipulations relating to the protection of wetlands and the undertaking of wetland assessments.
 - The wetland delineation procedure identifies the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas. This constitutes the part of the wetland that might remain flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.
 - The guidelines also state that the locating of the outer edge of the temporary zone must make use of four specific indicators namely:
 - terrain unit indicator
 - soil form indicator
 - soil wetness indicator
 - vegetation indicator

- In addition, the wetland/watercourse and a protective buffer zone beginning from the outer edge of the wetland temporary zone, was designated as sensitive in a sensitivity map. The guidelines stipulate buffers to be delineated around the boundary of a wetland. An adequate protective buffer zone, beginning from the outer edge of the wetland temporary zone, was implemented and designated as sensitive within which no development must be allowed to occur.
- Georeferenced photographs were taken of any significant watercourses/wetlands and/or other ecologically sensitive/conservationally significant aquatic features/habitats, as well as any Red Data Species Listed-, nationally- or provincially protected species if encountered. This was done in order to indicate their specific locations in a Geographic Information System (GIS) mapping format.

The **Present Ecological State (PES)** of the identified watercourses/wetlands and/or aquatic features/habitats was assessed and discussed as per the table below.

- The Present Ecological State (PES) refers to the current state or condition of an area in terms of all its characteristics and reflects the change to the area from its reference condition. The value gives an indication of the alterations that have occurred in the ecosystem.

Table 1: Criteria for PES calculations

Ecological Category	Score	Description
A	> 90-100%	Unmodified , natural and pristine.
B	> 80-90%	Largely natural . A small change in natural habitats and biota may have taken place but the ecosystem functionality has remained essentially unchanged.
C	> 60-80%	Moderately modified . Moderate loss and transformation of natural habitat and biota have occurred, but the basic ecosystem functionality has still remained predominantly unchanged.
D	> 40-60%	Largely modified . A significant loss of natural habitat, biota and subsequent basic ecosystem functionality has occurred.
E	> 20-40%	Seriously modified . The loss of natural habitat, biota and basic ecosystem functionality is extensive.
F	0-20%	Critically/Extremely modified . Transformation has reached a critical level and the ecosystem has been modified completely with a virtually complete loss of natural habitat and biota. The basic ecosystem functionality has virtually been destroyed and the transformation is irreversible.

The **Ecological Importance and Sensitivity (EIS)** of the identified watercourses/wetlands and/or aquatic features/habitats was assessed and discussed as per the table below.

- The Ecological Importance and Sensitivity (EIS) of an area is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance, once it has occurred.

Table 2: Criteria for EIS calculations

EIS Categories	Score	Description
Low/Marginal	D	Not ecologically important and/or sensitive on any scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.
Moderate	C	Ecologically important and sensitive on local or possibly provincial scale. Biodiversity is still relatively ubiquitous and not usually sensitive to habitat modifications.
High	B	Ecologically important and sensitive on provincial or possibly national scale. Biodiversity is relatively unique and may be sensitive to habitat modifications.
Very High	A	Ecologically important and sensitive on national and possibly international scale. Biodiversity is very unique and sensitive to habitat modifications.

Potential aquatic ecological impacts posed by the proposed development to the local aquatic ecosystem and ecology, were identified, evaluated, rated and discussed as per the methodology described below. The tables below indicate and explain the methodology and criteria used for the evaluation of the Environmental Risk Ratings as well as the calculation of the final Environmental Significance Ratings of the identified potential aquatic ecological impacts. Each identified potential aquatic ecological impact is scored for each of the Evaluation Components, as per the table below.

Table 2: Scale utilised for the evaluation of the Environmental Risk Ratings

Evaluation Component	Rating Scale and Description/Criteria
Magnitude of Negative or Positive Impact	<p>10 - Very high: Bio-physical features and/or ecological functionality/processes may be severely impacted upon.</p> <p>8 - High: Bio-physical features and/or ecological functionality/processes may be significantly impacted upon.</p> <p>6 - Medium: Bio-physical features and/or ecological functionality/processes may be moderately impacted upon.</p> <p>4 - Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>2 - Very Low: Bio-physical features and/or ecological functionality/processes may be slightly impacted upon.</p> <p>0 - Zero: Bio-physical features and/or ecological functionality/processes will not be impacted upon.</p>
Duration of Negative or Positive Impact	<p>5 – Permanent: Impact will continue on a permanent basis.</p> <p>4 - Long term: Impact should cease a period (> 40 years) after the operational phase/project life of the activity.</p> <p>3 - Medium term: Impact may occur for the period of the operational phase/project life of the activity.</p> <p>2 - Short term: Impact may only occur during the construction phase of the activity after which it will cease.</p> <p>1 - Immediate: Impact may only occur as a once off during the construction phase of the activity.</p>
Extent of Positive or Negative Impact	<p>5 - International: Impact will extend beyond National boundaries.</p> <p>4 - National: Impact will extend beyond Provincial boundaries but remain within National boundaries.</p> <p>3 - Regional: Impact will extend beyond 5 km of the development footprint but remain within Provincial boundaries.</p> <p>2 - Local: Impact will not extend beyond 5 km of the development footprint.</p> <p>1 - Site-specific: Impact will only occur on or within 200 m of the development footprint.</p> <p>0 – No impact.</p>
Irreplaceability of Natural Resources being impacted upon	<p>5 – Definite loss of irreplaceable natural resources.</p> <p>4 – High potential for loss of irreplaceable natural resources.</p> <p>3 – Moderate potential for loss of irreplaceable natural resources.</p> <p>2 – Low potential for loss of irreplaceable natural resources.</p> <p>1 – Very low potential for loss of irreplaceable natural resources.</p> <p>0 – No impact.</p>

Reversibility of Impact	<p>5 – Impact cannot be reversed.</p> <p>4 – Low potential that impact may be reversed.</p> <p>3 – Moderate potential that impact may be reversed.</p> <p>2 – High potential that impact may be reversed.</p> <p>1 – Impact will be reversible.</p> <p>0 – No impact.</p>
Probability of Impact Occurrence	<p>5 - Definite: Probability of impact occurring is > 95 %.</p> <p>4 - High: Probability of impact occurring is > 75 %.</p> <p>3 - Medium: Probability of impact occurring is between 25 % - 75 %.</p> <p>2 - Low: Probability of impact occurring is between 5 % - 25 %.</p> <p>1 - Improbable: Probability of impact occurring is < 5 %.</p>
Cumulative Impact	<p>High: Numerous similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Medium: Few similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts.</p> <p>Low: Virtually no similar historic, present or future development activities in the same geographical area, have taken or are anticipated to take place which may cumulatively contribute and increase the significance of the identified impacts. The development is anticipated to be an isolated occurrence and should therefore have a negligible cumulative impact.</p> <p>None: No cumulative impact.</p>

Once the Environmental Risk Ratings have been evaluated for each identified potential aquatic ecological impact, the Significance Score of each impact is calculated by using the following formula:

- **SS (Significance Score) = (magnitude + duration + extent + irreplaceable + reversibility) x probability.**
- **The maximum Significance Score value is 150.**

The Significance Score is then used to rate the Environmental Significance of each identified potential aquatic ecological impact, as per Table 4 below. The Environmental Significance rating process is completed for all identified potential aquatic ecological impacts for the construction- and subsequent operational phases of the proposed development, both before and after implementation of the recommended mitigation measures.

Table 3: Scale used for the evaluation of the Environmental Significance Ratings

Environmental Significance Score	Environmental Significance Rating	Description/Criteria
125 – 150	Very High	An impact of very high significance after mitigation will mean that the development may not take place. The impact cannot be suitably reduced and mitigated to within acceptable levels.
100 – 124	High	An impact of high significance after mitigation should influence a decision about whether or not to proceed with the development. Additional, impact-specific mitigation measures must be implemented if the continuation of the development is to be considered.
75 – 99	Medium-High	Additional, impact-specific mitigation measures must be implemented for an impact of medium-high significance if the continuation of the development is to be considered.
50 – 74	Medium	An impact of medium significance after mitigation must be adequately managed in accordance with the mitigation measures provided by the specialist.
< 50	Low	If any mitigation measures are provided by the specialist for an impact of low significance after mitigation, the impact must be adequately managed in accordance with these measures.
+	Positive impact	A positive impact is likely to result in a beneficial consequence/effect and should therefore be viewed as a motivation for the development to proceed.

9. Results and Discussion

9.1. Assessment Area Catchment and Watercourse Baseline Information

The assessment area falls within the Lower Orange Water Management Area (WMA 14) and the associated D73D quaternary surface water catchment- and drainage area. The Orange River flows past the assessment area, approximately 600 m to the west and continues in a north-westerly direction. The following baseline watercourse information and categorisation is applicable to the specific portion of the Orange River, which flows past the assessment area, in accordance with the latest South African National Biodiversity Assessment of 2018 (Van Deventer *et al.*, 2019):

• River order	=	Sixth-order river; ninth-order watercourse
• Mainstem	=	1 (quaternary mainstem)
• Flow	=	Permanent/perennial
• Geomorphic zone	=	Lowland river
• River condition	=	Moderately Modified
• Present Ecological State (PES), 2018	=	Class D (Largely Modified)
• Ecosystem Threat Status (ETS), 2018	=	Critically Endangered (CR)
• Ecosystem Protection Level (EPL), 2018	=	Poorly Protected (PP)

It is therefore evident from a hydrological perspective, that the Orange River forms an important part of the local and broader quaternary surface water catchment- and drainage area, towards the north-west. The Orange River is considered a primary national water resource; any potentially significant negative impacts on the ecological functionality and/or -services provided by the river, which could pose a potential threat to national water security, should therefore be avoided as far as practicably/reasonably possible.

A localised linear topographic highpoint/ridge apex is present directly adjacent east of the assessment area, which roughly lies in a north-south direction. This highpoint/ridge apex acts as a natural surface water runoff and drainage linear separation, between the areas east and west of the highpoint/ridge apex, respectively. The assessment area therefore forms part of a small localised catchment- and drainage area, from which all surface water runoff subsequently drains in a westerly direction, towards the Orange River. Surface water drainage towards the east will therefore not be affected/impacted upon by the proposed development.

The majority of the assessment area constitutes a relatively natural slight to moderately sloping landscape, while the south-western and central-southern portions consist of steeply sloping and undulating hills. Numerous ephemeral watercourses and small preferential water flow paths/drainage lines therefore traverse the assessment area, which all flow in a westerly direction, towards the Orange River. A small isolated depression water-pan is also situated directly adjacent outside the north-western corner boundary of the assessment area.

These watercourses, flow paths/drainage lines as well as the water-pan will be further discussed as the main semi-aquatic ecological features, which could potentially be impacted upon by the construction- and operational phases of the proposed development.

9.2. Proposed Development Area Clearance

The assessment area constitutes a single footprint area of approximately 178 ha in size. The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints. The assessment area could therefore likely be prone to significant potential surface soil erosion, due to the sloping and undulating landscape together with the loosening of surface materials and clearance of vegetation caused by construction activities, which usually binds the soil surface. Such soil erosion could potentially lead to gradual continual contamination of the Orange River over time.

It is therefore recommended that vegetation clearance should be minimised as far as practicably/reasonably possible and should only occur within the PV grid-, internal access/services road- and other associated facility infrastructure footprints. Existing vegetation in- between the main physical footprint areas, should not be cleared or damaged and should be left intact and adequately conserved, as far as practicably/reasonably possible. This must be done in order to sufficiently manage and prevent any significant soil erosion from occurring in and around the assessment area, which could potentially lead to contamination of the Orange River over time.

9.3. Significant Watercourses

Eight significant first- and second-order ephemeral watercourses traverse the assessment area, which constitute the main surface water flow paths of the small localised catchment- and drainage area towards the west, associated with the assessment area. These watercourses therefore form an important part of the localised surface water catchment and drainage.

Due to the lack of continuous water flow through the assessment area, the watercourses do not possess any distinct riparian zones or significant variations in vegetation species composition or - structure, relative to the surrounding terrestrial landscape. Moderate to high densities of woody shrub individuals of the species *Senegalia mellifera* and *Phaeoptilum spinosum* and to a lesser extent, *Ziziphus mucronata* and the nationally protected tree species *Boscia albitrunca* are however evident within- and along the edges of the watercourses, which are mostly absent from the surrounding terrestrial landscape.

The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (<https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731>). No conservationally significant or important waterbird species/nests were observed, during the site assessment or are necessarily expected to utilise the assessment area for breeding, foraging and/or persistence purposes. Only common local resident bird species/nests were observed.

Although this is the case, the increased woody densities associated with the watercourses likely provide significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.

It is therefore recommended that the identified eight significant watercourses be adequately buffered out of the proposed development footprint area. A minimum approximately 35 m buffer distance is proposed to be implemented on both sides of all the watercourse edges. No current or future development is allowed to take place within these buffered zones.

See photographs below.



Figure 4: Two images illustrating examples of the eight significant first- and second-order ephemeral watercourses which traverse the assessment area; the moderate to high densities of woody shrub individuals are also evident, within- and along the edges of the watercourses (red arrows indicate the water flow directions)

It must be noted that ten small artificial earth dam walls have been constructed within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream. **The EAP must determine from the relevant competent authorities whether these dam walls possess the required Environmental Authorisations and Water Use Licenses, in accordance with the relevant/applicable environmental legislation. If this is not the case, it is recommended that the dam walls be completely removed from the watercourses, with immediate effect. The flow regimes of the watercourses should also be adequately restored in order to allow for continued flow within the localised catchment. This must be done to assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.**

See photographs below.



Figure 5: Two images illustrating examples of the ten small artificial earth dam walls that have been constructed within the various watercourses and which are significantly impeding the ephemeral flow regimes of the watercourses (red arrows indicate the water flow directions)

9.4. Small Preferential Water Flow Paths/Drainage Lines

Due to the sloping and undulating landscape of the assessment area, numerous small first-order ephemeral preferential water flow paths/drainage lines also traverse the assessment area, of which three are deemed to be hydrologically significant. These flow paths/drainage lines assist with channelling and discharging surface water runoff through the assessment area, into the significant watercourses associated with the assessment area. These flow paths/drainage lines therefore merely play an assisting role in the localised catchment and drainage and are not necessarily viewed as being of high conservational significance, from a hydrological perspective.

Due to the lack of continuous water flow through the assessment area, the flow paths/drainage lines also do not possess any distinct riparian zones or significant variations in vegetation species composition or -structure, relative to the surrounding terrestrial landscape. Merely low to moderate densities of woody shrub individuals are evident within- and along the edges of the flow paths/drainage lines, which are mostly absent from the surrounding terrestrial landscape.

Avoidance of development through the flow paths/drainage lines would constitute the first impact mitigation option, in accordance with the requirements of the NEMA (Act No. 107 of 1998): Mitigation Hierarchy. However, as the flow paths/drainage lines merely play an assisting role in the small localised catchment and drainage, it is the opinion of the specialist that avoidance of development through the flow paths/drainage lines is not necessarily required, but is still recommended.

It is therefore recommended that the identified three flow paths/drainage lines be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is proposed to be implemented on both sides of all the flow path/drainage line edges. No current or future development is allowed to take place within these buffered zones.

However, if avoidance of development through the flow paths/drainage lines is not practicably possible/feasible, it is then recommended that sufficient continued stormwater runoff within- and through the assessment area towards the west, must still be ensured and sufficiently managed. An adequate Stormwater and Erosion Management Plan must be implemented during the construction- and operational phases of the proposed development, in order to assist with this and allow for continued flow within the localised catchment.

This must be done to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area. A Water Use License Application (WULA) must also be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the flow paths/drainage lines that traverse the assessment area, in accordance with the National Water Act (Act No. 36 of 1998).

See photographs below.



Figure 6: Two images illustrating examples of the three small but significant first-order ephemeral preferential water flow paths/drainage lines, which also traverse the assessment area; the low to moderate densities of woody shrub individuals are also evident, within- and along the edges of the flow paths/drainage lines (red arrows indicate the water flow directions)

9.5. Small Depression Water-Pan

Due to the lack of continuous water flow through the assessment area, the small isolated depression pan situated directly adjacent outside the north-western corner boundary of the assessment area, also does not possess any distinct riparian zones or significant variations in vegetation species composition or -structure, relative to the surrounding terrestrial landscape. A moderate to high density of woody shrub individuals is however evident along the edge of the pan, which is mostly absent from the surrounding terrestrial landscape. Habitat-specific semi-aquatic ephemeral plant species representation is furthermore also expected to increase within the pan, during more favourable precipitation conditions.

The pan furthermore likely also provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.

Due to the minute size and isolated nature of the pan, it is merely viewed as being of low to moderate conservational significance, from an aquatic perspective. **It is however recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.**

No other ecologically/conservationally significant or sensitive wetlands, pans or aquatic features/habitats were found to be present within the assessment area. Due to the moderate to steeply sloping topography of the local landscape towards the Orange River to the west, it is also unlikely/improbable that any ecologically/conservationally significant or sensitive wetlands or pans would be present within the approximate 500 m 'zone of influence' surrounding the assessment area to the west.

See photographs below.



Figure 7: Two images illustrating the presence of the small isolated depression pan, which is situated directly adjacent outside the north-western corner boundary of the assessment area; the moderate to high density of woody shrub individuals is also evident, along the edge of the pan

9.6. Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

Present Ecological State (PES)

Table 4: PES table for the significant watercourses and small preferential water flow paths/drainage lines (0-5 indicates decrease in significance)

Criteria & Attributes	Relevance	Score	Reasoning
Flow Modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime, volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota.	3	<p>The majority of the assessment area constitutes a relatively natural slight to moderately sloping landscape, while the south-western and central-southern portions consist of steeply sloping and undulating hills.</p> <p>Eight significant first- and second-order ephemeral watercourses traverse the assessment area, which constitute the main surface water flow paths of the small localised catchment- and drainage area towards the west, associated with the assessment area. These watercourses therefore form an important part of the localised surface water catchment and drainage.</p> <p>It must be noted that ten small artificial earth dam walls have been constructed within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream.</p> <p>If these dam walls do not possess the required Environmental Authorisations and Water Use Licenses, in accordance with the relevant/applicable environmental legislation, it is recommended that the dam walls be completely removed from the watercourses, with immediate effect.</p>

		<p>Due to the sloping and undulating landscape of the assessment area, numerous small first-order ephemeral preferential water flow paths/drainage lines also traverse the assessment area, of which three are deemed to be hydrologically significant. These flow paths/drainage lines assist with channelling and discharging surface water runoff through the assessment area, into the significant watercourses associated with the assessment area.</p> <p>These flow paths/drainage lines therefore merely play an assisting role in the localised catchment and drainage and are not necessarily viewed as being of high conservational significance, from a hydrological perspective.</p> <p>It is recommended that the identified watercourses and flow paths/drainage lines be adequately buffered out of the proposed development footprint area. No current or future development is allowed to take place within the buffered zones.</p> <p>It is the opinion of the specialist that the recommended mitigation measures and buffer zones should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habits within the assessment area. It should also allow for continued flow within the localised catchment and assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p>
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Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.	3	<p>It must be noted that ten small artificial earth dam walls have been constructed within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream.</p> <p>It is the opinion of the specialist that the recommended mitigation measures and buffer zones should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habits within the assessment area. It should also allow for continued flow within the localised catchment and assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p>
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities which reduce or changes wetland habitat directly or through changes in inundation patterns.	3	<p>It must be noted that ten small artificial earth dam walls have been constructed within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream.</p> <p>It is the opinion of the specialist that the recommended mitigation measures and buffer zones should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habits within the assessment area. It should also allow for continued flow within the localised catchment and assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p>

Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.	5	<p>Due to the lack of continuous water flow through the assessment area, the watercourses and flow paths/drainage lines do not possess any distinct riparian zones or significant variations in vegetation species composition or -structure, relative to the surrounding terrestrial landscape. Merely low to high densities of woody shrub individuals are evident within- and along the edges of the watercourses and flow paths/drainage lines, which are mostly absent from the surrounding terrestrial landscape.</p> <p>It is the opinion of the specialist that the recommended mitigation measures and buffer zones should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habits within the assessment area. It should also allow for continued flow within the localised catchment and assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p>
Indigenous Vegetation Removal	Direct destruction of habitat through any human activities affecting wildlife habitat and flow attenuation functions, organic matter inputs and increase potential for erosion.	4	<p>It must be noted that ten small artificial earth dam walls have been constructed within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream.</p>

			<p>Grazing by livestock and game takes place within the assessment area.</p> <p>It is the opinion of the specialist that the recommended mitigation measures and buffer zones should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habits within the assessment area.</p> <p>It should also allow for continued flow within the localised catchment and assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p>
Alien Fauna	Presence of alien fauna affecting faunal community structure.	5	At the time of the site assessment, no significant legally declared alien invasive species establishments were found to be present throughout the watercourses or flow paths/drainage lines, associated with the assessment area.
Over utilisation of biota	Over grazing, over fishing etc.	4	Grazing by livestock and game takes place within the assessment area.
Total		27/35	
Class		C or B	

The Present Ecological State (PES) of the significant watercourses and small preferential water flow paths/drainage lines which traverse the assessment area, is classified as Class C, although it still borders on Class B as they are slightly to moderately modified. Slight to moderate transformation and associated negative impact has occurred, mainly as a result of the construction of the ten small artificial earth dam walls within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream. The basic ecosystem functionality within the watercourses and flow paths/drainage lines has however remained predominantly unchanged.

Table 6: PES table for the small depression pan (0-5 indicates decrease in significance)

Criteria & Attributes	Relevance	Score	Reasoning
Flow Modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime, volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota.	5	<p>Due to the lack of continuous water flow through the assessment area, the small isolated depression pan situated directly adjacent outside the north-western corner boundary of the assessment area, also does not possess any distinct riparian zones or significant variations in vegetation species composition or -structure, relative to the surrounding terrestrial landscape. A moderate to high density of woody shrub individuals is however evident along the edge of the pan, which is mostly absent from the surrounding terrestrial landscape. Habitat-specific semi-aquatic ephemeral plant species representation is furthermore also expected to increase within the pan, during more favourable precipitation conditions.</p> <p>The pan furthermore likely also provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p> <p>Due to the minute size and isolated nature of the pan, it is merely viewed as being of low to moderate conservational significance, from an aquatic perspective. It is however recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.</p>

			It is the opinion of the specialist that the recommended buffer zone should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habit associated with the pan.
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.	5	<p>Due to the minute size and isolated nature of the pan, it is merely viewed as being of low to moderate conservational significance, from an aquatic perspective. It is however recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.</p> <p>It is the opinion of the specialist that the recommended buffer zone should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habit associated with the pan.</p>
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities which reduce or changes wetland habitat directly or through changes in inundation patterns.	5	<p>Due to the minute size and isolated nature of the pan, it is merely viewed as being of low to moderate conservational significance, from an aquatic perspective. It is however recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.</p>

			It is the opinion of the specialist that the recommended buffer zone should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habit associated with the pan.
Terrestrial Encroachment	Consequence of desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.	5	<p>Due to the lack of continuous water flow through the assessment area, the small isolated depression pan situated directly adjacent outside the north-western corner boundary of the assessment area, also does not possess any distinct riparian zones or significant variations in vegetation species composition or -structure, relative to the surrounding terrestrial landscape. A moderate to high density of woody shrub individuals is however evident along the edge of the pan, which is mostly absent from the surrounding terrestrial landscape. Habitat-specific semi-aquatic ephemeral plant species representation is furthermore also expected to increase within the pan, during more favourable precipitation conditions.</p> <p>It is the opinion of the specialist that the recommended buffer zone should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habit associated with the pan.</p>
Indigenous Vegetation Removal	Direct destruction of habitat through any human activities affecting wildlife habitat and flow attenuation functions, organic matter inputs and increase potential for erosion.	4	<p>Grazing by livestock and game takes place within the assessment area.</p> <p>It is the opinion of the specialist that the recommended buffer zone should be sufficient in preventing any potentially significant future disturbance of the relevant semi-aquatic habit associated with the pan.</p>

Alien Fauna	Presence of alien fauna affecting faunal community structure.	5	At the time of the site assessment, no significant legally declared alien invasive species establishments were found to be present within the pan.
Over utilisation of biota	Over grazing, over fishing etc.	4	Grazing by livestock and game takes place within the assessment area.
Total		29/35	
Class		B	

The Present Ecological State (PES) of the small depression pan which is situated directly adjacent outside the north-western corner boundary of the assessment area, is classified as Class B as it is largely natural. A small change in natural habitats and biota may have taken place, mainly as a result of grazing by livestock and game that takes place within the assessment area. The ecosystem functionality within the pan has however remained essentially unchanged.

Ecological Importance and Sensitivity (EIS)

Table 7: EIS table for the significant watercourses (0-5 indicates increase in significance)

Determinant	Score
1. Rare and Endangered Species	1
2. Population of Unique Species	1
3. Species/taxon Richness	1
4. Diversity of Habitat Types or Features	2
5. Migration route/breeding and feeding site for wetland species.	1
6. Sensitivity to changes in Natural Hydrological Regime.	3
7. Sensitivity to water quality changes.	2
8. Flood Storage, Energy Dissipation & Particulate/Element Removal	3
9. Protected Status	3
10. Ecological Integrity	3
Total	20/50
Overall Ecological Sensitivity and Importance	C

The Ecological Importance and Sensitivity (EIS) of the significant watercourses which traverse the assessment area, is classified as Class C (moderate) as they are viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) as well as these watercourses forming an important part of the localised surface water catchment and drainage. The assessment area and watercourses furthermore also form part of the local and broader quaternary surface water catchment- and drainage area, towards the north-west. Biodiversity is however still relatively ubiquitous.

The identified eight significant watercourses which traverse the assessment area, are viewed as being of moderate conversational significance/value for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, Critical Biodiversity Area two (CBA 2) as well as the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.

It is therefore recommended that the identified eight significant watercourses be adequately buffered out of the proposed development footprint area. A minimum approximately 35 m buffer distance is proposed to be implemented on both sides of all the watercourse edges. No current or future development is allowed to take place within these buffered zones.

Furthermore, if the artificial earth dam walls which have been constructed within the various watercourses, do not possess the required Environmental Authorisations and Water Use Licenses, in accordance with the relevant/applicable environmental legislation, it is recommended that the dam walls be completely removed from the watercourses, with immediate effect.

Table 8: EIS table for the small preferential water flow paths/drainage lines (0-5 indicates increase in significance)

Determinant	Score
1. Rare and Endangered Species	1
2. Population of Unique Species	1
3. Species/taxon Richness	1
4. Diversity of Habitat Types or Features	1
5. Migration route/breeding and feeding site for wetland species.	1
6. Sensitivity to changes in Natural Hydrological Regime.	2
7. Sensitivity to water quality changes.	2
8. Flood Storage, Energy Dissipation & Particulate/Element Removal	2
9. Protected Status	2
10. Ecological Integrity	2
Total	15/50
Overall Ecological Sensitivity and Importance	C

The Ecological Importance and Sensitivity (EIS) of the small preferential flow paths/drainage lines which traverse the assessment area, is classified as Class C (moderate), although it borders on Class D (low/marginal) as they are merely viewed as being ecologically important and sensitive on local scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.

The identified three flow paths/drainage lines which traverse the assessment area, merely play an assisting role in the localised catchment and drainage and are not necessarily viewed as being of high conservational significance, from a hydrological perspective.

Avoidance of development through the flow paths/drainage lines would constitute the first impact mitigation option, in accordance with the requirements of the NEMA (Act No. 107 of 1998): Mitigation Hierarchy. However, as the flow paths/drainage lines merely play an assisting role in the small localised catchment and drainage, it is the opinion of the specialist that avoidance of development through the flow paths/drainage lines is not necessarily required, but is still recommended.

It is therefore recommended that the identified three flow paths/drainage lines be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is proposed to be implemented on both sides of all the flow path/drainage line edges. No current or future development is allowed to take place within these buffered zones.

However, if avoidance of development through the flow paths/drainage lines is not practicably possible/feasible, it is then recommended that sufficient continued stormwater runoff within- and through the assessment area towards the west, must still be ensured and sufficiently managed. An adequate Stormwater and Erosion Management Plan must be implemented during the construction- and operational phases of the proposed development, in order to assist with this and allow for continued flow within the localised catchment.

This must be done to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area. A Water Use License Application (WULA) must also be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the flow paths/drainage lines that traverse the assessment area, in accordance with the National Water Act (Act No. 36 of 1998).

Table 9: EIS table for the small depression pan (0-5 indicates increase in significance)

Determinant	Score
1. Rare and Endangered Species	1
2. Population of Unique Species	1
3. Species/taxon Richness	1
4. Diversity of Habitat Types or Features	2
5. Migration route/breeding and feeding site for wetland species.	2
6. Sensitivity to changes in Natural Hydrological Regime.	3
7. Sensitivity to water quality changes.	3
8. Flood Storage, Energy Dissipation & Particulate/Element Removal	2
9. Protected Status	3
10. Ecological Integrity	3
Total	21/50
Overall Ecological Sensitivity and Importance	C

The Ecological Importance and Sensitivity (EIS) of the small depression pan which is situated directly adjacent outside the north-western corner boundary of the assessment area, is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) and the pan likely providing an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.

Due to the minute size and isolated nature of the small depression pan which is situated directly adjacent outside the north-western corner boundary of the assessment area, it is merely viewed as being of low to moderate conservational significance/value, from an aquatic perspective. **It is however recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.**

9.7. Aquatic Ecological Site Sensitivity Map

The site sensitivity map below (see A3 sized map in the Appendices) illustrates the identified eight significant ephemeral watercourses as well as the identified three small but significant ephemeral preferential water flow paths/drainage lines, which traverse the assessment area. The approximate delineation of the small isolated depression water-pan and its recommended buffer zone is also illustrated.

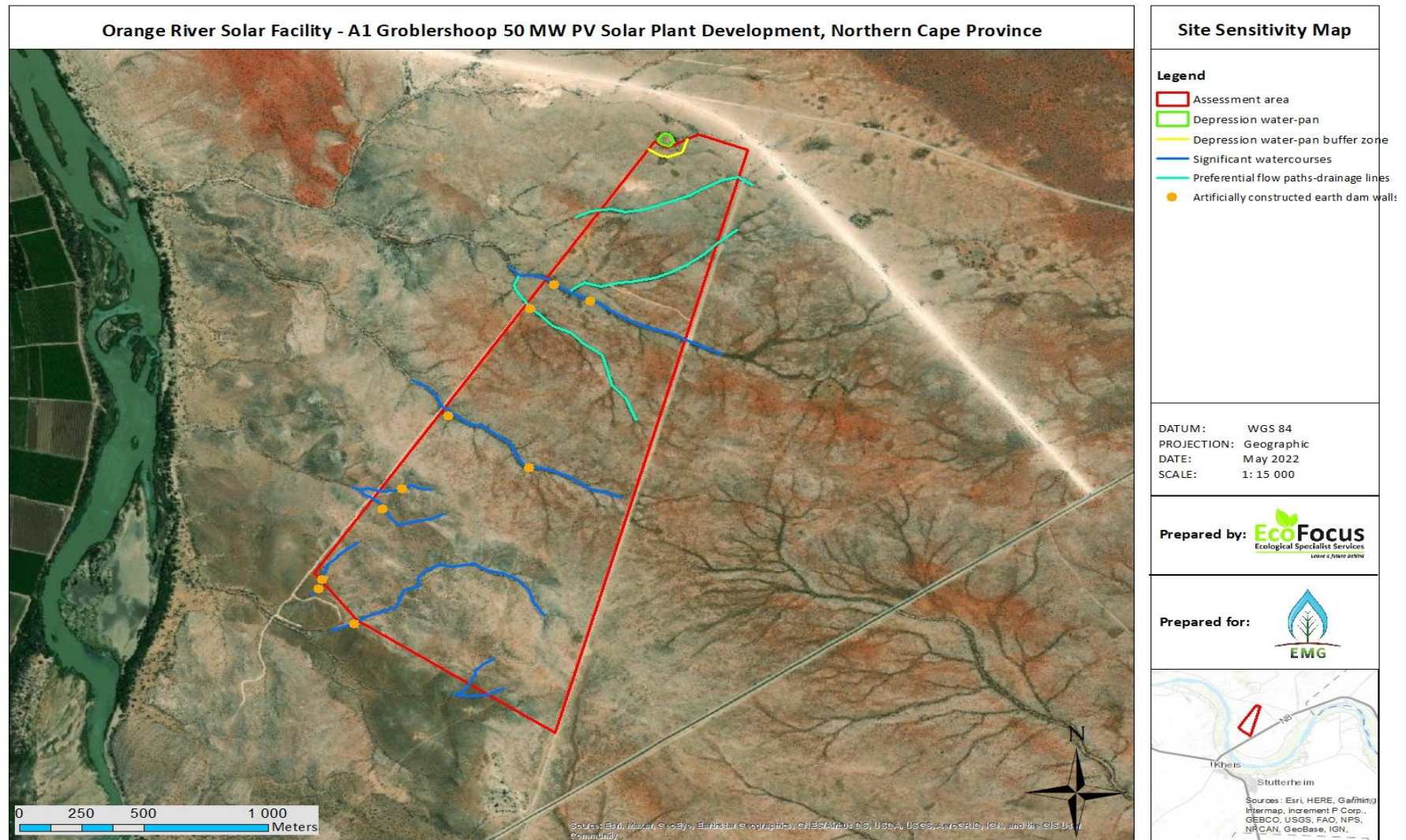


Figure 8: Aquatic site sensitivity map illustrating the identified eight significant ephemeral watercourses as well as the identified three small but significant ephemeral preferential water flow paths/drainage lines, which traverse the assessment area; the approximate delineation of the small isolated depression water-pan and its recommended buffer zone is also illustrated

9.8. Water Use License Application (WULA) Risk Assessment Matrix

Table 10: Water Use License Application (WULA) Risk Assessment Matrix

No	Phase	Activity	Activity Continued	Aspect	Impact	Severity				
						Flow Regime	Physico & Chemical (Water quality)	Habitat (Geomorph + Vegetation)	Biota	Severity
1	Construction Phase	<p>The project applicant, Orange River Solar Facility, proposes to develop a 50 MW Photovoltaic (PV) solar power generation facility outside the town of Groblershoop, Northern Cape Province. The proposed development will entail formal construction of approximately 178 ha for the associated solar infrastructure. The town forms part of the Ikheis Local Municipality which in turn, forms part of the ZF Mgcawu District Municipality.</p> <p>The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints.</p> <p>The broader region surrounding the assessment area constitutes a vast, continuous undeveloped natural landscape although extensive existing agricultural developments are present, along the localised and broader length of the Orange River.</p> <p>The assessment area falls within the D73D quaternary surface water catchment- and drainage area. The Orange River flows past the assessment area, approximately 600 m to the west and continues in a north-westerly direction. The Orange River is considered a primary national water resource; any potentially significant negative impacts on the ecological functionality and/or -services provided by the River, which could pose a potential threat to national water security, should therefore be avoided as far as practicable/reasonably possible.</p>	<p>Eight significant first- and second-order ephemeral watercourses traverse the assessment area, which constitute the main surface water flow paths of the small localised catchment- and drainage area towards the west, associated with the assessment area. These watercourses therefore form an important part of the localised surface water catchment and drainage.</p> <p>Due to the sloping and undulating landscape of the assessment area, numerous small first-order ephemeral preferential water flow paths/drainage lines also traverse the assessment area, of which three are deemed to be hydrologically significant. These flow paths/drainage lines assist with channelling and discharging surface water runoff through the assessment area, into the significant watercourses associated with the assessment area. These flow paths/drainage lines therefore merely play an assisting role in the localised catchment and drainage and are not necessarily viewed as being of high conservation significance, from a hydrological perspective.</p> <p>A small isolated depression water-pan is also situated directly adjacent outside the north-western corner boundary of the assessment area. The pan likely provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>	Mechanical clearance of vegetation and excavation activities, associated with the construction of the proposed solar facility development.	<p>Transformation of an aquatic Critical Biodiversity Area two (CBA 2), associated with the important ecological corridor that runs along the Orange River</p> <p>The assessment area constitutes a single footprint area of approximately 178 ha in size. The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints.</p> <p>The assessment area falls within a Critical Biodiversity Area two (CBA 2), in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSPBP), which sets out biodiversity priority areas in the province. From an aquatic perspective, the relevant CBA 2 is mainly associated with the important ecological corridor that runs along the Orange River, which flows past the assessment area, approximately 600 m to the west.</p>	2	2	2	2	2.00

Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Control Measures Continued	PES & EIS of Watercourse
2	2	6.00	3	3	5	1	12	72	Medium	90	<p>The EAP must determine from the relevant competent authorities whether the artificial dam walls which have been constructed within the various watercourses, possess the required Environmental Authorisations and Water Use Licenses, in accordance with the relevant/applicable environmental legislation. If this is not the case, it is recommended that the dam walls be completely removed from the watercourses, with immediate effect. The flow regimes of the watercourses should also be adequately restored in order to allow for continued flow within the localised catchment. This must be done to assist in maintaining the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area.</p> <p>It is recommended that vegetation clearance should be minimised as far as practicably/reasonably possible and should only occur within the PV grid-, internal access/services road- and other associated facility infrastructure footprints. Existing vegetation in- between the main physical footprint areas, should not be cleared or damaged and should be left intact and adequately conserved, as far as practicably/reasonably possible.</p> <p>The proposed development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the localised undeveloped landscape surrounding the proposed development footprint, may take place.</p> <p>No site construction basecamps may be established within the localised undeveloped landscape surrounding the proposed development footprint.</p>	<p>Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the localised undeveloped landscape outside the cordoned off area.</p> <p>Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern and restrict movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities.</p> <p>Existing roads and farm tracks in close proximity to the proposed development construction footprint area, must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented through the localised undeveloped landscape surrounding the proposed development footprint.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint area must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>From an aquatic ecological perspective, it is the opinion of the specialist that a Biodiversity Offset is not necessarily required for the proposed transformation of the relevant CBA 2 portion. The relevant competent authorities, namely DENC and DAFF, must however advise on the potential requirement of a Biodiversity Offset, in order to compensate for the inevitable loss of terrestrial biodiversity.</p>	<p>PES (Significant watercourses and small preferential water flow paths/drainage lines) = Class C (moderately modified), although it still borders on Class B. Slight to moderate transformation and associated negative impact has occurred, mainly as a result of the construction of the ten artificial earth dam walls within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream. The basic ecosystem functionality within the watercourses and flow paths/drainage lines has however remained predominantly unchanged.</p> <p>PES (Small depression pan) = Class B (largely natural). A small change in natural habitats and biota may have taken place, mainly as a result of grazing by livestock and game that takes place within the assessment area. The ecosystem functionality within the pan has however remained essentially unchanged.</p> <p>EIS (Significant watercourses) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) as well as these watercourses forming an important part of the localised surface water catchment and drainage. The assessment area and watercourses furthermore also form part of the local and broader quaternary surface water catchment- and drainage area, towards the north-west. Biodiversity is however still relatively ubiquitous.</p> <p>EIS (Small preferential flow paths/drainage lines) = Class C (moderate), although it borders on Class D (low/marginal). Merely viewed as being ecologically important and sensitive on local scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.</p> <p>EIS (Small depression pan) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) and the pan likely providing an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>

No	Phase	Activity	Activity Continued	Aspect	Impact	Severity				
						Flow Regime	Physico & Chemical (Water quality)	Habitat (Geomorph + Vegetation)	Biota	Severity
2	Construction Phase	<p>The project applicant, Orange River Solar Facility, proposes to develop a 50 MW Photovoltaic (PV) solar power generation facility outside the town of Groblershoop, Northern Cape Province. The proposed development will entail formal construction of approximately 178 ha for the associated solar infrastructure. The town forms part of the !Kheis Local Municipality which in turn, forms part of the ZF Mgawu District Municipality.</p> <p>The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints.</p> <p>The broader region surrounding the assessment area constitutes a vast, continuous undeveloped natural landscape although extensive existing agricultural developments are present, along the localised and broader length of the Orange River.</p> <p>The assessment area falls within the D73D quaternary surface water catchment- and drainage area. The Orange River flows past the assessment area, approximately 600 m to the west and continues in a north-westerly direction. The Orange River is considered a primary national water resource; any potentially significant negative impacts on the ecological functionality and/or -services provided by the River, which could pose a potential threat to national water security, should therefore be avoided as far as practicably/reasonably possible.</p>	<p>Eight significant first- and second-order ephemeral watercourses traverse the assessment area, which constitute the main surface water flow paths of the small localised catchment- and drainage area towards the west, associated with the assessment area. These watercourses therefore form an important part of the localised surface water catchment and drainage.</p> <p>Due to the sloping and undulating landscape of the assessment area, numerous small first-order ephemeral preferential water flow paths/drainage lines also traverse the assessment area, of which three are deemed to be hydrologically significant. These flow paths/drainage lines assist with channelling and discharging surface water runoff through the assessment area, into the significant watercourses associated with the assessment area. These flow paths/drainage lines therefore merely play an assisting role in the localised catchment and drainage and are not necessarily viewed as being of high conservation significance, from a hydrological perspective.</p> <p>A small isolated depression water-pan is also situated directly adjacent outside the north-western corner boundary of the assessment area. The pan likely provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>	Mechanical clearance of vegetation and excavation activities, associated with the construction of the proposed solar facility development.	<p>Disturbance of-/damage to semi-aquatic faunal habitats, associated with the watercourses and pan</p> <p>The assessment area constitutes a single footprint area of approximately 178 ha in size. The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints.</p> <p>The increased woody densities associated with the watercourses likely provide significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p> <p>The pan likely provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>	1	1	2	2	1.50

Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Control Measures Continued	PES & EIS of Watercourse
2	2	5.50	2	2	5	1	10	55	Low	90	<p>It is recommended that the identified eight significant watercourses be adequately buffered out of the proposed development footprint area. A minimum approximately 35 m buffer distance is proposed to be implemented on both sides of all the watercourse edges. No current or future development is allowed to take place within these buffered zones.</p> <p>Avoidance of development through the flow paths/drainage lines would constitute the first impact mitigation option, in accordance with the requirements of the NEMA (Act 107 of 1998) Mitigation Hierarchy. However, as the flow paths/drainage lines merely play an assisting role in the small localised catchment and drainage, it is the opinion of the specialist that avoidance of development through the flow paths/drainage lines is not necessarily required, but is still recommended.</p> <p>It is therefore recommended that the identified three flow paths/drainage lines be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is proposed to be implemented on both sides of all the flow path/drainage line edges. No current or future development is allowed to take place within these buffered zones.</p> <p>However, if avoidance of development through the flow paths/drainage lines is not practicably possible/feasible, it is then recommended that sufficient continued stormwater runoff within- and through the assessment area towards the west, must still be ensured and sufficiently managed. An adequate Stormwater and Erosion Management Plan must be implemented during the construction- and operational phases of the proposed development, in order to assist with this and allow for continued flow within the localised catchment. This must be done to attempt to maintain the ecological functionality and integrity of the local and broader quaternary surface water catchment- and drainage area. A Water Use License Application (WULA) must also be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the flow paths/drainage lines that traverse the assessment area, in accordance with the National Water Act (Act 36 of 1998).</p>	<p>It is recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.</p> <p>The proposed development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the localised undeveloped landscape surrounding the proposed development footprint, may take place.</p> <p>No site construction basecamps may be established within the localised undeveloped landscape surrounding the proposed development footprint.</p> <p>Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the localised undeveloped landscape outside the cordoned off area.</p> <p>Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern and restrict movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities.</p> <p>Existing roads and farm tracks in close proximity to the proposed development construction footprint area, must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented through the localised undeveloped landscape surrounding the proposed development footprint.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint area must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>	<p>PES (Significant watercourses and small preferential water flow paths/drainage lines) = Class C (moderately modified), although it still borders on Class B. Slight to moderate transformation and associated negative impact has occurred, mainly as a result of the construction of the ten artificial earth dam walls within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream. The basic ecosystem functionality within the watercourses and flow paths/drainage lines has however remained predominantly unchanged.</p> <p>PES (Small depression pan) = Class B (largely natural). A small change in natural habitats and biota may have taken place, mainly as a result of grazing by livestock and game that takes place within the assessment area. The ecosystem functionality within the pan has however remained essentially unchanged.</p> <p>EIS (Significant watercourses) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) as well as these watercourses forming an important part of the localised surface water catchment and drainage. The assessment area and watercourses furthermore also form part of the local and broader quaternary surface water catchment- and drainage area, towards the north-west. Biodiversity is however still relatively ubiquitous.</p> <p>EIS (Small preferential flow paths/drainage lines) = Class C (moderate), although it borders on Class D (low/marginal). Merely viewed as being ecologically important and sensitive on local scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.</p> <p>EIS (Small depression pan) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) and the pan likely providing an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>

No	Phase	Activity	Activity Continued	Aspect	Impact	Severity				
						Flow Regime	Physico & Chemical (Water quality)	Habitat (Geomorph + Vegetation)	Biota	Severity
3	Construction Phase	<p>The project applicant, Orange River Solar Facility, proposes to develop a 50 MW Photovoltaic (PV) solar power generation facility outside the town of Groblershoop, Northern Cape Province. The proposed development will entail formal construction of approximately 178 ha for the associated solar infrastructure. The town forms part of the !Kheis Local Municipality which in turn, forms part of the ZF Mgcawu District Municipality.</p> <p>The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints.</p> <p>The broader region surrounding the assessment area constitutes a vast, continuous undeveloped natural landscape although extensive existing agricultural developments are present, along the localised and broader length of the Orange River.</p> <p>The assessment area falls within the D73D quaternary surface water catchment- and drainage area. The Orange River flows past the assessment area, approximately 600 m to the west and continues in a north-westerly direction. The Orange River is considered a primary national water resource; any potentially significant negative impacts on the ecological functionality and/or -services provided by the River, which could pose a potential threat to national water security, should therefore be avoided as far as practicably/reasonably possible.</p>	<p>Eight significant first- and second-order ephemeral watercourses traverse the assessment area, which constitute the main surface water flow paths of the small localised catchment- and drainage area towards the west, associated with the assessment area. These watercourses therefore form an important part of the localised surface water catchment and drainage.</p> <p>Due to the sloping and undulating landscape of the assessment area, numerous small first-order ephemeral preferential water flow paths/drainage lines also traverse the assessment area, of which three are deemed to be hydrologically significant. These flow paths/drainage lines assist with channelling and discharging surface water runoff through the assessment area, into the significant watercourses associated with the assessment area. These flow paths/drainage lines therefore merely play an assisting role in the localised catchment and drainage and are not necessarily viewed as being of high conservation significance, from a hydrological perspective.</p> <p>A small isolated depression water-pan is also situated directly adjacent outside the north-western corner boundary of the assessment area. The pan likely provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>	Mechanical clearance of vegetation and excavation activities, associated with the construction of the proposed solar facility development.	<p>Terrestrial and aquatic alien invasive species establishment within the watercourses, flow paths/drainage lines and pan</p> <p>At the time of the site assessment, no significant legally declared alien invasive species establishments were found to be present throughout the watercourses, flow paths/drainage lines or pan, associated with the assessment area.</p> <p>The proposed development area could however potentially be prone to slight alien invasive species establishment, due to surface disturbance and vegetation clearance caused by construction activities. The presence of the watercourses and flow paths/drainage which traverse the assessment area, could further also potentially act as a significant transport/distribution vector for numerous terrestrial and aquatic alien invasive species into the broader region.</p>	1	1	1	1	1.00

Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Control Measures Continued	PES & EIS of Watercourse
2	2	5.00	2	2	5	2	11	55	Low	90	<p>Implement an adequate Alien Invasive Species Management Plan during the construction- and operational phases. Such a Management Plan must be compiled by a suitably qualified and experienced ecologist.</p> <p>It is recommended that the identified eight significant watercourses be adequately buffered out of the proposed development footprint area. A minimum approximately 35 m buffer distance is proposed to be implemented on both sides of all the watercourse edges. No current or future development is allowed to take place within these buffered zones.</p> <p>Avoidance of development through the flow paths/drainage lines would constitute the first impact mitigation option, in accordance with the requirements of the NEMA (Act 107 of 1998) Mitigation Hierarchy. However, as the flow paths/drainage lines merely play an assisting role in the small localised catchment and drainage, it is the opinion of the specialist that avoidance of development through the flow paths/drainage lines is not necessarily required, but is still recommended.</p> <p>It is therefore recommended that the identified three flow paths/drainage lines be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is proposed to be implemented on both sides of all the flow path/drainage line edges. No current or future development is allowed to take place within these buffered zones.</p>	<p>However, if avoidance of development through the flow paths/drainage lines is not practicably possible/feasible, it is then recommended that sufficient continued stormwater runoff within- and through the assessment area towards the west, must still be ensured and sufficiently managed. An adequate Stormwater and Erosion Management Plan must be implemented during the construction- and operational phases of the proposed development, in order to assist with this and allow for continued flow within the localised catchment. This must be done to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area. A Water Use License Application (WULA) must also be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the flow paths/drainage lines that traverse the assessment area, in accordance with the National Water Act (Act 36 of 1998).</p> <p>It is recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint area must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>	<p>PES (Significant watercourses and small preferential water flow paths/drainage lines) = Class C (moderately modified), although it still borders on Class B. Slight to moderate transformation and associated negative impact has occurred, mainly as a result of the construction of the ten artificial earth dam walls within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream. The basic ecosystem functionality within the watercourses and flow paths/drainage lines has however remained predominantly unchanged.</p> <p>PES (Small depression pan) = Class B (largely natural). A small change in natural habitats and biota may have taken place, mainly as a result of grazing by livestock and game that takes place within the assessment area. The ecosystem functionality within the pan has however remained essentially unchanged.</p> <p>EIS (Significant watercourses) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) as well as these watercourses forming an important part of the localised surface water catchment and drainage. The assessment area and watercourses furthermore also form part of the local and broader quaternary surface water catchment- and drainage area, towards the north-west. Biodiversity is however still relatively ubiquitous.</p> <p>EIS (Small preferential flow paths/drainage lines) = Class C (moderate), although it borders on Class D (low/marginal). Merely viewed as being ecologically important and sensitive on local scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.</p> <p>EIS (Small depression pan) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) and the pan likely providing an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>

No	Phase	Activity	Activity Continued	Aspect	Impact	Severity				
						Flow Regime	Physico & Chemical (Water quality)	Habitat (Geomorph + Vegetation)	Biota	Severity
4	Construction Phase	<p>The project applicant, Orange River Solar Facility, proposes to develop a 50 MW Photovoltaic (PV) solar power generation facility outside the town of Groblershoop, Northern Cape Province. The proposed development will entail formal construction of approximately 178 ha for the associated solar infrastructure. The town forms part of the !Kheis Local Municipality which in turn, forms part of the ZF Mgcawu District Municipality.</p> <p>The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints.</p> <p>The broader region surrounding the assessment area constitutes a vast, continuous undeveloped natural landscape although extensive existing agricultural developments are present, along the localised and broader length of the Orange River.</p> <p>The assessment area falls within the D73D quaternary surface water catchment- and drainage area. The Orange River flows past the assessment area, approximately 600 m to the west and continues in a north-westerly direction. The Orange River is considered a primary national water resource; any potentially significant negative impacts on the ecological functionality and/or -services provided by the River, which could pose a potential threat to national water security, should therefore be avoided as far as practicably/reasonably possible.</p>	<p>Eight significant first- and second-order ephemeral watercourses traverse the assessment area, which constitute the main surface water flow paths of the small localised catchment- and drainage area towards the west, associated with the assessment area. These watercourses therefore form an important part of the localised surface water catchment and drainage.</p> <p>Due to the sloping and undulating landscape of the assessment area, numerous small first-order ephemeral preferential water flow paths/drainage lines also traverse the assessment area, of which three are deemed to be hydrologically significant. These flow paths/drainage lines assist with channelling and discharging surface water runoff through the assessment area, into the significant watercourses associated with the assessment area. These flow paths/drainage lines therefore merely play an assisting role in the localised catchment and drainage and are not necessarily viewed as being of high conservation significance, from a hydrological perspective.</p> <p>A small isolated depression water-pan is also situated directly adjacent outside the north-western corner boundary of the assessment area. The pan likely provides an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>	Mechanical clearance of vegetation and excavation activities, associated with the construction of the proposed solar facility development.	<p>Contamination of the Orange River by surface material erosion</p> <p>The majority of the assessment area constitutes a relatively natural slight to moderately sloping landscape, while the south-western and central-southern portions consist of steeply sloping and undulating hills.</p> <p>The assessment area constitutes a single footprint area of approximately 178 ha in size. The mechanical clearance associated with the proposed solar development, will in all probability completely transform the majority of the existing surface vegetation within the PV grid-, internal access/services road- and other associated facility infrastructure footprints. The assessment area could therefore likely be prone to significant potential surface soil erosion, due to the sloping and undulating landscape together with the loosening of surface materials and clearance of vegetation caused by construction activities, which usually binds the soil surface. Such soil erosion could potentially lead to gradual continual contamination of the Orange River over time.</p> <p>The Orange River is considered a primary national water resource; any potentially significant negative impacts on the ecological functionality and/or -services provided by the river, which could pose a potential threat to national water security, should therefore be avoided as far as practicably/reasonably possible.</p>	1	1	1	1	1.00

Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence level	Control Measures	Control Measures Continued	PES & EIS of Watercourse
2	2	5.00	2	1	5	3	11	55	Low	90	<p>It is recommended that vegetation clearance should be minimised as far as practicably/reasonably possible and should only occur within the PV grid, internal access/services road- and other associated facility infrastructure footprints. Existing vegetation in-between the main physical footprint areas, should not be cleared or damaged and should be left intact and adequately conserved, as far as practicably/reasonably possible. This must be done in order to sufficiently manage and prevent any significant soil erosion from occurring in and around the assessment area, which could potentially lead to contamination of the Orange River over time.</p> <p>It is recommended that the identified eight significant watercourses be adequately buffered out of the proposed development footprint area. A minimum approximately 35 m buffer distance is proposed to be implemented on both sides of all the watercourse edges. No current or future development is allowed to take place within these buffered zones.</p> <p>Avoidance of development through the flow paths/drainage lines would constitute the first impact mitigation option, in accordance with the requirements of the NEMA (Act 107 of 1998) Mitigation Hierarchy. However, as the flow paths/drainage lines merely play an assisting role in the small localised catchment and drainage, it is the opinion of the specialist that avoidance of development through the flow paths/drainage lines is not necessarily required, but is still recommended.</p> <p>It is therefore recommended that the identified three flow paths/drainage lines be adequately buffered out of the proposed development footprint area. A minimum approximately 20 m buffer distance is proposed to be implemented on both sides of all the flow path/drainage line edges. No current or future development is allowed to take place within these buffered zones.</p>	<p>However, if avoidance of development through the flow paths/drainage lines is not practicably possible/feasible, it is then recommended that sufficient continued stormwater runoff within- and through the assessment area towards the west, must still be ensured and sufficiently managed. An adequate Stormwater and Erosion Management Plan must be implemented during the construction- and operational phases of the proposed development, in order to assist with this and allow for continued flow within the localised catchment. This must be done to attempt to maintain the ecological functionality and -integrity of the local and broader quaternary surface water catchment- and drainage area. A Water Use License Application (WULA) must also be submitted to the Department of Water and Sanitation (DWS), to request authorisation for the proposed development through the flow paths/drainage lines that traverse the assessment area, in accordance with the National Water Act (Act 36 of 1998).</p> <p>It is recommended that the identified pan be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer distance is proposed to be implemented around the pan edges. No current or future development is allowed to take place within this buffered zone.</p> <p>Disturbed areas within and immediately surrounding the proposed development footprint area must be adequately rehabilitated as soon as practicably possible after construction. A Rehabilitation Management Plan must be compiled by a suitably qualified and experienced ecologist.</p>	<p>PES (Significant watercourses and small preferential water flow paths/drainage lines) = Class C (moderately modified), although it still borders on Class B. Slight to moderate transformation and associated negative impact has occurred, mainly as a result of the construction of the ten artificial earth dam walls within the various watercourses, which are significantly impeding the ephemeral flow regimes of the watercourses. The negative impacts of these impediments will however mostly be experienced further downstream. The basic ecosystem functionality within the watercourses and flow paths/drainage lines has however remained predominantly unchanged.</p> <p>PES (Small depression pan) = Class B (largely natural). A small change in natural habitats and biota may have taken place, mainly as a result of grazing by livestock and game that takes place within the assessment area. The ecosystem functionality within the pan has however remained essentially unchanged.</p> <p>EIS (Significant watercourses) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) as well as these watercourses forming an important part of the localised surface water catchment and drainage. The assessment area and watercourses furthermore also form part of the local and broader quaternary surface water catchment- and drainage area, towards the north-west. Biodiversity is however still relatively ubiquitous.</p> <p>EIS (Small preferential flow paths/drainage lines) = Class C (moderate), although it borders on Class D (low/marginal). Merely viewed as being ecologically important and sensitive on local scale. Biodiversity is ubiquitous and not unique or sensitive to habitat modifications.</p> <p>EIS (Small depression pan) = C (moderate). Viewed as being ecologically important and sensitive on local or possibly provincial scale, mainly due to the area forming part of a Critical Biodiversity Area two (CBA 2) and the pan likely providing an important watering hole as well as significant refuge and locally distinct habitat for common and habitat-specific bird-, reptilian-, small antelope- as well as other mammalian species.</p>